HOW DO THEY FARE? A STUDY OF LEARNING ACHIEVEMENT AND SATISFACTION WITH BLENDED LEARNING FOR TRADITIONAL-AGE UNDERGRADUATES AT MODERATELY SELECTIVE COLLEGES

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Dedication and Acknowledgement

I would like to express my sincere thanks to my advisor, Dr. Yufeng Qian, who provided me with the support and guidance that I needed to get through this journey. Her positive, yet constructive feedback enabled me to tackle each phase of the process and successfully reach each milestone along the way. I would also like to thank Dr. Gail Matthews-DeNatale, for her thoughtful feedback as my second reader. Lastly, I would like to acknowledge Dr. Neil Trotta for his willingness to participate in this study and Dr. Thomas McGovern for his ongoing support and encouragement.

I would like to dedicate this work to my family for their sacrifices and understanding as I pursued this goal. First, I need to thank my husband, George, who was there to back me up with family responsibilities, and my children Kyle and Casey, who suffered the most during these past four years. To my parents, Alan and Joan Kuser, and my sisters, Debbie and Karen, I offer my appreciation for their encouragement and support; they will never know how much that meant to me. And I would also like to recognize my in-laws, Paul and Kim Komarnicki whose encouragement was greatly appreciated.
Abstract

Blended learning is proliferating rapidly in higher education across the United States. However, this learning environment may pose new challenges to learners at moderately selective colleges who are normally found to be low in autonomy. This study used a quasi-experimental design to examine student learning achievement and satisfaction in two sections of a course, with one being a blended class section and the other being a face-to-face class section. Course content, instructional design, the assessment, and the instructor were matched; the only difference was the mode of instruction. Data on students’ learning achievement was collected through a final exam. Students’ satisfaction with the class was measured via an end-of-course survey. In addition, the relationship between the constructs of structure, dialogue, and autonomy with satisfaction, as found in Moore’s theory of transactional distance, were examined. While the results lacked statistical significance, students in the traditional class achieved slightly higher learning achievement as measured by a final exam, despite a slight lower incoming mean GPA, and they had a slightly higher level of satisfaction. The constructs of transactional distance of structure, dialogue and autonomy showed strong correlation with satisfaction within both classes, but were stronger yet for the blended section. This stronger correlation in conjunction with the slightly lower assessment of satisfaction supports the existence of increased transactional distance, albeit minimal, in a blended format.

Keywords: blended learning, dialogue, hybrid learning, learning autonomy, moderately selective college, structure, traditional-age undergraduates
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Chapter 1: Introduction

Statement of the Problem

Blended learning is proliferating rapidly in higher education across the United States due to its prominent benefits, including flexibility, accessibility, and integration of traditional pedagogical benefits of face-to-face learning and potentially transformative learning enabled by emerging technologies. In 2005, 93% of higher education instructors and administrators surveyed reported using blended learning strategies in some courses within their institution (Bonk, Kim, & Zeng, 2005). In addition, seven in ten of the survey respondents referenced above, expected more than 40% of their courses to be blended by 2013. A Sloan Consortium study in 2007, found that 45.9% of undergraduate institutions offered some portion of their programs in a blended format and 55.3% offered some portion in an online format (Allen, Seaman, & Garrett, 2007). A 2011 Pew Research Study (Quitney, Boyles, & Rainie, 2012) on the future of higher education, surveyed over 1000 academic stakeholders and found that 60% expected dramatic change in higher education by 2020 including “a transition to ‘hybrid’ classes that combine online learning components with less frequent on campus, in person class meetings” (p.14). The insights and expectations from these higher education leaders, speaks to the growing relevance of this delivery mode.

There are many benefits associated with the blended (also referred to as hybrid) model, including the use of diverse pedagogical strategies, accessibility, flexibility, and convenience for the students (Kaleta, Skibba, & Joosten, 2007; Vasileiou, 2009). However, there are mixed results, as reported through various studies regarding the learning implications and student perceptions of blended learning (Ashby, Sadera, & McNary, 2011; Foulger, Amrein-Beardsley, & Toth, 2011). Blended learning, a variation of distance education, creates a different level of dialogue or interaction between students as well as with the instructor (Moore, 2013). Various
factors impact the level of dialogue in any environment, however the reduced face-to-face interaction in a blended environment may contribute to the psychological space and understanding between instructor and student. Transactional distance theory, further detailed in the following section, maintains that different levels of student autonomy are required based on the level of structure and dialogue within the course design (Moore, 2013). Student autonomy, or ability to work independently, is closely aligned with the concepts of self-determination, self-efficacy, and self-directed learning (Deci & Ryan, 2012; Hung, Chou, Chen, & Own, 2010; Tsai, Chuang, Liang, & Tsai, 2011). Each of these constructs influences student attitudes regarding the course (Moore, 2013). As the expansion of blended courses in higher education continues, refined evidence regarding student learning and the satisfaction of subsets of the general higher education population is needed (Manning & Emmons, 2010). As noted by Moore (2013), “a common cause of failure, or at least of courses falling short of expectations, is a failure to design the balance of structure and dialogue that is appropriate for a particular student population and subject field” (p.71). This study seeks to investigate this balance and the resulting student learning achievement and satisfaction in a blended learning environment for traditional-age undergraduates in moderately selective colleges.

In the fall of 2010, 18.1 million students were enrolled in undergraduate degree seeking programs in the United States, of these, 7 million students attended college full-time (Aud, Hussar, Johnson, Kena, & Roth, 2012). Of the full-time students, only 19% attended private nonprofits, which includes the highly selective institutions, and 26% attended two-year public colleges, which include primarily open enrollment institutions (Aud, et al., 2012). According to The College Board, 30% of colleges are less selective or somewhat selective, another 45% are open enrollment (2012). Given this categorization by the College Board, this study is designed
to address the students who attend the less selective institutions, a population that has not been addressed within the existing literature. This population is distinct from an academic perspective from the incoming class at selective or highly selective institutions, from non-traditional students, and from graduate students. Students with moderate academic performance have been found to be low in academic motivation and self-discipline (Beck, Rorrer-Woody, & Pierce, 1991; Fulk, 2003; Kim & Keller, 2008). Is a blended format an appropriate learning environment for this group of learners? Does it have negative implications for achievement of learning outcomes or student satisfaction for this group of learners? There has been limited research on this group of learners in higher education. Institutional interest in offering blended courses, driven by resource constraints and student demand for flexibility, necessitates the exploration of these impacts. Academic administrators and faculty members at moderately selective institutions may benefit from the insight provided by this study and enable them to design and develop blended learning environments that meet the needs of their students.

**Significance of the Problem**

Examination of the effectiveness of blended learning for traditional-age undergraduates at moderately selective colleges is significant for several reasons. As noted by Garrison and Kanuka (2004), blended learning “is having a volatile impact on traditional campus-based institutions of higher education” (p. 96). Students are increasingly arriving at college with technology-based learning experiences and expectations (Jefferies & Hyde, 2010; VanDerWerf & Sabatier, 2009). In addition, many students, even those of traditional-age, need to work through college (Foulger, et al., 2011; Garrison & Kanuka, 2004; Jefferies & Hyde, 2010; Johnson & Rochkind, 2010). According to a Public Agenda study by Johnson and Rochkind (2010) “among students in four-year schools, 45% work more than 20 hours per week” (p. 4).
Flexibility and convenience are important factors for these students, and blended learning fulfills these needs.

Additionally, institutions are increasingly taxed with serving more students with fewer resources, and blended learning allows them to leverage those resources (Ashby, et al., 2011; Garrison & Kanuka, 2004; Hartman, Dziuban, & Moskal, 2007; Thor, 2010). As noted by Kaleta, et. al. (2007), blended learning provides “faculty with greater flexibility in how they structure their time, and increases classroom space for institutions to serve more students without building more classrooms” (p. 112). Increased classroom utilization can be obtained through shared usage during the same time block, facilitated by the implementation of blended courses (Hartman, et al., 2007; Vaughan, 2007). Additional administrative cost savings have been identified through the use of technology to facilitate shared resources among more than one course section and automating assessments (Vaughan, 2007). This time savings provides instructors the opportunity to manage larger class sizes and engage in more high impact activities. Supplemental cost savings could be leveraged into shared office space, and reduced commuting costs for faculty as well as students.

Many research studies exist on the subject of blended learning in various settings and formats. However, a thorough review has uncovered no specific research related to blended learning for traditional-age undergraduates at moderately selective institutions. Research related to community colleges may offer some insight, as these institutions often serve underprepared students, but they differ in several significant areas: open enrollment and the combination of traditional and non-traditional students. Many studies take place at large universities but do not make any reference to level of selectivity of the institution (Hoyt, 2003; Kenney & Newcombe, 2011; López-Pérez, Pérez-López, & Lázaro, 2011; Uzun & Senturk, 2010), others are conducted
with graduate students (Falloon, 2011; McLaren, 2010). Traditional-age undergraduates at moderately selective colleges represent a void in the literature, and one that is in need of investigation.

**Practical and Intellectual Goals**

The primary goal of this research will be to inform practice at moderately selective institutions of higher education by examining the effectiveness of blended learning for traditional-age undergraduate students within the institution. As the Vice President for Academic Affairs (VPAA) at a moderately selective institution (average freshman class with 2.3 GPA) with space constraints, the researcher is challenged by the ability to expand course offerings. There is also a continuous need to ensure students are satisfied and learning is effective in the blended environment. The second goal of this study, therefore, is to examine what would be the optimal balance between course structure and dialogue based upon the autonomy of the individual learner. In order to determine if it is practical and ethical to expand this format of delivery at such institutions and what would be the ideal blended course design in response to learners’ autonomy levels, further research is warranted and will provide insight into a current problem of practice.

**Positionality Statement**

As an administrator at a moderately selective institution that is space constrained, the ability to offer blended courses holds great practical potential. My personal bias is that blended learning is an excellent teaching structure that can better meet the needs and learning style of students, therefore improving learning and satisfaction of these students. However, students with the GPA range that enter moderately selective institutions do not excel at school for various reasons which could include ability, motivation, self-management, resources and confidence
(Beck, et al., 1991; DeVilbiss, Rice, Laws, & Alfred, 2010; Fulk, 2003; Kim & Keller, 2010). In fact, a Learning House survey of Chief Academic Officers found that 70% of respondents reported “students’ lack of discipline to succeed in online courses appears to be the most significant barrier” to expanding the use of online and blended courses (Clinefelter & Magda, 2013, p. 13). My concern, along with these colleagues, is that blended learning, will require more learner autonomy than a face-to-face class, which may negatively affect student outcomes and satisfaction given this background.

**Research Questions**

The purpose of this study is to compare learning achievement and student satisfaction between two course structures for traditional-age undergraduates at a moderately selective college. The course delivery mode of blended and face-to-face forms the basis of the investigation. The study will address the following research questions:

**Question 1:** To what extent does learning achievement of traditional-age undergraduates in a moderately selective college differ in a blended learning mode and a face-to-face mode?

**Question 2:** To what extent does course satisfaction of traditional-age undergraduates in a moderately selective college differ in a blended learning mode and a face-to-face mode?

**Question 3:** To what extent do a course’s structure, dialogue, and student autonomy relate to course satisfaction of traditional-age undergraduates in a moderately selective college in a blended learning mode and in a face-to-face mode?

**Theoretical Framework**

As noted by Anfara and Mertz (2006) “a useful theory is one that tells an enlightening story about some phenomenon” (p. xvii). A theoretical framework is necessary to ground the
study and interpret the findings (Rocco & Plakhotnik, 2009). In quantitative research, a study is framed by a theory and used to test the theory through analysis of the results (Anfara & Mertz, 2006; Creswell, 2007; Merriam, 2001; Rocco & Plakhotnik, 2009). As noted by Merriam (2001), a theory should provide the “structure, the scaffolding, the frame of your study” (p. 45). Furthermore, a theory should provide an explanation for the observed phenomenon (Anfara & Mertz, 2006).

Blended learning can be framed and evaluated from any number of theoretical lenses. Minter (2011) identified 22 theoretical categories relevant to pedagogical issues in higher education, including adult learning, behavioral, collaborative, transformational and motivational theories. This study seeks to evaluate both learning and satisfaction of a course, in two course structures; therefore, the selected theory must provide a framework to provide comparisons. Learning theory provides an appropriate perspective; however, there are many theoretical perspectives and individual theories from which to choose. Learning theory has evolved over time in keeping with the evolution of research within social sciences and resulted in the development of three primary paradigms (Ertmer & Newby, 2013; Harasim, 2012). This historical continuum provides the basis for the development of additional theories and frameworks (Harasim, 2012). The first framework in the continuum is represented by the works of behaviorist theorists such as Pavlov and Skinner, and is based on the concept of conditioning and how to elicit the desired response from the subject (Ertmer & Newby, 2013; Harasim, 2012). Behaviorists have focused on stimulus and response without consideration for thought by the subject (Harasim, 2012).

This school of thought gave way to cognitivist learning theory, which additionally recognized the role of the individual and their own mind and its ability to process information
and contribute to the student action and outcomes (Harasim, 2012; Shuell, 1986). Cognitivists gave significant consideration to the role of the student in learning but continued to see the relationship of the student as assimilating information provided by an instructor (Harasim, 2012). These theoretical perspectives are based on the epistemological assumption that knowledge is transferred through effective communication from teacher to student (Ertmer & Newby, 2013; Harasim, 2012).

The third framework is referred to as the constructivist school of thought which suggests that learners construct knowledge through interactions and activities (Ertmer & Newby, 2013; Harasim, 2012; Jonassen & Land, 2012). As noted by Jonassen and Land (2012), this represented a paradigm shift “to a view of learning that is necessarily more social, conversational, and constructive than traditional transmissive views of learning” (p.1). Learning theories within the constructivist paradigm are also referred to as student-centered learning (Jonassen & Land, 2012). Many theories within this paradigm have evolved including problem-based learning, anchored learning, and collaborative learning (Jonassen & Land, 2012). The community of inquiry framework specifically reflects the social nature of learning and the process of personal construction of meaning and has been used specifically in the analysis of blended learning (Garrison & Vaughan, 2008). From the constructivist perspective, and the associated theories, learning is an active knowledge construction process, with applicability to online and blended learning.

As noted above, blended learning represents a pedagogical approach that modifies the course delivery model and structure, and can be framed from any number of these theoretical perspectives. A theory that derives elements from the cognitivist and constructivist frameworks can be found in Moore’s (1993) theory of transactional distance. The theory of transactional
distance originated during the cognitivist era and addresses the “transmission” of knowledge between teacher and student through analysis of the course structure and communication. However, it can also be framed from the constructivist viewpoint because of the nature of distance education and the need for students to be active participants in the learning process.

The theory of transactional distance was first proposed by Moore in 1972, and formally named in 1980, to address distance education (Moore, 2013). The theory of transactional distance was the first to recognize the pedagogical distinctions associated with distance learning (Saba, 1994). Distance education was defined by Moore (1973) as teaching and learning that did not take place in a classroom with direct contact between student and teacher. Distance education was not limited to geographical distance (Moore, 2013). The use of the term “transaction” was built from a concept by Dewey and relates to the interplay between teachers and learners in a special learning environment (Moore, 2003). Transactional distance is the psychological space and communication gap between student and teacher (Falloon, 2011; Goel, Zhang, & Templeton, 2012; Moore, 2003). The theory has evolved to support a full range of academic structures relative to the separation of learner and teacher, including the use of current technologies in course delivery, specifically blended and online pedagogy (Moore, 2003).

Course structure: The first element of the theory of transactional distance is referred to as course structure. Structure can be defined as the “rigidity or flexibility of the course’s educational objectives, teaching strategies and evaluation methods” (Moore, 2013, p. 70). A course with high structure would have little opportunity for a student to deviate from a prescribed path in the course delivery (Falloon, 2011; Moore, 2013). This theory presumes that online components of the course allow for little deviation and therefore are highly structured, leading to a high level of transactional distance (Moore, 2003). High transactional distance
allows for, and requires a high level of student autonomy, which will be further defined in the following section. Alternatively, the face-to-face class will be directed by the faculty member and allow for modification and adaptation of the learning activities based on the interaction between the students and teacher. Students in the study will complete a survey to evaluate the perception of course structure, providing an analysis of their perception within each course format. This is the first construct within the framework, and one that provides a point of analysis relative to student satisfaction.

**Dialogue:** The second component of transactional distance theory relates to the concept of dialogue (Moore, 2013). Dialogue refers to interpersonal interaction aimed at the creation of knowledge specifically between student and teacher (Moore, 2013). The amount of interaction between student and teacher can be varied across any delivery modality including face-to-face and blended courses. Although Moore limited his concept of dialogue to student-teacher interaction, subsequent theorists have expanded the concept of interaction and dialogue to include student-student interaction as a significant component (Bajt, 2009; Falloon, 2011; Garrison & Vaughan, 2008; Saba, 2013). This construct aligns with current theory, including the community of inquiry framework, which emphasizes social, teaching and cognitive presence (Garrison & Vaughan, 2008). Participants in the study will complete a survey that addresses various aspects of student-student as well as student-teacher dialogue, which will be used to evaluate and interpret the study results. Student satisfaction with dialogue and interaction within the course will be a factor that contributes to the analysis of student satisfaction.

**Autonomous Learning:** The third component of the theory of transactional distance is the concept of learning autonomy (Moore, 2013). Learning autonomy refers to the degree of student independence and self-management relative to establishing goals, seeking support when
needed, managing time, implementing learning strategies and evaluating outcomes as required for the course. The theory proposes that courses will vary in the degree of autonomy required, based on course structure and dialogue. The concept of autonomy is aligned with other theories that relate to student motivation and ability to work independently, such as self-determination theory (Deci & Ryan, 2012; Falloon, 2011) and self-directed learning (Garrison, 1997). Various studies have found autonomy to be a success factor for blended learning (Abulibdeh & Ishtaiwa, 2012; Hung, et al., 2010; López-Pérez, et al., 2011; Owston, York, & Murtha, 2012). Chief Academic Officers report this as their major obstacle in the use and expansion of online and blended learning (Clinefelter & Magda, 2013). These observations support the inverse relationship between structure, as defined by Moore, and autonomy. Using Moore’s theory, Figure 1.1 identifies the degrees of learner autonomy required, across three dimensions of autonomy (establishing goals, executing the learning program and evaluating progress) contingent upon the course structure.

Figure 1.1 Graphical depiction of the various levels of autonomy across three dimensions (establishing goals, executing learning programs, evaluating progress) (Moore, 2013).

All courses require some level of learner autonomy, regardless of the delivery modality. However, by applying the theory of transactional distance, blended course structure may require
a higher level of learning autonomy in all three dimensions of autonomy depicted in Figure 1.1. Students in a blended course must establish weekly goals for work completion that are not driven by the same day/time requirements of a face-to-face course. They must establish their own schedule and then execute the learning activities on their own, not in the context of a classroom setting. The learning activities are established and although a student may have flexibility relative to the time they complete them, as well as in which order, the learning activities themselves have no flexibility in design and no interaction with faculty for those structured learning components. Lastly, students must complete and submit assessments electronically on their own, without the benefit of a faculty member handing out an assignment and collecting it during class time. Each of these elements of student behavior relate to Moore’s construct of autonomy.

Saba (1994) empirically verified the concept of transactional distance to validate the relationship between structure, dialogue and autonomy. A study by Goel, Zhang, and Templeton (2012) provided empirical evidence of the influence of the elements of transactional distance on student’s intention to take a second elearning course. Their study evaluated the core tenants of the theory and supported “the conceptualization of transactional distance as a cognitive phenomenon in the minds of the learner” (p. 1122). Similarly, Falloon (2011) empirically established the relationship between course structural elements, dialogue and learner autonomy and concluded “Moore’s theory provides a useful conceptual lens through which to analyze online learning practices” (p.187). Figure 1.2 graphically demonstrates the relationship between dialogue, structure, and autonomy in the theory of transactional distance.
Figure 1.2. Theory of Transactional Distance. This model demonstrates the relationship between structure and dialogue, which create transactional distance, and the associated level of autonomy that is required (Moore, 2013).

The previously mentioned studies, along with the extensive work of Moore in the development of the theory, are not universally supported. Gorsky and Caspi (2005) conducted a meta-analysis of empirical studies to ascertain construct validity relative to the theory. Among their findings, the theory did not clearly define the constructs operationally, therefore, interpretations of each were varied and inconsistent. Second, they concluded that structure and autonomy both impact dialogue in a meaningful way, therefore the theory can be reduced to a tautology; as dialogue increases, transactional distance decreases. Despite these criticisms, they recognized the importance of the theory for practical purposes relative to understanding distance education and recognition of the need to reduce transactional distance (Gorsky & Caspi, 2005).

The study will evaluate performance and satisfaction with a course, in a quasi-experimental design, using two teaching structures. Application of the theory of transactional distance identifies the relationship of each of the three constructs and the inverse relationship between structure and dialogue, relative to the required level of learning autonomy. Student assessment of satisfaction as well as these constructs, will be evaluated for traditional-age undergraduates at a moderately selective institution, as they apply to blended learning environment. A question remains as to whether these relationships are applicable and therefore
if students will exhibit the required level of learning autonomy, and achieve an equal level of satisfaction with the course.

**Theoretical Framework Summary:** Student learning achievement and satisfaction in a blended format, can be framed from many theoretical perspectives. This study will be framed from the perspective of the theory of transactional distance, which encompasses an evaluation of course structure, level of student-student and student-teacher interaction or dialogue, and the level of autonomy required for student success within different structures. Each of these constructs provides a useful framework to evaluate the results of the study. The theory of transactional distance can be used to provide an explanation for observed behavior and make recommendations for continuous improvement (Anfara & Mertz, 2006; Keller, 2008). As noted by Moore (2013) the theory “is a continuous rather than a discrete variable” and therefore can be applied to both face-to-face and blended course structures. In addition, it provides a broad framework for the pedagogy of distance education. It allows the generation of an almost “infinite number of hypotheses for research into the interaction between course structures, dialogue between teachers and learners and the student’s propensity to exercise control of the learning process” (p.80). The study, to compare student learning achievement and satisfaction between a face-to-face and blended learning environment, and evaluate the influence of student perception of structure, dialogue and autonomy on satisfaction, provides an example of such a research study. The theory of transactional distance will provide the framework to evaluate the outcomes. In addition, the study will provide an opportunity to evaluate the relevance of the theory in the blended learning environment.
Terms and Definitions

**Blended Learning** – also referred to as hybrid learning, is a learning environment that combines traditional face-to-face instructional practices with online instruction. For the purposes of this study, the mix will be approximately 50/50 of each instructional method.

**Dialogue** – the level of interaction between students, and between students and their instructor within the learning environment

**Face-to-Face** – traditional classroom instruction

**Learning achievement** – learning outcomes of a course as measured by a final exam in multiple-choice and open-ended question format.

**Learner autonomy** – independence and self-management relative to establishing goals, seeking support when needed, managing time, implementing learning strategies and evaluating outcomes

**Learning outcomes** – the knowledge and skills students are expected to achieve through the course

**Moderately selective college** – admissions standards of 2.1 high school GPA for bachelor degree seeking students

**Performance** – learning achievement as measured by course assessments

**Structure** – rigidity or flexibility of the course’s educational objectives, teaching strategies and evaluation methods

**Student satisfaction** – perceptions and opinions students have about the overall quality of the course and effectiveness of the instructor

**Support** – the level of advice and guidance provided by the instructor

**Traditional-age undergraduates** – students who are first time college students in the age group of 18-24
Chapter 2: Literature Review

Significant research exists on the topic of blended learning (Bonk & Graham, 2006; Dziuban, Hartman, & Moskal, 2007; Garrison & Kanuka, 2004; Moore, 2013), however further research is needed before confidently expanding the blended learning delivery method to traditional-age undergraduate students (Arbaugh, Desai, Rau, & Sridhar, 2010; Ashby, et al., 2011; Banerjee, 2011; Koenig, 2010; Owston, et al., 2012). As noted by Banerjee (2011) “learning effectiveness and student satisfaction are seen to be decisive in whether blended environments are a positive development or not” (p. 8). Despite this extensive volume of literature, a 2010 study by the Department of Education, found only 45 studies that had objective measures of learning outcomes and met minimum quality criteria established for their meta-analysis (Means, Toyama, Murphy, Bakia, & Jones, 2010). Within the 45 evaluated studies, there was a combination of K-12, undergradate (traditional and older students) and graduate studies, which further demonstrates the limitations within current research (Means, et al., 2010).

This literature review attempts to synthesize what is currently known about blended learning and its use for traditional-age undergraduates in higher education, and identify a gap in the literature. Studies that incorporate and evaluate the concept of transactional distance as it relates to online and blended learning are summarized within this literature review. The review begins with a definition of blended learning. Research findings relative to the potential benefits, as well as areas of concern, are explored. Each of these elements will be analyzed within the chosen theoretical framework of the theory of transactional distance. Despite the extensive body of literature that addresses the concepts of blended learning, there are disparities in the conclusions, and gaps in the body of knowledge that currently exist. The following literature review will address these issues.
Blended Learning Defined

Blended learning has been defined in many different ways with considerable variation (Bonk & Graham, 2006; Kerres & De Witt, 2003). The use of the term hybrid is often used synonymously with blended learning (Lin, 2008; Ng, 2011), and will be used as such in this analysis. Graham (2013), a seminal author and known expert on blended learning, framed the definition according to several dimensions. Is the blend referring to seat time requirements relative to online learning requirements? Alternatively, is the blend associated with instructional methods and content quality? According to Garrison and Vaughan (2008), “blended learning is the thoughtful fusion of face-to-face and online learning experiences” (p.5). Although there is no universally agreed upon definition, each of these constructs are discussed throughout the literature and will be evaluated in the following sections relative to the definition of blended learning.

The first construct poses a question about the quantity of seat time verses online time (Graham, 2013). Blended learning is universally described to offer a combination of face-to-face as well as computer-assisted instruction (Kenney & Newcombe, 2011; Kerres & De Witt, 2003; Ng, 2011; Owston, et al., 2012). In an attempt to define this element, Allen, Seaman and Garrett (2007) conducted an extensive literature review and concluded that blended learning consists of between 30% and 79% online content and activities, with the remaining taking place in traditional face-to-face format. Throughout the studies evaluated for this literature review, few explicitly identified the percentage of face-to-face relative to online content delivery, yet all referred to some mixture (Alonso, Manrique, Martinez, & Vines, 2011; Castle & McGuire, 2010; Qiuyun, 2008). As noted by Bonk, Kim and Zeng (2005) “blended learning happens when some course meetings or training events are conducted virtually rather than face-to-face” (p.550). This
The concept of online relative to face-to-face time, is related to the second major dimension of blended learning, instructional methods, and is a factor in establishing transactional distance.

The second element often used to describe blended learning relates to the mix of instructional methods and strategies. Blended learning, as noted by Vasileiou (2009), moves instruction away from the “traditional transmission model to one which is much more complex, interactive and evolving” (p. 4). Kerres and De Witt (2003) used a definition of blended learning built around the course structure and content, identified as the 3C-model of didactical components. The three components include content, as in the material that needs to be learned, communication as it relates to interpersonal exchanges and a constructive element that refers to learning activities that engage the student in learning tasks (Kerres & De Witt, 2003). Graham (2006) has developed another model that defines blended learning according to instructional methods or content. This model defines blended learning according to three levels: enabling, enhancing and transforming blends. Enabling blended courses are least significant in their use of technology and primarily use the learning management system to provide access and convenience (Graham, 2006). Garrison and Kanuka (2004) use the term “enhanced” to refer to this basic level of technology usage (p.97). Twigg (2003) defined this level of blend as “supplemental.” Using Graham’s (2006) model, “enhancing blends” make a more significant impact on pedagogy by augmenting teaching strategies and tactics through the use of learning management technology. “Transforming blends” require the active engagement of the learning process to create a deeper connection and enriched knowledge of the material (Graham, 2006). Twigg (2003) used the terms “emporium” and “buffet” to refer to blends that replace course face-to-face content with online components to enrich and enhance the learning process. The
preceding models choose to define blended learning according to instructional methodologies rather than addressing seat time as the primary distinction.

While various definitions and boundaries exist for defining blended learning, such definitions do not provide an explicit model to deliver the promising pedagogical benefits of this learning environment (Bonk & Graham, 2006; Garrison & Kanuka, 2004). Various models and studies have been evaluated for this literature review, yet few have specified the exact extent of the blend of instruction used for their research (Arbaugh, et al., 2010; Banerjee, 2011; Bliuc, Ellis, Goodyear, & Piggott, 2011; Kenney & Newcombe, 2011; Koenig, 2010). Each framework and model provides useful information to higher education administration in their effort to differentiate blended learning from face-to-face and fully online courses, yet leave a gap in terms of a formal definition. According to Dziuban, Hartman and Moscal (2007), “it is far more important to have a well-defined model that fits the institution’s needs and can be understood, explained and adopted, than it is to choose the best label” (p.267). The inconsistency in definition and operationalization of the concept of blended learning presents a challenge for comparative analysis purposes.

As noted above, blended learning can be defined from various perspectives. The concept of blending seat time with face-to-face time is one designation. The other common definition attempts to define the modality according to a blend of instructional methods. Despite these variations in the operational definitions of blended learning, attempts have been made, and must be made to continuously evaluate the impact of this delivery mode. The goal of continuous improvement for student learning and satisfaction can only be achieved through ongoing analysis within different contexts, informed by the research that has preceded it, as will be done in the study.
The research study will be conducted at an institution that has an existing model for blended learning, utilized over the past five years for non-traditional learners. This format includes the replacement of one-half of the contact hours with online components and requires weekly discussion forums and the use of various online educational activities. This model will be used for the research because of the institutional experience and instructional training available to support this model.

Regardless of the distinction between seat-time or instructional methods as defined, the use of blended learning may reflect a change in course structure and dialogue, as represented in the theory of transactional distance. The study will control for course delivery through the use of two class sections, one with each delivery modality. The instructor has been trained in the use of blended learning and will utilize equivalent learning activities, delivered in different formats. It is a comparison of outcomes in each course that is of interest in this study. As proposed in the transactional distance theory, course structure and level of interaction determine transactional distance, which in turn determines the amount of student autonomy required (Moore, 1993). In theory, transactional distance and student autonomy each may affect student learning and satisfaction. The use of the same instructor, course content and learning activities, delivered face-to-face in one class section, and with a blended design in the second section, provides the basis of this study, which in turn will be framed and analyzed from the perspective of the theory of transactional distance.

**Blended Learning: Results and Implications**

**Learning Outcomes – Positive Implications**

Various empirical studies have shown positive results from blended learning (Kenney & Newcombe, 2011; López-Pérez, et al., 2011; Means, et al., 2010; Roscoe, 2012; Shibley, Amaral,
In several studies, final exam or final grades were slightly higher in blended sections compared to a control group (Kenney & Newcombe, 2011; Uzun & Senturk, 2010). Other studies indicated that students reported higher levels of satisfaction in the blended format (Kenney & Newcombe, 2011; López-Pérez, et al., 2011; Shibley, et al., 2011). A meta-analysis incorporating 45 studies from 1996-2008 found that online learning has been modestly more effective overall, however, the advantage is attributable to blended learning strategies applied within the courses evaluated (Means, et al., 2010). Within the above referenced analysis, of the 11 studies with significant effects that favored online, nine were using a blended approach (Means, et al., 2010). These studies provide some insight into the positive potential of blended course delivery on student learning and satisfaction. However, throughout the literature, there is no research to specifically address the student population targeted by this study.

A major factor used for analysis of the impact of blended learning is a final exam or course grade. Kenney and Newcombe (2011) provide one such example of experimentation using blended learning with traditional-age undergraduates. This study used an action research design with the researcher’s Introduction to Psychology course. The experimental group had 60 students, and two alternative groups of 60 and 30 respectively, were identified as the control group. The study was designed to answer five questions related to the impact of the blended approach on student learning, engagement, participation, and satisfaction. The study found that the blended section had slightly higher scores on the final exam than the non-blended sections. In addition, respondents reported positive perceptions of their interest and engagement in the course, however less than 50% felt a positive impact was achieved relative to participation. In this study, the blended delivery resulted in generally positive results.
Another study using final grades is provided by Uzun and Senturk (2010) who conducted an experiment with seven sections of an introductory management course. This study used purposeful sampling through a random selection process, to establish a control group and experimental group, and to study student achievement in computer literacy classes between traditional and blended delivery. A pre-test and post-test format was used for evaluating both final course grades and student attitude scores. The students in the blended course performed higher in their final grade and had higher satisfaction scores. This study included 179 students and used two different teachers; however, extensive work went into the structure and design of both courses, which supported the positive student outcomes. The studies by Uzen and Senturk (2010), as well as Kenney and Newcombe (2011) used sophomore students at mid-size universities. In each case, student learning was measured by a final exam, both resulting in positive outcomes.

Additionally, López-Pérez et al. (2011) found that the use of blended learning in the freshman level general accounting course, had a positive impact on exam marks in a study of 985 students, based on a standardized final exam. The results were also based on student attitude and perceptions of blended activities and their utility as evaluated via a survey (López-Pérez, et al., 2011). Shibley et al., (2011), conducted a study over a three-year period using hybrid and non-hybrid instructional sections of a general chemistry course. In this study, they found a 25% GPA improvement in the chemistry course when redesigned in a blended format. They noted that students who had taken the course in the blended format earned a significantly higher GPA than the students who had taken the course in the lecture format. Roscoe (2012), used three in-class exams, to evaluate learning outcomes in two 300-level political science classes, and found no significant difference in learning achievement. However, the blended section used in the study
consisted of non-traditional students while the face-to-face class was traditional age students. This difference presents a significant concern over the usefulness of the results. Despite this concern, in each of these preceding studies, blended learning has shown positive or neutral results as related to student achievement.

However, not all studies have neutral or positive results, and none of the aforementioned studies address the specific audience of traditional-age undergraduates at moderately selective colleges. In general, student GPA and other demographic characteristics were not factored into these studies, with the exception of Owston, York, and Murtha (2012), who identified cumulative GPA as a covariate, with far less positive results as discussed in the following section. Applying the theoretical framework of Moore’s theory of transaction distance, final exam grade is a representation of performance, which can be analyzed with insight from the constructs of course structure, dialogue and student autonomy.

**Learning Outcomes - Concerns**

As noted in the previous section, not all results are positive. Several studies found students did not perform as well in blended courses, relative to traditional face-to-face courses (Ashby, et al., 2011; Castle & McGuire, 2010; Wach, Broughton, & Powers, 2011). Significant concerns have been identified regarding the need for students to be highly organized and self-motivated in a blended learning environment (Abulibdeh & Ishtaiwa, 2012; Bliuc, et al., 2011; López-Pérez, et al., 2011; Owston, et al., 2012; Roscoe, 2012). Additionally, some studies have highlighted student dissatisfaction with the learning activities, the amount of work required and the quality of interactions (Banerjee, 2011; Bliuc, et al., 2011; George-Walker & Keeffe, 2010). Each of these studies provide cause for concern and are directly related to the constructs of transactional distance, therefore further analysis is warranted.
Relative to student learning and performance, a study was conducted by Ashby, Sadera and McNary (2011) for students taking an intermediate algebra class at a community college. Data from this study of 167 students in a developmental math course found troubling outcomes. This study evaluated students in three course delivery modalities (face-to-face, online and blended) based on standardized tests. The researchers found that students in the blended course had the lowest completion rate (70%), and had the lowest mean scores on all assessments. This study is the only one in this review that evaluated students who had demonstrated academic challenges, in this case, they placed into a developmental math course. Similarly, a study of students at the Bronx Community College in the fall of 2009, found that students with a GPA of 2.0 or higher with high developmental English placement, taking a mix of traditional and blended courses had a lower “pass rate” than students who took only face-to-face courses (Wach, et al., 2011). These studies present some concerns relative to academic performance in blended courses.

The second area of concern regarding blended courses is relative to student discipline and organization toward their studies, concepts that align with Moore’s concept of learner autonomy. As noted by Owston et al (2012), research has found that student achievement in blended courses is influenced by “their ability to accept responsibility for their learning” (p. 2). Studies have shown that student disengagement, feeling of isolation and inactivity can occur when the use of electronic instruction is established (Keller & Suzuki, 2004). In a blended format, students must take increased responsibility for their own learning, requiring discipline and initiative (Ashby, et al., 2011; Foulger, et al., 2011; Lin, 2008; Owston, et al., 2012; Roscoe, 2012). Ishtaiwa and Abulibdeh (2012) conducted a qualitative study to evaluate student perceptions of asynchronous blended learning tools such as discussion boards and electronic communication, relative to
classroom interaction and learning achievement. In this study, students reported several challenges including a lack of immediate feedback, extra heavy workload, shortcomings relative to instructor guidelines and student self-discipline. Roscoe (2012) found no significant difference in overall student performance outcomes between a blended and face-to-face course, however, found that students in the blended section performed better on the first two exams in the course, while the face-to-face students performed better on the third. This result raised a concern regarding loss of initiative toward the end of the term. Although technology has the potential to make instruction more interactive and engaging, therefore enhancing learning, it presents some challenges relative to student initiative and discipline (Keller & Suzuki, 2004). Each of these challenges and concerns align with the constructs associated with the theory of transactional distance and will be further explored throughout the study.

The final area of concern is relative to student perception of the modality. Castle and McGuire (2010) conducted an analysis of student self-assessment of learning in three delivery modalities and found that undergraduate students perceived the highest self-assessment of learning in traditional face-to-face course delivery. Students have been found to perceive the online components of the course as busy work (Bliuc, et al., 2011). Research has also shown that students perceive the instructor’s expectations to be unrealistic (Banerjee, 2011). A specific area of concern has been found relative to online discussions (Bliuc, et al., 2011; George-Walker & Keeffe, 2010). This research found that online discussions are perceived by students as a necessity but did not support deep thinking and critical reflection and were not as substantive as face-to-face discussions (Bliuc, et al., 2011). Students in blended courses have reported a lack of a sense of community with the course (Roscoe, 2012). Additionally, students have reported that blended courses require more time and effort and provide less faculty guidance and support.
(Banerjee, 2011). Therefore, various concerns relative to student perception can be found in the literature, which also align with the foundational principles of the theory of transactional distance.

Several studies have evaluated the constructs of student learning and satisfaction in combination. Castle and McGuire (2010) evaluated 4038 student self-assessment surveys from courses across three delivery modalities (online, face-to-face, and blended). The purpose of the study was to analyze trends between delivery modalities and student self-assessment of learning. They found that undergraduates perceived learning to be best in onsite courses; however, they perceived hybrid more positively than fully online. Roscoe (2012) found no statistical significance in student learning when comparing a face-to-face and blended course but did find that face-to-face students “thought they learned more, enjoyed the course more, felt more engaged in the course and thought it was better designed” (p. 9). Additionally, Owston, York & Murtha (2012) conducted a study at a large Canadian university to establish the relationship between student perceptions of blended learning and their learning outcomes. The study found a strong relationship between perceptions and grades, with high achieving students expressing greater satisfaction; however the study raised concerns that low achieving students would not be able to manage the blended learning environment the way higher achieving students would. Lower achieving students performed less positively and expressed less satisfaction with the course. As such, concerns exist for some students relative to the blended delivery format and student learning as well as satisfaction (Castle & McGuire, 2010; López-Pérez, et al., 2011; Owston, et al., 2012; Roscoe, 2012).

In summary, although there is a broad scope of studies on student outcomes and satisfaction with blended learning, the results are not universal. There is research that suggests a link between student maturity, background, class attendance and motivation and achievement,
with negative implications for lower performing students (Bliuc, et al., 2011; López-Pérez, et al., 2011; Owston, et al., 2012). Other studies have found negative results particularly related to the use of blended learning for students with developmental course placements or at community colleges (Ashby, et al., 2011; Wach, et al., 2011). However, none have specifically addressed the impact of blended learning on students at moderately selective colleges. As noted by Owston, et al. (2012), research is needed so that “academic policy makers will be better able to understand whether there are differential effects between high and low achievers in blended courses on factors such as satisfaction, convenience, engagement, and learning in the blended environment” (p.2). The theoretical framework of Moore’s theory of transactional distance will provide guidance in the analysis of the research through the evaluation of the constructs of structure, dialogue, and autonomy. Each of the areas of concern discussed above, can be framed from these constructs and provide insight into the results.

**Student Satisfaction in Blended Learning in Higher Education**

Multiple studies using quantitative and/or qualitative approaches were found that evaluate student perception and satisfaction with blended learning (Banerjee, 2011; Castle & McGuire, 2010; Foulger, et al., 2011; Koenig, 2010; Laumakis, Graham, & Dziuban, 2009; Lin, 2008; López-Pérez, et al., 2011; Owston, et al., 2012). Lin (2008) used both quantitative and qualitative survey data to identify attitudes and perceptions from 51 students in hybrid courses. Kenney and Newcombe (2011) used a survey to measure student perceptions in their blended course. Vernadakis, Giannousi, Tsitskari, Antoniou, and Kioumourtzoglou (2012) completed a quasi-experiment with two classes, comparing a blended section with a traditional section. Results were generally positive, with students reporting both satisfaction and a positive perception of learning in blended courses (Kenney & Newcombe, 2011; Lin, 2008). In several
studies, students recommended the increased use of blended courses (Foulger, et al., 2011; Kenney & Newcombe, 2011; Lin, 2008). Some key findings and promising results will be further analyzed below.

One of the studies with highly promising results was conducted by Kenney and Newcombe (2011), who reported that 75% of students indicated that the blended approach had a positive impact on their learning, and 64% felt more engaged. A majority of students (78%) recommended the continuation of the blended learning format. Lin (2008) reported equally positive student results from a mixed methods survey and student interviews. Students identified the benefits associated with blended learning and its support of different learning styles. Vernadakis et al. (2012) found that students preferred the blended course delivery to the traditional format. Foulger et al. (2011) surveyed 364 undergraduate students and asked them to evaluate their hybrid course experience. The general attitude about hybrids was positive with over 50% of respondents supportive of expansion of the use of this delivery format (Foulger, et al., 2011).

Similarly, a case study completed by Nowell (2011), was used to determine student satisfaction with blended learning courses. The study included seven sections of the same undergraduate course, two were blended and taught by the same instructor, the others were not. The mean scores on 8 out of 10 measures were statistically even for the blended verses the traditional courses, however, the blended courses scored higher on the criteria of “degree of learning” and “effectiveness of teaching methods” (Nowell, 2011). Dziuban, Graham and Laumakis (2009) conducted a case study with a large (500) seat course at a large university. Their study found that students rated satisfaction slightly higher in a blended section relative to a face-to-face section but only after the initial first semester. This pattern was replicated through
the use of multiple survey instructions. In addition, the results were compared to a large
database of satisfaction data and the results for the blended course were very high in comparison
to the overall results in the database.

However, not all results have proven to be positive. Castle and McGuire (2010) reviewed
over 4000 student course self-assessments and found that undergraduates perceived face-to-face
instruction to be more effective for their learning. Ng (2011) conducted a study using two
classes to evaluate the use of blended learning activities to foster interclass interactions. In this
study, interclass discussion boards and debates were orchestrated through technology in support
of the curriculum. The researcher used a triangulated analysis that included surveys, focus
groups and tracked statistics. The results found that students preferred the face-to-face
interactions over the technology mediated ones. Similarly, other studies found that students
considered the online work “busy work” and a heavier workload, which was not useful to their
learning process or relevant to their expectations (Abulibdeh & Ishtaiwa, 2012; Bliuc, et al.,
2011; Foulger, et al., 2011; Lin, 2008). Students miss the classroom interaction, even in a
blended format and found the lack of immediate response during online portions of the class to
be a detriment (Abulibdeh & Ishtaiwa, 2012; Foulger, et al., 2011). In some studies, students in
blended sections gave their courses lower satisfaction ratings for community, engagement and
design than face-to-face matched classes (Roscoe, 2012).

Despite the comfort that traditional-age undergraduates have with technology, it is not
embraced in the same way relative to the classroom. Students require clear instructions
regarding activities and expectations (Foulger, et al., 2011; Manning & Emmons, 2010; J. Moore,
2011; Shibley, et al., 2011). Research had found that students in a blended course perceived
materials difficult to find and felt they received less instructor feedback (Kenney & Newcombe,
Communication by faculty of their expectations, and clear instructions on class activities and usage, become increasingly important when face-to-face opportunities for verbal explanations and inquiries are reduced (Ackerman, 2008). Banerjee (2011) found that students still preferred face-to-face teaching and felt that instructors had unrealistic expectations in blended courses. Students can perceive blended courses as being more work (Banerjee, 2011). Each of these elements of concern regarding satisfaction is directly related to the constructs of dialogue and autonomy, as theorized by Moore.

Student satisfaction with blended learning can be influenced by various elements of course structure as well as dialogue, as indicated above. These course attributes support the constructs of the theory of transactional distance and have been shown to influence student outcomes and satisfaction. Although these studies can be discussed and aligned with the constructs within the theory of transactional distance, some studies are specifically designed and framed with the study. These will be discussed in the following section.

**Transactional Distance**

As seen in the previous discussion, student learning and satisfaction in the blended learning environment can be influenced by various factors. Many of these factors, can be aligned with, or framed from, the constructs of course structure, dialogue, and student autonomy as explored in the theory of transactional distance. Structure encompasses course design and flexibility. Dialogue speaks to the relationship established between students and faculty, and among students. Autonomy directly speaks to student preparedness to assume responsibility for their learning and can be assessed by evaluating students’ ability to set goals, manage their time, implement learning activities, seek support and assess their performance. Although each of these constructs have been incorporated into the previous discussions, the following section highlights
studies that specifically addressed the theory of transactional distance. However, it should be noted that one criticism of the theory of transactional distance is relative to the inconsistent operational definitions of the constructs (Gorsky & Caspi, 2005). This factor should be noted when reflecting upon the discussion and outcomes in the following studies.

As previously stated, various studies have evaluated both online and blended courses specifically using the constructs of the theory of transactional distance (Bajt, 2009; Carey, Carey, Grinnell, & Wallace, 2006; Falloon, 2011; Horzum, 2011; McLaren, 2010). Bajt (2009), for example, conducted a comprehensive study to evaluate student satisfaction within blended and online courses, based on age, across all three constructs of transactional distance theory. This study was conducted at a community college and was specifically interested in the attitudes of millennial age students. Within the study, the researcher matched classes within five different disciplines, having one section fully online and the second section blended. For millennial students in a blended course, the interaction of structure and satisfaction was not significant. However, the model was significant for millennial students in an online environment, indicating the less severe implications of blended learning with traditional age undergraduates.

Alternatively, Falloon (2011) used the constructs of transactional distance to evaluate a virtual classroom (live synchronous learning environment), and the results were in alignment with the theory. In general, student perceptions of dialogue were positive in the virtual environment, but they were contingent on the structural elements of the course delivery including organization of sessions and feedback. Outcomes specific to the construct of dialogue will be further discussed below.

Dialogue has been found to impact student satisfaction across various studies (Bajt, 2009; Falloon, 2011; McLaren, 2010). Bajt (2009) found a positive coefficient related to dialogue and
student satisfaction within both online and blended courses. The level of significance varied by discipline reflecting different pedagogical approaches and formats. McLaren (2010) studied the impact of dialogue on student satisfaction in an online master’s degree program. This study found a statistically significant relationship between instructor interactions and learner satisfaction. Furthermore, Bajt (2009) found that both student-student and student-instructor interaction had positive implications for satisfaction across age groups. In this study, student-instructor dialogue had a greater effect. Carey, Carey, Grinnell and Wallace, (2006) conducted a study to evaluate the impact of structure and dialogue in an upper level university web-based course. Two sections of the course were delivered online with different treatments of feedback. They found that lower transactional distance or greater dialogue, resulted in higher test scores. The higher dialogue treatment provided automatic responses within practice tests. Students in this section rated the practice and feedback in the course as more relevant than the alternative treatment, which required students to seek feedback independently.

A qualitative case study by Falloon (2011), investigated virtual classrooms across the variables of transactional distance theory, and found that most participants found the virtual classroom had a positive impact on student-student and student-faculty relationships. Alternatively, Chen and Willits (1998) found that “the relation between dialogue and transactional distance depended on the type of dialogue involved and how transactional distance was measured” (p. 6). This observation reflects one of the concerns relative to the theory of transactional distance, in that these constructs are operationalized differently within various studies. They did however find that the greater the classroom discussion, the higher the student perception of their learning outcomes. Despite these variations and potential concerns, the preceding studies indicate that dialogue has relevance for the evaluation of student satisfaction as
well as learning achievement (Bajt, 2009; Carey, et al., 2006; Chen & Willits, 1998; Falloon, 2011; McLaren, 2010).

Throughout the studies, various researchers found support for the relationship between transactional distance and the concept of learner autonomy (Carey, et al., 2006; Falloon, 2011). Some researchers have concluded that less mature learners required greater opportunity for dialogue along with a more flexible structure, in support of Moore’s theory (Carey, et al., 2006). Also in support of the theory, Falloon (2011) found that the use of a virtual classroom diminished the level of learner autonomy required, by improving the level of dialogue within an online classroom. Bajt (2009) using the construct of support to represent the higher level of guidance needed by less autonomous learners, found that student assessment of support was significant and positive; satisfaction increased as support increased. As demonstrated by these studies, transactional distance has been shown to increase the need for learner autonomy or the corresponding increase in instructor support, to maintain student satisfaction within a learning environment.

Goel, Templeton, and Zhang (2012) used the core tenets of the theory of transactional distance to develop a model to predict future intentions toward elearning. The study evaluated survey responses from students enrolled in online sections of both undergraduate and graduate courses. The results indicated strong support for the influence of constructs of transactional distance factors on individual’s intentions to take another online or blended course. Structural factors such as ease of use, as well as the level of dialogue and interaction affected student satisfaction with the modality. A key take away from the study was the conclusion that elearning is not for everyone, reinforcing the concept of increased autonomy required with higher levels of transactional distance.
Despite the preceding studies and the generally supportive findings relative to the theory of transactional distance, there are criticisms of the theory. A meta-analysis conducted by Gorksy and Caspi (2005) identified several concerns with the theory. First, there were no operational definitions of the constructs, therefore, each study used different variables and models. According to the researchers, these variations resulted in ambiguous relationships between variables. Some studies lacked reliability or construct validity, according to their analysis. They also concluded that the theory could be reduced to a tautology; as dialogue increases, transactional distance decreases. Although these criticisms provide some value in the analysis of the theory, they do not provide definitive conclusions regarding the value of the theory, which continues to bear relevance today. In fact, Moore (2013), has published the third edition of the Handbook of Distance Education, with significant and ongoing reference to the theory and its relevance to online, as well as blended learning.

Summary

Expansive research to date regarding blended learning has shown both encouraging results and areas for concern (Ashby, et al., 2011; Bajt, 2009; Kenney & Newcombe, 2011; López-Pérez, et al., 2011; Roscoe, 2012; Shibley, et al., 2011). Several studies found higher test scores and levels of satisfaction in blended courses (Kenney & Newcombe, 2011; López-Pérez, et al., 2011; Uzun & Senturk, 2010). Although these studies have shown improved grades, others have demonstrated concerns specifically for students of lower academic standing (Ashby, et al., 2011; Castle & McGuire, 2010; Wach, et al., 2011). Although students find the access, convenience and flexibility to be beneficial, they also are concerned about the time requirement and instructor demands (Banerjee, 2011; Moore, 2013). Lastly, because of the reduced level of
dialogue concerns are raised relative to students who may exhibit lower levels of initiative and discipline (McFarlane, 2010; Owston, et al., 2012; Roscoe, 2012).

Applying the theoretical lens of transactional distance, traditional age students at moderately selective colleges, may perform differently in a course with a higher level of transactional distance. However, there is conflicting evidence related to the potential increase in transactional distance in the blended format. In addition, different operational definitions of the constructs of course structure, dialogue, and autonomy present a challenge for comparative analysis of the theoretical impact. Despite these challenges, the theory postulates that the elements of course structure, dialogue and required autonomy may influence student learning and satisfaction with the learning experience and warrant further analysis.

The purpose of a further, targeted study, informed by this literature review, will be to evaluate student learning and satisfaction within the blended delivery modality and compare it to traditional face-to-face delivery, at a moderately selective institution. The practical goal is to use this knowledge to inform the future implementation of blended learning at that institution, with the hope to expand usage. This research will add to the body of knowledge in the field, by filling a gap in the research as it relates to traditional-age students at moderately selective colleges. The research will determine if expanding and institutionalizing blended learning is practical, and provide justification to administration and faculty alike to ensure buy-in. They must be comfortable that “our students” at “our type of institution” can be successful in this model. In addition, this study will evaluate the relevance of the theory of transactional distance in the blended learning mode, with this specific population.

Much is known about blended learning, but much still needs to be researched. As noted by Garrison and Vaughan (2008) “blended learning is a coherent design approach that openly
assesses and integrates the strengths of face-to-face and online learning to address worthwhile educational goals. When blended learning is well understood and implemented, higher education will be transformed.” (p. x). Based on the preceding review, it is clear that two primary areas of focus are relevant and impactful when discussing the future of blended learning: student outcomes and student satisfaction. A further evaluation using the constructs of transactional distance can be used to inform the needed analysis.
Chapter 3: Research Design

The following section will present and discuss the research methodology used in this study. The research questions, design, data collection, and analysis will be addressed as well as the validity, reliability, and generalizability of the study. This quasi-experimental study compares outcomes regarding learning achievement, satisfaction and the constructs of transactional distance between an experimental, and comparison group.

Research Questions

The purpose of this study is to compare learning achievement and satisfaction between blended and face-to-face class sections, with traditional-age undergraduates at a moderately selective college. The construct of satisfaction will be further analyzed in relation to student assessment of course structure, dialogue, and autonomy, each representing elements of the theory of transactional distance. Following are the research questions addressed in this study.

Question 1: To what extent does learning achievement of traditional-age undergraduates in a moderately selective college differ in a blended learning delivery mode and a face-to-face delivery mode?

This question has been investigated by evaluating student learning achievement for this specific type of student in a blended learning environment versus a traditional face-to-face learning environment. The null hypothesis is as follows:

Hypothesis 1: There is no significant difference in learning achievement of traditional-age, undergraduates at a moderately selective college in a face-to-face delivery mode and a blended delivery mode.
Question 2: To what extent does course satisfaction of traditional-age undergraduates in a moderately selective college differ in a blended learning delivery mode and a face-to-face delivery mode?

This question has been investigated by evaluating the construct of student satisfaction, for this specific type of student, in a blended learning environment verses a traditional face-to-face learning environment. The null hypothesis is as follows:

*Hypothesis 2: There is no significant difference in satisfaction of traditional-age, students at a moderately selective college in a face-to-face delivery mode and a blended delivery mode.*

Question 3: To what extent do a course’s structure, dialogue, and student autonomy relate to course satisfaction of traditional-age undergraduates in a moderately selective college in a blended learning delivery mode and in a face-to-face delivery mode?

This question provides the framework for analysis of the relationship between the constructs of course structure, dialogue, and autonomy to satisfaction in each course format. The null hypothesis is as follows:

*Hypothesis 3: There is no significant difference in relationship between course structure, dialogue, autonomy and satisfaction of traditional-age undergraduates at a moderately selective college in a face-to-face delivery mode and blended delivery mode.*

This study contains the independent variable instructional mode, across all three research questions. One class section of a specific course has used a blended learning delivery mode and another class section has used a traditional face-to-face delivery mode. In research question one, the dependent variable of student learning achievement has been measured by the final exam. The same instructor taught both sections and the same final exam was delivered in the same
environment (proctored face-to-face exam). For the second research question, the dependent variable of student satisfaction with the course, was measured by student responses to a survey instrument with a Likert-like scale. For the third research question, additional independent variables of structure, dialogue and autonomy were evaluated in relation to the dependent variable of satisfaction, as measured by a survey instrument with a Likert-like scale. Students also provided answers to open response questions that addressed their reason for selecting the format they choose and if they would consider future blended courses. Additionally, feedback on learning activities was collected as supplemental information. The student survey was used with both the experimental and the comparison group to enable comparison of results in terms of student satisfaction as well as the constructs of structure, dialogue and autonomy.

**Research Design**

This study utilized a quantitative quasi-experimental design. Supplemental qualitative data, in the form of open-ended responses on the survey instrument, were collected to help interpret the data collected quantitatively. A quasi-experimental research design was selected for the quantitative study, because it is particularly well suited for studying factors in a natural educational setting (Muijs, 2011). Quasi-experiments attempt to approximate the advantages of a pure experiment, but allow for data collection in a natural school setting (Muijs, 2011). As with true-experimental designs, the study includes both experimental and comparison groups. The major distinction between true experimental design and quasi-experimental, is random assignment (Gall, Gall, & Borg, 2007; Muijs, 2011). Quasi-experiments are used when random assignment is not practical (Gall, et al., 2007; Muijs, 2011). The primary advantage to this design is its ability to be conducted in an actual educational setting. The primary disadvantage is
related to the lack of random assignment and the possible validity issues associated with non-random groups (Fraenkel, Wallen, & Hyun, 2011; Muijs, 2011).

As a quasi-experimental, this research could be influenced by various extraneous variables (Gall, et al., 2007). First, student characteristics can influence the study results. Students self-select into the course so there is no guarantee that the number of students within the classes will be consistent, and that they will equally distributed in terms of their academic ability. Students who do not like the instructional mode might drop the course and therefore not be part of the survey results relative to learning achievement and satisfaction of a course. Some students might have previous experience in blended courses, which can influence the outcomes. In addition, the faculty might prefer one delivery modality to the other, therefore, impacting student satisfaction in one of the two sections. The study was designed to address these concerns in various ways as detailed in the following sections.

Site and participants. This research has taken place at a small, moderately selective college in New England, where the researcher is the Vice President for Academic Affairs. Access and convenience made this site a logical selection. As noted by Gall, Gall and Borg (2007), “the majority of doctoral dissertations with which we have been associated were conducted at the institution where the student was currently employed” (p. 87). Using the researcher’s place of employment is common and acceptable for academic research. The selection of this site allows for practical applicability, as the results are specific to this institution. The results of the research have relevance to a problem of practice at the institution so the use of the research at this site supports the applicability.

The target population for this study was the 368 full-time bachelor degree seeking, traditional-age undergraduates at the institution. The entire enrollment at the institution in fall of
2013, was 788, of these 48% were baccalaureate degree seeking. There are currently five bachelor degrees and 11 associate degree programs offered at the institution. The institution was founded over 100 years ago as a business school designed to provide administrative skills to the working class. Until 2000, the school was a junior college offering only associate and certificate degrees but has successfully transitioned to a baccalaureate degree seeking institution. The researcher has conducted this study using a sample from this population, and evaluated the results for possible generalization to the target population at the institution. As a moderately selective institution, applicants require a 2.1 GPA from high school to enroll in a baccalaureate degree. The average high school GPA for the entering class of bachelor degree seeking students in the fall of 2013 was 2.3. Once students matriculate, their class work is evaluated and graded using a traditional scale as follows:

Table 1

*Grading Scale*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4.0</td>
</tr>
<tr>
<td>A-</td>
<td>3.7</td>
</tr>
<tr>
<td>B+</td>
<td>3.3</td>
</tr>
<tr>
<td>B</td>
<td>3.0</td>
</tr>
<tr>
<td>B-</td>
<td>2.7</td>
</tr>
<tr>
<td>C+</td>
<td>2.3</td>
</tr>
<tr>
<td>C</td>
<td>2.0</td>
</tr>
<tr>
<td>C-</td>
<td>1.7</td>
</tr>
<tr>
<td>D+</td>
<td>1.3</td>
</tr>
<tr>
<td>D</td>
<td>1.0</td>
</tr>
<tr>
<td>D-</td>
<td>0.7</td>
</tr>
<tr>
<td>F</td>
<td>0</td>
</tr>
</tbody>
</table>

This subset of students is distinct from the subjects of prior research where selectivity of the institution was not addressed. Many of the existing studies are focused on non-traditional students, or include non-traditional or graduate students in the analysis. At this institution, a
GPA of 2.0 (C) is required for graduation; students who fall below this GPA in any semester receive academic sanctions of varying degrees. At this moderately selective institution, over 20% of students receive some type of academic sanction each semester.

The selected course for the study, MG435-Operations Management, was delivered in two class sections during the same semester, with the same instructor, one in a traditional face-to-face format and the other in a blended format. Student participants self-selected into one of the two sections of each course. All students were in their junior or senior year of study when taking this 400 level course, which represents the level of rigor and study appropriate for junior and senior level students. The course is typically taken in the first semester of the senior year and is required of all bachelor degree in management students. Underclassman may select this class if they have the proper prerequisites.

Course Design. The course description and learning outcomes are identical, despite the delivery modality. As a 400-level course, the learning outcomes must incorporate five levels of learning, based on Bloom’s Taxonomy. During the first week of class, both sections were given the course syllabus and outline. Each week the subject matter covered, and the learning activities were matched. There are various pedagogical strategies that can be used in a blended format, the model used in this study was selected based on institutional experience. Table 2 represents the typical week course delivery:
Table 2

*Weekly Class Learning Activities Comparison*

<table>
<thead>
<tr>
<th>Format – Example #1</th>
<th>First Class Meeting</th>
<th>Second Class Meeting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face</td>
<td>45 minutes lecture</td>
<td>Case study/problem solving activity (individual reading, followed by small group discussion, followed by class discussion)</td>
</tr>
<tr>
<td></td>
<td>15 minutes small group problem solving</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 minutes class discussion</td>
<td></td>
</tr>
<tr>
<td>Blended</td>
<td>30 minutes lecture and review</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30 minutes small group problem solving/learning activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 minutes class discussion</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Format – Example #2</th>
<th>First Class Meeting</th>
<th>Second Class Meeting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face</td>
<td>45 minutes lecture</td>
<td>Video – Product design and manufacturing process followed by class discussion.</td>
</tr>
<tr>
<td></td>
<td>15 minutes small group problem solving</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 minutes class discussion</td>
<td></td>
</tr>
<tr>
<td>Blended</td>
<td>30 minutes lecture and review</td>
<td></td>
</tr>
<tr>
<td></td>
<td>30 minutes small group problem solving/learning activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 minutes class discussion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Video – Product design and manufacturing process followed by original posting to discussion question, followed by responses to three classmates, followed by follow-up responses and faculty member summation of discussion.</td>
<td></td>
</tr>
</tbody>
</table>

Dialogue in the online environment was asynchronous in nature through the use of discussion boards and email. The face-to-face classroom component included a mixture of lecture, small group activities, and discussion. Although there are other strategies that might result in different levels of dialogue, this format was selected because the institution and instructor are experienced using this model for non-traditional learners. The syllabi for each class section were evaluated by the researcher, followed by a meeting with the instructor, to
ensure that the course sequence, material, learning activities, and assessments remained exact, with the only modification being the delivery format.

**Instructor selection and preparation.** The instructor selected to participate in this quasi-experiment was highly experienced with teaching in the traditional, online and blended learning environments. All faculty at the research site who teach in the online and blended environments, must take part in a three week, online training program. In addition to assisting in the development of this program, the instructor selected for this quasi-experiment had personally taught two previous blended courses for the intended population, and four additional blended courses for non-traditional learners in the continuing education division. In addition, he has taught 10 traditional face-to-face classes for the population in question over the past five years. This previous experience ensured a level of quality and consistency in delivery along with an awareness of the student population and the associated implications. As an instructor, this professor’s overall ratings are consistently strong as demonstrated by his spring 2013 student rating of 4.71 compared to the overall instructional average of 4.41, on a Likert-like scale of 1-5, with five representing the highest rating.

**Data collection.** Data was collected to measure the constructs of learning achievement, and student satisfaction, along with the relationship between satisfaction and the constructs of course structure, dialogue, and autonomy. Achievement of learning outcomes was evaluated using a subject matter test, developed by the faculty member who is an experienced teacher in the course and a subject-matter expert, drawing from test questions provided by the text book publisher. These test bank questions were developed, tested, and peer-evaluated by experts in the field and were sorted and selected by the faculty member to meet the specific learning outcomes of the course. The faculty member developed the final exam using the test bank and
refined it as needed at the end of the course to ensure the questions remained relevant to actual content delivered. The final exam contained 40 multiple choice, ten short answer questions and one essay question. Use of subject matter experts is a common practice for validity measurement (Gall, Gall, & Borg, 2007). A further review by a second subject matter expert was completed to establish construct validity. Content validity is implied through the use of test questions that measure student knowledge of the subject matter. Following are two sample test questions:

An operations task performed at Hard Rock Café is
A) borrowing funds to build a new restaurant
B) advertising changes in the restaurant menu
C) calculating restaurant profit and loss
D) preparing employee schedules
E) all of the above
Answer: D

Operations management is applicable
A) mostly to the service sector
B) to services exclusively
C) mostly to the manufacturing sector
D) to all firms, whether manufacturing or service
E) to the manufacturing sector exclusively
Answer: D

The second instrument that was used measured students’ satisfaction with the course and their assessment of course structure, dialogue, and autonomy. The primary foundation for the instrument was the Course Interaction, Structure, and Support (CISS) instrument, developed and refined by Shaik (2002) based on the theory of transactional distance. The CISS was validated for content through a review by experts in the field of education. It was then pilot tested and a factor analysis was completed to ensure construct validity. The instrument was further revised and resulted in a 27 question survey (Shaik, 2002). The Cronbach’s alpha reliability test ranged between .76 and .85 for the individual measures. The combined scale had a Cronbach’s alpha coefficient of .89, all within the commonly accepted level for internal consistency reliability of .7
The instrument used in this study has been slightly modified to remove three questions relative to an individual construct of departmental support, which is not relevant to the current study. Four questions regarding instructor support will remain on the instrument but do not directly factor into the analysis. One short-coming in the CISS instrument from the perspective of the researcher, was the measurement of student autonomy. Therefore, an alternative instrument was appended to the survey. The Online Learning Readiness Scale (OLRS) identified and validated five composite variables relative to student readiness for online learning (Hung, et al., 2010). One composite variable, comprised of five individual questions, directly addresses the construct of autonomy and was therefore selected for inclusion in this study. This variable had a composite reliability rating of .871, exceeding the generally accepted value of .7. The final instrument contained four primary sets of variables, each using the same scale within the group. The variables and question alignment are displayed in Table 3.

Table 3

<table>
<thead>
<tr>
<th>Survey Design and Question Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Course Structure</strong></td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Work at own pace</td>
</tr>
<tr>
<td>Quality of syllabus</td>
</tr>
<tr>
<td>Class activities</td>
</tr>
<tr>
<td>Content organization</td>
</tr>
<tr>
<td>Student input</td>
</tr>
<tr>
<td>Teaching methods</td>
</tr>
<tr>
<td>Student assessment</td>
</tr>
<tr>
<td>Real world examples</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Treatment of students

Questions: 5, 7, 14, 17, 19, 21, 24
Questions: Student/Student: 3, 8, 9, 12, 13
Questions: 27, 28, 29, 30, 31
Questions: 25, 26
Questions: Student/Instructor: 6, 10, 11, 15, 18, 22, 23

This survey aligned with the researcher’s goals of measuring student satisfaction with the course as well as the impact that structure, dialogue and autonomy have on satisfaction. The researcher conducted further analysis by comparing the results from two class sections, taught by the same instructor but using an alternative format for course delivery. The full survey can be found in Appendix A. Sample questions are found in Table 4.

Table 4

Sample Survey Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Scaled Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 I was able to share learning experiences with other students in this course.</td>
<td>Strongly Disagree 1</td>
</tr>
<tr>
<td>2 The instructor helped me identify problem areas with my study for this course.</td>
<td>Strongly Disagree 1</td>
</tr>
<tr>
<td>3 The organization of the course content made learning easier.</td>
<td>Strongly Disagree 1</td>
</tr>
<tr>
<td>4 I was able to interact with the instructor during the class sessions.</td>
<td>Strongly Disagree 1</td>
</tr>
<tr>
<td>5 The instructor followed the course syllabus.</td>
<td>Strongly Disagree 1</td>
</tr>
</tbody>
</table>

Several additional questions were added to gain supplemental data. Students were asked to identify why they selected the blended or face-to-face format, and if they would choose a blended course in the future. Information regarding the students’ prior experience with the
blended delivery mode was also collected. Several open-ended questions were included to obtain more detailed feedback on student opinions of instructional methods. This survey was administered via a web-based survey tool in a computer lab during class time to ensure maximum participation.

**Process and Timeline.** Both class sections of the course were taught by the same instructor who had previous experience teaching the course in both the face-to-face and blended formats. The class sections were delivered in a traditional 15-week term. Class meetings for the face-to-face class were twice per week on Tuesdays and Thursdays from 9:30-10:45, while the blended class section met on Monday’s only from 12:45-1:15. The same classroom was used. In addition to the weekly class meetings, the blended class section comprised a weekly class session using Blackboard, the institution’s learning management system.

In the 14th week of class, the researcher visited each class to distribute and explain the informed consent form. Students were then sent a link to the web based survey. During the following class meeting, the instructor escorted the class to a computer lab and had the students complete the survey. As part of the survey students were informed of their voluntary entry into a raffle for two $50 gift cards, in appreciation for their feedback. The faculty member and researcher were not present during the completion of the survey. Students were asked to include their student identification number on the survey, and be ensured that results would be evaluated and documented in aggregate. At the completion of the course, a spreadsheet, with final exam scores by student identification number was sent to the researcher, without the student name column, to allow alignment of student outcomes with survey responses.

Once all data points were collected and incorporated into SPSS, the researcher assigned a random number to replace each student identification number in the data results. At that point,
all reference to original student name and identification number was deleted. The document linking the student identification number to the random number was shredded. No compensation was provided, but students were given the opportunity to participate in a raffle for two $50 gift cards. Upon completion of the survey, students were asked to provide their name and address in a separate email, addressed to the researcher, for entry into a random drawing. The researcher administered and explained the study and associated informed consent form, but did not have any active role in the course delivery or relationship with the subjects during this class.

**Data Analysis.** For research question one, this study was designed to compare the means of the dependent variable of learning achievement between an experimental and comparative group. The comparison group participated in a traditional face-to-face course delivery while the experimental group participated in a blended course. First, the researcher compared the means of the dependent variable, final exam score, between the comparison (face-to-face) and experimental (blended) course groups. To measure a nominal independent variable and continuous dependent variable, the t-test was employed. This test allows for the measurement and comparison of two means. The conditions or assumptions for the use of t-test include the need for the dependent variable to be continuous. In addition, the t-test is appropriate for the comparison of means for two groups, a criterion which has been met in this research design. Although random sampling is required, Muijs (2011) notes that in educational research convenience sampling is often used and the t-test if found to be “quite robust despite violation of these assumptions” (p.119).

However, to ensure differences in results are not due to differences in the characteristics of the groups, a test of normality was conducted to verify relative normal distribution of students. Using prior semester cumulative GPA, each class section was evaluated for normal distribution,
both visually and statistically using a QQ Plot and Shapiro Wilk test. The results were reviewed to determine if each class had a normal distribution of students within the class section. Further analysis was conducted to determine if each section was comparable with the other. Upon determining normal distribution, within and between class sections, the mean final exam score of the students in the blended class were compared to the mean score of the students in the traditional class. A t-test was then conducted to determine if the difference was statistically significant. The t-test was used to determine if these two samples differed and at what the significance level (p-value). This measurement allows the researcher to identify if there is a statistical significant difference in the mean scores between the groups and therefore can be considered representative of the population. The effect size, or relative size of the difference in means attributable to the independent variable, was evaluated using the Cohen’s d measure. The null hypothesis suggests there is no significant difference, therefore a p-value greater than .5 will support the null hypothesis. The supplemental survey questions were then used to inform the analysis of the results.

For research question two, the groups were compared on a measure of student satisfaction. Student satisfaction was measured on a self-reported Likert scale. Two questions were combined to develop a measure of overall satisfaction. In addition, as noted in Table 3, composite variables were calculated for student attitude regarding each of the constructs of course structure, dialogue (student/student and student/instructor) and autonomy. Means were calculated of these composites and a t-test analysis of statistical significance was conducted. This was followed by a Cohen’s d measure of effect size between teaching modality and satisfaction to determine the relative impact of modality on satisfaction. Although the Likert scale measures are not purely
continuous, there is precedence for treating it as such (Knapp, 1990; Labovitz, 1970). As noted by Labovitz (1970):

“Treating ordinal variables as if they are interval has these advantages: (1) the use of more powerful, sensitive, better developed and interpretable statistics with known sampling error, (2) the retention of more knowledge about the characteristics of the data, and (3) greater versatility in statistical manipulation, e.g., partial and multiple correlation and regression, analysis of variance and covariance, and most pictorial presentations.” (p. 523)

Muijs (2011), notes that “many researchers have used t-tests for ordinal values, and the test is reasonably robust in these circumstances” (p.119).

For research question three, composite variables were established, as noted in Table 3, for each of the constructs of transactional distance. A comparison of means, using t-test was conducted, as with previous research questions, to establish statistical significance. This was followed by a Cohen’s d measure of effect size between course delivery modality and student assessment of each construct, to establish a relative impact of delivery mode on these constructs. This analysis was furthered by the use of Pearson r, to evaluate the relationship between two variables, in this case course structure, dialogue and autonomy with overall satisfaction. The results will indicate whether there is a positive or negative relationship in each scenario. An analysis was then conducted comparing the relationship in the blended courses to the face-to-face course. The supplemental survey questions were used to inform the analysis of the results and evaluate the relationships.

Data collection took place at the end of a traditional day school semester, in December 2013. Grades were provided by the faculty member and survey results were collected via a web-based survey, using Survey Monkey. Results were exported or data entered into SPSS, through
which the statistical analysis was conducted. The data was screened for any incomplete data sets. If a participant did not complete both the final exam and the survey, their data was excluded from the study.

Additionally, a review of open-ended questions as well as student prior experience with blended learning was incorporated and used as supporting data in discussion of the results. These questions solicited students’ reasons for choosing the delivery mode (blended or face-to-face), if they would choose a blended course in the future, and feedback on individual instructional methods. These open-ended questions were designed to give individual voice to the students, and present some potential examples or supporting information to inform the analysis of the quantitative data results.

Validity, Reliability and Generalizability

Validity. Because the sampling is not random, there are particular threats to internal validity. The primary threat as noted by Gall, et.al. (2007) is the “possibility of group difference” (p. 417). The best means to address this concern is to make the groups as similar as possible. In this regard, the researcher has used two sections of the same required course, during the same semester, at the same institution. Although the students self-selected into their preferred section, their academic background and course of study was similar. The groups were evaluated for normal distribution within each class section, based on GPA, via QQ Plot analysis and Shapiro Wilk statistical analysis. Each group was also compared to the other using descriptive statistics of mean as well as range, also based on prior semester cumulative GPA. Threat to the implementation fidelity was managed by using the same faculty across sections, with the same material, even though delivery method will vary. Measurement took place at one point in time, post-test only, so only those students who completed the course during the semester were
evaluated. Mortality could be a factor; therefore, data was collected regarding the number of students who withdraw from each section to determine if this was a meaningful factor relative to the results.

Content validity of the measure of learning achievement in the Operations Management class was completed through the use of a final exam. The final exam has been developed by a subject matter expert using the test bank associated with a peer developed text book. A second instructor reviewed the test against the course materials to provide further validation. The satisfaction survey used has been empirically tested and validated through expert analysis, pilot testing and factor analysis. The satisfaction survey evaluated student opinion by asking questions around several areas related to the course. Construct validity was obtained by using an expert designed survey that was built on the foundation of theory and had been empirically tested.

**Reliability.** Reliability across the survey instrument was ensured through the use of multiple questions that address each individual construct. The CISS instrument was evaluated for internal consistency relative to each individual construct of structure, dialogue, support and satisfaction. The Cronbach’s alpha coefficient ranged from .76 to .85 for the individual measures and .89 for the combined scale, meeting the generally accepted threshold of .7. The supplemental scale for the evaluation of autonomy was tested for composite reliability and was found to have an acceptable level of .871, also meeting this threshold.

The site was selected based on the researcher’s access and the immediate problem of practice. A convenience sample was used. Although random sampling is always preferable, convenience sampling is an acceptable alternative in educational research (Gall, et al., 2007; Muijs, 2011). The primary threats relative to this site, sample, and data collection included characteristics and attitude of subjects, as well as location and implementation (Fraenkel, Wallen,
Although not random, internal reliability relative to implementation was maintained by use of the same instructor in each delivery model, the same curriculum, and the same exams. Each class section was delivered during typical weekday class times and the same room was used for both classes to eliminate any variance in the location factor. The use of several qualitative questions, as well as quantitative data collection provided additional insight and validation of the results.

The faculty member teaching the course indirectly reports to the researcher. In addition, as a currently active faculty member at the institution, some students participating in the research have knowledge of, or had a working relationship with the researcher. Given these relationships, there could be concern that both students and faculty will feel obligated to please the researcher with their answers, imposing a bias on the results. This was addressed through the selection of a seasoned faculty member, the avoidance of the researcher having direct contact with the participants in the study, and clearly articulated objectives to ensure reliable results, free of bias. However, it is important to note that the researcher did work closely with the faculty member to ensure proper implementation of the elements of this quasi-experiment to ensure implementation fidelity.

**Generalizability.** As noted by Light, Singer and Willett (1990), generalizability refers to “the extent to which your results are applicable to other persons, places and times” (p. 9). In other words, can the study results be assumed to apply to the population that the sample represents (Gall, et al., 2007). In this study, despite the small sample size of students, the sample represented approximately 50% of senior level students in the management program, supporting the generalizability of results to the full population of 346 bachelor degree seeking students at the institution. This relatively small sample, is a representative sample of the population,
supporting the notion of generalization. Based on the research design, replication will be possible to further support the results. The study was designed to support external validity by controlling the experimental treatment as well as experimenter effect (Gall, et al., 2007).

The intent of the study was to evaluate the three hypotheses’ and generalize them to the larger population of all students at this institution. Control factors support this level of generalization. However, ecological generalizability, as defined by Fraenkel, Wallen and Hyun (2011) as “the degree to which the results of a study can be extended to other settings or conditions” (p.105), is limited. Beyond that, this study, with this particular target audience presents a new contribution to the literature and despite the limitations, can provide insight for future research in this area.

**Protection of Human Subjects**

There was minimal risk to the participants in this study. The participants were informed of the research and how the data will be used. As recommended by the Northeastern University Institutional Research Board (IRB), unsigned informed consent forms were distributed. Students completed their survey and final exam grades were reported using their assigned student number. Once the data was compiled, the numbers were changed to a randomly assigned identifier to eliminate any identifying characteristics. Only the researcher has access to the combined data of grades and survey results to minimize access to the information. The original data has been stored on the researchers personal home computer on a secure network. The only risk to participants is relative to confidentiality, addressed via the procedures noted above.

The second area of concern was relative to the researcher’s role at the institution and the possible influence and bias this might cause. As the Vice President for Academic Affairs, the faculty member who taught each class section, has an indirect reporting line to the researcher.
This could potentially influence the faculty member to provide the researcher with data that supports the desired outcomes. This concern was mitigated by providing a clear guideline to follow in grading, with a standardized exam. The instructor did not have access to the student survey data so this could not influence or affect grading strategy. The researcher was removed from the process and worked behind the scenes with no direct interaction with the participants. In addition, clearly articulated goals of valid assessment without bias toward any intended outcome were communicated to the faculty member.

**Summary**

This study was conducted at a small moderately selective New England college. Students at this institution are accepted into bachelor degree programs with a GPA of 2.1 or higher. These students were evaluated using a quantitative quasi-experimental research study design. The sample included 37 students in a 400-level Operations Management class, conducted in two course delivery modes with the same instructor, during the same time period, with students of similar academic preparedness. Data collection consisted of final exam grades for each class section, as well as survey responses that were used to assess student satisfaction along with their evaluation of course structure, dialogue, and autonomy. Several open-ended questions were collected to provide insight into survey results. The researcher employed a t-test analysis to compare the difference between the means of final exam scores, and overall satisfaction ratings in each course format. In addition, a Cohen’s d measure of effect size was calculated for all variables to establish relative impact of course delivery mode on each construct. A further analysis, using Pearson r, was conducted to evaluate the relationship between the individual constructs of course structure, dialogue, and autonomy relative to satisfaction in each class section to compare the relationships. The researcher established a process and procedures to
ensure validity and reliability and identified the limitations. This research design and data collection will be fully evaluated and analyzed in the following chapter.
Chapter 4: Report of Research Findings

The purpose of this study was to compare learning achievement and student satisfaction between two course structures for traditional-age undergraduates at a moderately selective college. In addition, the relationship between the constructs of structure, dialogue, and autonomy, as developed in the theory of transactional distance, was examined. The difference in assessment between class sections was evaluated, and the correlation between each construct and satisfaction was separately calculated for each section. The following sections provide a review of the results.

Quantitative Data Results

In the fall of 2013, the quasi-experiment was conducted using an upper level management class. One instructor taught a class section of the course in the traditional face-to-face format and a second class section in a blended format. The courses were conducted over a traditional 15 week semester. The face-to-face class section met twice per week for 75 minutes each. The blended class section met once per week for 75 minutes and replaced the second 75 minutes of contact hours with instructional activities administered through the learning management system, Blackboard. During week 14 of the semester, the researcher visited each of the two sections and delivered to each student an informed consent form. The researcher read a prepared script that explained the purpose of the research. The students were informed that their consent was voluntary and that they could opt out of participation by declining to complete the survey instrument. The informed consent and the presentation clearly identified the institutional benefits associated with the research, and requested their participation. Students were assured that their responses would be confidential and there was no risk to them relative to participation.
Based on this protocol, approved by the Northeastern University Institutional Research Board (IRB), and the IRB at the research site, all students who completed the survey were considered participants, thereby allowing their results to be included in the analysis. During week 15 of the term, students were escorted to the computer lab at the end of their class period to complete the survey. Neither the professor nor the researcher remained in the lab, ensuring that students would not be monitored or feel pressured to participate. The students who completed the survey had the option of emailing the researcher to be entered into a random drawing for two $50 gift cards. The participation rate can be found in Table 5.

Table 5

<table>
<thead>
<tr>
<th>Class Section Participation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class</strong></td>
</tr>
<tr>
<td>Group 1: face-to-face</td>
</tr>
<tr>
<td>Group 2: blended</td>
</tr>
</tbody>
</table>

The face-to-face class did not experience any attrition and all students completed the survey. The blended section lost one student as a result of withdrawal, and three other students did not complete the survey. Therefore, all data analysis for the study was conducted with a total of n=37 (19 in group 1/face-to-face, 18 in group 2-blended).

**Research question 1.** To what extent does learning achievement of traditional-age undergraduates in a moderately selective college differ in a blended learning mode and a face-to-face mode? The null hypothesis for this question predicts that there is no significant difference in learning achievement of traditional-age, undergraduates at a moderately selective college in a face-to-face delivery mode and a blended delivery mode. In this quasi-experiment, students self-selected into the face-to-face or blended section of the course. Given this limitation, a test of normality was required to ensure that each group was similarly aligned and that results
would not be impacted by differences that pre-existed within the sample. Normality of data was assessed both graphically and numerically in this study. The first test of normality was conducted to determine if each section was comprised of like students, relative to each other. The second test of normality was conducted to ensure the students within each class section demonstrated a normal distribution. To address each issue, several strategies were employed. First, the research was conducted at a single moderately selective institution, as previously defined, which established a general assumption regarding the academic skill level of students within the institution. Second, the course selected is available to juniors and seniors only, which ensures a minimum level of academic ability resulting in persistence beyond their first and second year in higher education. Lastly, a review of descriptive statistics and Q-Q plots for each group, in addition to a Shapiro-Wilk test of normality were conducted. In order to establish normality, prior semester cumulative GPA of each student provided the foundation for the analysis. The descriptive statistics relative to GPA can be found in Table 6.

Table 6

**GPA Statistics by Class Section**

<table>
<thead>
<tr>
<th>Format</th>
<th>Statistic</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional face-to-face</td>
<td>Mean</td>
<td>2.7747</td>
</tr>
<tr>
<td></td>
<td>Minimum</td>
<td>1.93</td>
</tr>
<tr>
<td></td>
<td>Maximum</td>
<td>3.84</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>1.91</td>
</tr>
<tr>
<td>Blended</td>
<td>Mean</td>
<td>2.9900</td>
</tr>
<tr>
<td></td>
<td>Minimum</td>
<td>1.94</td>
</tr>
<tr>
<td></td>
<td>Maximum</td>
<td>3.82</td>
</tr>
<tr>
<td></td>
<td>Range</td>
<td>1.88</td>
</tr>
</tbody>
</table>

As noted in Table 6, the average GPA for both classes is less than 3.0, which is indicative of the overall student population at the research site. However, the blended section has a mean that is .22 higher than the students in the face-to-face section, which will be further discussed in
the analysis of results. The minimum and maximum GPAs of each class section are within a .02 variance of each other, resulting in a total range of .03. The GPA’s for students in each class were also visually evaluated on a Q-Q Plot. From this review of the descriptive statistics and the visual review of the Q-Q plot, the two groups demonstrate reasonable equivalence.

The second test of normality is relative to the composition of each class section individually, to ensure a normal distribution of students. To make this assessment, the Shapiro-Wilk test of normality was conducted using prior semester GPA. Results can be found in Table 7.

Table 7

<table>
<thead>
<tr>
<th>Course Format:</th>
<th>Shapiro-Wilk Statistic</th>
<th>Df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPA Traditional face-to-face</td>
<td>.901</td>
<td>19</td>
<td>.051</td>
</tr>
<tr>
<td>Blended</td>
<td>.969</td>
<td>18</td>
<td>.779</td>
</tr>
</tbody>
</table>

The Shapiro-Wilk test is considered appropriate for small sample sizes such as the one used in this study (n=37). To interpret this value, the standard measure of normality was applied. As such, the benchmark p-value of .05 or greater would indicate the data is normal. In this study, both sections meet the test of normality; however the face-to-face section is only slightly over the commonly acceptable minimum threshold.

After normality was established as indicated above, the next step was to evaluate the actual learning outcomes, as measured by a final exam. The final exam was a comprehensive test administered to both classes together during the final exam period at the same time, and in the same room, to minimize any possible environmental influences on outcomes. Table 8 provides a summary of the mean scores as well as standard deviation for each section.
Table 8

Class Section Final Exam Results

<table>
<thead>
<tr>
<th>Course Format:</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Exam</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traditional face-to-face</td>
<td>19</td>
<td>74.9474</td>
<td>9.25247</td>
<td>2.12266</td>
</tr>
<tr>
<td>Blended</td>
<td>18</td>
<td>73.6111</td>
<td>12.10318</td>
<td>2.85275</td>
</tr>
</tbody>
</table>

As shown in Table 8, the final exam grades were slightly higher for the face-to-face class with a mean of 74.95 compared to the mean score of 73.61 for the blended section. To compare the mean scores for each class section, a t-test was conducted. The t-test provides a tool to compare the dependent variable between two groups, in this case final exam scores have been compared between each course section. The measure is designed to test for a statistically significant finding relative to the variance between the two groups. The commonly accepted benchmark of statistical significance is p=.05 or lower. The results are provided in Table 9.

Table 9

Final Exam T-Test Results

<table>
<thead>
<tr>
<th></th>
<th>T</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
<th>Mean Difference</th>
<th>Std. Error Difference</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Exam</td>
<td>.379</td>
<td>35</td>
<td>.707</td>
<td>1.33626</td>
<td>3.52998</td>
<td>-5.82998 8.50250</td>
</tr>
</tbody>
</table>

This benchmark p-value implies a 5% or lower chance that the results are by coincidence and would not exist in the population. In order to determine which p-value to use, the Levene’s test of equality must be reviewed. In this case, the Levine’s test is greater than .05, which indicates that equal variances can be assumed. As a result, the associated p-value is .707. A p-value greater than .05 indicates that there is no statistically significant difference in final exam scores between the face-to-face and blended class sections. This p-value can be interpreted to
mean that there is a 70% chance that the difference we have found in the sample may be based on coincidence and not be representative of the population (t=.379, df=35, p=.707). However, a caveat against the no significant difference regarding the achievement between the two groups must be considered, given the small sample size (37) and higher starting GPA. A Type II error (concluding no significant difference in the sample when one does exist in the population) might be possible.

Despite the lack of statistical significance, a separate measure of effect size was conducted to determine the potential effect of course format on learning achievement. This supplemental measure is designed to provide additional insight into the results. The Cohen’s d measure of effect size was calculated for the final exam scores and resulted in a measure of .065. Based on standard benchmarks, this effect size represents a minimal practical effect of course format on learning achievement.

**Research question 2.** *To what extent does course satisfaction of traditional-age undergraduates in a moderately selective college differ in a blended learning mode and a face-to-face mode?* Its null hypothesis predicts that there is no significant difference in satisfaction of traditional-age undergraduates at a moderately selective college in a blended learning mode and a face-to-face mode.

To address the research question and test the hypothesis relative to student satisfaction, a composite variable was created and the results were represented in Table 6. This variable was comprised of the mean of the combined responses to two questions. Each question within the composite used the same 5-point Likert-like scale and had been validated as previously noted. The mean of the composite variable on satisfaction for each class section is identified in Table 10.
Table 10

*Class Section Course Satisfaction Results*

<table>
<thead>
<tr>
<th>Course Format:</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfaction</td>
<td>19</td>
<td>4.6842</td>
<td>.53257</td>
<td>.12218</td>
</tr>
<tr>
<td>Blended</td>
<td>18</td>
<td>4.2778</td>
<td>.71171</td>
<td>.16775</td>
</tr>
</tbody>
</table>

As shown in Table 11, the mean rating of satisfaction in the face-to-face section was slightly higher with a score of 4.68, as compared to the blended section with a mean score of 4.28. The variance of .40 indicates a slightly lower level of satisfaction for students in the blended section. This result was further analyzed with the use of a t-test (see Table 11).

Table 11

*Satisfaction T-Test Results*

<table>
<thead>
<tr>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
<th>Mean Differences</th>
<th>Standard Error Diff.</th>
<th>95% Confidence Interval of Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>1.974</td>
<td>35</td>
<td>.056</td>
<td>.40643</td>
<td>-.01158</td>
</tr>
</tbody>
</table>

Although t-test is best suited when working with continuous variables, it is often used by researchers for ordinal variables, as is the case with this analysis. The Levene’s test for equality of variances is .064, therefore equal variances can be assumed with an associated p-value of .056. Although this does not meet the standard benchmark for statistical significance of .05 or lower, it is quite near this commonly accepted, and somewhat arbitrary benchmark (Muijs, 2011). The p-value of .056 can be interpreted to mean there is a 5.6% chance that these results would not be found in the full population. Despite the nearness of the measure, the t-test for satisfaction from the face-to-face class and the blended class would not be considered statistically significant (t=1.974, df=35, p-value=.056). Given this p-value and the associated relatively small sample
size (37), a Type II error (concluding no significant difference in the sample when one exists in the population) might be possible.

As with the previous research question, the Cohen’s d measure of effect was calculated and resulted in a measure of .0625 which implies a minimal practical effect of course format on overall satisfaction. Cohen’s d attempts to estimate the percentage of the difference between the two means that can be associated with the independent variable. In this case, a minimal practical effect is implied indicating that less than 1% of the variance can be attributed to the class format.

**Research question 3.** To what extent do a course’s structure, dialogue, and student autonomy relate to course satisfaction of traditional-age undergraduates in a moderately selective college in a blended learning mode and in a face-to-face mode? Its null hypothesis predicts that there is no significant difference in relationship between course structure, dialogue, autonomy and satisfaction of traditional-age undergraduates in a moderately selective college in a blended learning mode and in a face-to-face mode.

This research question is more complex, as such; the results relative to question three required multiple levels of analysis. Each construct within the framework of the theory of transactional distance was evaluated in each class section to determine if a blended course delivery demonstrated a higher level of transactional distance than a traditional face-to-face class. By conducting this analysis, not only could the question be answered but the relevance of the theory of transactional distance to blended learning could be assessed. Each construct will be discussed in the following sections.

**Course structure.** The students in each class were asked seven questions that related to their perception of course structure. Course structure, according to the theory of transactional distance, could be perceived differently based on the use of distance education within the
blended delivery modality. Of the seven questions relating to course structure, question 14 had to be reverse coded prior to creating the composite variable. Each question within the composite was evaluated on a 4-point Likert-like scale. Once the composite variable was constructed, several steps were taken to complete the analysis. First, mean scores were calculated for each group relative to the student assessment of structure. For this factor, a score of four represented the most favorable opinion of the course structure. The composite variable included questions relative to content, organization, teaching methods and assessment.

As demonstrated in Table 12, the mean score for the blended class section was once again slightly lower (3.42) than the mean for the face-to-face class section (3.58) indicating a slightly more positive assessment of structure by students in the face-to-face class. A t-test was conducted to evaluate the significance of the difference in means between these two groups. Levene’s test of equality indicated a significance of .011, less than the .05 benchmark, therefore equal variances cannot be assumed. The t-test resulted in the associated p-value of .261, indicating that there was not a statistically significant difference in the two groups as they perceived course structure (t=1.146, df=29.443, p-value=.261). As previously stated, care must be given to avoid a Type II error.

The t-test was followed by the calculation of Cohen’s d test for effect size. The effect size was .193, which represents a minimal practical effect between course format and student perception of structure, but approaches the benchmark for moderate effect size (.2). This variable was further analyzed for each group to determine the relationship between student perception of structure and their level of satisfaction. To complete this analysis a Pearson’s r test was completed for each group separately and can be reviewed in Table 12.
Table 12

<table>
<thead>
<tr>
<th>Class Section Course Structure Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
</tr>
<tr>
<td>-------------------------------------</td>
</tr>
<tr>
<td>Face-to-Face</td>
</tr>
<tr>
<td>Blended</td>
</tr>
</tbody>
</table>

The Pearson’s r test is a correlation coefficient measure designed to determine if a high score in one variable is associated with a high score in another variable. This test does not indicate causality, but identifies a relationship. Pearson r coefficients range on a scale from -1 to +1, with a +1 indicating a perfect positive relationship. As seen in the preceding charts, the correlation coefficient is .718 for the face-to-face class indicating a strong positive relationship. The correlation coefficient for the blended class is a .860 which indicates a very strong association. The Spearman’s rho test was also completed and resulted in the same finding as Pearson r; therefore, only Pearson r has been reported. Students in the blended class gave the assessment of structure a slightly lower rating, but there is a stronger association between structure and satisfaction for this group. This finding may be useful in the analysis of overall satisfaction by the blended students.

Course dialogue. The second construct of transactional distance, dialogue, was further segmented into an analysis of student/instructor dialogue and student/student dialogue and discussed in the following sections.

Student/instructor dialogue. Student/instructor dialogue was assessed through the responses to seven questions related to interaction between the professor and the student. Two of the seven questions, questions 10 and 18, had to be reverse coded in SPSS prior to the development of the composite variable. These questions were all based on a 4-point Likert like scale. As indicated in Table 13, students in the blended class section evaluated the level of
student/instructor dialogue, with a mean score of 3.42, slightly lower than their counterparts in the face-to-face class section with a mean score of 3.58.

Table 13

*Class Section Student/Instructor Dialogue Results*

<table>
<thead>
<tr>
<th>Student/Instructor</th>
<th>Comparison of Means</th>
<th>T-Test</th>
<th>Cohen’s d</th>
<th>Pearson’s r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-Face</td>
<td>3.58</td>
<td>.159</td>
<td>.23</td>
<td>.677</td>
</tr>
<tr>
<td>Blended</td>
<td>3.42</td>
<td></td>
<td></td>
<td>.805</td>
</tr>
</tbody>
</table>

A t-test was conducted to evaluate the significance of the difference in means between these two groups. Levene’s test of equality indicated a significance of .463, greater than the .05 benchmark, therefore equal variances can be assumed. The t-test resulted in a p-value of .159, indicating that there is not a statistically significant difference in the two groups as they perceived student/instructor dialogue (t=1.439, df=35, p-value=.159).

To further the analysis a Cohen’s d measure of effect size was conducted, resulting in a measure of .23. This measure indicates that course format has a moderate practical effect on students’ perception of student/instructor dialogue. This variable was further analyzed for each group to determine the relationship between student perception of student/instructor dialogue and their level of satisfaction. To complete this analysis a Pearson’s r test was conducted for each group. As previously stated, the Pearson’s r test is a correlation coefficient measure designed to determine if a high score in one variable is associated with a high score on another variable, or vice versa. This test does not indicate causality, but identifies a relationship. Pearson r coefficients range on a scale from -1 to +1, with a +1 indicating a perfect positive relationship. As seen in the preceding table, the correlation coefficient is .677 for the face-to-face class, indicating a strong positive relationship. The correlation coefficient for the blended class is a .805 which indicates a very strong association. Students in the blended class gave the
assessment of student/instructor dialogue a slightly lower rating, but there is a stronger
correlation between student/instructor dialogue and satisfaction for this group. This represents a
potentially meaningful finding.

**Student/student dialogue.** Student/student dialogue was assessed through the responses
to five questions, each based on a 4-point Likert-like scale, related to interaction between
students within the class. These five questions were combined to create the composite variable
of measurement for student/student dialogue. A review of the data in Table 14 demonstrates a
recurring observation; students in the blended section evaluated the level of student/student
dialogue to be slightly lower with a mean score of 3.17, than their counterparts in the face-to-
face class with a mean score of 3.39. An additional observation relative to this data is that this
construct received the lowest assessment from each of the two class sections.

Table 14

<table>
<thead>
<tr>
<th>Class Section</th>
<th>Student/Student Dialogue Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Comparison of Means</td>
</tr>
<tr>
<td>Face-to-Face</td>
<td>3.39</td>
</tr>
<tr>
<td>Blended</td>
<td>3.17</td>
</tr>
</tbody>
</table>

A t-test was conducted to evaluate the statistical significance relative to the difference in
means between these two groups. Levene’s test of equality indicated a significance of .975,
greater than the .05 benchmark, therefore equal variances can be assumed. The t-test resulted in
a p-value of .131, indicating that there is not a statistically significant difference in the two
groups as they perceived student/student dialogue (t=1.548 df=35, p-value=.131). The Cohen’s
d measure of effect size was then calculated and resulted in a measure of .26 indicating that
course format has a moderate practical effect on student/student dialogue. This variable was
further analyzed for each class section to determine the relationship between student perception
of student/student dialogue and their level of satisfaction. To complete this analysis both Pearson’s r and Spearman rho tests were completed with similar results. For that reason, as with prior variables, Pearson’s r was selected to run the analysis and can be found in the preceding table.

A consistent finding is relative to the strength of the association between variables for the students in the blended section. As with the previous variables, students in the blended section demonstrated a very strong relationship, with a correlation of .812, between their assessment of student/student dialogue and their assessment of satisfaction, while the face-to-face section demonstrated a strong relationship, with a correlation of .565. This finding is particularly useful in addressing the future development of blended courses. In addition, this variable received the lowest rating of the course related constructs from both class sections, representing another area for further consideration.

**Autonomy.** The final construct of transactional distance, autonomy, was also evaluated relative to the third research question. The measure of autonomy was completed through the development of a composite variable comprised of a previously validated scale of five survey questions, based on a 5-point Likert-like scale. With this composite variable, a score of 5.0 represents a students’ strongest assessment relative to their own learning autonomy. Students with a high rating consider themselves to be self-initiated, able to manage their own time, and generally better disciplined as a student.

Table 15

**Class Section Autonomy Results**

<table>
<thead>
<tr>
<th>Autonomy</th>
<th>Comparison of Means</th>
<th>T-Test</th>
<th>Cohen’s d</th>
<th>Pearson’s r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-Face</td>
<td>3.83</td>
<td>.321</td>
<td>.165</td>
<td>.544</td>
</tr>
<tr>
<td>Blended</td>
<td>4.0</td>
<td>.688</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
As seen in Table 15, the students in the blended class rated themselves slightly higher relative to their individual autonomy, with a mean score of 4.0, as compared to the students in the face-to-face class with a mean score of 3.83. A t-test was conducted to determine if there was a statistical significance of the difference in means from these two class sections. Levene’s test of equality indicated a significance of .363, greater than the .05 benchmark, therefore equal variances can be assumed. The t-test resulted in a p-value of .321, indicating that there is not a statistically significant difference in the two groups as they perceived their own learning autonomy (t=-1.006, df=35, p-value=.321).

This analysis was followed by the Cohen’s d measure of effect size. The Cohen’s d measure for autonomy was -.165, which indicates a minimal practical effect of course format on student autonomy. With Cohen’s d, absolute value is used; therefore the negative number bears no significance to the finding. Autonomy, was not expected to be influenced by course format, instead was expected to be a personal attribute of students that would influence their success, as represented in the theory of transactional distance. Lastly, this variable was analyzed for each group to determine the relationship between student perception of autonomy and their level of satisfaction. To complete this analysis a Pearson’s r correlation test was used to evaluate each group separately. As previously noted, the pattern of response continues to show that there is a stronger relationship between the two variables for the blended section, however, the relationship for each class section falls within the range that is commonly considered strong. An important factor for consideration in this analysis is that the instrument measures a student’s self-reported perception of their autonomy, not their actual behavior. Further analysis is warranted to measure student’s actual autonomy and the resulting effect on course satisfaction, which was beyond the scope of this research study.
Open Response Data Analysis

Each class section was asked several open-ended questions that have been summarized for analysis. A simple descriptive coding method was used, which as noted by Saldana (2013), “leads primarily to a categorized inventory, tabular account, summary, or index of the data’s contents” (p.89). The small volume of text collected in response to the open ended questions, was easily structured and did not warrant any further sub-categorization. A tabular summary of the responses by student’s in the face-to-face class to the question regarding their reason for selecting the face-to-face class section rather than the blended section, can be found in Table 16.

Table 16

Reasons for Selecting Face-to-Face Class Section

<table>
<thead>
<tr>
<th>Code</th>
<th>Number of References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tried Blended Previously</td>
<td>4</td>
</tr>
<tr>
<td>Learns better/Likes Face-to-Face Format</td>
<td>9</td>
</tr>
<tr>
<td>Time Management Concerns</td>
<td>1</td>
</tr>
<tr>
<td>Liked Schedule</td>
<td>3</td>
</tr>
</tbody>
</table>

Four students indicated that they had tried blended courses in the past and preferred the face-to-face format. Nine students (may overlap with four who previously tried blended) indicated that they learn better in the face-to-face format. The students in the blended section were asked why they selected that class section rather than the face-to-face section and their categorized responses can be found in Table 17.

Table 17

Reasons for Selecting Blended Class Section

<table>
<thead>
<tr>
<th>Code</th>
<th>Number of References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less Work Anticipated</td>
<td>1</td>
</tr>
<tr>
<td>Learns better/Likes Blended Format</td>
<td>8</td>
</tr>
<tr>
<td>Liked Schedule</td>
<td>11</td>
</tr>
</tbody>
</table>
The highest response to this question in the blended course related to the schedule. However, a reasonable number of responses indicated that students liked the blended format for learning purposes. An additional question asked students in each section to indicate their willingness to take a blended class in the future.

Table 18

*Willingness to Select a Blended Class Section in the Future*

<table>
<thead>
<tr>
<th>Class Section</th>
<th>Yes</th>
<th>No</th>
<th>Maybe</th>
<th>No Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face-to-face</td>
<td>4</td>
<td>9</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Blended</td>
<td>15</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

A review of the results found in Table 18 indicates that students in the blended class section would overwhelmingly be willing to take additional classes in the blended format; however, the students in the face-to-face format are much less likely to make that decision.

Table 19 displays representative comments from students in each class section to provide some insight into the above referenced results.

Table 19

*Student Comments Regarding Blended Class Selection*

<table>
<thead>
<tr>
<th>Face-to-face</th>
<th>Blended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reasons not to choose blended</td>
<td>Reasons to choose blended</td>
</tr>
<tr>
<td>I’ve tried blended before and it did not work for me</td>
<td>It works with my schedule</td>
</tr>
<tr>
<td>I like to have more face-to-face time with my professor</td>
<td>This allows flexibility to participate online and in person at the next class</td>
</tr>
<tr>
<td>I like to go to class and listen to the professor explain things and if I have a question be there to ask them</td>
<td>It is a different commitment and style of coursework, but if you are up for it, it is a good method.</td>
</tr>
<tr>
<td>This is the best way to learn</td>
<td>Since half the class is on line there is more independent learning but still meets once a week to maintain structure.</td>
</tr>
<tr>
<td>I do not think blended courses are the way to</td>
<td></td>
</tr>
</tbody>
</table>
If I were to stay home and have a blended class, where I can manage my own time, I tend to procrastinate. Because I needed to use blackboard for this class, I was always logging in which forced me to keep up with announcements and assignments from other classes.

A further review of these responses indicates strong sentiments in each case. Some of the hesitation on the part of the students in the face-to-face section could be addressed through better communication regarding the format and strong instructional design techniques. Misperceptions from students in the blended section regarding the workload can also be addressed through communication. These results will be further interpreted with associated recommendations in Chapter 5.

**Summary of Data Analysis**

In this study, the descriptive data of students’ learning achievement, course satisfaction, and the constructs of structure and dialogue, all produced more positive results for the students in the face-to-face class section. Further inferential analysis, however, indicated that none of the variances were considered statistically significant. This result supports one common finding from instructional technology research: delivery mode does not appear to have a significant effect on learning achievement and course satisfaction (Cheng, Lehman, & Armstrong, 1991; Russell, 1999). However, the mean scores do indicate that the face-to-face students performed better on the final exam, despite the fact that students in the blended section began the class with a slightly higher overall GPA. Similarly, student course satisfaction in the face-to-face format was higher than that in the blended format, with its p-value of .056 approaching closely to statistical significance. Regardless of the no-significance conclusion, these results do raise
concerns about the blended format for traditional-age undergraduates at moderately selective colleges.

Additionally, each of the constructs of transactional distance relative to course delivery (structure, student/instructor dialogue, and student/student dialogue) were evaluated more favorably by the students in the face-to-face class section. However, none of the variances were considered statistically significant. Despite the lack of statistical significance, these results also raise some concerns regarding this delivery modality for these students and demonstrate the possibility that transactional distance is indeed increased in the blended delivery modality. A correlation analysis was completed for each class section between the students’ assessment of each of the constructs, and satisfaction. There was a strong correlation for all constructs for both class sections; however, all correlations were stronger for the blended class section. Students in both sections also assessed their own autonomy, and for this construct the students in the blended class section considered themselves slightly higher in autonomy. However, this finding also lacked statistical significance. The correlation between autonomy and satisfaction was strong for each class section, but stronger for the blended section.

In summary, the students in the traditional class achieved slightly higher learning achievement as measured by a final exam, despite a slight lower incoming mean GPA, and they had a slightly higher level of satisfaction. Therefore hypothesis one and two can be supported, with the caveat that caution in interpreting the results is needed as concern over a Type II error may exist given the small sample size and nearness of the measure of satisfaction to statistical significance. The constructs of transactional distance of structure, dialogue and autonomy showed strong correlation with satisfaction within both classes, but were stronger yet for the blended section. This stronger correlation in conjunction with the slightly lower
assessment of satisfaction supports the concept of increased transactional distance, albeit minimal, in a blended format, therefore hypothesis three cannot be supported.
Chapter 5: Interpretation of Findings

The purpose of this study was to evaluate the implications of blended learning at a moderately selective college with traditional-age undergraduates. Faculty at this institution have expressed concerns relative to the ability of this specific sub-set of students to succeed in a blended format. The first common concern was relative to their ability to connect with students given the reduced face-to-face time. They also expressed significant concern relative to the ability of “their” students to self-manage time well enough to complete the required online tasks. There was an assumption that students would consider the reduced face-to-face time to mean there would be a less content and less time required to complete the assignments. They were also concerned about the quality of the online discussions and if these would enhance and support the learning environment in a meaningful way. These concerns needed to be meaningfully addressed in order to ensure faculty support for the expanded use of this delivery mode in the traditional day school model, and directly relate to the purpose of this study. As previously stated, the research questions, designed in part to address these concerns, were as follows:

Question 1: To what extent does learning achievement of traditional-age undergraduates in a moderately selective college differ in a blended learning mode and a face-to-face mode?

Question 2: To what extent does course satisfaction of traditional-age undergraduates in a moderately selective college differ in a blended learning mode and a face-to-face mode?

Question 3: To what extent do a course’s structure, dialogue, and student autonomy relate to course satisfaction of traditional-age undergraduates in a moderately selective college in a blended learning mode and in a face-to-face mode?
Each of these questions have been evaluated and framed by the theory of transactional distance. Learning achievement was measured via a comprehensive final exam. Satisfaction, as well as student perception of structure, student-instructor dialogue, student-student dialogue, and autonomy were evaluated through the use of an empirically tested survey instrument, adapted for the aforementioned study. Statistical analysis was completed with use of SPSS and open-ended questions provided supplementary data to inform the discussion of results. The following sections provide results and discussion relative to each of the research questions.

**Results and Discussion Learning Outcomes**

A fundamental concern relative to the adoption of any new teaching methodology is to ensure that learning is not compromised and students are not harmed by the implementation. There is risk with the implementation of any new program, but the risk is mediated by careful analysis. The extensive literature review completed for this study identified significant prior studies that found equal or improved learning outcomes, which provided the researcher with the validation to attempt blended learning at the moderately-selective college, with traditional-age undergraduates (Kenney & Newcombe, 2011; López-Pérez, Pérez-López, & Lázaro, 2011; Roscoe, 2012; Uzun & Senturk, 2010). Based on these positive outcomes, this study proceeded, using final exam to measure learning achievement.

In this study, students in the face-to-face class had a mean score on the final exam of 74.95 which is slightly higher than the students in the blended section, who earned a mean score of 73.61. This result lacked statistical significance. This finding supports the findings of previous studies that found slightly improved or equal performance, as measured though the use of a final exam or grade (Kenney & Newcombe, 2011; Uzun & Senturk, 2010). As noted in Chapter 4, there was a minimal practical effect of course format on learning achievement. Given
these results, it can be interpreted that students perform equally well in each delivery mode, and the null hypothesis is supported. However, one area of particular concern is indicated given the fact that students in the blended class section had a slightly higher mean cumulative GPA of 2.99 when the semester began, compared to the mean GPA of 2.77 for the face-to-face class. This result, though not significant, represents the first key finding of the study. Should a Type II error exist, the extended use of blended learning for this sub-set of students may result in lower achievement, detrimental to the students and the institution alike.

**Results and Discussion Satisfaction**

The results of the analysis on satisfaction provide a second area of concern. The students in the blended class had a mean satisfaction rating of 4.23 as compared to the rating of 4.68 for the face-to-face class, on a 5-point Likert-like scale. Given the previously discussed p-value of .56, which is quite near the commonly accepted level of statistical significance, there is very strong likelihood that these results are indicative of the population, and represent the second major finding. In other words, this study raises concerns over student satisfaction in blended courses. However, the no significant difference finding is supported by the positive feedback of students in the blended section, 83% of whom would definitely take another blended class. Given the totality of the evidence, there is valid reason to accept the null hypothesis while recognizing that satisfaction can be impacted, therefore appropriate pedagogical strategies should be developed to support continuous improvement. A further analysis of the constructs of transactional distance follows and will attempt to identify areas in which satisfaction could be improved.
Results and Discussion of Transactional Distance

One goal of this quasi-experiment has been to validate the relevance of the theory of transactional distance as it relates to blended learning. In fact, some researchers have questioned the scientific validity of the theory, and the studies that attempt to validate the theory (Gorsky & Caspi, 2005). Indeed, distance education is far different from the model in existence when Moore first proposed the theory. Although this study did not attempt to examine the validity of the theory overall, it did attempt to determine if blended learning demonstrates the same constructs and relationships as proposed in the theory. The following sections provide the analysis associated with these results.

Structure. Structure, the first construct of transactional distance, refers to the flexibility and adaptability of the course material in order to meet the needs of the student. A measure of structure, using the CISS survey instrument, established that the course was rated slightly higher by the students in the face-to-face class section. This however lacked statistical significance and course format demonstrated a minimal practical effect size on perception of structure. Therefore the implication is that students had no significant issues or concerns relative to course structure, in either class section. Although it can be interpreted that students are equally pleased with course structure, a correlation analysis, using Pearson’s r, was completed for each section to see if there was variance in the correlation between structure and satisfaction. The correlation between satisfaction and structure for the face-to-face section can be interpreted as strong, given common guidelines, however it was considered very strong for the blended section. Therefore, a key finding is that students in the blended course rated the structure slightly lower, satisfaction slightly lower, and demonstrated a stronger correlation between the two. This finding leaves
open the possibility that structure, as defined by Moore, is higher and less flexible in a blended format, which increases transactional distance, which in turn impacts student satisfaction.

**Dialogue.** Dialogue, the second construct of transactional distance, as identified by Moore (1993), refers to a specific type of interaction between teachers and learners. Garrison and Vaughan (2008), scholars and researchers in blended learning, frame their analysis of blended learning from the community of inquiry theory, emphasizing the importance of this interaction communication beyond student/instructor. Community of inquiry was developed by Garrison and colleagues initially to frame their research into online learning (Garrison & Vaughan, 2008). As leading researchers in the study of blended learning, they emphasize the connection and collaboration among students, as well as between students and teachers, as essential elements in the achievement of learning goals. Although this theory did not provide the basis of analysis for the current study, its significance in the discussion of dialogue can inform the analysis. For this reason, this study considered the construct of dialogue from both the student/instructor, and student/student perspectives.

**Student/instructor dialogue.** As with previous findings, students in the face-to-face class rated student/instructor dialogue slightly higher with a mean of 3.58 as compared to a mean of 3.42 for the blended section. Although the results lacked statistical significance, there is a moderate practical effect, as indicated by the Cohen’s d measure, between course format and assessment of student/instructor dialogue. To complete the analysis, the correlation between this sub-construct and satisfaction was conducted for both class sections. The findings indicated that students in face-to-face section demonstrated a strong relationship between student/instructor dialogue, while students in the blended section demonstrated a very strong correlation. This result is consistent with the finding relative to structure and leads to an additional finding.
The key findings associated with student/instructor dialogue can each be framed through the lens of transactional distance. On the one hand, the lack of statistical significance in the comparison of means relative to student/instructor dialogue, as always, makes us question the applicability of the results to the overall population. However, a moderate effect size does imply that course format had some practical effect on student assessment of dialogue. In addition, there is a stronger correlation in the blended class section, between a student assessment of student/instructor dialogue and satisfaction. Therefore, there is a minor finding of reduced student/instructor dialogue, yet there is a moderate practical effect of course format on student/instructor dialogue, and this dialogue is more closely correlated to student satisfaction in the blended class. This supports the premise that dialogue is reduced in a blended course, reinforcing the applicability of this theory to the study of blended learning. According to Moore (2013), “dialogue is, of course, also powerfully affected by the abilities of students to manage their side of the process, highly autonomous learners are able to cope with a lower degree of dialogue but less autonomous need a relatively high degree of dialogue” (p.71). This connection will be further reviewed in the section on autonomy.

**Student/Student.** Although Moore (2013) did not specifically focus on the dialogue between student and student in his initial premise of the construct, further theorists, particularly in the study of blended learning, have incorporated this construct as fundamental element of learning. In fact, the CISS instrument selected for this study, developed by Shaik (2002), was designed to assess student perception of student/student dialogue in addition to student/instructor dialogue. In both class sections, student/student dialogue had the lowest mean score of any construct measured, based on percentage of highest possible score, with a mean of 3.39 for the face-to-face section and mean of 3.17 for the blended class section. This indicates that the level
of student/student dialogue is lacking in both situations. As with previous measures, the results lacked statistical significance, however the effect size, as measured by Cohen’s d, was considered moderate. Therefore class format has a moderate practical effect on student assessment of student/student dialogue. The correlation coefficient analysis identified that the relationship between student/student dialogue and satisfaction was significantly higher for the students in the blended section which leads to several findings to be discussed as below.

From this data analysis, it can be interpreted that student/student dialogue has a greater impact on satisfaction for students in the blended class than in the face-to-face class. In addition, they assessed satisfaction slightly lower. This lower assessment of student/student dialogue and the stronger relationship to their satisfaction, could have impact on overall satisfaction, which should be addressed.

Although Moore (2013) emphasized the dialogue between student and instructor, and student autonomy, it can be complimented with the analysis of student/student interaction and supported by the community of inquiry theory. As noted by Garrison and Vaughan (2008), in the community of inquiry theory, community emphasizes “the social nature of education and the role that interaction, collaboration and discourse play in constructing knowledge” (p.9). The results of this study support the importance of community in its relationship to satisfaction, more importantly for students in the blended class section, which is coupled with a slightly lower overall assessment of this relationship. Accepting the importance of the collaborative-constructivist impact of student/student dialogue in addition to student/instructor dialogue presents another finding relative to blended learning.

In this study, despite the lack of statistical significance, the difference in the means, as measured by Cohen’s d, is considered moderate. In addition, there is a stronger relationship
between student/student assessment of dialogue and satisfaction for the students in the blended class section. In addition, this sub-construct was assessed lowest by both class sections. This finding identifies an important opportunity to impact satisfaction in the blended delivery modality to support student satisfaction, by increasing student/student collaboration and communication. Rovai and Jordan (2004) found that “blended courses produce a stronger sense of community among students than either traditional or fully online courses” (p. 26). The findings from the current study relative to dialogue do not support this finding, however the recognition of the importance of this factor represents an important and actionable finding.

**Autonomy.** The third construct of the theory of transactional distance, autonomy, refers to a student’s self-management relative to developing their personal learning plan, including setting goals, execution of the plan, and evaluation of their progress. A review of the descriptive statistics relative to student autonomy, as measured via the variable adapted from the Online Readiness Scale, found that student’s who self-selected into the face-to-face class considered themselves slightly less autonomous, with a mean of 3.83, than those who selected the blended class section who had mean self-assessment of autonomy of 4.0. As indicated by Moore (2013), a course with lower transactional distance “is invariably more attractive to those learners who are less secure in managing their own learning” (p.73). This is supported by the open-response questions and the previous experience with blended learning. As one faculty member has recently stated, “the word is out that blended is not easier” so students are cautious when considering a blended class. The students who selected the blended section may have had an understanding that it would require more discipline and self-management and had the requisite confidence in their ability to do so. Conversely, the students who avoided the blended section did so in part, because of their lack of confidence in their own autonomy. However, the t-test
demonstrated a lack of statistical significance and the Cohen’s d measure of effect size indicated a minimal practical effect of course format on student assessment of their autonomy. For both groups, the correlation between their assessment of autonomy and satisfaction was strong with a correlation. This represents another finding in this study.

Although students in the blended class considered themselves slightly higher in autonomy, they performed slightly lower on the final exam and were slightly less satisfied with the class overall. These findings could be interpreted in several ways. One interpretation could imply that the students in the blended class, having a slightly higher level of autonomy, were able to perform at a near equal level in the class. Had the students in the blended class demonstrated a lower level of self-reported autonomy, the performance on the final exam, might have been more significantly impacted. In addition, the stronger relationship between autonomy and satisfaction for the blended course section validates that students perceive autonomy to be more important in a blended class than it is in a face-to-face class. This is supported by faculty, who additionally reported student self-discipline as a primary concern in the expanded use of blended learning. These results support the relevance of autonomy to student satisfaction in a blended course and present another opportunity to impact student success and satisfaction.

**Summary of transactional distance.** According to the theory of transactional distance, distance education is inherently higher in structure, for example less flexible and adaptable to student needs and is lower in dialogue, which speaks to the connection between student and instructor (Moore, 2013). For this reason, distance education requires students to be more autonomous learners to be successful. This study attempted to assess the applicability of this theory to a blended learning environment for traditional-age undergraduates at a moderately selective college. This was done by measuring student perception of each of the constructs of
the theory for a blended class section and a traditional face-to-face section. The means were compared to determine if the constructs were perceived differently in one section or the other. A test of statistical significance was followed by a measure of effect between course format and each construct, and lastly a correlation coefficient was calculated for each class section separately to see if there was a different relationship between each construct and satisfaction. The resulting data and analysis lends support for the value of the theory of transactional distance relative to blended learning.

First, each of the constructs that result in transactional distance, structure and dialogue, were perceived less favorably by the student’s in the blended section. Although the results lacked statistical significance, there was a moderate practical effect size, which in conjunction with a slightly lower mean supports the notion that the students in the blended course were slightly less pleased with the level of structure and dialogue. This in turn, supports the premise that transactional distance is increased through higher structure and lower dialogue in a blended format. This development leads to the second major finding or implication.

The second major implication relates to the fact that students in both class sections demonstrated a strong correlation between the constructs and their satisfaction, but the blended section had higher correlation. Once again, the constructs were important to all students, but more so for the students in the blended class who simultaneously rated the constructs less favorably. Therefore, in the blended course, the constructs of structure, student/instructor dialogue, and student/student dialogue were more highly correlated with satisfaction and the assessment was lower, demonstrating another finding in support of the theory of transactional distance.
The last finding is relative to autonomy. As presented in the theory, a higher level of autonomy is needed when transactional distance is increased. In this study, the students in the blended section considered themselves slightly higher in autonomy, yet were slightly less satisfied with the course. In all cases there is minimal to moderate practical effect size that links the students’ perception of autonomy to their level of satisfaction and the stronger correlation between autonomy and satisfaction for the blended students further enhances the argument. This is anecdotally supported by the open ended responses of the students in the face-to-face class who indicated they had tried the format before and didn’t like it; nine students indicated that they “learned better in class” and one specifically mentioned their own lack of time management to be successful in blended. This assessment of autonomy neither supports nor refutes the theory of transactional distance for several reasons. First, student autonomy is not being measured, only student perception of their own autonomy is measured. Second, the correlation between this assessment and satisfaction demonstrated a stronger relationship to the blended class. Lastly, this study did not correlate autonomy (actual or assessed) to learning achievement. However, slightly lower achievement in the blended class provides a source of concern and one for further research and analysis. In addition, the stronger relationship of autonomy to satisfaction, validated through open-response answers, does support the increased need for autonomy in this modality.

Summary of Key Findings

The preceding analysis, relative to the aforementioned study, identified the key findings detailed in Table 20, and provide a basis for the subsequent implications for practice.
Table 20

*Key Findings*

<table>
<thead>
<tr>
<th>#</th>
<th>Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Students in the blended class section performed slightly lower on the final exam (not statistically significant, minimal practical effect of course format on learning outcomes)</td>
</tr>
<tr>
<td>2</td>
<td>Students in the blended class section were slightly less satisfied with the course (approached statistical significance, minimal practical effect of course format on satisfaction)</td>
</tr>
<tr>
<td>3</td>
<td>Students in the blended class assessed structure less favorably, and demonstrated a higher correlation between structure and satisfaction (lacked statistical significance, moderate practical effect of course format on satisfaction, very strong correlation for blended class section between structure and satisfaction)</td>
</tr>
<tr>
<td>4</td>
<td>Students in the blended class assessed student/instructor satisfaction slightly less favorably, and demonstrated a higher correlation between student/instructor dialogue and satisfaction (lacked statistical significance, moderate practical effect of course format on satisfaction, very strong correlation for blended class section between student/instructor dialogue and satisfaction)</td>
</tr>
<tr>
<td>5</td>
<td>Both class sections rated student/student dialogue least favorably of all of the constructs measured</td>
</tr>
<tr>
<td>6</td>
<td>Students in the blended class assessed student/student dialogue less favorably, and demonstrated a much stronger relationship to satisfaction (lacked statistical significance, moderate practical effect of course format, very strong correlation for class section between student/student dialogue and satisfaction)</td>
</tr>
<tr>
<td>7</td>
<td>Students who self-selected into the blended course considered themselves slightly higher in autonomy (lacked statistical significance, minimal practical effect)</td>
</tr>
</tbody>
</table>

Each of these findings can be addressed through academic and pedagogical practices designed to improve student learning and satisfaction. Although this study did not indicate any statistically significant detriment to the use of blended learning with this population, the totality of the results provides insight into some areas that can be improved to support student success and institutional goals. These suggested practices will attempt to mitigate the potential implications of blended learning on traditional-age undergraduates at a moderately selective college through, among other things, reduced structure (increased flexibility) and increased dialogue.
As previously noted, a fundamental concern relative to the adoption of any new learning environment is to ensure that learning is not compromised and students are not harmed by the implementation. There is a risk with the implementation of any new instructional format, but the risk can be mediated by careful analysis and planning. Based on the findings from this quasi-experimental study, the following section discusses recommendations for introducing and implementing blended learning, particularly at moderately selective institutions.

Implications for Practice

Despite the lack of statistical significance in the findings, there are several practices that can be implemented to mitigate any potential impact of the blended teaching mode on traditional age undergraduates at a moderately selective college. Given the small sample size and near statistical significance of several findings, as well as the strong correlation among the key constructs, the potential of a Type II error (assuming the outcomes are not typical of the population when in fact they are) does exist. Under these circumstances, the results can provide some insight for improved educational practice and should be taken into consideration. First, given the support of the null hypothesis for both the first and second research questions, the expanded use of blended learning with this population is reasonable and responsible. However there are practices that could be implemented to mitigate any possible differences that might not be the result of coincidence relative to learning and satisfaction. Additionally, the relationships between the constructs of transactional distance and student satisfaction, demonstrate a higher level of correlation for the blended section, which also present opportunities to improve outcomes through best practices. Based on these insights the following practices are recommended.
**Student preparedness.** Institutions must educate students regarding the blended learning modality. False perceptions held by students relative to blended learning such as “I figured it would be easier on my work load,” coupled with the perception of others that face-to-face is a better learning environment, expressed by such comments as “the key to success and the only way to get both (visual learning and repetition) is through face to face,” demonstrate the various perceptions and potential misunderstandings. Therefore, institutions should assess student readiness and provide student training as well as faculty training, to support students in this format (Jaggars, 2013; Moore, 2013).

To address the issue of student preparedness, the researcher would suggest two practices. The first practice would involve institution-wide education regarding blended learning. Something as simple as a brochure or as high touch as information sessions could fill this need. Information should be incorporated into freshman and transfer student orientation each year. Great importance needs to be placed on the communication of accurate information regarding the format, and the requirements, to ensure students understand what blended learning is, and what it is not. The second form of communication that is recommended is an orientation session for each blended class. Instructors should incorporate a blended learning orientation into the first day of class each semester. In addition, for students who join the class on the last day of the typical add/drop period, a mandatory subsequent orientation must be provided. Students could be required to complete a small quiz, via the learning management system, to ensure their understanding of the format and the access to the technology that will support the course delivery. Orientation needs to clearly explain the expectations, time commitment and concepts behind the delivery mode, and their role as a participants within this environment.
Lastly, the institution must provide the appropriate technical infrastructure and support to address issues as they occur (Ackerman, 2008; Jaggars, 2013; Jefferies & Hyde, 2010). Access is a pervasive and positive element relative to student perception of blended learning because it provides the ability to interact with course content and materials, where and when convenient (Banerjee, 2011; Lin, 2008). For this reason, it is essential that the technology is properly managed and supported to meet these expectations. Student success is tied to their level of security and self-confidence, which is made possible with the proper support (Ackerman, 2008; Jaggars, 2013).

**Promote learner autonomy in blended learning.** The results of the study are in line with the decades-long common theme in learning research that learner autonomy is essential to a successful learner regardless of learning environments (Little, 1991), and it is especially seen as indispensable in distance education where transactional distance is presumably high due to the quasi-permanent separation of learner and instructor (Moore, 1993). As previously studied, in a blended learning environment students require self-discipline (Abulibdeh & Ishtaiwa, 2012; López-Pérez, et al., 2011; Owston, York, & Murtha, 2012), which can present a challenge with under-motivated students (McFarlane, 2010). Under-motivated students and under-prepared students may be particularly vulnerable in this format due to the lower level of structure (Moore, 2013). The learning environment associated with the online components of a course may result in procrastination and falling behind for students who require more guidance (Jaggars, 2013). In addition, recent advances in learning pedagogy suggest that learning in nature is an autonomous, self-directed knowledge construction process, a process that involves both active individual construction of meaning and an individual enculturation into a community (Garrison & Vaughan, 2008). It is, therefore, imperative to support learner autonomy in blended learning environments.
Supporting autonomy refers to “an individual in a position of authority (e.g., an instructor), takes the other’s (e.g., a student’s) perspective, acknowledge the other’s feelings, and provides the other with pertinent information and opportunities for choices, while minimizing the use of pressures and demands” (Black & Deci, 2000, p. 742). However, a significant challenge with low achieving learners is that they may feel lost, frustrated or demotivated in a more open learning environment that allows for more choices and autonomy. It is, therefore, important for instructional designers and instructors to design specific instructional strategies to help low achieving students in developing self-directed learning skills, time management skills, and decision-making skills. With sufficient support and scaffolding, these learners can increasingly improve learner autonomy, which will help them assume greater responsibility for their learning.

**Provide a low-structure and high-dialogue learning environment to reduce transactional distance.** The results of the study concur with the findings from many other studies in transactional distance. Moore (1993) noted that low structure and high dialogue can reduce transactional distance, which was supported by Wikeley and Muschamp’s (2004) study on doctoral students in distance education. While recognizing the critical role of increasing dialogue for online learner success, they further argued “it is better achieved by tightening the structure to allow greater adaptability of content through careful moderation by tutors” (p. 125). It is, therefore, important for instructional designers and instructors at moderately selective colleges to design and develop a course with clear learning outcomes and expectations, stable routines, well-structured course materials, learning tasks, and assessment with clear step-by-step instructions. At the same time, instructors need to monitor, assess, and respond to individual learners’ challenge and progress by providing customized learning materials and tasks. Just as importantly, instructors need to be highly interactive, flexible, and responsive during the online
sessions in a blended course by providing prompt and explicit feedback and directive step-by-step guidance. Student/instructor communication coupled with a highly organized, yet adaptable class delivery experience support the reduction in transactional distance.

In addition to student/instructor dialogue, student/student dialogue also must be addressed. The community of inquiry theory provides some guidance in improving this dialogue. The theory addresses three key factors in online learning: cognitive presence, social presence, and teaching presence (Shearer, 2013). The theory proposes that the interactions within the e-learning environment establish a community which encourages discourse and reflection and construction of learning (Jézégou, 2010). Gradel (2010) incorporated specific design elements into an undergraduate and graduate course to evaluate community based learning activities. Key recommendations from the study indicated the need to require more review of the material, reflection on independent work, peer review, wiki comment’s on others original work and reflection on individual role and contribution to group activities. Collaborative learning, rather than the self-paced, self-directed conceptualization has been evaluated to promote increased learning and engagement (Gradel & Edson, 2010; Manning & Emmons, 2010; Shearer, 2013). Specific tactics such as group problem solving and other collaborative activities including peer evaluations have been beneficial to student outcomes (Jézégou, 2010; Manning & Emmons, 2010). Collaborative learning in both online and blended courses is a proven and significant design element in support of student learning and motivation (Gradel & Edson, 2010; Manning & Emmons, 2010).

In order to implement these high value practices, faculty training and development are essential. Faculty skills with varied teaching strategies for this learning environment play a key role in student’s perception of the quality of blended courses (Bonk & Kim, 2004; Kenney &
Newcombe, 2011). The ability of instructors to select appropriate learning materials and assignments through the online course component is a factor in student acceptance and evaluation of blended learning (Arbaugh, Desai, Rau, & Sridhar, 2010; Kenney & Newcombe, 2011). A study conducted at two community colleges in Texas determined that faculty actions within the online components or course delivery found a correlation between faculty actions and student satisfaction, specifically the timeliness of response and the accessibility of the faculty member (Jackson, Jones, & Rodriguez, 2010). The instructor’s role is not diminished in this format, but requires additional skills and abilities (Bonk & Kim, 2004; Kaleta, Skibba, & Joosten, 2007). Faculty training and development will provide instructors with the knowledge to provide the optimal level of course structure, communication, and community, to support student learning and satisfaction.

Use a synchronous format for the online component. Synchronous eLearning can be defined as a real-time, instructor-led online learning event in which all participants are logged on at the same time and communicate directly with each other (Gilbert, 2000). Spontaneous interactions with peers and instructors as well as real time collaborations enabled by the synchronous communication tools are critical elements for enhancing learner experience within online courses. The results of the study support the recommendation for incorporating synchronous elements into the online part of a blended course. Although blended learning, provides a combination of both synchronous (face-to-face) and asynchronous environments, the specific concerns raised by students in this study relative to access to their faculty member, can be enhanced through the use of synchronous technology. Oztok, Zindaro, Brett and Hewitt (2013), examining the use of synchronous private messaging between students and instructor as well as student to students, in conjunction with asynchronous methods, found that private
synchronous messaging supported asynchronous discussions and enhanced the social and collaborative nature of the course. As noted by Giesbers, Rienties, Tempelaart and Gijselaers (2014), the use of virtual face-to-face real time communication “allows for more direct social interaction and feedback among learners and teachers” (p. 30). Synchronous group chats have also shown promise by allowing students both the time to reflect as they type, while also supporting collaborative learning and shared solutions (Stein et al., 2007).

Instructional designers and instructors need to explore how best to take advantage of the abundance and versatility of current synchronous communication tools, such as Blackboard's Collaboration, and Google’s Hangout, to engage learners and enable “higher order” learning (such as critical thinking, multiple perspectives, socialization, acculturation) that is most likely enabled via purposeful and meaningful social interaction. A caveat to this recommendation however is the impact it would have on increased flexibility provided by the asynchronous format. Offering synchronous meetings decreases the freedom associated with time and place which is a primary advantage of reduced classroom time. A way to mediate this is to offer multiple sessions for the synchronous meetings which increases the flexibility for the student, but is an increased burden on the faculty member (Giesbers, et al., 2014). Given this concern, finding the right balance and usage of this powerful medium is essential.

As noted by Moore (2013), synchronous communication is more highly dialogic than asynchronous, allowing for the immediate interaction between student and instructor. Because online learning sessions allow a learner to be more autonomous, or as suggested by Moore (1993), require them to be more autonomous, synchronous communication tools can provide autonomy support and structure (Giesbers, et al., 2014). In a blended environment, which
already provides a combination of both, the use of synchronous tools can further enhance both the student to instructor interactions and the student to student collaborations.

**Implications for Further Research**

To delve further into the continued growth of blended learning, and the subsequent implications, there are multiple aspects that warrant further research and analysis. First, as it relates specifically to the population of interest in the current study, additional comprehensive studies would support the current body of knowledge. Limitations of this quasi-experiment include the small sample size, the use of one course within a specific discipline, the use of one research site, and the non-random class section assignment. Further study into other disciplines, other institutions, larger overall sample sizes, and true experiments with random class assignment would be valuable. This further research is needed as it relates to various aspects of student success including, but not limited to, learning and satisfaction.

A second area where additional research is highly warranted is relative to the assessment of student autonomy. The current study used student perception of their own autonomy, rather than measuring actual autonomy. Actual autonomy might better be evaluated through the use of interviews, observations or other instruments that provide evidence of behavior rather than perception. Additionally, the link between student autonomy (either observed or perceived) to learning outcomes was beyond the scope of this study but would provide further insight into the relationship and identify potential opportunities to improve practice. Another area that warrants further exploration is in the combined use of synchronous and asynchronous components in the online portion of a blended session. Lastly, further research in general relative to the theory of transactional distance and the implication of the constructs for student learning would provide insight in the applicability of the theory to blended learning. As noted by Gorsky and Caspi
(2005), “if the theory of transactional distance is to be useful to distance education (and possibly education in general), the variable transactional distance must correlate in a significant and meaningful way with learning outcomes” (p. 2).

Conclusions

Blended learning will continue to gain prominence at all types of institutions; however, the implications for each unique sub-set of students must continue to be explored. The small size, single location, single course, and convenience sampling used in the previously discussed study represent significant limitations. In addition, the lack of statistical significance relative to findings in this study indicates that the results may be coincidental rather than representative of the population of study. Given these conditions, practitioners must use caution in interpreting the findings. However, based on both the theory of transactional distance and the results of this quasi-experiment, several factors should be taken into consideration when developing blended learning programs at moderately selective institutions. The results support a stronger relationship of the constructs of the theory of transactional distance to satisfaction for the students in the blended class, providing evidence of the value of this theory in the analysis of the blended format and its incorporation of distance education within the delivery structure. Given the results of this quasi-experiment, the expanded use of blended learning for traditional-age undergraduates at moderately selective colleges can be supported. In addition, the theory of transactional distance can provide insight into best practices to meet the needs of the students.
References


### Appendix A

Class Interaction, Structure, and Support (CISS) Instrument

Student Identification Number: ________________________________

**Course Format:**
- [ ] Traditional face-to-face
- [ ] Blended

<table>
<thead>
<tr>
<th></th>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I was able to share learning experiences with other students in this course.</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>2</td>
<td>The instructor helped me identify problem areas with my study for this course.</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>3</td>
<td>The organization of the course content made learning easier.</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>4</td>
<td>I was able to interact with the instructor during the class sessions.</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>5</td>
<td>The instructor followed the course syllabus.</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>6</td>
<td>Increased contact with fellow students helped me get more out of this course.</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>7</td>
<td>I was able to communicate with other students in the course.</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>8</td>
<td>The instructor did NOT provide me encouragement in this course.</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>9</td>
<td>The instructor informed me about my progress periodically during the course.</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>10</td>
<td>A sense of community existed with fellow students taking this course.</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>11</td>
<td>This course encouraged me to work together in small groups.</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>12</td>
<td>The instructor did NOT use a variety of teaching methods in the course.</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>13</td>
<td>The instructor made an effort to fit the teaching style to suit my learning needs.</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>14</td>
<td>The instructor provided me feedback that is useful.</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>15</td>
<td>The instructor gave tests and assignments based on what I learned in the course.</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td>16</td>
<td>I was NOT able to interact with the instructor outside of regular class time.</td>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>
17. I was allowed to work at my own pace in this course.  

18. The instructor encouraged me to become actively involved in class discussions.  

19. The structure of class activities allowed me to actively participate in the class.  

20. The instructor provided comprehensive feedback on assignments.  

21. The instructor treated me as an individual.  

22. The instructor used real work examples in the course lectures.  

23. Please rate the instructor's overall teaching effectiveness.  

24. Please rate the overall quality of the course.  

25. I carry out my own study plan  

26. I seek assistance when facing learning problems  

27. I manage time well  

28. I set up my learning goals  

29. I have high expectations for my learning performance  

Why did you select the course delivery format (blended or face-to-face)? Identify the primary reason(s) for selecting this option.

What teaching methods or activities did you find most valuable?

What teaching methods or activities did you find least valuable?

If given the opportunity would you select a blended course option in the future?

    Why or why not?

Have you previously taken a blended course?

    □ Yes
    □ No
Appendix B

Informed Consent Form

Northwestern University
Human Subject Research Protection

Northeastern University, Department of Education
Name of Investigator(s): Dr. Jennifer Qian, Janet Kauer Komarnicki
Title of Project: Impact of blended learning on traditional age undergraduates

Request to Participate in Research

Many colleges like Fisher College are increasing the use of blended course offerings in the traditional day school. This study will investigate student learning as well as their attitudes about the blended learning teaching environment. It is being conducted for the dissertation work of Janet Komarnicki.

You must be at least 18 years old to be in this research project.

You will be asked to complete a special class web-based satisfaction survey at the end of the semester. This will be done during class time at no inconvenience to you and will replace the class evaluation you would normally complete. You will be asked to enter your student ID in order to match your final exam grade with your survey responses.

There are no foreseeable risks or discomforts to you for taking part in this study.

Your part in this study will be handled in a confidential manner. Your part in this study will be handled in a confidential manner. Any reports or publications based on this research will use only group data and will not identify you or any individual as being affiliated with this project. Your opinions will be collected through an electronic survey.

If you have any questions regarding electronic privacy, please feel free to contact Mark Nardone, NU's Director of Information Security via phone at 617-373-7091, or via email at privacy@nue.edu.

The decision to participate in this research project is up to you. You do not have to participate and you can refuse to answer any question. Even if you begin the study, you may withdraw at any time. Your responses will have no bearing on your standing in the class.

In appreciation for your participation, you will be entered into a drawing for a $50 Visa Gift Card. To avoid any connection between your survey and the drawing, please send an email to KomarnickiJ@husky.neu.edu indicating you have completed the survey and with your mailing address. All email entries will be collected and a random drawing will take place on December 18th, 2013. The winner will be notified by email and their gift card will be sent in the mail.

If you have any questions about this study, please feel free to call Janet Kauer Komarnicki (617) 236-5458, KomarnickiJ@husky.neu.edu the person mainly responsible for the research. You can also contact Dr. Jennifer Qian, jqian@neu.edu, the Principal Investigator.

If you have any questions regarding your rights as a research participant, please contact Nan C. Regina, Director, Human Subject Research Protection, 960 Renaissance Park, Northwestern University, Boston, MA 02115. Tel: 617-373-4388, Email: nregina@neu.edu. You may call anonymously if you wish.

You may keep this form for yourself.

Thank you, Janet Kauer Komarnicki!

APPROVED
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10-2-13
TIPODION 10-4-12
Appendix C

IRB Approval

Northeastern
Notification of IRB Action

Date: October 2, 2013  IRB #: CP613-09-01
Principal Investigator(s): Yuhong "Jennifer" Qian
Janet Kucer Komarodzicki
Department: Doctor of Education Program
College of Professional Studies
Address: 20 Beulah Rd
Northeastern University
Title of Project: How Do They Fare? A Study of Learning Achievement and
Satisfaction with Blended Learning for Traditional-age Undergraduates at Moderately Selective Colleges
Participating Sites: IRB approval for Fisher College enclosed
Informed Consent: One (1) unsigned consent
DHHS Review Category: Expedited #7
Monitoring Interval: 12 months
Approval Expiration Date: OCTOBER 1, 2014

Investigator's Responsibilities:
1. Informed consent forms bearing the IRB approval stamp must be used when recruiting
   participants into the study.
2. The investigator must notify IRB immediately of unexpected adverse events, or new
   information that may alter our perception of the benefit-risk ratio.
3. Study procedures and files are subject to audit any time.
4. Any modifications of the protocol or the informed consent as the study progresses must be
   reviewed and approved by this committee prior to being instituted.
5. Continuing Review Approval for the proposal should be requested at least one month prior to
   the expiration date above.
6. This approval applies to the protection of human subjects only. It does not apply to any other
   university approvals that may be necessary.

C. Randall Colvin, Ph.D., Chair
Northeastern University Institutional Review Board

Kim C. Regan, Director
Human Subject Research Protection