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The Development of a Survey Instrument to Measure Transactional Distance in Secondary Blended Learning Environments

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College of Education

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Abstract

The goal of this study was to develop a survey instrument to measure transactional distance in secondary blended learning environments. This study resulted in a 35-item survey instrument, the Blended Learning Assessment Scale of Transactional Distance (BLASTD), which was tested using a convenience sample of secondary students (n = 222) at a secondary blended learning site. The research followed a methodology for scale development developed by Hinkin, Tracey, and Enz (1997), and was conducted through the following seven steps: (1) Item Generation; (2) Content Adequacy Assessment; (3) Questionnaire Administration; (4) Factor Analysis; (5) Internal Consistency Assessment; (6) Construct Validity; and (7) Replication. The initial survey was administered a semi-rural blended learning site in the pacific northwest. The gathered responses were then used in statistical analyses that included an exploratory factor analysis utilizing a scree plot and item response eigenvalues to identify the underlying dimensions of the BLASTD survey, and a Cronbach's alpha to establish the reliability of items and factors. Validity was examined by using a Pearson's product-moment correlation coefficient correlating the results of the BLASTD with the selections of the Huang, Chandra, Depaolo, Cribbs, and Simmons or HCDCS Survey. The final survey contained 35 survey items and the survey instrument took into account Moore's theory of transactional distance and is able to measure the dialogue between the instructor and student, the structure of the learning environment and educational learning opportunities, as well resulting student sense of separation or transactional distance.

Keywords: transactional distance, blended learning, survey, scale development

Dedication

I dedicate this work to my daughter Avery, follow your dreams and never stop learning, and to my Grandfather who helped kindle a love learning in me and always took time for curiosity.

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Chapter 1: Introduction

Introduction to the Problem

It has been estimated that by 2019, at least 50% of all High school courses will be taught online or in a blended digital learning environment (Christensen, 2008). The blended learning environment mixes aspects of the traditional face-to-face classroom model with elements of new digital learning tools. New digital tools and teaching methods are seen as a disrupting force to decades of educational thought (Christensen, 2008) and these new tools are opening possibilities for educators to follow the pedagogical aims of John Dewey and the progressive (Bertram, 1998; Kuriloff, 2000). It is possible that the blended digital learning environment may be the best hope to create a modern student-centered educational environment (Christensen, 2008; Jones, 1997; Palloff & Pratt, 2001).

The blended digital learning environment shares with previous distance learning models, such as virtual or online schooling and correspondence courses, a physical separation between the learner and the educator along with technology-facilitated communication (Shin, 2002). Michael G. Moore (1973) described the separation between the educator and student as both a physical separation as well as psychological and sociological separation. Moore (1973, 1997) labeled this separation, *transactional distance,* and described it as the relationship between the *structure* and *dialogue* of the learning environment.

The blended learning environment is mixture of traditional face-to-face learning activities with distance digital learning (Staker & Horn, 2012). Blended learning is a pragmatic approach that strives to find a learning model that is meaningful to current students and society. This method of learning aims to allow students the benefits of digital environment but foster a traditional connection and relationship between student and educator. Currently, there are

limited tools for measuring the impact and effects of mixing elements of a brick and mortar education model with a digital distance learning effects upon perceived transactional distance of the learner.

Conceptual Framework for the Problem

Since the turn of the 20th century, John Dewey and the progressive education model have influenced the creation of the modern school environment. Building upon Dewey's beliefs on pragmatism and instrumentalism, the progressive educational model focuses on students building meaning about the world around them through experience and experimentation. This is accomplished through the inquiry process outlined through Dewey's philosophical work. The Deweyan model can be seen today in the development of educational technology and construction of a blended learning environment.

Progressive education. Many contemporary educational leaders are calling for a new disruptive force in education (Christensen, 2011). Clayton Christensen (2011) is calling for the negation of "monolithic" or "wholesale" traditional education models that push student through a "one size fits all" education system. In its place, Christensen argues for a personalized system that allows for learners to control the type of learning, the subjects, the scope, the pace, and direction of the learning. The characteristics of Christensen's new "disruptive" model of education is not new but harkens back to John Dewey's progressive education model.

The progressive education model's roots within American schools reaches back to the beginning of the 20th century and John Dewey, as noted above. Dewey (1997) described the education system of his time as being "traditional" and its aims were to instill the ideas of the past into modern students. Dewey saw in his era an educational system that was more concerned with instilling cultural beliefs and the ideas, theories, and rules of previous generations than

fostering students' own abilities to learn about the world around them and build their own understanding of it (Dewey, 1997).

Many elements of the "traditional" education system can be found in modern classroom. Some policy makers, educational leaders, educators, and parents have argued for and created a contemporary educational setting much like the one Dewey opposed (Christensen, 2011; Digital Learning Now, 2011). In a traditional educational setting, the educator is the dispenser of knowledge through textbooks and compartmentalized subjects (Dewey, 1997). The source of knowledge is not the only feature of the traditional model to be external to the student; it is the student's obligation to accommodate the educator and learn in the manner that the instructor dictates (Dewey, 1997). In contrast, within Dewey's progressive model, an educator guides and responds to the student's experiences so the types of learning and meaning are student driven (Dewey, 1897, 1990, 1997).

Dewey's progressive education model is built upon his own philosophical work within the field of epistemology, pragmatism. Pragmatists like William James, C. S. Peirce, and John Dewey argued that individuals evaluate ideas, events, and experiences by their practical usefulness (James, 1907; Menand, 2001). All of knowledge is evaluated in relationship to other knowledge; ideas are deemed worthy when they help an individual better navigate the world around them (Atkin, 2015). This is a departure from traditional views of knowledge that looked to evaluate knowledge against a concept of truth (Atkin, 2015).

Dewey expanded upon the earlier work of the pragmatist C. S. Peirce and described that when an idea has been evaluated to be useful it becomes a tool or instrument to understand the world (Dewey, 1938, 1952). Dewey called his own personal brand of pragmatism "instrumentalism" and argued that learners create tools that are useful for navigating the world

around them (Hickman, 1990). These instruments could be a tangible physical tool or intellectual concept that proves to be able to predict the outcomes of the world around an individual (Dewey, 1952). Within a progressive model of education, students build these instruments and then abandon them as new experiences fall outside the instrument (Dewey, 1938). An educator's role is to provide the experiences and transactions that push students to explore and develop these new tools (Dewey, 1897).

Experiences rest at the heart of a progressive education model and an understanding of Dewey's instrumentalism (Hickman, 1990). An experience is an event that causes an individual to reevaluate the world or relationship between instruments (Dewey, 2005). As an example, Dewey described eating his first French food, which redefined his concept of food and what was meant by *good food* (Dewey, 2005). For Dewey, this model for *good food* was formed through the internal transaction (Dewey, 1997). Dewey's experience with French food that reshaped and redefined his relationship to the world and previous knowledge and the meaning of food. (Dewey, 1997)

Dewey saw that learning was accomplished through a transaction between the learner and world around them (Dewey & Bentley, 1949). The portion of this transaction internal to the learner is called *inquiry*, and is echoed in the scientific method (Dewey, 1938). If an experience or new ideas do not fit with existing models or instruments, then a learner questions the world around them and begins the process of constructing a new model for how the world works. (Dewey, 1938, 1952). Learners then predict outcomes to the new dilemma and test their predictions against the world. If the new instrument is useful in predicting how the world works, then the new idea is accepted and the learner builds new knowledge (Dewey, 1938, 1952).

Central to the progressive education model is the dissolving of subject-specific classes and the pre-established scope and sequence of content because tightly controlled subject matter unduly shaded and controlled the types of student experiences (Dewey, 1997). Dewey argued that education and the classroom should reflect the larger world outside the classroom, where instruments are not specific to a subject but universal to navigating the world (Dewey, 1997). The structure of the educational environment should be flexible to accommodate the learner and the transactions the learner uses to build meaning out of their experiences (Dewey & Bentley, 1949; Moore, 1973; Shin, 2002).

The concepts at the foundation of the progressive education model are further explored in Chapter 2. Within in the literature review a detailed investigation of pragmatism, instrumentalism, experience, inquiry, and the progressive education model help shed light on the problems facing the contemporary educational system and how the characteristics of a blended learning environment can lead to some degree of perceived distance between the learner and educator.

Blended learning environment. Examining our current educational environment, it is increasingly obvious the world is being shaped by the prevalence of digital technology. Some educators have called current generation of learners "Digital Natives," because they have grown up with ease access to the internet and a life mitigated by technology (Maton & Kervin, 2008; Palfrey & Gasser, 2008; Tapscott, 2009). These students look for a school environment that echoes the abilities of the digital society that they have grown up in (Christensen, 2011). In response to the changing societal demographics many schools have moved towards a blended learning environment (Horn & Staker, 2015).

A blended learning environment combines elements of a traditional "face-to-face" or "brick and mortar learning" environment with digital components (Christensen, 2008; Horn & Staker, 2015). There are varying degrees and types of blends that are further explored in Chapter 2. These blended learning environments offer students the ability to personalize their learning while still maintaining the direction and personal learning assessment brought by a traditional classroom model (Christensen, 2008).

Some blended learning environments are constructed with a balance between the traditional educational model and digital learning by utilizing the physical educator as a learning monitor and guide, keeping tabs and ensuring that students are completing their prescribed digital learning and offering assistance if asked by the student (Horn & Staker, 2015). The educators may be employed at centralized location that allows for students to access a face-to-face educator if needed (Horn & Staker, 2015). This model is called the *enhanced virtual academy* because it reflects a distance education model for blended learning, more so than other models.

Transactional distance. Since the 1890s distance education has been an option within the educational environment (Crobett, 2010). Michael Moore (1972) examined the distance education environment and found that the physical separation from a face-to-face educator resulted in a psychological separation from the learning environment. Moore stated that "distance education is not simply a geographic separation of learners and teachers, but, more importantly, is a pedagogical concept . . . with separation there is a psychological and communications space to be crossed, a space of potential misunderstanding between the inputs of instructor and those of the learner" (1997, p. 28). Moore called this psychological separation

"transactional distance" and further explored the factors within a distance education setting that resulted in a student's sense of separation (Shin, 2002).

Transactional distance is dependent upon two underlying factors, dialogue and structure. Moore established dialogue as the purposeful constructive transaction between learners and educators (1991). Moore (1997) explained the concept of dialogue as being "developed by teachers and learners in the course of the interactions that occur when one gives instruction and the others respond" (p. 24). This transaction is much more encompassing than simple interactions or describing communication; transactions in dialogue echo Dewey's inquiry process (Shin, 2002). Dialogue is a means for the educator and the student to create meaning in the learning environment as well as build understanding of both the learner and the educator (Shin, 2002).

Structure is the ability for the learning to be customized and tailored to the learner (Moore, 1973). Moore described structure that it "expresses the rigidity or flexibility of the program's educational objectives, teaching strategies, and evaluation methods. It describes the extent to which an education program can accommodate or be responsive to each learner's individual needs" (1997, p. 30).

As transactional distance increases, students needed a greater level of self-autonomy to be successful in the educational environment (Moore, 1973). The learner autonomy is "the extent to which in the teaching/learning relationship it is the learner rather than the teacher who determines the goals, the learning experiences, and the evaluation decisions of the learning program" (Moore, 1997, p. 34). Ultimately Moore argues that when a student experiences large transactional distance the educational experience becomes an independent study that is bound to textbooks and self-directed independent reading.

Researchers have utilized transactional distance and its underlying constructs to examine digital learning environments (Giossos, Koutsouba, Lionarakis, & Skavantzos, 2009; Hollier, 2011; Huang, Chandra, Depaolo, Cribbs, & Simmons, 2015; Moore, 2013). Marley Belair (2012) found that by increasing the personal teacher-student dialogue through personal phone conversations aided at risks students in online virtual high schools. Researchers examining various digital classroom tools utilized transactional distance to facilitate students' engagement (McBrien, Jones, & Cheng, 2009). Even the personal and professional experiences of an educator teaching with technology has been explored through the research lens of transactional distance (Whitesel, 2009)

Transactional distance is further explored in the next chapter, where considerable amount of space is given exploring previous research into transactional distance its underlying elements. Since the theory of transactional distance was first published in the earlier 1970s, researchers have explored transactional distance in various environments and distance education models. The unique attributes of a blended learning environment allow for a unique and relatively unexplored application of the Moore's theories on transactional distance.

Statement of the Problem

John Dewey articulated that the objective of education was for the students to find their own meaning in the world around them. Dewey explained that this was accomplished in a school by the social transactions between student and teacher. The social culture of the school was to instill a sense of inquiry through the types of experiences for a student. Over the past 20 years, education has seen the beginnings of a shift away from traditional "brick and mortar" schools that are built upon a face-to-face connection between teachers and students as the means for fostering a sense of inquiry, and towards digital distance learning. The new digital learning

environments and subsequent teacher-to-student transactions are different from traditional settings in that they are asynchronous, geographically isolated, and conducted through digital communication tools. These new characteristics create transactional distance between the inquiry process of the learner and the social transaction of the teacher. To understand the experiences of students in the blended learning environment the researcher will develop a survey instrument (the Blended Learning Assessment Scale of Transactional Distance). The following research question arises: How does the Blended Learning Assessment Scale of Transactional Distance compare to Moore's theory of transactional distance?

Purpose of the Study

In this study, the problem is to create a valid and reliable instrument that measures the transactional distance of secondary blended digital learning environments that include the factors identified by Moore (1973): transactional distance, learner autonomy, structure, and dialogue. The tool took into account Moore's theory of transactional distance and is able to measure the dialogue between the instructor and student, the structure of the learning environment and educational learning opportunities, as well resulting student sense of separation or transactional distance. Both Moore's theory of transactional distance and Dewey's progressive model of education provide the framework for the exploration this aspect of blended learning.

Research Questions

This study focused on the creation of a tool to measure the transactional distance within secondary blended digital learning environments. The following research questions guided the study:

1. How does the Blended Learning Assessment Scale of Transactional Distance compare to Moore's theory of transactional distance?

2. Does the Blended Learning Assessment Scale of Transactional Distance developed in this study demonstrate a level of validity and reliability that meets or exceeds research standards for social science research?
3. Are there significant differences between Blended Learning Assessment Scale of Transactional Distance and other survey instruments developed to investigate transactional distance in higher education settings?
4. What is the relationship between responses to the variables of learner autonomy, structure, dialogue, to the responses for transactional distance?

Rationale, Relevance, and Significance of the Study

A 2015 report on the state of education in Washington State found that over 23,000 students were taking at least one class online and a vast majority were taking these courses in a blended learning environment (Tamayo, 2015). Within the Washington State blended learning environments, online courses were completed 75% of the time compared to 89% in traditional face-to-face educational environments (Tamayo, 2015). The percentage of students with successful outcomes also dropped as students took more courses online. Tamayo (2015) found that the percentage of students with successful outcomes dropped from 60% in 1–4 online course to 45% in 5–9 online courses. Other states have reported similar results in online learning environments, for example, Minnesota (Lemagie, 2011), Iowa and Wisconsin (Clements, Pazzaglia, & Stafford, 2015), and Tennessee (Holian, Alberg, Strahl, Burgette, & Cramer, 2014).

Surveys of students in digital online learning environments found the biggest hurdles to student success were social interactions and educator issues (Clements, et al., 2015; King & Cerrone Arnold, 2012; Muilenburg & Berge, 2005). These findings support the foundations of Moore's theory of transactional distance that describes a student's success as based upon the

need for meaningful transaction between and educator and student along with an appropriate personalized academic structure for students (Saba, 2013).

The very nature of education is social transaction between the educator and a student (Dewey & Bentley, 1960; Dewey, 1897). Social transaction between an educator and a student is integral to a student's academic success (Delaney, 2012; Riley, 2011). Students' construction of meaning and understanding is guided by an educator's careful, nurturing, purposeful interactions (Dewey, 1997).

Modern American society is characterized by the use of technology and greater demand for personalization; to reflect these societal characteristics, the education system is moving to embrace those attributes in disrupting the current brick-and-mortar educational system (Christensen, 2008). A personalized education model allows for educators and students to craft learning experiences that focus on the individual, in contrast to focusing on a group of students or an entire classroom. Many in the movement towards a more personalized and student-centered education system hope that utilizing digital tools within the classroom and in the traditional distance education will allow for a more meaningful student experience (Staker & Horn, 2012). Blended learning offers many of the key characteristics of online distance learning while maintaining some degree of the physical connection between educator and student (Staker & Horn, 2012).

Aspects of the distance-learning component of blended learning allow for learning to occur outside of the classroom and at the direction of the learner, which is a departure from traditional centralized classroom model (Christensen, 2008; Khan, 2012; Staker & Horn, 2012). The decentralized aspects of the blended learning environment are subject to Moore's theory of transactional distance, and perceived sense of separation between the learner and educator

(Moore, 1997). The combination of traditional teacher-student relationships of the face-to-face classroom settings, with the transactional distance of the digital portion adds to the complexity of the educational environment.

The present study developed and tested a tool that may assist educators in measuring and understanding the transactional distance of the blended digital learning environment. A functional and easily understandable tool offers educators better insight into the student learning experiences. This study's ultimate goal was to develop a tool that could be a resource for educators to aid them in shaping and guiding the experiences of 21st century learners living in a growingly digital world.

Definition of Terms

A number of key terms and concepts were used throughout this study. It was important that these terms were clearly defined and used consistently throughout the research process. These terms are defined below for the reader.

Education. Dewey described *education* as deeply personal endeavor, where students develop their own meaning for their experiences (Dewey, 1997). Dewey hoped that the learner would control and drive the learning experiences. Moore (1972) echoed Dewey's sentiments, that key component of education is the student's ownership of the learning.

Blended digital learning. A blended digital learning or environment, or sometimes referred to simply as blended learning, takes aspects of traditional classroom learning environments and uses some degree of digital learning tools (Christensen, 2008; Staker & Horn, 2012). Blended learning environments allow some content and instruction to be delivered through online where students have increased control over the time, place, path, and pace.

Learning, is at least supervised by an educator in a traditional brick-mortar educational setting (Staker & Horn, 2012).

Dialogue. Dialogue refers to the purposeful constructive personal interaction between learners and educators to aid guide the creation of meaning (Moore, 1997). Together with structure, distance educational activities that have low dialogue lead to a sense of separation between the educator and student or transactional distance (Moore, 1973).

Structure. A fundamental tenet of Dewey's progressive model of education is that students must build their own meaning (Dewey, 1997). Dewey argued that a student's creation of meaning was accomplished by both learner and the instructor creating educational activities that centered on and responded to the student (Dewey, 1997). In distance education models, Moore (1997) argued that allowing for the flexibility for student diminished the transactional distance. *Structure* refers to the ability for the learning environment and instructional activities to be customized and tailored to the learner (Moore, 1973).

Autonomy. Moore (1991) defined *autonomy* as "the extent [within] the teaching/learning relationship the learner, rather than the teacher, that determines the goals, the learning experiences, and the evaluation decisions of the learning program" (p. 31). Autonomy grants students the control with the establishing of educational goals and objectives, executing the learning process, and evaluating their progress (Moore, 1972, 1991, 2013). For the purposes of this research, autonomy will be defined as the degree that the student controls the learning process.

Transactional distance. In a traditional face-to-face or brick-and-mortar school setting the student and educator are interacting synchronously and within close physical proximity. Classroom transactions are occurring in a context of a physical connection (Moore, 1973). The

student is using these transactions to build meaning between the new knowledge and the outside world (Dewey, 1952). An educator uses these transactions and connection to the student to guide and provide experience to aid in the development of student's understanding of the world (Dewey, 1997). Working as team, the educator and the student work towards meaningful and fruitful educational experiences.

As students engage in distance learning, those instructional transactions are separated by both time and space and result in increased transactional distance (Moore, 1973). Moore (1997) described transactional distance as "the psychological and communications space to be crossed, a space of potential misunderstanding between the inputs of instructor and those of the learner" (p. 28). High degrees of transactional distance may lead a student to reduced levels of motivation, engagement, and possible attrition in courses (Moore, 1991). Transactional distance is defined as the perceived social separation and communicational space between a student and educator. Separation between the learner and the student is not unique to distance education, but can also be found in traditional classrooms (Rumble, 1986), but in digital learning environments the physical separation between the educator and the learner which necessitates focusing on the transactional distance (Moore, 1997).

Assumptions

Within the actions of the study it is assumed that each respondent to the survey instrument reflected upon their experiences in a blended learning environment, and evaluated those experiences using Likert scale responses to simple statements. The researcher assumed respondents answered each question honestly and to the best of their ability. The researcher also assumed that the blended learning environment has more in common with a distance learning model than with a traditional face-to-face learning environment. While transactional distance

can be found in traditional classrooms (Rumble, 1986) within this research there was an underlying assumption that the digital aspects of the blended learning environment exhibited the same characteristics of the traditional distance learning model described by Moore. This assumption was not unique to this study but can be found in many research studies that utilize the transactional distance model in order to study blended learning environment (Dron, Seidel, & Litten, 2004; Giossos et al., 2009; Shearer, 2010; So & Brush, 2008).

Delimitations

This study is limited in its scope, restricted to 250–400 high school students in a blended learning environment. These students come from various socioeconomic backgrounds but are students at a single blended learning site. This study is also limited to the investigation of transactional distance and the sub-factors of dialogue, structure, and learner autonomy, as well as to the enhanced virtual model of blended learning. Additionally, these factors are limited to the operationalized definitions.

Limitations

This study is limited to secondary blended learning environments and has only limited relevance to both early childhood educational environments and higher education environments. Within the secondary educational environment, the study focused primarily on high school students and has inherent limitations in the application of its findings to the study of middle school students. This study utilized a convenience sampling method and therefore may be limited in the generalizability of its findings to the population of secondary blended learning students as a whole.

Summary

In recent years, the rise of the blended learning environment has presented students with a new and unique opportunity for education. This new learning environment offers students the opportunity to personalize and individualize learning with a blend of traditional face-to-face interactions with an educator while also using digital learning platforms as medium for learning (Christensen, 2011). This new learning environment has many of the same elements as the distance learning model described by Moore (1991). Transactional distance and its underlying factors of dialogue, structure, and learner autonomy offer insights into the types of transactions and experiences of students in this environment. This researcher's goal in this study was to develop a survey scale instrument that educators in secondary blended learning environments could use to understand and examine their students' transactional distance within their classes.

Chapter 2: Literature Review

Introduction

The new blended learning environment offers students a new avenue to learn but is still bound by the same goals and objectives to the educational process outlined by John Dewey at the turn of the 20th century (Christensen, 2008; Horn & Staker, 2015). Dewey philosophical ideals of pragmatism, inquiry, experience, and instrumentalism established a societal need for the educational system (Dewey, 1990). Dewey's ideas continue to give context to both the current educational system and also the innovation process that has led to the creation of digital learning environments and the blended learning model (Hickman, 1990).

Dewey's ideas also influenced the ideas of Michael Moore and have served as a philosophical grounding for his theory of transactional distance (Giossos et al., 2009). In this literature review, Dewey's philosophical pragmatism and educational theory will serve as a framework to explore transactional distance and the blended learning environment.

Pragmatism

Pragmatism (and its subsequent philosophical offspring) is the first truly American philosophical school (Menand, 2001). Its roots can be traced back to the aftermath of the American Civil War. That conflict divided the nation on ideological grounds, with both the North and the South clinging to their core values and their view of the "truth" (Atkin, 2015; Menand, 2001). The aftermath of the war left the nation searching for a new way of understanding and evaluating the world around them as they experienced fragmentation and division in their daily lives (Menand, 2001). William James and Charles Sanders Peirce began the formulation of a school of philosophy later called *pragmatism*. Drawing on the turmoil of the war and the chaotic recovery that followed the war's end, pragmatism searched for a way to

evaluate differing models of the world. Pragmatism sought the integration of differing ideas so as to build meaning in a chaotic world; both C. S. Peirce and William James sought ways to make sense of the ideological confusion of the time (Menand, 2001).

Growing scientific and industrial worldviews also largely influenced Peirce and James (Menand, 2001). The country was experiencing rapid development of railroads, steel and iron production, manufacturing, and the development of new forms communication. The world was becoming illuminated by the growing use of electricity. All of these advancements were due to growing focus on science and logic (Armstrong, 2001). The growing scientific revolution and chaos of the reconstruction through the Civil War worked together to provide a context for the development of pragmatism (Menand, 2001).

At its core, pragmatism evaluates ideas, events, and experiences by a criterion of practical usefulness. Truth, in the traditional philosophical or positivist sense, following replaced with usefulness as a standard for evaluating ideas. William James summed up the idea in a lecture at Columbia University in which he hoped to solidify and define the emerging pragmatist philosophy. James (1910) said, "The pragmatist clings to facts and concreteness, observes truth at its work in particular cases, and generalizes. Truth, for him, becomes a class-name for all sorts of definite working-values in experience" (p. 68).

Pragmatism traces back to the work of Charles Sanders Peirce in the 1870s on the philosophical disciplines of logic and epistemology. Peirce was a mathematician and scientist, whose interests included logic, statistics, chemistry, in addition to many other sciences (Menand, 2001). He was particularly interested in epistemology and the concept of truth. In 1878 C. S. Peirce published "How To Make Our Ideas Clear," which is considered by many to be the first

clear statement of pragmatism (Atkin, 2015). There he established the foundations of pragmatic thought using as a primary principle the "Pragmatic Maxim" (Atkin, 2015).

Using the "Pragmatic Maxim" the pragmatist looks at the world with the "grades of clarity" defining epistemological levels of understanding. Each "clarity" allows the observer to view objects or events in our reality with increasing understanding (Atkin, 2015). The first grade of clarity are events and objects that are unexamined and are simply accepted within the construct of everyday experiences. Albert Atkin described the first clarity as "unreflective grasp of [an object or event} in everyday experience" (Atkin, 2015). C. S. Peirce (1872/1986) illustrated his first clarity in the following way,

> Some elements (the sensations) are completely present at every instant so long as they last, while others (like thought) are actions having beginning, middle, and end, and consist in a congruence in the succession of sensations which flow through the mind. They cannot be immediately present to us, but must cover some portion of the past or future. (p. 262)

In this understanding of events, the learner makes no inferences nor attempts to build a new understanding of the world, because the event or object is simply accepted. For example, when standing upright or walking we do not question or challenge the existence of gravity. We accept it and it remains unexamined or unquestioned (Atkin, 2015).

There are many occurrences that do require the observer to at least identify and define the experience. Peirce's (1872/1986) second clarity states "different systems are distinguished by having different motives, ideas, or functions" (p. 263). In experiencing something that is new, the mind begins to catalogue and inquire to its purpose and define its nature (Atkin, 2015). These definitions and concepts represent the formation of a belief (Peirce, 1878/1986).

Peirce's pragmatic maxim rests on his third clarity, that once an object or event has become familiar then the observer can begin to explore its effects and relationships to other objects (Atkin, 2015). Peirce argued that beliefs can be evaluated and understood by their practical application to the world around them. Peirce (1878/1986) stated,

> It appears, then, that the rule for attaining the third grade of clearness of apprehension is as follows: Consider what effects, that might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object. (p. 266)

Pragmatists argue that at this juncture traditional ideological philosophies stop with the second clarity and arguments ensue over the "true" definition or purpose of an idea or construct. Each respective camp forms their own beliefs that they defend and argue for; pragmatists point out that ideas can only be truly evaluated in the deepest understanding, i.e., with the third clarity. Here an individual builds new meaning by evaluating the relationships and effects of a belief. Atkins (2015) summarizes the pragmatic position by saying the importance of this, "pragmatism is that for any statement to be meaningful, it must have practical bearings" (para. 1).

Instrumentalism

By the end of the 19th century Peirce's ideas were firmly in place within academic circles of northeastern United States and were being expanded upon by fellow pragmatists, William James and John Dewey (Menand, 2001). Both philosophers saw Peirce's Pragmatic Maxim as a tool that could be used to overcome the philosophical quandaries of the past (Menand, 2001). Their insight into pragmatism came from the unique confluence of contexts. Both scholars were operating in a time where scientific thought promised a solution to the world's problems (Armstrong, 2001). Advances in agriculture and medicine were improving health of population,

communication technology such as the telegraph and Morse code were allowing for communication across oceans, and railroads allowed for new opportunities for trade and transportation (Armstrong, 2001). The new scientific world also offered answers to some of the big questions of life and religion (Armstrong, 2001). Charles Darwin's book *The Origin of Species* had been published in 1859 and offered an explanation for the origins and diversity of life. Both James and Dewey lived in a world being shaped by scientific thought, and worked in environments that allowed the exploration of those ideas; James at Harvard and Dewey at the University of Michigan and the University of Chicago (Menand, 2001).

John Dewey's thinking regarding the relationship between meaning and objects or events has philosophical similarities to the work of James and Peirce (Godfrey-Smith, 2013). Dewey saw that objects and events held value or meaning, in relationship to other objects. People build meaning by finding and experiencing these relationships. This idea can be found in *Experience and Nature*, where for example he says,

> [I]t is not thought as idealism defines thought which exercises the reconstructive function. Only action, interaction, can change or remake objects. The analogy of the skilled artist still holds. His intelligence is a factor in forming new objects which mark a fulfillment. But this is because intelligence is incarnate in overt action, using things as means to affect other things. (Dewey, 1952, p. 158)

Dewey's brand of pragmatism differed from James and Peirce in that Dewey was interested in the learning processes within educational settings that were expounded by the scientific ideals of the time (Hickman, 1990). Dewey followed a continuous thread of thought between the scientific inquiry processes outline by Francis Bacon and Peirce's Pragmatic Maxim (Hickman, 1990). Dewey saw pragmatism then not as an epistemology or search for a definable universal

truth, but rather as a process of inquiry and questioning of experience (Field, 2005). Dewey thought that the human mind makes meaning of experience in the same way that a scientist develops models for understanding the universe. Richard Field (2005) described Dewey, saying that the,

> focus of [his] philosophical interests throughout his career was what has been traditionally called "epistemology", or the "theory of knowledge." It is indicative, however, of Dewey's critical stance toward past efforts in this area that he expressly rejected the term "epistemology," preferring the "theory of inquiry" or "experimental logic" as more representative of his own approach. (p. 4)

Dewey called his brand of pragmatism, *instrumentalism*. In his essay "The Development of American Pragmatism," Dewey (1984) described instrumentalism as "an attempt to establish a precise logical theory of concepts, of judgments and inferences in their various forms, by considering primarily how thought functions in the experimental determinations of future" (p. 14). Instrumentalism is defined as using experience and inquiry for the development of tools or instruments that build a model of the world that has meaning (Dewey, 1984).

To Dewey a model has meaning when it is predictive and helps the user better navigate the world (Dewey, 1952). These models are instruments of the mind that are "manufactured" by the observer and do not connect to a universal truth outside the observer. The value is in their practical use and implications in the world (Dewey, 1952). In *Art as Experience*, Dewey (2005) outlined that instruments of the mind help user define and build meaning in the world around them. Whether the tool is an idea or a physical instrument, its sole purpose is the construction of

meaning. He said,

> Consider the bare possibilities that tools and works of art give the key to the question at hand: that works and tools of art are precisely the sought-for alternative to physical, psychical and metaphysical entities . . .. Manufactured articles do not exist without human interventions; they do not come into being without an end in view. But when they exist and operate, they are just as realistic, just as free from dependence upon psychical states (to say nothing of their not being psychical states) as any other physical things… They are simply prior natural things reshaped for the sake of entering effectively into some type of behavior. (Dewey, 2005)

Experience

A fundamental aspect of John Dewey's pragmatic worldview is the role experience takes in forming meaning. In *Art as Experience* he points to the differences between an experience and "*an* experience"; harkening back to Peirce's Pragmatic Maxim, Dewey (2005) pointed out that the vast majority of events in life do not rise to the questioning of *an* experience.

> We put our hands to the plow and turn back; we start and then we stop; not because the experience has reached the end for sake of which it was initiated but because of extraneous interruptions or of inner lethargy (p. 36).

Dewey uses illustrations of experiences as an example of experiences that are unquestioned and do not provoke further thought. For example, in the act of stopping his task of plowing because he is exhausted, the laborer does not change their relationship to the field or their understanding of the task. The laborer's act of stopping is unquestioned and not transformative.

Some activities are transformative and cause an individual to redefine their understanding of the world. Dewey (2005) provided a second illustration of eating a meal in a Paris restaurant, the food was unlike anything previously experienced and so it caused him to rethink his ideas of food. Dewey's experiences of this meal redefined his relationship to food and built a new meaning in his mind with which he could examine future meals. This experience transformed the meaning of *food* for Dewey.

Dewey (1997) described this transformative experience in *Experience and Education* as "a moving force. Its value can only be judged on the ground of what it moves toward and into" (p. 38). Such experiences reshape our context and perspectives on the world, forcing us to accommodate the new information that is acquired through reflection and inquiry (Dewey, 1997).

Dewey's philosophical work on experience formed the basis for his own pedagogy. In the early 1900s, he envisioned a new mode of schooling that would differ from traditional model of memorization, recital, and static content. In *Experience and Education*, Dewey (1997) outlined a school system that is built upon providing experiences that students can find meaning in and in which they can redefine their view of the world around them. A fundamental aspect of Dewey's "progressive education," as outlined in *Experience and Education*, was the dissolving of school subjects and discrete content in the favor of wide-sweeping experiences that allowed students to investigate the wide breadth of world around them. Dewey (1897) famously described this approach in the following way in *My Pedagogical Creed*: "I believe that education, therefore is a process of living and not a preparation for future living" (p. 7).

Inquiry

Experiences can only be truly educational in Dewey's model when they spur questioning of the relationships and connections between other experiences. Dewey (1984) explained, "It is therefore in submitting conceptions to the control of experience . . . that one finds examples of what is called truth" (p. 11). To find truth and meaning, Dewey points to a reflective process called *inquiry*.

Dewey clearly outlined the inquiry process in his 1938 book, *Logic: The Theory of Inquiry*. There he sees a pattern for the construction of meaning from experience, beginning with "antecedent conditions" (p. 105). Inquiry can only take place when the learner can establish the first two degrees of Peirce's maxim and a learner can begin to develop a preliminary worldview and relationships between experiences. Dewey (1938) points out that inquiry can only occur when previous held meanings become "doubtful" (p. 106).

The rising doubt leads to formation of a problem. Previously held ideas are no longer useful with new experiences and the learner begins to question previously held experiences and meaning. Dewey called this step of the inquiry process "the institution of the problem" and his position shares many similarities with the role that the hypothesis takes in the scientific method outlined by Francis Bacon (Dewey, 1938). In the 17th century, Francis Bacon looked for a way to explore the world in a repeatable and logical ways. The scientific method or Baconian method utilizes inductive reasoning. A scientific idea first begins as a question; the observer then makes a prediction about the answer to the stated question. This prediction or hypothesis is then tested by experiments, which provide evidence to support an answer to the original question (Andersen & Hepburn, 2013).

The influence of the scientific method can be seen throughout Dewey's model of inquiry. Once a learner experiences a discongruency between their previously held understanding of the world and a new experience, then they move on to the "determination of a problem-solution." After the learner can isolate a specific question or problem, Dewey (1938) argued that the learner infers possible solutions or hypotheses. The possible solutions are suggested answers that can be measured or evaluated for new meanings and models. Because inquiry is a progressive determination of a problem and its possible solution, ideas differ in grade according to the stage of inquiry reached. At first, save in highly familiar matters, ideas and solutions are vague. These ideas and solutions may occur at first simply as a suggestion; suggestions just spring up, flash upon us, or occur to us. They may become stimuli to direct overt activity but they have yet no logical status (Dewey, 1938).

A hypothesis can only be meaningful if it can be shown to provide a meaningful solution to the initial question. Dewey's (1938) process of "reasoning" examines the evidence for support of the newly found inference. "This *examination consists* in *noting* what the *meaning* in *question implies* in *relation* to *other meanings* in the *system* of which it is a *member*" (p. 111). In some circumstances, Dewey points out that the examination process could take the form of a scientific experiment and test or careful examination of the logical implications of the information. Without this careful examination of evidence and acceptance of ideas, Dewey (1938) claims that ideas are "not grounded, even if [the idea] happens to be true" (p. 111) and concepts are integrated into a new understanding of the world without a true exploration of their effects and worthiness. This idea is the basis of his critique of traditional education systems that are built upon standardized, subject-specific, teacher-driven learning (Dewey, 1997).

Dewey, in his progressive pedagogy, argued that students need to be able to operationalize the information on their own. In *Logic: The Theory of Inquiry,* Dewey (1938) called the organization of the information gathered in "reasoning" into a new meaning for the experience world. Dewey labeled this step "the operational character of facts-meaning" and encompassed it into a synthesis of a new model for the world around the learner. Dewey pointed out that learner assembles the facts and results from reasoning into a new model. "[Facts] are not merely results of operations of observations . . . but they are the particular facts and kinds of facts that will link up with one another in the definite ways that are required to produce a definite end" (Dewey, 1938, p. 113).

This new understanding or instrument is then applied to outside world. The application of new idea becomes the instrument for navigating the outside world. Its value is in its ability to predict the outcomes of problems and their practicality (Hickman, 1990). The new model is accepted until new experiences prompt the user to return to reflective inquiry process in the formation an inquiry cycle.

The inquiry process outlined by Dewey extends beyond the formation of ideas and models of understanding. Larry Hickman (1990) pointed out that Dewey's inquiry process also applies to the construction and use of tools. Technology is the outcome of previous inquiry processes, solving problems for the user and providing meaningful experiences.

Technology

Since the 20th century, philosophy has begun explicitly exploring technology as an independent field of inquiry. Many philosophers within the field—Heidegger, Mitcham, and Borgmann—are looked to as providing a foundation for this field due to their direct study of technology (Hickman, 1990). Hickman (1990), who is a professor of philosophy at Texas A &

M, contends in his book *John Dewey's Pragmatic Technology*, that while "Dewey is not generally known for his critique of technology . . . concerns about technology pervade all of his published work" (p. 6).

Dewey's (1997) philosophical work in *Pragmatism and Experience* speaks directly to the "intellectual and social context of technology" (p. 7). Dewey saw technology as an aspect of the world, i.e., a tool to create understanding of our experiences. Hickman (1990) uses Dewey's own words from *Art as Experience* to illustrate context for technology:

> Mountain peaks do not float unsupported; they do not even just rest upon the earth. They *are* the earth in one of its manifest operations. It is the business of those who are concerned with the theory of the earth, geographers and geologists, to make this fact evident in its various implications. The theorist who would deal philosophically with fine art has a like task to accomplish. (p. 8)

Like fine art, technology must be understood as a part of the greater system of human experiences. Hickman (1990) points to Dewey's concepts for inquiry and learning. According to Hickman (1990), "Intelligence is for Dewey not something over or against technology, but a characteristic of technology in its honorific sense" (p. 11).

Hickman contends that many philosophers of technology form opinions on Dewey through the lens of *instrumentalism*. Instrumentalism is the defined as the use of tools, both physical or with in the mind, to solve problems or make sense of the world (Hickman, 1990). Dewey labeled his philosophy as *instrumentalism*, the idea that theories, models, and ideas are instruments to better understand how the world works and find meaning. Many philosophers of technology have extended Dewey's concept of instrumentalism to include the use of tools and technology, since he never explicitly connected his forms of instrumentalism to technology.

Counter Arguments to Dewey's Views on Technology

When investigating the philosophy of technology, many thinkers do not immediately turn to the works of John Dewey (Hickman, 1990). Hickman points out that neither Dewey nor any of his students ever directly reference technology as a unique field of study. Dewey instead saw technology as an outgrowth of the inquiry process and manifestation of the instrumentalism (Hickman, 1990). In research on technology, many researchers turn to the works of Martin Heidegger, a 20th Century German philosopher and Albert Borgmann, a contemporary American philosopher (Borgmann, 1984; Hickman, 1990; Wheeler, 2015). Heidegger and Borgmann held contrary views on the use and effects of technology.

Martin Heidegger had a highly productive period of philosophical research working in Germany during the aftermath of the First World War and build up to the Second World War. With the publication of *Being and Time* in 1927, Heidegger's work became a part of the 20th century philosophical canon (Wheeler, 2015) Before the second world war, Heidegger had joined the Nazi Party but distanced himself from Nazi politics (Wheeler, 2015). His experiences under Nazi controlled Germany and the impact that the U.S. use of the first atomic bomb to end World War II had upon him, contributed to his shaping a new philosophy of technology (Wheeler, 2015). Heidegger (1953) outlined his post-war views on technology in *The Question Concerning Technology*.

Heidegger (2014) offered the readers two specific definitions for technology, "technology is a means to an end" (p. 305) and "technology is a mode of revealing" (p. 308). These definitions offer two very different conceptions of technology. John Dewey would agree that the tools and apparatuses that are termed *technology* emerge out of the process of searching out

solutions to problems (Hickman, 1990). For Dewey, inquiry involved the process through which human beings, when faced with problems, developed tools to solve these problems. In Heidegger's (2014) language, the resulting tool is "a means to an end" (p. 305). The tool in this case serves a practical place with the user because it solves a problem in the real world.

Heidegger (2014) furthered his critique of technology and argued that the problems that modern technology solves are different from those that previous inquiry processes addressed, because modern technology further separates us from each other and the world and fundamentally changes our state of being. In doing so, Heidegger (2014) failed to see modern technology as a spectrum of inquiry and instead compared current tools like hydroelectric power to ancient tools such as windmills. Heidegger (2014) lamented the construction of a hydroelectric dam because it changed the essence of the Rhine River from its state as a river to a commodity. At same time, Heidegger (2014) pointed to agricultural use of the windmill arguing that while this tool is in use, the windmill has no challenge to the air. Heidegger (2014) pointed out that the hydroelectric dam physically changes the river and fundamentally changes the role the river plays in the world, no longer a force of nature that supports the environment but instead a tool for humanity. While the windmill has no discernable effect on the air it occupies, and does not change our perception of the wind. In this case, Heidegger (2014) saw the windmill as an admirable technology, while hydroelectric dam a model for his critique.

The illustration is a common one for opponents of modern technology. The juxtaposition of these two images does not convey the entirety of inquiry process that led from small-localized windmills to large centralized power plants. Heidegger (2014), like many after him, selected a previous technology as idyllic and belabors modern technology as corrosive while not truly

appreciating the inquiry processes that led to the advancement. The very nature of instrumentalism, which Heidegger accepts in his first definition, points to ongoing inquiry.

The reality of Heidegger's arguments about the modern technology compared to previous forms of technology is the scope around which technologies shape the world. Take for example his contention that "The work of the peasant does not challenge the soil of the field. In sowing grain, it places seed in keeping of the forces of growth and watches over its increase" (Heidegger, 2104, p. 309). This is a narrow presentation; even at the height of past agricultural process farmers and society viewed land as a "thing" and worked to enhance its yields. This artificial enhancement of fertilizer, plowing, and irrigation changed or challenged the phenomenological essence of the land. The only difference between modern mechanized farming and peasant farming, which employed livestock in a technological capacity would be scale.

Heidegger's (2014) more nuanced concerns with modern technology arise from his second definition, "technology is a mode of revealing" (p. 308). Tools come into the world and "reveal" the state of being. This new revelation about the state of being is not the entire truth of an object but instead shows the relationship between the world and technology. When examining the "being" of things Heidegger uses Aristotelian logic and argues that things are made from a material (*causa materialis),* formed into a specific shape (*causa formalis*), for a specific purpose (*causa finalis*), and brings about an effect (*causa efficiens*) (Heidegger, 2014). As an example, the Rhine River is now seen as a way to generate electricity and is no longer seen as a river; or a coal deposit is seen as a storage of energy and no longer as a part of a mountain. Heidegger (2014) uses the illustration of jetliner taxiing in preparation to take off in order to illustrate how modern technology reduces humans into "being" things. In his illustration, each

worker; flight attendant, pilot, ground crew, tower controller, and others act of objects or tools; their state of being is changed. These workers were given the skills to accomplish their task (*causa formalis*), they work together for a specific purpose (*causa finalis*), and they bring about the plane's liftoff (*causa efficiens*) (Heidegger, 2014). He points that modern technology changes what is revealed to human beings. The technology becomes our state of being and "enframes" the world around us (Heidegger, 2014, p. 311).

Again, Heidegger is presenting only a partial picture of human existence. The illustration of workers becoming tools or objects such as workers on air crew, is meant to lead the reader to believe that humans possessing a vocation and working in concert with one another is new and unique and that working as tools is a new phenomenon; but as long as humans gathered into groups and acted as communities we can find the manifestation of enframing or redefining humanity relationship to outside world. In order to remove the effect of technology and its effect on "being," humanity would need to shun all tools, disband community and groups, and become individual gatherers living off subsistence that we can forage in isolation (Heidegger, 2014).

Ultimately, the most significant problem with Heidegger's (2014) *The Question Concerning Technology* is that it views the modern world as somehow less authentic than the past. Modern technology has led humans to an existence in which they are less connected to each other and nature, and this is somehow of "less" value than the past. He views the world through the lens of nostalgia and pins all of the evils of the world on something new, i.e., on modern technology. In truth, many of Heidegger's arguments can be easily labeled as *Luddite* and it seems clear they cannot provide a framework for finding practical and meaningful solutions to the problems people face today. This point is affirmed by Julian Young (2002), who

echoed the Luddite label of Heidegger's early work on technology and saw it as an outgrowth of his experiences in Nazi Germany.

Placed in context, the researcher claims that modern technology is merely the latest in long line of inquiry and problem solving approaches. Technology and the inquiry based processes that develop new tools, is amoral at its worst and at best, a positive for humanity in its ability to solve problems. Heidegger is absolutely correct in his first definition of technology, but the problem with his subsequent definitions is that they put ownership of enframing on the tool and not the people.

Modern philosophers have used Heidegger's critique of technology as a foundation for their own criticisms. Albert Borgmann, a professor of philosophy at the University of Montana, expands on Heidegger's critique and looks at cultural implications of technology. Where Heidegger sees redefinition of nature and the objects around us, Borgmann (1984) sees technology redefining culture.

Borgmann (1984) has developed the idea of "focal things and practices," which are objects or actions that form the center of our lives. In an interview for *The Christian Century*, Borgmann describes a *focal thing* as "something that has a commanding presence, engages your body and mind, and engages you with others" (Wood, 2003, p. 23). These objects define how we relate to other people, objects, culture, and the physical world around us. Borgmann uses the example of a guitar to illustrate sustained attention; as someone learns to play the guitar leads to a focal practice of playing. The act of playing connects the person to the discipline of music and the historical tradition of music; the practice has cultural connections and engages both the mind and body. The practice also takes a role in the community and defines relationships to others as groups may form around the music (Wood, 2003). Borgmann described it in this way, "Focal

things and the kinds of engagements they foster have the power to center your life, and to arrange all other things around this center in an orderly way because you know what's important and what's not" (Wood, 2003, p. 22).

Focal things not only determine and shape the current cultural experiences but also shape future relationships. In *Real American Ethics*, Borgmann (2006) applied the philosophical construct, the Churchill Principle. Borgmann (2006) quotes Winston Churchill, applying the following quote to culture: "We shape our buildings, and afterwards our buildings shape us" (p. 7). So, persons select focal points and practices, which in turn shape the types of interactions and relationships, they experience.

In this way, Borgmann does not see technology as culturally neutral. When asked about technology's neutrality, Borgmann responded: "No. It's an inducement, and it's so strong that for the most part people find themselves unable to refuse it. To proclaim it to be a neutral tool flies in the face of how people behave" (Wood, 2003, p. 23).

Modern technology such as television, computers, and the internet are therefore hurting our culture and relationships because of the focal practices they promote or fail to promote. Borgmann sees these technologies as divisive because they do not create focal practice or promote focal practices that separate relationships (Borgmann, 2006). He describes a world where the focal practices of television, computers, and other digital environments weaken the personal physical connections between people and replace them with amoral superficial relationships (Borgmann, 1984).

Ultimately Borgmann's critique of technology rests on the same Luddite impulses that are evidenced in Heidegger's work some 30 years earlier. Borgmann sees technology not as a continuum of problem solving but as static snapshots that do not show the progress of problem

solving. He has inconsistent application of the inquiry process, on one hand praising the advancements in modern medicine while on the other hand pointing to the degradation of the family by the same engineering process. In the interview with David Wood (2003) in *The Christian Century*, Borgmann points out that one job of philosophers of technology is to "point out the liabilities, what happens when technology moves beyond lifting genuine burdens and starts freeing us from burdens that we should not want to be rid of" (p. 24). This arbitrary appraisal of what "we should not want to be rid of" (Wood, 2003, p. 24) allows for individual assessment of technology instead of declarative cultural appraisal.

In pointing towards the regression of familiar and cultural bonds that have risen in modern times, he neglects a primary aspect of the technology he is critiquing. Modern digital technologies, including the internet, computers, and television, do allow for the selection of community. What Borgmann sees as the breaking down of relationships with those around us, others see as the ability to connect to others in ways not possible before. Communities are selected because they allow for the individual to find meaning and purpose in the world. Modern technology has now made it possible for culture and community to become instruments to better model and navigate the world.

Educational Technology

Critics of the use the digital learning environment, increased use of technology in the classroom, along with opponents of modern technology have argued that its use is corrosive to societal fabric. In summary, the arguments of Heidegger and Borgmann contend that social institutions, such as the school system, are losing connection the people and traditions of the culture. At the heart of educational technology is drive to reach out to and connect to students,

both physical and relationally. The inquiry process that is responsible for the creation of the personal computer also feeds and drives education technology innovations

The inquiry process that is outlined by John Dewey, is responsible for all the technological advancements, each step is an answer to the problem (Hickman, 1990). In constructing new instruments, humanity builds more meaning and creates a better model of the world around them (Hickman, 1990). This inquiry process is intimately connected to the world of the schoolhouse. Various problems and questions have spurred innovation within the educational system (Christensen, 2008).

Dewey's own progressive education model arose out of inquiry process; while the traditional education model was rooted in innovations of the past. He described the traditional education process as teacher-directed, linear, and standardized learning, which was oriented toward students learning at a common pace, and largely built upon regurgitation of facts and information by the students without their actually exploring the implications of the information (Dewey, 1997). Dewey (1997) wondered in *Experience and Education*, "How shall the young become acquainted with the past in such a way that the acquaintance is a potent agent in appreciation of the living present?" (p. 23). His response was to rethink the roles that both the student and teacher take within the classroom, as well as the role experience plays in the types of learning activities (Dewey, 1997).

Dewey's inquiry process can be seen throughout education, especially in the types and use of tools and specifically in the classroom. In an article for the *New York Times,* Sara Corbett (2010) highlights how teachers are using current technology as a way to bridge the gap between students and content. Corbett (2010) points out that using innovation in the classroom is not new to education. In an online addendum to the article a timeline of education technology is given.

From the 16th to 18th centuries, many students were utilizing hornbooks to guide daily lessons (Crobett, 2010). Hornbooks were wooden paddles that had standardized lessons written on them with ink or paint (Crobett, 2010). Use of these learning devices arose within the classroom to address a number of problems. Large scale use of printed books was too expensive and hard to come by while wood was easily accessible (Bailey, 2013). Teachers sought a method for standardizing lessons while still allowing for the reuse of materials (Bailey, 2013). The hornbooks allowed for large scale use but also allowed for customization. The wooden panels could also be used as a form of discipline and punishment if needed (Bailey, 2013).

By 1890, educators sought a way to continue the personalization of instruction and looked for a reusable medium (Wilson, 2010). "Perhaps the most durable instrument of American education" (Wilson, 2010), the chalkboard offered educators the ability to quickly and independently personalized lessons to the classroom. Before its development teachers would have to attend to each student with a lesson individually, while the chalkboard allowed for mass communication (Concordia University, 2015).

In an effort to make the communication more permanent but still maintain the flexibility of a reusable medium, by early 1900s many schools began using pencils for student work (Crobett, 2010). A chalkboard or personal slate allowed students to express and demonstrate learning but the evidence was lost with formation of a new lesson. While a pencil and paper allowed students the flexibility of generating evidence and correcting errors by erasing, much like the chalkboard (Crobett, 2010).

By 1925, the use of the radio offered schools the ability to overcome the problems of proximity (Crobett, 2010). Leading up to the innovational use of radio, some students participated in school through correspondence courses through the mail; they suffered from a

time lag in instruction and assessment (Thibault, 2012). With the inception of radio based lessons, students in a given geographical area could be instructed from home and not have to come to a centralized classroom (Crobett, 2010). The ability to deliver content quickly and on a mass scale cut the time needed for correspondence courses in half, while also opening up the instructional process to a much wider audience.

At the conclusion of World War II and beginning of the Baby Boom Generation, mass media began to become a cultural force. Television and increased radio use became a unifying force. Education was not untouched by these forces. By the mid-1960s over 50 channels had sprung up to deliver educational content (Crobett, 2010). Radio was effective to deliver to students the audio portions of a lesson, however it lacked visuals. Therefore, many schools created and broadcast televised lessons, thus creating a personal image or presence of the instructor for their lessons (Sumner, 2000). Now students outside of the traditional classroom could not only hear their teacher but also see their instructor in personal ways (Sumner, 2000).

Limitations to video and radio broadcasts lessons limited their appeal when compared to traditional classroom experience. Students could hear and see the lesson, but feedback, student input, and assessment still needed to be accomplished largely through the mail. By 1980s many educators in the university setting were exploring the use of teleconferencing and two-way satellite media (Thibault, 2012). During 1990s this technology began to find its way into K–12 education (Thibault, 2012) and offered many of the same features of radio and television distance learning but allowed for easy teacher-student interactions (Sumner, 2000).

The Dewey inquiry processes that led to innovations in the educational system, that were developed in response to a problem within education. These innovations show the concentrated effort to reach larger numbers of students in new and meaningful ways. To understand each

innovation John Dewey would point that we need to understand the larger context in which they occur (Dewey, 2005). Hickman (1990) recall the insight from Dewey that was shared earlier:

> Mountain peaks do not float unsupported; they do not even just rest upon the earth. They *are* the earth in one of its manifest operations. It is the business of those who are concerned with the theory of the earth, geographers and geologists, to make this fact evident in its various implications. The theorist who would deal philosophically with [technology] has a like task to accomplish. (pp. 3–4)

Formation of Digital Learning Environments

The digital learning environment grew out the same inquiry process that led to many innovations reviewed in the preceding section. Educators throughout history have sought ways to reach as many students as possible (Sumner, 2000). Until the advent of digital learning environments, schools were limited to serving students in their local geographic areas. Even students in traditional classroom settings found that the use of computers in the classroom allowed for learning to occur in new and meaningful ways (Keegan, 1996). As information increased and became more accessible web-based instruction gave students the ability to connect new information to create a new deeper model of understanding (Berg & Clark, 2005).

Berge and Clark (2005) found that digital learning or virtual schools and groups grew out of a need to expand the access to education. In 1997, the first online public high school, called the *Virtual High School*, was established to reach out to students offer new opportunities to students (Barbour & Reeves, 2009). Within five years there were over 50 virtual public schools running 30 states, drawing students from across the country (Barbour & Reeves, 2009). These programs allowed students in remote areas access to educational opportunities that they unable to connect to in the traditional educational system (Barbour & Hill, 2011).

The large scale virtual schools were built upon the lessons learned from the use of computers in the traditional classroom. By the early 1980s, computers and computer based lessoned had become widely accepted in the traditional K–12 classroom (Johnstone, 2003). Johnstone points out how computer programs throughout their use, have offered unique and creative ways to deliver content. They have allowed students the ability for self-paced, interactive, and individual experiences that was not available in traditional classroom models (Christensen, 2008).

In the 1990s the prevalence and advancement of the *world-wide web* offered educators a unique and exciting solution to connecting content into transformative experiences (Khan, 1997). Badrul Khan (1997) explained that as information has become more accessible it has caused instructional dilemmas for educators, the sheer amount of information available makes it difficult for students to find new tools that allow them to facilitate understanding. Khan (1997) explained that, "As the Information Age and technical advances make resources more accessible, the Web will become a viable medium to facilitate learning" (p. 8). Web-based instruction gave learners the ability to navigate information through the use of hypertext or linked concepts (Khan, 1997). Learners could utilize multimedia, information links, as well as traditional text to create a meaningful learning environment.

The internet of the early 1990s and 2000s has been replaced with a second generation of web based tools. Called *Web 2.0*, its defining characteristics move from information delivery to collaboration and creation (Levinson, 2009). Web 2.0 applications include: wikis, shared multimedia like YouTube and Vine, and social media (Levinson, 2009). These new tools prompted new innovations in Web-based Instruction. Students could collaborate and interact, and build relationships with each other in native conditions (Levinson, 2009). Levinson (2009)

describes how digital learning environments have also adapted to encompass these tools, pointing to one-to-one student-technology programs, development of school social media uses such as Facebook, increased use of the digital communication tools among students and teachers, as well as a focus on digital collaboration.

The digital learning environment was formed by embracing of new innovations that have grown out problems with traditional educational systems. The movement towards digital distance learning is a response to student access to quality education (Christensen, 2008). The use of computers in the classroom is a development of building student engagement and finding meaningful ways of instruction delivery. Web-based instruction allowed students to navigate vast amounts of information and build new meaningful experiences. The collaborative tools of Web 2.0 gave students and teachers opportunities to communicate, create, and collaborate that were previously unavailable.

Karl Maton and Lisa Kervin (2008) offered a differing perspective to the formation of digital learning environments, seeing the movement as an overreaction to cultural shifts and a negation of traditional learning environments. These researchers argued that education has falsely focused on the changing learning styles of current students and that the label of "Digital Natives" that is being used to indicate the current learning style is really inaccurate in its application. (Maton & Kervin, 2008). Maton and Kervin (2008) point to a definition of digital natives used by Prensksy (2001) in an article titled "Digital Natives, Digital Immigrants" as a generation of students who are "surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the other toys and tools of the digital age" (p. 776). Maton and Kervin (2008) point toward a conglomerate of early research that this generational distinction for current learners is unjustified because these learners do not have the widespread

access to digital tools as predicted. In addition, these researchers pointed out that there is a lack of evidence for changing learning styles. The educational response to the development and migration towards digital learning environments is a product of "moral panic" in that some educators are using extreme arguments without the backing of evidence (Maton & Kervin, 2008).

Maton and Kervin's (2008) critique of the formation and migration toward the digital learning environment fails to examine the nature of the tools. While many education leaders and public decision makers may use changing cultural research standards to justify the emphasis on digital learning, the real justification lies in the types of educational freedom that the digital environment allows. The inquiry process that led to formation of digital learning environments was grounded in the ability to personalize education and allow for increased interconnectedness between subjects. Digital learning environments offer the educator unique educational opportunities that are only available because of the characteristics of a digital learning environments.

Characteristics of Digital Learning Environments

In the early 20th century, John Dewey was making his argument for repeal of the "traditional" education system and implementing a new or "progressive" model. Dewey (1997) described this model of education in the book *Experience and Education*, as where "Teachers [were] the agents through which knowledge and skills are communicated and rules of conduct enforced" (p. 18). Clear divisions of subjects also marked traditional education, linear and sequential progression of learning prescribed content, and group delivery of content (Dewey, 1997). Dewey (1997) saw this model as largely an "imposition from above and from outside"

(p. 18) of the students. The traditional education model focused on instilling previous social and cultural norms that were constructed in the past.

Dewey's progressive model focused more on the individual students' needs. Learning was based largely upon personal exploration of a facilitated experience (Dewey, 1997). Students learned new material by personal inquiry into an experience (Dewey, 1997). The organization of ideas and subjects is fluid in response to students' interests and investigation compared to scripted and predetermined in traditional education systems (Dewey, 1997). The progressive education model is student centered, looking for individual students to find meanings and build their own view of the future.

Much like Dewey, almost a hundred years prior, other educational leaders are painting a similar picture of modern education today. Clayton Christensen (2008) sees a similar pattern of current education models. He calls it *monolithic learning* and describes the same set of attributes as John Dewey: one size fits all curriculum, teacher focused instruction, learning dictated by group of students, and unconnected independent subjects (Christensen, 2008). Christensen sees this model of education as incapable of meeting the changing cultural and political pressures put on the school system. Christensen (2008) describes the model as being built for the past, to prepare students for industrial and manufacturing world and in need for "disruption" to prepare students for the digital information world that they are inheriting.

The disruption that Christensen argues for also matches Dewey's progressive model but relies upon emerging digital technologies to accomplish student centered, experience orientated, and decentralized educational systems. Christensen compares current educational system with the business world. He points out examples how various industries and companies are able to embrace innovation as a disruptive and creative force (Christensen, 2008). The disruptive

education innovation is the digital learning format and Christensen (2008) describes that it is characterized by: (a) being built upon a highly-connected subject interface; (b) being modular and open to competition; (c) being customizable to each student; and (d) being open to a variety of learning methods.

Christensen is not alone in his assessment that digital learning environments offer an avenue towards Dewey's Progressive Model. Careful and deliberate implementation of digital learning environments could provide the means to moving towards a new model for education. Salman Khan (2012), the creator of the world largest digital learning environment highlighted the advances of the digital learning environment but cautioned that it without careful planning may be just a gimmick in his book *The One World School House*:

> What will make this goal attainable is the enlightened use of technology. Let me stress ENLIGHTNED use. Clearly, I believe that technology-enhanced teaching and learning is our best chance for an affordable and equitable educational future. . . . The idea is to integrate the technology into how we teach and learn; without meaningful and imaginative integration, technology in the classroom could turn out to be just one more very expensive gimmick (p. 122).

Careful examination of research shows many commonalities in the characteristics of an enlightened use of digital learning. In examination of all traits of the digital learning environment its characteristics could be summarized as "flexibility" (Collis & Moonen, 2002) and "personalized" (Christensen, 2011). The ability for students to drive learning and customize the education experience promotes a flexible learning environment (Collis & Moonen, 2002). Aspects of this flexibility can be found throughout the literature.

In a report published by Digital Learning Now (2011), the digital learning environment characterized "by technology that gives students some element of control over time, place, path, and/or pace" (p. 5). The report then goes on to define the four characteristics of time, place, path, and pace. The report defines *time* in the following way: "Learning is no longer restricted to the school day or the school year. The internet and proliferation of internet access devices has given students the ability to learn anytime" (Digital Learning Now, 2011, p. 5). *Place* is defined as: "Learning [being] no longer restricted within the walls of a classroom. The internet and a proliferation of internet access devices have given students the ability to learn anywhere and everywhere" (Digital Learning Now, 2011, p. 5). Digital Learning Now (2011) defines the characteristic of a path as "no longer being restricted to the pedagogy of the teacher" (p. 5) but able to use technology to personalize to learning styles of the students. Lastly, Digital Learning Now, saw the that the personalization of learning not only applied to how lessons were delivered but also how fast the students were moved through them. "Interactive and adaptive software allows students to learn at their own pace, spending more or less time on lessons or subjects to achieve the same level of learning" (Digital Learning Now, 2011, p. 5).

Christensen (2008) described digital learning environments as being "customizable" to the skills and desires of each student, they are "modular" in that students can move outside of the instructional system to gain knowledge, subjects and learning are "interconnected," and learning is "decentralized" from a specific time and location. Christensen (2008) saw these traits as being a new disruptive force that would necessitate a new disruptive educational innovation.

Desmond Keegan (1996) agreed with Christensen's focus on the decentralized nature of the modern digital learning environment but does not explore the effect upon the subject matter structure and personalization of learning. His definition of the digital distance education listed

four characteristics: (a) a complete or partial separation between the educator and the student; (b) the use of technology to bridge this separation; (c) use of two-way communication tools; and (d) possible separation between students from peers (Keegan, 1996).

Blended Learning Environment

In *My Pedagogical Creed*, John Dewey (1897) argued that the classroom should mirror the society around it. In examining our current educational environment, it is increasingly obvious the world is being shaped by the prevalence of digital technology. Some educators have called current generation of learners "Digital Natives," because they have grown up with easy access to the internet and a life mitigated by technology (Maton & Kervin, 2008; Palfrey & Gasser, 2008; Tapscott, 2009). These students look for a school environment that echoes the abilities of the digital society within which they have grown up (Christensen, 2011).

The new digital society and subsequent school environment is not without its negatives characteristics. Within a new digital-centered model of education it is easy for a student to be lost without communication and a relationship with an educator (Hollier, 2011). In response to this, a new innovation arose in the early 2000s, a blended learning model (Staker & Horn, 2012). The blended learning model mixes aspects of distance digital learning with aspects of traditional face-to-face education (Staker & Horn, 2012).

A digital learning environment is characterized by decentralized communication, personalized learning, and linked content and concepts (Carr, 2010; Christensen, 2011). The structure of the internet allows ideas and concepts to be linked to each other through hyperlinks, allowing learners to be flexible and in control their own learning (Thompson, 2013). This echoes Dewey's call for the end of subject-specific learning and its being replaced with flexible and student-driven learning. The vast amount of digital and internet resources available to a

student allows a student to participate in a marketplace of ideas and resources, putting the student in the position of personalizing their learning (Christensen, 2011). Again, the personalized nature of the digital world furthers Dewey's progressive model by giving students ownership of building the connections between educational experiences. Learners are able to use the internet and digital communication tools such as social media and email to connect with fellow learners and educators electronically, thus decentralizing the very nature of teacher-student relationships (Turkle, 2011).

The blended learning environment is a relatively new innovation in education that builds upon methods of distance education. Blended learning differs from fully virtual or fully online schools, in that these virtual and online schools do not retain the physical aspects of the teacher-student relationship (Barbour & Reeves, 2009). In a blended learning model, some semblance of traditional education environment remains such as a physical location of the classroom environment or face-to-face interactions with an educator (Staker & Horn, 2012). Virtual schools utilize digital information and communication technology to replace traditional education systems (Barbour & Reeves, 2009; Johnstone, 2003).

There are varying degrees of mixtures of digital learning and traditional face-to-face educational settings within blended learning environments. Staker and Horn (2012, 2015) outlined four models that create a spectrum of blended learning: the rotational model, the flex model, a la carte model, and enriched virtual model.

The *rotational model* focuses largely on the traditional face-to-face instruction. The rotation model uses digital learning tools as a station or small piece that students rotate with other traditional classroom activities (Horn & Staker, 2015). Rotational model classrooms

include flipped classrooms, digital learning labs, station rotations, and individual rotations (Staker & Horn, 2012).

The *flex model* uses digital learning activities as the foundation of the classroom but occurs largely in a brick-and-mortar campus (Horn & Staker, 2015). In the flex model an educator may provide activities that work to support the learning that occurs (Horn & Staker, 2015). The fundamental difference between the flex and rotational models is the role the digital learning plays. In the rotational models, digital learning augments or supplements the traditional classroom while in the flex model it is the primary source of learning and traditional classroom transactions act as enrichment (Vander Ark, 2012).

The *à la carte model* is increasingly more common at high schools and higher education institutions (Staker & Horn, 2012). The à la carte model allows students to choose to take a course online or through traditional settings (Horn & Staker, 2015). Staker and Horn (2015) pointed out that many times these courses are offered during open periods or study halls, keeping students in the brick-and-mortar school. These courses can also be completed like a traditional distance course and away from the school building (Horn & Staker, 2015).

In the *enriched virtual model* students have very limited physical interaction with educator and large parts of the learning process are completed away from the school building (Horn & Staker, 2015). Staker and Horn (2015) point out that educators may "customize the in-person meeting requirements based upon student progress . . ." (p. 50).

Virtual schools are a digital incarnation of distance education (Johnstone, 2003). Distance education is an educational environment where the learning is solely accomplished without the physical school environment (Barbour & Reeves, 2009; Johnstone, 2003; Moore, 1973). Distance education has been a part of the education setting early 1890s (Crobett, 2010).

Following the path of inquiry established by John Dewey (Hickman, 1990), educational systems have grown to respond to new societal pressures (Christensen, 2011).

Teacher-Student Transactional Relationships

In a Deweyan "progressive" education model, learning is a transaction between the learner, the teacher, and the knowledge to be gained (Dewey, 1990). Dewey utilized an analogy of a mother and child to illustrate this transaction, explaining how "a wise mother" responds and reacts to the information that an infant is giving to meet the needs of her child (Dewey, 1997). The interactions between a child and parents are aimed at a common goal, the development of a healthy child, but these can be viewed as transactions in that both parent and child respond and react to each other. Dewey (1997) argued that for an educator, like a parent, "These interactions . . . assign equal rights to both factors in experience—objective and internal conditions" (p. 42).

> The teacher is not in the school to impose certain ideas or to from certain habits in the child, but is there as a member of the community to select the influences which shall affect the child and to assist [them] in properly responding to these influenced" (Dewey, 1897, p. 293).

Dewey (1997) argued that this form of guided education where students drive the learning and build their own meaning for experience is the more natural and authentic means for building a healthy democracy.

John Dewey's later work focused on the role of democracy and the relationship between individuals in society. Matthew Festenstein (2014) described Dewey's definition of democracy as *relational*, relying upon discussion and collaboration. In *The Public and its Problems*, Dewey (1997) argued against a political system that sees a single controlling authority and instead each individual working together, collaboratively, for each other and social goals. Clear parallels can

be seen with Dewey's rejection of the traditional education model, where learning is driven through a central authority, i.e., the teacher. Dewey's (1997) educational system is built in shared authority between the teacher and the student. Dewey's vision of democracy requires individuals "to develop through the give-and-take of communication an effective sense of being an individually distinctive member of a community" (p. 154). For a true democratic society to take hold, Dewey states, "it must affect all modes of human association, the family, the school, industry, religion" (1954, p. 143). Dewey's (1997) progressive model was designed around this definition of democracy.

Leonard Waks (2011) found that the biggest difference between traditional education models and John Dewey's progressive model is the use of *transactional listening* built upon mutual friendship. Waks (2011) stated that John Dewey saw the traditional teacher centered classrooms utilizing "one way or straight-line communication" (p. 91). The learner directly receives communication from an educator without the actively engaging with the teacher. In contrast, Dewey's progressive education model relies upon transactional listening, Waks (2011) quoted Dewey in describing transactional listening, "When A and B carry on a conversation together the action is a trans-action: both are concerned in it; its results pass, as it were, across from on to the other" (p. 61). Communication within a framework of transactional listening grows beyond simply being practical for the situation but also consummatory (Waks, 2011). Waks (2011) pointed out that John Dewey called the resulting relationship a *cooperative friendship* (p. 198).

Leonard Waks is not alone as seeing the teacher-student relationship as a form of friendship. Sam Sellar (2012) described student-relationship in terms of friendships and sees a classroom environment built upon this that fosters "intellectual hospitality" in students. John E.

Kesner (2000) describes the significance teacher student-relationships, saying, "Perhaps there is no other nonfamilial adult that is more significant in a child's life than his or her teacher" (p. 134).

Philip Riley described the teacher-student relationship through the lens of attachment theory. Riley's (2011) saw the progressive educational model built upon students and teacher forming meaningful relationships with one another, and sees teachers as the "alloatachment figure." He described three forms of attachment or relationships, professional, personal, and collectively. Teachers bond and relate to whole groups of students and may build attachments collectively, relating to group (Riley, 2011). Most teacher-student relationships are built upon a combination of both the personal and professional aspects (Riley, 2011). Teachers are personally invested in their students' success and have an underling sense of a student's personal value or worth; these aspects of the relationship manifest as a teacher fosters a student's growth (Riley, 2011).

Research has shown that a quality teacher-student relationship has profound effect on students (Allan, 2008; Cronoe, Johnson, & Elder, 2004; Davila, 2003; Gallagher & Mayer, 2006; Poll, 2010). A positive teacher-student relationship increases student engagement, achievement, as well as student self-expectations (Davila, 2003). Further study of classroom relationships provides evidence that the quality of student-relationships is a predictor for student achievement (Allan, 2008; Cronoe et al., 2004; Gallagher & Mayer, 2006; Poll, 2010). Students in complex subjects such as mathematics, who had built quality relationships with their teachers, outperformed those who did not have a quality relationship (Allan, 2008; Poll, 2010). Students utilized the relationship with their teachers to help find meaning for abstract concepts (Allan,

2008). Regardless of the subject matter, students are more engaged in learning if they have meaningful and quality relationships with teachers (Skinner & Belmont, 1993).

Other researchers also focused on the implications for classroom management and work with at-risk-students. In a large-scale study, Crosnoe, Johnson, and Elder (2004) surveyed over 90,000 students and compared their personal assessment of their relationship with their teachers with their grades and discipline marks. The researchers clearly found a strong correlation between the quality of the self-reported teacher-student relationship and the subsequent student achievement and discipline marks (Cronoe et al., 2004). Crosnoe, Johnson, and Elder (2004) concluded, "the findings thus far indicate that factors that are related to school structure, composition, and climate were associated with students' bonding with teachers" (p. 3). Research has shown that the teacher-student relationship is even more pivotal for minority and at-risk students (Calabrese, Goodvin, & Niles, 2005, Crosnoe et al., 2004) When at-risks students feel attached to a teacher in a meaningful relationship they are less likely to drop out of school (Calabrese et al., 2005), had higher academic achievement (Calabrese et al., 2005, Crosnoe et al., 2004), and had fewer disciplinary issues (Calabrese et al., 2005, Crosnoe et al., 2004).

The reviewed research studies confirmed that quality teacher-student relationships are key to the academic success of students regardless of the age or abilities of the student. Gallagher and Mayer (2006) pointed out that early on in a child's life, quality relationships with teachers aided in the development of social-emotional and intellectual development. These traits take on significant roles in a student's success later in school and life (Gallagher & Mayer, 2006). On the other hand, a negative or even neutral teacher-student relationship can have a negative influence upon student abilities (Pianta & Stuhlman, 2004).

Students' perception of the relationship with teachers is driving force for their perception of the overall school environment. Slaughter-DeFore and Carlson, along with Spencer and Markstrom-Adam (as cited by Witherspoon, 2011) found that how students viewed the school could be broken up through three key elements: (a) positive relationships teacher-student affected student achievement; (b) teacher's interest in the personal lives; and (c) teacher's ability to allow and develop a student's own ideas about the world. These three traits are the hallmark of the John Dewey's progressive education model.

In a progressive education model, where ownership and direction of learning is shared between the student and teacher, the teacher-student relationship must be built upon the same democratic ideals (Dewey, 1997). Christopher Murray (2002) states that students are more likely to mimic the teacher's behaviors and beliefs. These relationships should be grounded upon clearly stated research standards, which are part of the day-to-day activities (Murray, 2002). These research standards should reflect the social structure of larger society and work to prepare students to participate in society (Dewey, 1897). John Dewey (1897), in *My Pedagogical Creed* said:

> I believe that the school is primarily a social institution. Education being asocial process, the school is implying that form of community life in which all those agencies are concentrated that will be most effective in bringing the child to share in the inherited resources of the race, and to us his own powers for social ends.

Digital Relationships

A major tenet of Dewey's progressive model of education was the schools' place within society (Hollier, 2011). Dewey argued that the school should mirror a student's life outside of the school building and not be a stand-alone social apparatus. "What can be done, and how can

it be done, to bring the school into closer relation with the home and neighborhood life—instead of having the school a place where the child comes solely to learn certain lessons?" (Dewey, 1897, p. 18). Dewey (1897) went so far to argue that the reason that many schools fail is that they fail to take into account the modern forms of community life and "as a result do not become a part of the life experience of the child and so are not truly educative" (p. 18).

David Hollier (2011), the Director of the Master of Arts in Teaching Program St. Edward's University, applied Dewey's belief about school and the larger community to the modern educational environment:

> Granted, we are in a new technology age, and we may even desire to create "community" even if we are only connected by cyberspace. True, we are able to be "connected" electronically and there are mechanisms in place to create "electronic community units, web-based communities, electronic community of learners, virtual learning communities, e-learning community environments," and the list of possible names for online classes continues. (p. 3)

Digital technology has become almost ubiquitous with modern life. A 2015 Pew Research poll found that 92% of Americans own a cell phone and 68% own and use a smartphone (Anderson, 2015). The same poll found that over half of American households own at least one tablet computer and over 73% own a computer (Anderson, 2015). All of these devices are connected to the internet and provide individuals with a new model to connect to friends, family, and the outside world.

Many schools have incorporated digital communication into their classrooms and migrated to total online learning environment that is not flexible and built upon the needs of the individual student, thereby abandoning Dewey's ideals concerning the nature of community and

social institution functions of schools (Hollier, 2011). Hollier stated this is partly due to the nature of digital relationships. The very nature digital communication that makes it revolutionary, also forces its user to develop new ways to connect to people (Turkle, 2011).

Digital communication strengths come in its ability to bridge both geography and time, allowing people to connect to others from around the globe and do so on their own terms (Thompson, 2013). The decentralized and asynchronized nature of the digital communication can be transformative, allowing individuals to make connections and form relationships with people all round the world (Thompson, 2013). According to Thompson (2013), in these new digital relationships individuals are exposed to new and unique ideas that are not a part of the traditional physical communities of the past.

There are contradictory arguments over whether new digital relationships are different than previous physical community relationships. Sherry Turkle (2011), in the book *Alone Together*, pointed to a number of differences between the digital relationships and traditional physical relationship. For starters, Turkle argued that building relationships through technology instead of person-to-person interactions changes the way technology is viewed. Some researchers have found that many of the emotions and sentiments that come with an intimate relationship with another human were being displaced from the other individuals and to the technology that facilitates the relationship (Turkle, 2011). Turkle pointed out that many technology companies are aware of this and have worked to strengthen this bond by personifying the technology like Apple and Siri (Turkle, 2011). A point echoed by Nicholas Carr (2013), who argues that the promise of technology to bring the world closer together has failed to materialize and instead we are instead chasing the tool. The technology has become the focus and not the

promised personal connection (Carr, 2013). Technology has become the focal point not the underlying connection (Borgmann, 1984).

The medium that the relationship takes place in may be different but attributes of the underlying relationship to other individuals is the same (Boyd, 2014). Danah Boyd pointed out that while the modern community may rely upon digital technology previous generations used tools to connect to others. She points to the example of teenagers in the fifties and sixties building relationships around driving around to meet each other, or teens in the eighties or nineties use of the mall as a tool to build relationships. In comparing digital relationships of modern teenagers researchers found that they were no more attached to their phone, tablet, or computer than teens in the 1950s and 1960s were attached to their car (Boyd, 2014). Boyd (2014) pointed out that, while the medium that teens connected and communicated had changed the relationships and the characteristics of the relationships that were occurring had not.

Turkle (2011) pointed out that new digital relationships are different because they take place in isolation and used the prevalence of a texting and cell phones as further distancing our self from one another. The self-induced isolation forces its user to an increased reliance upon the technology for communication and connection. Turkle (2011) quotes a high school student who is tethered to her smart phone: "I know I should, but it's not going to happen. If I get a Facebook message or something posted on my wall . . . I have to see it. I have to" (p. 171).

Addiction researchers argue that users are so tethered to their technology and relationships built within it that it has become an addiction (Carr, 2011). In closer examination of the addiction claims for social media show that the relationships that underlie it and not the technology itself (Boyd, 2014). Boyd (2014) sites a 1996 study by Sonia Livingston of media addiction that found it was relationship that drove use not the technology itself. Internet's ability

to connect people from diverse background in meaningful ways is the driving force for these relationships and people utilizing digital tools feel more connect to each other than without them (Boyd 2014; Thompson 2013).

Regardless of the opposition to digital relationships, our world is shaped and will be shaped by digital technology in the future. Dewey (1897) instructed educators saying, "knowledge of social conditions, of the present state of civilization, is necessary in order properly to interpret the child's powers" (p. 18). He further illustrated the role of a teacher saying:

> If we take an example from an ideal home, where the parent is intelligent enough to recognize what is best for the child, and is able to supply what is needed, we find the child learning through the social converse and constitution of the family. There are certain points of interest and value to him in the conversation carried on: statements are made, inquiries arise, topics are discussed, and the child continually learns. He states his experiences; his misconceptions are corrected . . . . The child must be brought into contact with more grown people and with more children in order that there may be the freest and richest social life. (Dewey, 1902, pp. 23–24)

A primary characteristic of the digital environment is the ability to build a wide variety of relationships with diverse population. There is a variety of tools at hand for educators to build these types of digital relationships. Hollier (2011) pointed out that,

> community or virtual community is created through online discussion boards and online chat rooms facilitated by instructors and students together attempting to understand each other's ideas through these two main ways. Group projects and

> group assignments are additional ways community can be created in online classes, just as these same instructional approaches create community in face-to-face environments. (p. 7)

Hollier (2011) also affirms that these tools can only be used to build the type of social institution that Dewey proposed when they are taken with the entirety of the progressive model where students utilize digital tools to create and find meaning in learning experiences. Researchers affirm that students require the ability to find their own meaning in their relationships and freedom to form their own communities (Hollier, 2011).

Transactional Distance

Albert Borgmann (2006) in *Real American Ethics,* explained that the Churchill principle states that, "We shape our buildings, and afterwards our buildings shape us" (p. 5). The types of and structures of educational environments determine the types transactions that take place within them (Borgmann, 2006). This interaction between the environment and the types of activities also was described by Dewey (1990) in *The School and Society*. Dewey (1990) recalled looking to purchase desks for his Lab school. In doing so he found that all of the options available reinforced an educational model that was devoid of transaction and interaction and instead focused on the one-directional communication.

> Some few years ago I was looking about the school supply stores in the city, trying to find desks and chairs which seemed thoroughly suitable from all points of view—artistic, hygienic, and educational—to the needs of the children. We had a great deal of difficulty in finding what we needed, and finally one dealer . . . made this remark: "I am afraid we have not what you want. You want something at which the children may work; these are all for listening." That tells the story of the traditional education . . .. If we put before the

> mind's eye the ordinary schoolroom, with its rows of ugly desks placed in geometrical order, crowded together so that there shall be as little moving room as possible, desks almost all of the same size, with just space enough to hold books, pencils and paper, and add a table, some chairs, the bare walls, and possibly a few pictures, we can reconstruct the only educational activity that can possibly go on in such a place. It is all made "for listening". . . . The attitude of listening means, comparatively speaking, passivity, absorption . . .. (Dewey, 1990, pp. 30–31)

Dewey's anecdote underscores the relationship between the learning environment and the type of educational activities that can take place. It is difficult for educators in systems built for one-way teacher-to-student communication to build progressive or transactional learning environments.

Starting in the 1970s, Michael G. Moore (1973) began exploring the distance-learning environment and how educators and students were creating transactional learning environments. Moore attempted to define the unique characteristics and out coming educational activities of distance learning. Moore (1997) found that there were unique pedagogical needs of distance education. Moore (1997) stated that "distance education is not simply a geographic separation of learners and teachers, but, more importantly, is a pedagogical concept . . . with separation there is a psychological and communications space to be crossed, a space of potential misunderstanding between the inputs of instructor and those of the learner" (p. 28). Moore labeled the physical along with psychological distance between learner and instructor the *transactional distance*. Moore utilized the concept of the transaction of education from John Dewey, citing that learning occurs as transaction between the learner and experience, the learner and context of the experience, and learner and the educator (Giossos et al., 2009; Moore, 1972, 1973, 1997).

Underlying Moore's theory is the understanding that space and time of distance learning is constantly changing the context and nature of learning (Chen, 2001).

As a complete and intact theory, transactional distance and its underlying variables can be found in a number of studies. Huang et al. (2015) utilized transactional distance to create a survey to explore the perception of university blended learning settings. Two hundred and twenty-seven students in a Midwest university were surveyed about their experiences and feelings about a blended learning course (Huang et al., 2015). The survey was built using Moore's theory of transactional distance and focused on the variables of transactional distance, dialogue, structure, and learner autonomy (Huang et al., 2015). After basic and initial statistical analysis, the survey instrument created was found to be a valid and reliable measure of transactional distance and its contributing variables (Huang et al., 2015).

Zhang's original scale was administered to 192 university students and utilized a goodness-of-fit analysis of the statements to determine which statements were not statistically significant and remove them (Paul, Swart, Zhang, & MacLeod, 2015). Zhang (2003) created a survey instrument to examine transactional distance in high education settings. While Zhang's survey targeted web-based online education settings, it had become outdated for the modern higher education settings due to the development and implementation of new digital learning platforms. (Paul et al., 2015). In an attempt to modernize and streamline the survey instrument Paul, Swart, Zhang, and MacLeod (2015) revisited the survey and streamlined it from 31 to 12 items. The researchers administered Zhang survey to a new group of students and utilized a factor analysis to find the statically significant survey items (Paul et al., 2015). The researchers noted that they believed the 21 statements that were eliminated from the survey tool were eliminated because of the prevalence of social media and wireless technology (Paul et al., 2015).

Paul, Swart, Zhang, and Macleod (2015) argued that modern technology may ultimately negate the need for the theory of transactional distance because students are becoming more accustomed to digital relationships. The researchers determined that the new refined tool would allow researchers to quickly and accurately measure the transactional distance of university learning environment (Paul et al., 2015).

In 2011, Horzum developed a survey for higher education students in economics and business. This survey was developed to measure transactional distance, dialogue, structure, and learner autonomy (Horzum, 2011). The purpose of the scale development research was two-fold: (a) to create a standardized scale of transactional distance and its 5 components, and (b) to examine the transactional distance differences by gender (Horzum, 2011). One-hundred and ninety-seven students were surveyed and it was found that gender was not a significant contributor to a university student's transactional distance (Horzum, 2011).

In 2014, Horzum followed up is initial survey with a cross-sectional and longitudinal survey study. The study consisted of two distinct survey groups; 34 university education students participated in the longitudinal study, and 47 third year students participated in the cross-sectional. The longitudinal study followed the 34 students from the 2009-2010 academic to the end of 2011-2012 year (Horzum, 2014). The researcher conducted a longitudinal study that found that as the students moved through their college education, their sense of dialogue decreased while their transactional distance increased (Horzum, 2014). Additionally, Horzum (2014) found no change in the structure and learner autonomy over time. These findings were supported by the cross-sectional survey that surveyed students in their first, second, and third year at a university. Horzum (2014) postulated that these results could be due to the learning

process becoming "superficial" and digital learning environments become more built upon "surface learning."

Horzum is not alone in measuring transactional distance as a whole, Jung (2006) utilized transactional distance in the form of immediacy between educator and student, as well as perception of separation between students or solidarity. Jung (2006) argued that both immediacy and solidarity encompass the elements of transactional distance. Jung (2006) believed that as transactional distance increased, students would become less motivated. The researcher surveyed 79 business administration students who were enrolled in a videoconference course (Jung, 2006). The study concluded that there was no correlation between students sense of separation and student motivation (Jung, 2006). Like Stewart (2008) and Falloon (2011), Jung (2006) found the transactional distance between the teacher and learner within a course was also affected by student-to-student transactions. Jung (2006) found that in courses of low immediacy, students exhibited high solidarity.

In an attempt to improve instruction, Swart and Wuensch (2016) created digital activities for students to complete outside of the classroom. These activities provided the basis for learning in a graduate-level quantitative business course (Swart & Wuensch, 2016). At the end of the course students completed Zhangs's (2003) transactional distance survey (Swart & Wuensch, 2016). The researchers then compared the result of the flipped classroom to previous years (Swart & Wuensch, 2016). Based on the survey data Swart and Wuensch (2016) found that using the digital tools decreased the transactional distance and increased the overall course satisfaction. The researchers concluded that by utilizing a flipped classroom, which is a form of blended learning (Horn & Staker: 2015), increased satisfaction and lower transactional distance

could lead to higher achievement for the student and increased revenues for the higher education institutions (Swart & Wuensch, 2016).

In 2006, Wallace, Grinnell, Carey, and Carey conducted an experiment to evaluate the principles of transactional distance in web-based distance learning with 40 education graduate students. The researchers created two different courses in the "the principles of assessment" (Wallace, Grinnell, Carey, & Carey, 2006). One course was labeled high transactional distance and was characterized by assessment activities that were low structured, students could view test questions before answering, as well as low dialogue, students studied independently and could not ask questions during assessments (Wallace et al., 2006). The other course was labeled low transactional distance and was characterized by high structure, students could not see questions and chose answers, and high dialogue, the students could ask questions and would receive feedback (Wallace et al., 2006). The two groups were then compared using a t-test on achievement on the final examinations as well as responses to a survey about their attention, content relevance, confidence, and course satisfaction (Wallace et al., 2006). Students in the Low Transactional Distance course performed statistically better on the final examination than their fellow students in the high transactional distance course (Wallace et al., 2006).

Dialogue

Moore described transactional distance as a continuum rather than a discrete quantity. Transactional Distance was the result of two factors: dialogue and structure. Dialogue was defined as purposeful constructive interaction between learners and educators (Moore, 1997). Moore (1997) explained the concept of dialogue as being "developed by teachers and learners in the course of the interactions that occur when one gives instruction and the others respond" (p. 24).

While Moore's original concept of dialogue referred only to learner-to-educator, others have taken the concept of dialogue and extended it to include the learner-to-learner interactions (Benson & Samarawickrema, 2009; Bischoff, Bisconer, Kooker, & Woods, 1996; Huang et al., 2015). The quality dialogue can be measured using the following constructs of "purposeful," "constructive," "positive," and "valued by each party" (Moore, 1991). Purposeful dialogue describes communication that is learner-learner and learner-instructor which is designed to improve the understanding of the student (Moore, 1997). According to Shearer (2010), communication should also be constructive in that it builds upon ideas and work from others, as well as assists others in learning. Moore (1972) affirmed that learners also must realize that and value the importance of the learning interactions and value it as a vital part of the learning process.

In a manner that is similar to Benson and Samarawickrema's (2009) study of teacher preparatory students, Falloon (2011) investigated the use of digital tools in a case study at a teacher education program in New Zealand. Falloon (2011) observed 30 education students in a digital classroom that utilize Adobe Connect Pro as its digital classroom platform. Adobe Connect Pro allows students and educators interact with each other both through audio and visuals, by viewing presentations through PowerPoint and Flash, as well as by sharing resources, such files and notes (Falloon, 2011). The researcher observed classroom activities on this platform, collected observations of activities, and interviewed participants (Falloon, 2011). Falloon found that the use of Adobe Connect Pro increased the dialogue between as parties in the educational environment but reduced learners' sense of control over learning, that is, it decreased learner autonomy (Falloon, 2011). Falloon (2011) summarized transactional distance as a

conceptual "lens" to analyze learning practices and key tool to understand the implementation of digital learning platforms and its affects.

In another university case study, Stewart (2008) utilized interview, surveys, and observation to examine synchronous learning environments similar to those examined by Falloon (2011). The study included interviews and surveys of 13 experts or instructors, and 42 students regarding their experiences in digital learning environments (Kuskis, 2006). Specifically, Stewart (2008) examined a synchronous web platform, Elluminate Live!, which offered users audio and text communication, as well a collaborative white board. Stewart (2008) found that these tools increased dialogue and decreased the transactional distance and anxiety that students felt in the learning environment.

Mathieson (2012) also explored the role dialogue plays in digital learning environments. She created a digital survey that examined students' perception of audiovisual feedback in courses that utilize screencasting digital tools (Mathieson, 2012). Mathieson (2012) compared text-only feedback to text-plus-audio feedback to student submissions and questions. Fifteen students were separated into two courses college level statistics courses; each course was taught by the same instructor (Mathieson, 2012). Students were then randomly selected to either receive text-only feedback or text-plus-audio feedback for half the course and then were flipped (Mathieson, 2012). Students completed four assignments in each section (Mathieson, 2012). Students' were then asked to evaluate the type of feedback based upon learning satisfaction, instructor interaction, whether the course aided in building community, and whether the course aided in in the learning process (Mathieson, 2012). Students responded that text-only feedback was satisfactory, but text-plus-audio feedback was more "real" and "personal," and lowered the sense of separation between learner and educator (Mathieson, 2012).

Researchers have created survey instruments that focus on dialogue and have found the type of feedback, availability of instructor, and the degree and quality of communication and interaction largely contribute to a student's sense of separation (Beasley, 2007; Belair, 2012; Wang & Morgan, 2008; Falloon, 2011; Kuskis, 2006; Mathieson, 2012; Minor, 2014; Rabinovich, 2009; Stewart, 2008). Beasley (2007) utilized transactional distance and dialogue to examine instructor communication behaviors. The researcher administered the 55-item survey to 203 different college students at two universities, all of whom were majoring in business and enrolled in digital course (Beasley, 2007). Beasley (2007) found that type, quality, and amount of feedback that a student received was correlated to a student's sense of success or course satisfaction. Her results were viewed as supporting the relevance of transactional distance theory to digital learning platforms (Beasley, 2007; Moore, 2013).

In attempt to refine and measure transactional distance using a survey tool, Rabinovich (2009) created a survey instrument to measure transactional distance in a higher education setting. A survey was sent to 235 students enrolled in a synchronous web-based graduate class in business regarding transactional distance and dialogue (Rabinovich, 2009). The synchronous learning environment was described as a place where "live on-campus classes are delivered simultaneously to both in-class students on campus and remote students on the Web who attend synchronously via virtual classroom Web collaboration software" (Rabinovich, 2009, p. vi). The virtual classroom software is similar to the characteristics of the two-different software described by Falloon (2011), Mathieson (2012), and Stewart (2008) in that allows for students to interact with the educator and fellow students in real-time (Rabinovich, 2009). In this study, students were grouped by the following modes of attendance: "always online;" "always in class;" "mixed" (Rabinovich, 2009). The "mixed" category of students is of particular interest for the

present research due to the similarities between the "mixed" attendance mode and blended environments. Rabinovich (2009) found that utilizing a Pearson's *r*, the survey implemented in his/her study did correlate in a reliable and valid way to Moore's theory of transactional distance and that learner-instructor interactions were significant for understanding transactional distance. Within the different attendance groups, the research found that differing types of dialogue were important (Rabinovich, 2009). For the "always online group" and "mixed" group, student-instructor interactions had the largest effect on transactional distance resulting a strong sense of emotional separation, while "always in class" found that all types of dialogue were important to transactional distance (Rabinovich, 2009). This stands in contradiction to the work by Jung (2006), who argued that in online environments students relied upon each other as solidarity to be successful learners.

Other researchers have utilized a synchronous digital learning environment to investigate dialogue. Wang and Morgan (2008) developed a survey to measure graduate students in a teacher education course's perceptions of synchronous learning environment using instant messaging software. Using a 47-item scale, 44 graduate students answered survey questions about a class that utilized instant messaging as form of communication (Wang & Morgan, 2008). The results from the survey instrument showed that the immediacy and availability of the communication tool resulted in a higher evaluation of dialogue than courses that did not use instant messaging software (Wang & Morgan, 2008). Wang and Morgan (2008) proposed that further use of Instant Messaging could make students more comfortable and reduce transactional distance and anxiety in online courses.

Instant messaging, social media, email, and other web based tools opened new avenues to apply Moore's dialogue and transactional distance, other researchers have investigated more

traditional communication forms to decrease transactional distance. Both Belair (2012) and Minor (2014) utilized calling students on the telephone as way to communicate with students but had markedly differing results. Belair (2012), teaching at virtual high school found that many of her students were not completing classwork or participating in activities. Belair (2012) developed an action research project that enlisted eight other educators and 60 struggling high school students. Each educator called their students on the telephone once a day to check in, remind them of upcoming assignments, and class activities (Belair, 2012). Belair (2012) and her colleagues found that only 20% of students responded to the phone calls and less than half of the responses generated the work requested. The 60 students and educators were then surveyed, and both groups felt that digital or written communication was more effective than the telephone (Belair, 2012). Belair concluded that dialogue is simply not enough on its own but must be authentic and useful to both the learner and educator.

Other researchers have found that more traditional communication tools such as the telephone can increase dialogue (Minor, 2014). Minor (2014) used conference calls with students in an online university reading course to decrease the transactional distance. The study found that if an instructor was trained on transactional distance and dialogue, using a conference call with their students increased the instructors' abilities to connect to their students and adapt lessons to meet the student's needs (Minor, 2014). Minor (2014) conducted weekly conference calls with her students and after the course interviewed each student about their experiences. Students reported "feeling a greater sense of connection to their instructors as a result of having participated in the call" (Minor, 2014, p. 4). Minor (2014) agreed with Belair's (2012) assessment that a drawback to this form of classroom dialogue is low student participation.

Kuskis (2006), in a doctoral research study, examined the experiences of 18 experienced digital educators from around the world. Through a series of interviews, questionnaires, biographical information, and examination of respondent's published writings Kuskis (2006) examined how each educator applied elements of transactional distance. Out of the 18 respondents to the study, 11 actively worked to build social learning dynamics that foster higher degrees of dialogue (Kuskis, 2006) like those found in Fallon (2011). Kuskis (2006) argued that Moore's concepts of dialogue should be expanded past learner-to-educator but also include communication between individual learners.

Structure

Structure is the ability for the learning to be customized and tailored to the learner (Moore, 1973). Moore (1997) described structure that it "expresses the rigidity or flexibility of the program's educational objectives, teaching strategies, and evaluation methods. It describes the extent to which an education program can accommodate or be responsive to each learner's individual needs." (p. 30). A learning environment that offers students the flexibility and personalization allows student to feel more connected to the learning environment (Moore, 1997). Flexible or low-structured learning environments reduce the transactional distance within a learning environment (Lee & Rha, 2009).

A learning activity or environment's structure can also be described in terms of its formality, individualization, and variety of the learning activities (Huang et al., 2015). Formality is described as clear and rigid adherence to a pre-set learning structure (Kearsley & Lynch, 1996). Formal learning environment structures have preset and clear-cut sequences of class content, learning activities, assignments, and assessments (Lee & Rha, 2009). In highly formalized learning environments the assessment of learning objectives is made by an educator

from the beginning of the learning process (Lee & Rha, 2009) and stands in contrast to the educational environment established by John Dewey.

Dewey argued for a learning environment where students could be free to develop their own meaning for their experiences and an environment that is individualized to each student (Dewey, 1997). This idea was echoed by Kearlsey and Lynch (1996) who pointed out that a flexible- or loosely-structured course allowed for greater student understanding. A flexibly-structured class focuses on the individual students and allows for individuals to share with an educator the ownership and creation of course objectives, activities, and assessment (Huang et al., 2015; Kearsley & Lynch, 1996; Moore, 2013). This allows for students to personalize the education setting with class content, learning activities, assessment of learning goals, the pace of the learning, and learning setting (Christensen, 2011).

It is important to point out that the presence of a flexible or low-structured learning environment reduces the transactional distance, it is not always the most optimal design for a learning environment (Benson & Samarawickrema, 2009). In some learning objectives and systems necessitate a preset content and understanding, participating in a highly structured formal learning environment ensures uniformity among students (Benson & Samarawickrema, 2009) and allows for students to meet learning objectives in a linear and shorter process (Christensen, 2008). A flexible learning environment may not be opposite of a highly formal educational setting, but an educational setting can maintain a degree of formality while focusing on the individual needs and backgrounds of the students or population (Huang et al., 2015).

Transactional distance is the relationship between dialogue and structure (Moore, 1997). In an educational environment, when dialogue decreases and the structure increase, the perceived physiological or transactional distance between the educator and the learner (Moore, 1997).

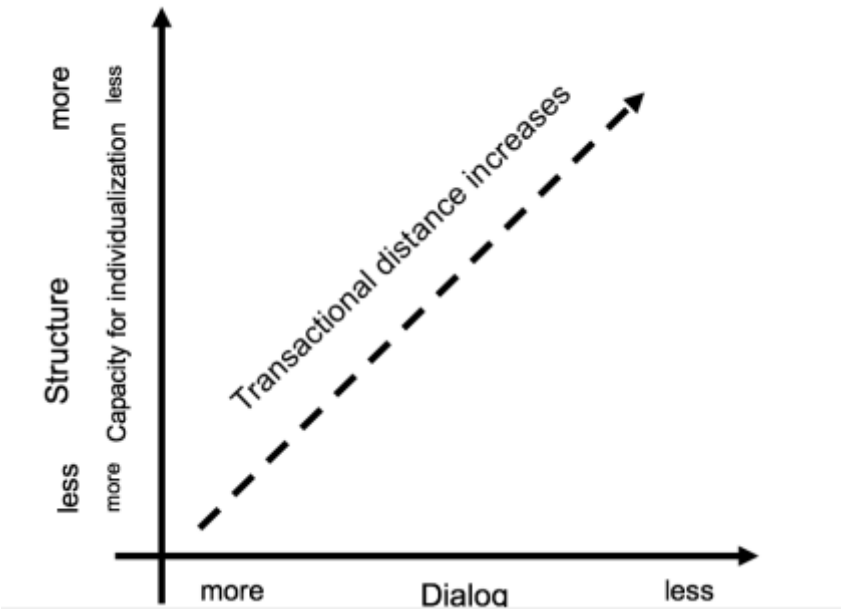

Figure 2.01. From Michael G. Moore's presentation to European Distance Education Network October 27, 2006.

Moore's concept of structure can be found in contemporary research. In a 2009 case study, Benson and Samarawickrema (2009) examined a digital learning environment for nursing preparatory courses at two different Australian universities. The researchers observed various course activities and then applied elements of transactional distance to understand the student experience (Benson & Samarawickrema, 2009). They found that the setting that the learning took place in created an unplanned context for learning (Benson & Samarawickrema, 2009). Benson and Samarawickrema (2009) argued that "the context of learning has significant implications for [digital learning] design, and that one way of analyzing these implications is to draw on understanding from distance education, particularly the theory of transactional distance" (p. 21).

Similar to Benson and Samarawickrema (2009), Veale (2009) conducted a phenomenological case study of 20 students in a fully online health program. Participants were interviewed and the responses were analyzed to examine the structure of learning environment

(Veale, 2009). Veale (2009) found that "design, environment, social, and transitions" (p. 11) were the major themes that contributed to perceived structure of a course and sense of transactional distance. The researcher contends that courses should be restructured so that these instructional themes minimize a student's sense of distance.

Expanding on Veale's (2009) research into dialogue, Watt (2010) conducted a case study of the different students in the same courses and settings as Veale (2009). Focusing on dialogue, Watt (2010) interviewed seven university students who had participated in online courses and seven instructors. Respondents found that students felt connected to instructors when activities promoted communication and collaboration (Watts, 2010). Additionally, students wanted to be more connected to each other than current practice was allowing (Watts, 2010). The researcher argued that for students to be more successful in the fully online education environment, instructors need to provide clear and simple discussions and interactions between students and instructors.

Bajt (2009) also created an experiment to examine transactional distance in the higher education setting. She compared 59 millennial and 41 adult community college students in blended and online courses (Bajt, 2009). Millennial students are described to be anyone born after 1984 (Bajt, 2009). In the experiment the researcher conducted a survey that explored Moore's concept of Structure and the overall satisfaction with the course (Bajt, 2009). Bajt's (2009) results show a correlation exists between a flexible course structure and overall course satisfaction, while other adult students did not. Bajt (2009) suggested that educators utilize transactional distance and in particular structure to better design courses that meet the needs of "Millennial" students.

Bajt's (2009) tool was developed for a specific environment while other researchers have sought to develop a research instrument that investigates structure in multiple learning environments (Sandoe, 2005). The Structure Component Evaluation was created to measure and evaluate the structure of online university courses (Sandoe, 2005). The Structure Component Evaluation contains 50 items that form a rubric for educators to evaluate a course. This rubric was evaluated by three experts to ensure the rubric validity (Sandoe, 2005). Components of the rubric where two-thirds of the experts agreed on the component validity were determined to be reliable measures of structure (Sandoe, 2005). Courses were then evaluated twice using the new tool—once by the researcher and then by an expert, in order to strengthen and ensure inter-rater reliability (Sandoe, 2005). The Structure Component Evaluation was used to evaluate 20 online course and responses were analyzed using a Cronbach alpha to ensure reliability and validity (Sandoe, 2005). Sandoe (2005) argued that the resulting instrument could be used for evaluating online courses in the future.

Learner Autonomy

As transactional distance increases and students needed a greater level of student autonomy is needed to be successful in the educational environment (Moore, 1973). The learner autonomy is "the extent to which in the teaching/learning relationship it is the learner rather than the teacher who determines the goals, the learning experiences, and the evaluation decisions of the learning program" (Moore, 1997, p. 34). Ultimately Moore (1972), argued that when a student experiences large transactional distance the educational experience becomes independent study that is bound to textbooks and self-directed independent reading.

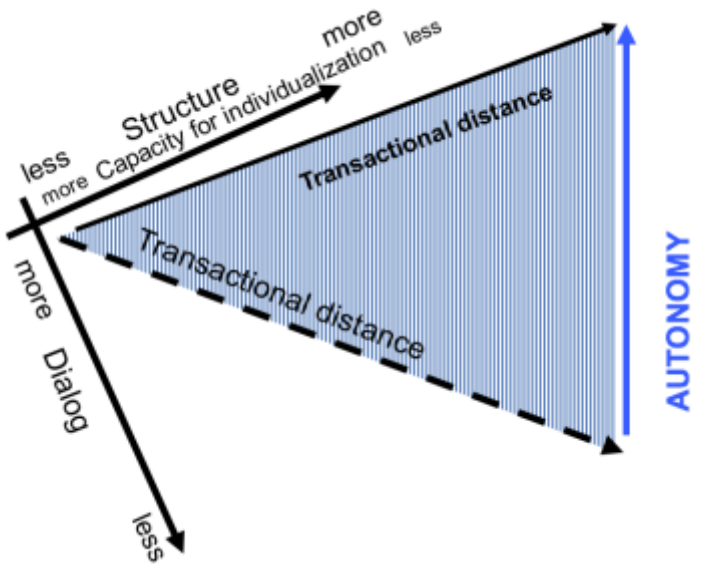

Figure 2.02 From Michael G. Moore's presentation to European Distance Education Network October 27, 2006.

In an autonomous learning environment, a student is responsible to find and utilize new information and resources on their own (Moore, 1972). In doing so, an autonomous learner finds key pieces of information and utilizes it to answers questions without help from other students or an instructor (Moore, 1972). This includes being able to utilize resources to make new key learning gains outside of the learning resources provided in the learning environment (Nada, 2007).

Mulhollen (2008) examined students in education settings with high transactional distance to understand the correlation between learner autonomy and Gardner's theory of multiple intelligences. Mulhollen (2008) utilized the Multiple Intelligences Developmental Assessment Scales and Adult Attitudes Toward Independent Learning survey to investigate university students' experiences in similar high transactional distance learning environments. The Multiple Intelligences Developmental Assessment Scales was used to measure a high transactional distance educational setting since the structure of the learning environment is not

personalized to the individual students' learning modality (Mulhollen, 2008). Mulhollen (2008) postulated that if students are learning out of their comfort zone and not provided with much feedback from their instructor, then this could be considered a high transactional distant course. In this high transactional learning environment, those students who succeed or are satisfied with their learning would be identified on Adult Attitudes Toward Independent Learning survey (Mulhollen, 2008). The two surveys were administered to 46 university students in a physician assistant program and the researcher found a strong correlation between a student's sense of learner autonomy and a student's success in a high transactional distance course (Mulhollen, 2008).

Students who are successful autonomous learners exhibit a high degree of self-direction and are able to control and drive their own learning progress (Moore, 1972). Students who are successful in a high autonomous learning environment are skilled in the independence of learning and have developed strong and regular study skills (Macaskill & Taylor, 2010). Macaskill and Taylor (2010) defined independence of learning as the "application of personal initiative in engaging with learning and finding resources and opportunities for learning, persistence in learning, and resourcefulness" (p. 352) and the application of the internal construct into action in Study habits. Autonomous learners able to use these tools to navigate through learning content as well as learning environments to reach academic goals (Huang et al., 2015).

Learner autonomy also denotes that a leaner has some level of independence from the educator and the learner. Independent learners are able to make connections and build meaning to what they are learning without clear guidance from outside factors (Dewey, 1997). Moore's (1991) image of a complete autonomous learner is a student who is able to investigate a question or experience and develop a new construct without the aid of adult, educator, or other students.

In an autonomous learning environment, learners must have a degree of reflection and self-awareness. Autonomous leaners define personal learning goals, as well as strategies for achieving those goals (Moore, 1972). This process requires a learner to understand their own progress and reflect on what additional information or support is needed to reach their goals. (Moore, 1997).

Highly autonomous learners are able to be successful in high transactional distance education settings due to their skills to control their own learning (Moore, 1972). These autonomous learners do not rely upon transaction with other students and an educator thus they are not adversely affected by a perceived psychological separation from the learning environment.

Summary

John Dewey's pragmatic philosophy and progressive pedagogy have shaped our culture for more than a century (Hickman, 1990; Menand, 2001). Influenced by fellow pragmatist James Peirce, Dewey combined pragmatic philosophy with scientific method (Dewey, 1938, 1952). As a result, Dewey derived new concepts to understand the world in ways of practicality and usefulness (Dewey, 1938; Godfrey-Smith, 2013; Menand, 2001). These concepts which were later cemented into instrumentalism, inquiry, and experience have laid the technological innovation and provided a framework to investigate the context for the creation of new tools (Hickman, 1990).

What separates Dewey from other philosophers and pragmatists, is that Dewey (1997) explicitly applied his philosophical ideas to education institutions and the process of learning. Dewey's (1902) progressive education model focused on the individual and personal

development of meaning. Dewey (1990) saw the school not as training for life but a part of it, and pushed for schools that mirror the surrounding communities.

Currently our culture is dominated by digital technology (Borgmann, 2006; Carr, 2011; Christensen, 2011; Digital Learning Now, 2011; Thompson, 2013; Turkle, 2011) and so schools are responding by adopting more digital learning tools (Christensen, 2011; Horn & Staker, 2015). A recent education innovation is the development of blended learning environoment, which mixes elements of digital learning with some degree face-to-face physical interaction with an instructor (Horn & Staker, 2015). This new education setting follows a long line of education innovations that look to enhance learning and connnection students (Jones, 1997; Staker & Horn, 2012). Elements of the new blended learning environment share a kinship with the traditional distance learning model described by Moore (1972).

Moore (1972, 1973, 1991, 1997, 2013) described that in an education setting where there is a physical seperation between the instructor and students, then there is also a psychological separation or "transactional distance." Transactional distance in founded in the work of John Dewey and the progressive education model (Giossos et al., 2009; Moore, 1973, 1991). Moore (1973) described transactional distance as being built upon Dewey and Bentley's (1960) idea of transaction, two-directional interactions that both are shaped by and shape the participants. Transactional distance is the product of dialogue and structure; which results a degree of learner autonomy (Moore, 1972, 1973, 1991, 1997, 2013). As education systems move towards new digital blended learning environments, understanding and investigating transactional distance will give educators key insight into students experiences.

Chapter 3: Methodology

Introduction

Distance education has been a part of the educational environment for over three centuries (Crobett, 2010; Sumner, 2000; Thibault, 2012). The distance educational model allows students to access educators and learning without being in a physical connection to the school setting and educator (Thibault, 2012). In the contemporary education setting, distance education utilizes the internet and digital communication to reach students outside the traditional classroom setting. The implementation of a distance education model is not without its unique challenges, the physical separation coupled with the forms of educator-to-student communication and types of learning activities created a physiological and social distance between the learner and educator, which Moore (1972) identified as transactional distance.

Moore's (2013) asserted that a student's sense of autonomy within a distance education setting is the outcome of the relationship of the type and depth of educator-student communication, and flexibility of learning activities. If students are unprepared for the autonomy of distance education or an educator does not create a learning environment that meets the needs of the students, then the perceived distance between the educator and student can increase and students will be more likely to be unsuccessful when compared to their peers in traditional face-to-face education settings (Moore, 1972). Researchers have found that students in distance digital learning settings are less likely than their peers in traditional settings to be successful in academic achievement and course completion (Clements et al., 2015; Holian et al., 2014; Lemagie, 2011; Tamayo, 2015) and the primary reason for this difference was social interactions and issues with educators (Clements, et al., 2015; King & Cerrone Arnold, 2012; Muilenburg & Berge, 2005).

Compared to distance education, the blended digital learning environment is a relatively new advancement in the field of education. The blended digital learning environment combines elements of the traditional face-to-face classroom with aspects of distance learning (Christensen, 2011; Horn & Staker, 2015). There are various models for blending learning that have different amounts of digital distance learning and traditional classroom settings (Horn & Staker, 2015). The different blended learning models put different emphasis on the role that digital learning takes within the classroom (Horn & Staker, 2015). By adding some elements of the traditional face-to-face classroom, blended learning provides an interesting and underexplored application of Moore's theory of transactional distance.

Purpose of the Study

The purpose of this research study was to create a survey instrument that educators could use to measure and evaluate transactional distance in secondary blended learning environments.

Research Design

This scale development study employed a seven-phase protocol for the creation and validation of a survey instrument; each phase within the process is built upon the template for scale development by Hinkin et al., (1997). While researching the hospitality industry these researchers found many of the tools being utilized were inadequate, inappropriate, or inaccessible to researchers to utilize in the field, and so they worked to create standards for scale development (Hinkin et al., 1997). The Hinkin et al. (1997) standards utilized seven steps for scale creation.

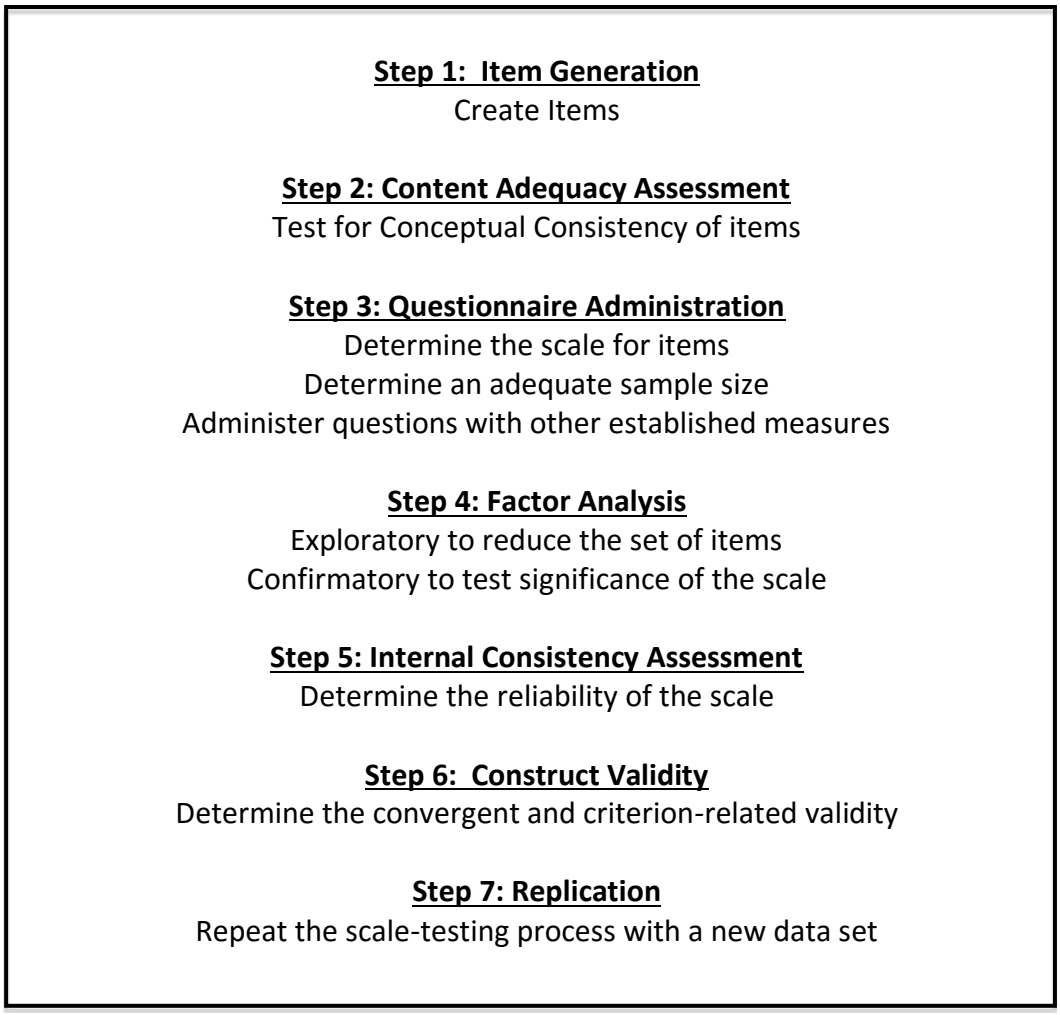

Figure 3.01 Seven-step scale development plan. From "Scale construction: Developing reliable and valid measurement instruments." by T. R. Hinkin, J. B. Tracey, & C. A. Enz (1997) *Journal of Hospitality & Tourism Research*, *21*(1), pp. 100-120. Used with permission.

Procedure, Targeted Population, and Participant Sampling

Hinkin et al. are not alone in their description of the scale development process. The seven steps outlined by Hinkin et al. (1997) are built upon the work of Gilbert Churchill (1979) and 8-step approach to scale development (Hinkin, 1995). Other scale development models contain many of the same aspects such as factor analysis, reliability assessment, and validity testing but provide a nonlinear framework to construct the scale (Fowler, 2014; DeVellis, 2016). After close examination of all available scale development models, the linear and sequential

process outlined by Hinkin et al. (1997) matched to both research variables and provided a strong tangible research design.

Step 1: Item generation. To begin the research process of developing a tool to measure the transactional distance in blended learning environments, the researcher generated a survey item pool that participants could respond to using a Likert scale. The researcher generated these items using a deductive analysis of the conceptual framework and literature review research materials. The item generation phase yielded an item pool that contained twice as many items as included on the final tool, or 120 items. These items corresponded to the following operationalized constructs: dialogue; structure; autonomy; and transactional distance. Transactional distance is the psychological distance that a student experiences ~~is~~ in a distance learning environment (Moore, 1973). Transactional distance is the product of the relationship between structure and dialogue (Moore, 1973). Dialogue is degree and quality of communication in the learning environment, and the structure is the ability for the learning environment to be tailored to the student (Moore. 1973). The researcher derived these constructs from Moore's theory of transactional distance, described in the Chapter 2 review of literature.

By focusing on a single construct for each item, the researcher avoided "double-barreled" items that address more than one variable. "Double-barreled" items combine constructs and do not provide clear, separate, distinct responses that provide clear analysis. A "double-barreled" item adds confusion for the instrument respondent and can cause increased difficulty for the later analysis of results. (Fowler, 2014; Hinkin et al., 1997). Examples of some of the consideration in developing items included avoiding adjectives and adverbs in a survey item as well maintaining short, simply, and positively-phrased statements (Hinkin et al., 1997). Negatively phrased statements or reversed scored items can cause issues with reliability because they may

create challenges to later statistical analysis, so are used to a minimum or avoided (Harrison & McLaughlin, 1991).

Step 2: Content adequacy assessment. An integral part of the scale development is testing and evaluating proposed items for their degree of content adequacy (Hinkin et al., 1997). Pretesting for content adequacy saves time and ensures that scale items support valid constructs (Hinkin et al., 1997). Pretesting also gives researchers the opportunity to delete items that may be confusing or inconsistent with operationalized variables (DeVellis, 2016: Fowler, 2014).

After the creation of the item pool, the researcher pretested the items and assessed the items to determine whether they accurately and comprehensively cover all operationalized variables. The researchers accomplished the content adequacy assessment by sorting the items according to the constructs or underlying variables and examining the distribution (Hinkin et al., 1997). The sorting of items was accomplished by providing experts who had preexisting knowledge of blended learning with the item pool, and asking them to assess the degree each item aligned to the desired variable (Hinkin et al., 1997). This study used a small group of experts who had direct knowledge of blended learning environments and transactional distance to conduct the content adequacy assessment. The experts included a researcher in transactional distance, a professor of education technology, a director of technology at who has worked for 10 years in the a blended/online learning environment, two directors of blended learning schools, and a blended learning educator at the pilot site. Of the seven experts who agreed to participate five completed the survey and these results were used for research purposes.

The researcher provided experts with a digital survey utilizing Qualtrics. Respondents were asked to rate each statement created during Step 1 by the degree to which the statement is consistent with the constructs. Response choices ranged from 1 (strongly disagree) to 7 (strongly

agree) with 4 being neutral. While Likert scales were originally developed as a four-point measuring scale, expanding the scale to seven points increases the reliability of results by allowing respondents more options for responses (Allen & Seaman, 2007), and using a wider scale allows for later analysis to be streamlined by condensing categories (Jamieson, 2004). The content adequacy assessment responses were compiled and median scores for each statement's correspondence to each construct were calculated. The researcher compared the resulting median scores for each statement and determined that survey items below "4" did not adequately represent the original construct. An item that did not have a significant median score was deleted. This analysis generated a list of items that were statistically associated with a variable and provided face validity for the item pool.

In an analysis of various studies utilizing content adequacy assessment, Hinkin and Tracey (1999) found that 10%–40% of items were eliminated from original survey tools through this process. The content adequacy assessment resulted in 3.3% of survey items were eliminated from the original survey item pool, this is below the Hinkin and Tracey's (1999) findings. Additionally, shorter scale and survey instruments have higher response rates but the smaller statement pool may give rise to issues in later validity and reliability (Rolstad, Adler, & Ryden, 2011). General rule of thumb is that surveys responses decrease after 10 minutes, and so instruments should be designed to take no more than 10 minutes to complete (Kitchenham & Lawrence Pfleeger, 2002).

Given these factors, the final instrument was no longer than 60 items in length with a targeted 10-minute survey duration. Accounting for some of the original items being eliminated, it was estimated that each of the 5 constructs should contain at least 18 in the initial item pool. If

a construct did not have at least 18 associated items after the initial content adequacy assessment, a new item pool would have been created and sent out to experts to evaluate.

Step 3: Questionnaire administration. After the completion of the content adequacy assessment, all retained items were used to create a pilot study of the item pool. The large number of retained items, and the fact that the items had not been evaluated for construct validity or reliability, necessitated the need for a pilot study to further refine the tool. Each item was administered using a seven-point Likert scale.

The content adequacy assessment provides the researcher with the first evidence that the underlying constructs of the survey item pool are valid measures. During the content adequacy assessment experts are utilizing their knowledge to evaluate whether each survey item is a valid measure of the construct. This is a very preliminary assessment and so there needs to be further testing on the validity of the constructs that the survey is designed to measure. To do this survey items from another survey that has already been found to be a valid measure of transactional distance and blended learning is added to the survey item pool.

Through the literature process 8 surveys were identified that measured at least one construct of transactional distance in the blended learning environment (Beasely, 2007; Horzum, 2011; Huang et al., 2015; Jung, 2006; Mathieson, 2012; Ravi, William, Zhang & Macleod, 2015; Wang & Morgan, 2008; Zhang, 2003). All of the surveys identified studied transactional distance in the undergraduate and graduate setting and so could not be used to for a complete construct validity.

The generated statement item pool was mixed with 12 items from the transactional distance tool created by Huang et al. (2015) (referred to as the HCDCS Survey). These items from HCDCS Survey (2015) align to constructs outlined in the conceptual framework and were

reported to have a rotated factor loading score of 0.8, which is twice the research standard established in the social science literature for scale development (DeVellis, 2016). The HCDCS Survey targeted population has a higher degree of expected learner autonomy, because undergraduate students are expected to be more self-directed learners than secondary students. Additionally, many of the items measuring the mechanics of dialogue and structure are built upon a higher education model that is not found in the secondary classroom. More specifically, the HCDCS Survey was developed to measure transactional distance in online courses in higher education. The claims represented in the technical manual indicate that the HCDCS survey item pool have already undergone validity and reliability testing and its item pool has shown to measure the constructs dialogue, structure, learner autonomy, and transactional distance in the higher education setting (Huang et al., 2015). The HCDCS Survey was designed to target higher education students, making the instrument not completely applicable for the secondary education environment. However, the tool provided an opportunity to partially analyze the concurrent validity of the new developed item pool in step 6. Since HCDCS Survey has already undergone validity and reliability testing, it was able to be used as a partial foundation to evaluate the validity of the item pool.

The research site was a blended learning school at a rural district in Pacific Northwest. The school offered courses from 7th grade through 12th grade and a variety of blended learning options. The administrators at research site, utilized their own records and provided basic demographic information. The site administrators reported there were 412 students enrolled in the school at the conclusion of the research and 54% (222) participated in some portion of the study. Eighty percent of the students at the site location identified as White, 12% as Hispanic, 4% as Other, 2% as Native American, 1% as Asian, 1% as African American, and less than 1%

as Native Hawaiian/Pacific Islander. Of the student population 31% were economically disadvantaged and 7% were English Language Learners. Fifty-two percent of the student population were male and 48% were female.

Of the student population that participated in the study 72.5% self-identified as White, 15% as Hispanic, 3% as Black, 1.8% as Native Hawaiian/Pacific Islander, 1.3% as Asian, 0.9% as Native American, and 5% as other. Forty-seven percent of respondents to the survey identified as male, 50% identified as female, 2.2% identified as other, and 1.3% preferred not to respond.

Responses to the pilot study survey were submitted largely from students in the 10th, 11th, and 12th grades. Thirty students participated in the pilot, 16 were enrolled in 12th grade, 6 were enrolled in 11th grade, 7 were enrolled in 10th grade, and 1 student was in 9th grade. The variations in the numbers of students enrolled from the three grade levels may have been due to the consent process employed in the study. The students who were age 18 or older, could provide their own informed consent, while students who were under the age of 18 were required to obtain written parental consent along with the student's own personal assent to participate. The requirement that 9th, 10th, and 11th graders needed parental permission to participate in the study reduced the likelihood that 11th, 10th, and 9th graders would participate in the pilot study.

While the initial pilot study had a 9% survey return rate, the replication study had 47% survey return rate. The higher return rate allowed the replication portion of the research to have a more diverse and representative demographics than the smaller pilot study. While the pilot study was skewed towards older white females, the replication study was a more diverse in all demographics. Of the 190 completed surveys, 47% of respondents identified as male, 48% of respondents identified as female, 2% identified as other, and 3% preferred not to respond.

Seventy-one percent of survey respondents identified as White, 15% identified as Hispanic, 3.6% identified as African American, 1.5% identified as Asian, 1.5% identified as Hawaiian/Pacific Islander, 1% identified as Native American, and 4.7% preferred not to respond.

The largest difference in the demographics between the pilot study and replication study came in the participants' grade levels in school. Where the pilot study largely relied upon seniors in high school who were over the age of 18, the replication study's new consent/assent process allowed for greater participant representation from other grade levels. Of the respondents to the replication study, 10% identified as 7th-grade students, 11.6% identified as 8th-grade students, 33.6% identified as 9th-grade students, 11.1% identified as 10th grade students, 24.2% identified as 11th grade students, and 8.9% identified as 12th grade students.

Step 4: Factor analysis. The exploratory analysis was performed using the pilot results to reduce the number of items or variables to only the most predictive (Hinkin et al., 1997). The pilot item pool contained twice as many items as the intended scale tool, the exploratory analysis allowed for reduction of the number of items. To reduce the number of items, the researcher utilized a Principle Component Analysis for each operationalized variable (dialogue, structure, autonomy, and transactional distance) to reduce the number of items. Data was exported from Qualtrics to the statistical software SPSS, which was used to determine eigenvalues and to perform a Varimax rotation of the data set. Any survey item that exhibited an eigenvalue over 1 was excluded from the final tool since a value of 1 would mean that the item contained too much variability to be predictive of the larger construct (Hinkin et al., 1997). The data also underwent a Varimax rotation method to correlate the association between the results and established constructs. Finally, all results were measured for factor loadings at 0.4 or greater in accordance with the research standards for social science research (Costello & Osborne, 2005). The factor

loadings of 0.40 or greater indicated the degree that each statement measured a single variable. Factor loadings below 0.40 indicated that the responses for that instrument statement had an unacceptable degree of variability and maybe measured another factor (Hinkin, 1995).

Step 5: Internal consistency assessment. After all unacceptable items had been removed from the item pool, the next step was to measure the internal reliability. Reliability is the measurement of the overall consistency of the tool. The reliability of each of the operationalized variables (dialogue, structure, autonomy, and transactional distance) was assessed using a Cronbach's alpha test. The statistical software SPSS was used to conduct this test and results above .70 indicated acceptable levels of reliability (Hinkin et al., 1997).

If a large number of items were left after the internal consistency assessment and the factor analysis, then some items would have been removed from the item pool. These items would have only been removed if they did not have a negative effect on the overall reliability of the scale, these items include items that indicate a negative relationship, and if needed survey items with unacceptable reliability would also be removed from the instrument. Survey instruments that have a large number of items, have a negligible effect on the over reliability and may later effect the validity of the tool (Hinkin et al., 1997). Reducing the item pool to the smallest set of items needed, while maintaining internal reliability of the constructs, ensured that the instrument measured the desired variable in the most concise and most effective fashion (Hinkin et al., 1997).

Step 6: Construct validity. Construct validity is degree that survey measures the targeted variables and produces reliable measurements of the constructs (Hinkin et al., 1997). The reliability of the tool was partially accomplished through the factor analysis along with internal consistency assessment but was supported by assessing the validity of the tool. To do

this, the researcher compared the remaining items that had been shown to be reliable and been shown to relate to each factor, to another scale that had already been shown to be valid.

During the initial pilot survey, items from transactional distance tool created by Huang et al. (i.e., the HCDCS Survey) were included with the original survey. These items were the basis for a partial convergent validity. The designers of the HCDCS Survey utilized the same variables with exception of blended learning, so it was used to partially validate the research tool. The HCDCS Survey was only used as evidence for partial convergent validity because the survey was designed for higher education students and some of the items were not applicable to secondary students.

To accomplish the construct validity testing, the results of the pilot study and responses to each HCDCS Survey were used to conduct a Pearson product-moment correlation coefficient to find a value of *r* (Huck, Ren, & Yang, 2007). The *r* coefficient shows the correlation between two data sets (Huck et al., 2007). The *r* values range between 1 and -1, with positive *r* values showing a positive correlation and negative values denoting a negative correlation (Huck et al., 2007). As the *r* value approaches 0 the level of correlation reduces, with a value of 0 meaning there is no correlation between the two data sets (Huck et al., 2007). Results for each variable were correlated across the two tools and a correlation matrix was created. Correlations with a significance level $r = 0.6$ were used to demonstrate that the new tool meets the social science standards for being a valid measurement of transactional distance in blended learning environments and describes a strong correlation between the two data sets (Huck et al., 2007).

Step 7: Replication. Once the remaining items had been found to be valid and reliable, the items were combined into a new tool, which the researcher named the Blended Learning Assessment Scale of Transactional Distance (BLASTD). The BLASTD was then administered

to a larger sample so that a greater amount of data could be gathered and confirm the pilot study results. The new sample included secondary students in the same location as the pilot study and the content adequacy assessment but did not take part in either of the prior parts of the research process. Students were administered the BLASTD using Qualtrics, and data was compiled and then exported to SPSS. This data was then used to conduct a second factor analysis and internal consistency assessments, to further refine the BLASTD and to ensure that the final survey demonstrates strong construct validity and internal consistency.

Operationalization of Variables

The researcher operationalized the variables identified in the study. The variables included: Dialogue, structure, autonomy, and transactional distance.

Dialogue. Dialogue is the communication and interaction between the learner, other learners, and the instructor. Throughout the learning process a learner communicates with teachers and other learners. Moore identified the interaction between educator and learners as Dialogue (1991). The dialogue is a product of the amount and quality of the communication that occurred in the process of learning (Moore, 2013). Others have taken the concept of dialogue and extended it to include the learner-to-learner interactions (Benson & Samarawickrema, 2009; Bischoff et al., 1996; Huang et al., 2015). Given the blended learning environment in which this study is taking place in, it is important to examine dialogue in the setting of the dialogue. Within a blended learning environment student and teacher interactions occur in both face-to-face as well as through digital tools (Horn & Staker, 2015).

The quality dialogue can be measured by assessing whether the learning environment is "purposeful," "constructive," "positive," and "valued by each party" (Moore, 1991). Purposeful dialogue describes communication that is learner-learner and learner-instructor which is designed

to improve the understanding of the student (Moore, 1997). Communication should also be constructive in that it builds upon ideas and work from others, as well as assists others in learning (Shearer, 2010). Learners also must realize that and value the importance of the learning interactions and value it as a vital part of the learning process (Moore, 1972).

These characteristics provided insight into a qualitative view of dialogue but did not provide a concrete or quantitative assessment of dialogue. Additionally, continuous and constant communication is important for assessing dialogue. Using a quantitative approach and measuring the amount of communication also contributes to qualitative aspects of the dialogue outlined by Moore and other researchers (Bischoff et al., 1996).

Structure. Structure of a learning environment is the combination of the flexibility of the learner-to-activity and the learner-to-interface. Given the blended learning environment, students interact with instructors, content, and assignments and assessments through both digital mediums and traditional face-to-face settings. This facilitates both the instructor's and the overall learning environment's ability to adapt to each individual student's needs, as well as adaptability of the digital interface that at least some degree of learning is taking within (Huang et al., 2015).

The flexibility of a learning activity or environment is measured by formality, individualization, and variety of the learning activities (Huang et al., 2015). Formality is described as clear and rigid adherence to a pre-set learning structure (Kearsley & Lynch, 1996). Formal learning environments have clear cut sequence of class content, learning activities, assignments, and assessments (Lee & Rha, 2009) In highly formalized learning environments the assessment of learning objectives is made by an educator from the beginning of the learning process (Lee & Rha, 2009).

In contrast, Dewey argued for a learning environment where students could be free to develop their own meaning of their experiences and where the learning is individualized to each student (Dewey, 1997). This idea was echoed by Kearlsey and Lynch (1996) who pointed out that a flexible or loosely structured course allowed for greater student understanding. A flexibly structured class allows for students to share in ownership and creation of course objectives, activities, and assessment (Huang et al., 2015; Kearsley & Lynch, 1996; Moore, 2013). Individualization allows for students to personalize the education setting with class content, learning activities, assessment of learning goals, the pace of the learning, and learning setting (Christensen, 2011). While at first glance flexibility maybe the opposite of formality, an educational setting can maintain a degree of formality while focusing on the individual needs and backgrounds of the students or population (Huang et al., 2015).

In a digital learning environment, these learning activities are accessed through a digital interface that provides a degree of structure and affects transactional distance. The learner-to-interface structure is the product of and measured by the digital learning interface's usability, visualization, and cognitive load (Huang et al., 2015; Stoney & Wild, 1998). Usability is how intuitive or easy the interface is for students to use (Huang et al., 2015). Visualization refers to the overall organization and aesthetic appeal of the interface (Huang et al., 2015). Additionally, if the interface is difficult to understand or requiring the acquisition of new skills in order to use, it then demands additional mental effort that may cause students to feel separated from their learning environment. Stoney and Wild describe this as *cognitive load* (1998).

Autonomy. Learner autonomy is defined as the degree a learner controls the learning goals, learning experiences, and the assessment of the learning (Moore, 1991). Autonomy can be

measured by examining a student's propensity for being resourceful, self-directed, independent, and reflective.

An autonomous learner is able to find, utilize new information and recourse on their own (Moore, 1972). This includes finding key pieces of information and answers to questions without help from other students or an instructor as well as being able to utilize resources to make new key learning gains (Moore, 1972; Nada, 2007). High degrees of learner autonomy show that learners are able to collect and synthesize outside information without the help of an instructor or other students (Moore, 1972).

Successful autonomous learners have a high degree of self-direction and are able to control and drive their own learning progress. Macaskill and Taylor (2010) found that Moore's description of learner autonomy could be measured using two factors: independence of learning and study habits. Macaskill and Taylor (2010) define independence of learning as "application of personal initiative in engaging with learning and finding resources and opportunities for learning, persistence in learning, and resourcefulness" (p. 352), and the application of the internal construct into study habits. Autonomous learners are able to navigate through learning content as well as learning environments to reach academic goals (Huang et al., 2015).

Learner autonomy also denotes that a learner has some level of independence from the educator and the other learners. Independent learners are able to make connections and build meaning to what they are learning without clear guidance from outside factors (Dewey, 1997). Moore's (1991) image of a complete autonomous learner is a student who is able to investigate a question or experience and develop a new construct without the aid of adult, educator, or other students.

In an autonomous learning environment, learners must have a degree of reflection and self-awareness. Autonomous leaners define personal learning goals, as well as strategies for achieving those goals (Moore, 1972). This process requires a learner to understand their own progress and reflect on what additional information or support is needed to reach their goals. (Moore, 1997).

Transactional distance. Michael G. Moore (1972) defined the transactional distance as the perceived psychological separation or space between a student and educator is a distance education source. Within this psychological space there are opportunities for misunderstandings and miscommunications that can lead to a break down in the learning environment (Moore, 2013). This space can be measured in the amount of communication and to the degree that communication reflects a meaningful student teacher relationships (Chen, 2001). Researchers Huang et al. (2015) chose to focus on transactional distance as misunderstandings that arise from structure and dialogue gaps.

Transactional distance can also be measured as the interpersonal closeness between learners and fellow learners as well as learners and the educators (Bischoff et al., 1996). Separation between learners, other students, and instructors can diminish the personal connections and decrease the learning incentives (Lee & Rha, 2009). Transactional distance leads to a learner's overall satisfaction of the knowledge gained in the learning environment (Stein, Wanstreet, Calvin, Overtoom, & Wheaton, 2005). Ultimately this study has operationalized transactional distance as the shared understanding and learning satisfaction.

Limitations and Delimitations of the Research

The study was delimited to secondary students who are engaged in a learning environment that utilizes both traditional physical and digital distance learning activities. The

research will focus on students in 7th through 12th grade. The students who participate in the study will be in an education environment that utilizes 1 of the 4 blended learning models established by Horn & Staker (2015).

The blended learning environment encompasses four different models that utilize digital learning tools in different ways. The rotation model utilizes digital learning tools to augment the traditional classroom setting; students are participants in a traditional brick-and-mortar setting but use digital tools to aid the traditional setting (Horn & Staker, 2015). The flex model utilizes a brick-and-mortar setting with a physical instructor but the majority of the learning occurs with digital learning tools (Horn & Staker, 2015). The self-blend model students have the flexibility to select courses are even activities in either digital or traditional formats (Horn & Staker, 2015). The scope of this research focused on an enhanced virtual academy model, where students take the entirety of the classroom through digital learning environments but are monitored or augmented by a physical educator in a brick and mortar setting (Horn & Staker, 2015).

This model offers a close link to traditional distance education settings and allows for a clearer and easier connection to Moore's theories surrounding distance education and transactional distance. Additionally, the Enhanced Virtual Academy Model is increasingly popular with school district due to its relative low-cost to operate and wide spread population of students. The increased access to this model made it a natural choice for investigation.

There is an identified difference in the role that learner autonomy for the students in blended learning environment. The students who are drawn to this model of education find that the traditional classroom setting does not meet their needs for flexibility (Nada, 2007). Distance education research has shown that online learners have a strong academic self-concept and exhibit self-directed learning skills (Nada, 2007). These students are drawn to a learning

environment that allows them to control or at least shape many of the learning activities and attributes of the learning environment (Christensen, 2011).

Given that students are self-selecting for the blended learning environment, the students responding the study have a strong sense of self-directed learning. This will have an effect on the learner autonomy construct compared to the general population of secondary students. This effect is not clearly identified and is a limit to the further application of the research/

The discussion of a learner's sense of self and search for an education model that matches their drive may influence their responses to the survey instrument. It stands to reason that students who are drawn a blended learning model that is built upon autonomy and the self may have a different perception of the transactional distance of a blended learning environment than students in other models. Due to this built-in bias of the sample population, all results from this study are limited to the exploration of the Enhanced Virtual Academy.

Expected Findings

The researcher expected that BLASTD would provide educators with a new insight into the digital secondary blended learning environment. It was the objective of the research that this study would create a tool that would aid secondary educators to examine the blended learning environment in the light of Moore's transactional distance. While transactional distance and Moore's work have affected educational research since the early 1970s, researchers have yet to fully explore transactional distance in the new field of blended learning, and more specifically in secondary learning environments. The researcher anticipated that this study would help other researchers and educators examine the secondary blended learning environment and further explore the implications of distance digital learning environments.

Ethical Issues

Any research conducted in a K–12 setting potentially contains a variety of ethical issues. At its most foundational level, an ethical research model must protect research participants. This can be described by the Kantian ideal "always treat the person as end in themselves and never solely as means" (Howe & Moses, 1999). In applying this ethical principle and for the purposes of this study research participants include: secondary students who are using the tool, their educators, and their school sites.

A central ethical issue within education research is informed consent (Howe & Moses, 1999). All participants in the present study has to be informed and understand the potential risks and benefits of the research for their persons. This maintained the participant's autonomy and allowed individual participants, or their parent(s) or guardian(s), to make informed decisions about their participation or determination not to participate in this research.

When the researcher was reaching out to potential research sites for this study, he made the site administrator or other responsible party aware of both the objectives and requirements of the study. From this knowledge, the administrator or responsible party at the site was able to make an informed decision about participation in a study. The researcher gave both students and educators complete information and confirmation of informed consent was obtained in writing from all participants, prior to their participation.

The researcher provided students and educators with a written recruitment letter explaining the goal of the research as well as a description of what participation required. Since secondary students are under the age of consent, the researcher sent a recruitment letter to parents explaining the purpose of the research as well as a description of what participation will require. If a parent or legal guardian chose not to have their child participate, they can return the

bottom of the portion back to their school and their child were excluded from participating in the study.

Other than maintaining informed consent, the other central ethical issue is privacy and obligation of the research to maintain the highest degree allowable for confidentiality (Howe & Moses, 1999). All participants, research sites, educators, and students may be concerned that responses could be used in a manner that has negative consequences. To guard against this, no identifying information was gathered or maintained. This included student names, ID numbers, or other research site centric identification information. The researcher gathered basic demographic information such as age, grade level, and gender to aid in validating the instrument responses, but respondents did not provide any personal information that could link survey responses to any specific students.

Howe and Moses (1999) describe educational research as "advocacy research inasmuch as it unavoidably advances some moral-political perspective" (p. 56). It is important that the researcher kept this in mind as the researcher worked to ensure that the objectives of the research were balanced by participants' knowledge of the research goals and participation requirements. While maintaining this objective, the researcher must work to maintain the highest degree of maintainable confidentiality. In doing so, the objective for this research study was to ascribe to the Kantian ideal "always treat the person as end in themselves and never solely as means" (Howe & Moses, 1999).

Summary

Transactional distance has been paradigm for understanding the world of distance education. In recent years, the blended learning environment has utilized digital learning technology to integrate parts of the distance education model into the traditional classroom

(Christensen, 2011; Horn & Staker, 2015). Educators by utilizing differing degrees of digital technology in the classroom are also allowing for opportunity for students to feel isolated and separated from the personal learning process. The researcher's goal was to develop a survey instrument for educators to utilize to measure and explore the transactional distance in a digital blended learning environment.

The research was built upon statistical analysis of the data gathered using a large item pool that is the foundation of a survey instrument. The researcher piloted the item pool at a rural school district's digital learning center and analyzed results to determine the correlation of survey items to the variables of learner autonomy, structure, dialogue, and transactional distance, as well as for its validity and reliability. This item pool was then use to form the Blended Learning Assessment Scale of Transactional Distance (BLASTD). The researcher then administered the BLASTD in other research settings and implemented the same statistical analysis as the pilot study. The researcher made every effort to maintain the highest ethical standards and ensure that students and other research participants were protected at each step. By following a research-based approach to scale development and ensuring an ethical study, the researcher developed a tool to further investigate the blended learning environment.

Chapter 4: Analysis of Data

Introduction

The goal of this study was to develop a survey instrument to measure transactional distance in secondary blended learning environments. This study resulted in a 35-item survey instrument, the Blended Learning Assessment Scale of Transactional Distance (BLASTD), which was tested using a convenience sample of secondary students (n = 222) at a secondary blended learning site. This chapter describes the results of the scale development, which the researcher conducted through the following seven steps: (1) Item Generation; (2) Content Adequacy Assessment; (3) Questionnaire Administration; (4) Factor Analysis; (5) Internal Consistency Assessment; (6) Construct Validity; and (7) Replication. In this chapter, the researcher will present the quantitative results for the Step 2 Content Adequacy, Step 4 Factor Analysis, Step 5 Internal Consistency Assessment, Step 6 Construct Validity, as well as for the factor analysis and internal consistency assessment performed as part of the replication step. First, the researcher will share a brief synopsis of the protocol of each step. Second, the researcher will present a brief summary of the results and a detailed presentation of results and analysis from those methodology steps that produced data. The statistical analyses included exploratory factor analysis utilizing a scree plot and item response eigenvalues to identify the underlying dimensions of the BLASTD survey, and a Cronbach's alpha to establish the reliability of items and factors. The researcher examined validity by using a Pearson's product-moment correlation coefficient, correlating the results of the BLASTD with the selections of the Huang et al. or HCDCS Survey.

Description of Sample

The researcher administered the study in a blended learning environment in a rural school district in the Pacific Northwest. The setting was an enhanced virtual academy run by a school district. This site contained approximately 350 students distributed among 484 digital courses. Some students in this program were enrolled in courses in a flex model, utilizing the digital courses in lieu of traditional course at the high school setting, while others are utilizing the school site for more traditional digital distance learning.

Summary of Results

The researcher conducted a factor analysis as an exploratory multivariate technique to assess the dimensionality of transactional distance and its underlying constructs dialogue, structure, and learner autonomy. The Blended Learning Assessment Scale of Transactional Distance (BLASTD) began as a 118-survey item pool and after statistical analysis resulted in a 35-item survey. The dimensionality of 35 items stated as the BLASTD survey was analyzed using maximum likelihood factor analysis. Bartlett's test of sphericity $\chi^2 (990) = 4118.295$, $p < .001$, indicated that correlations between items were sufficiently large for principal component analysis and, the Kaiser-Meter-Olkin (KMO) that measures the adequacy was 0.841, also indicating that the sample size was adequate for factor analysis. An initial analysis was run to obtain eigenvalues for each component of the data. Two factors had eigenvalues over Kaiser's criterion of 1 and in combination explained 65% of the variance. A scree plot was generated and showed inflexions that would justify retaining two factors. In addition, the scree plot also indicated that there were two factors to be rotated using the Varimax rotation. The rotated factor solution yielded two interpretable factors, Appendix G: Item Bank Correlation Factors shows the factor loadings after rotation. The items that cluster on the same factors suggest that Factor 1

represents transactional distance along with its underlying constructs of dialogue and structure, and Factor 2 learner autonomy. A more detailed analysis of the results of this research are to follow, while a deeper application of the results to the research questions can be found in Chapter 5.

Statistical Analysis

Results of Step 2: Content adequacy assessment. Based on the results of the content adequacy assessment, survey item respondents returned a median score of 4 or below were eliminated from the item pool. Out of the 118 items, 5 items were eliminated due to the resulting median scores falling below 4. The researcher used the resulting 113 items to create a finalized survey item pool to be used for an initial pilot study. A table containing the median scores for all 118 survey items can be found in Appendix F.

Results of Step 4: Factor analysis. A small pilot study using a 113-survey item pool was analyzed using a factor analysis to reduce the survey item pool was reduced from 113 to 45 items. Three factors: dialogue, structure, and learner autonomy, had eigenvalues over Kaiser's criterion of 1 and in combination explained 64% of the variance. Three criteria determine the number of factors to rotate: the scree plot, a hypothesis that the pilot study survey items are unidimensional, and the items can be interpreted through identified factors. The scree plot showed changes in eigenvalues that justified identifying and retaining three components. In addition, the scree plot also indicated that there were three factors to be rotated using the Varimax rotation. The factor analysis of the pilot study found three underlying factors; Structure (Factor 1), Dialogue (Factor 2) and Learner Autonomy (Factor 3). Statements from transactional distance were split between dialogue and structure.

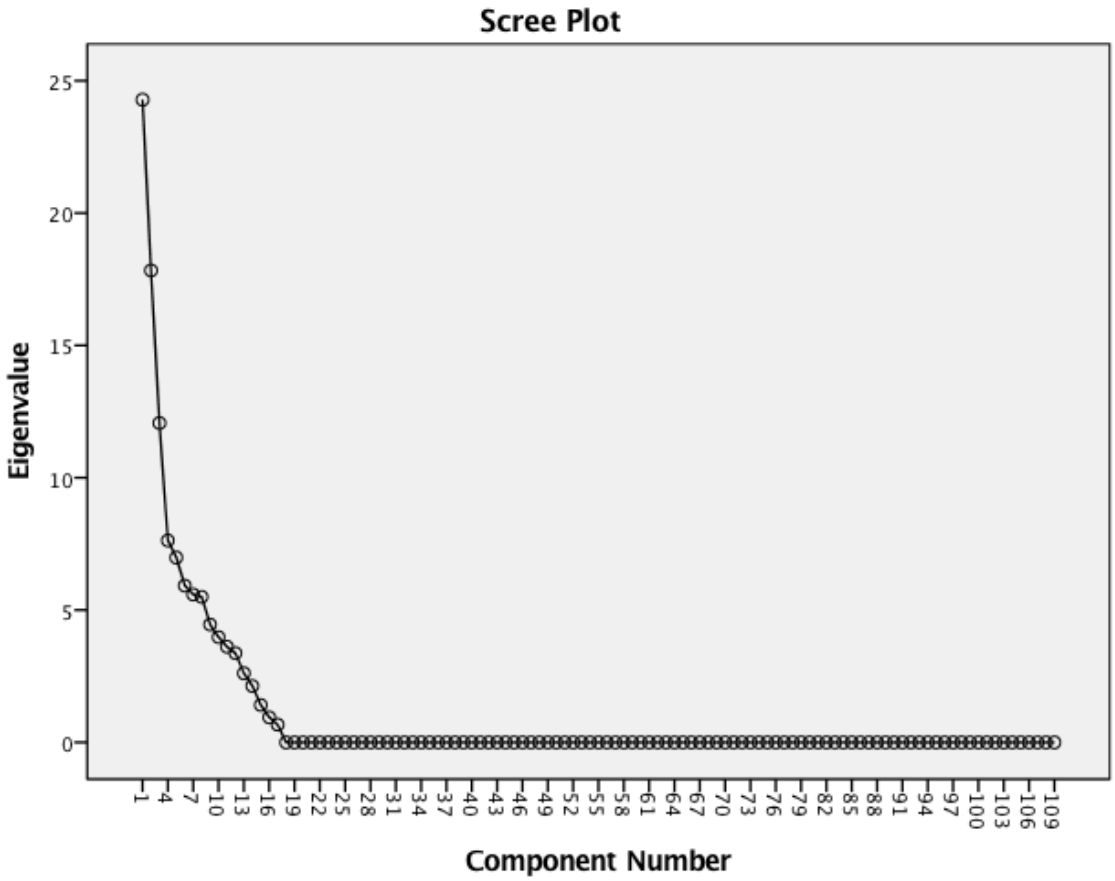

Figure 4.01. Item bank response scree plot.

When interrupting scree plots there are two accepted methods in the literature (Grace-Martin & Sweet, 2011). When a factor falls below a value of 1 which yields inaccurate results and then that can be deduced as the number of factors, or when the scree plot has an "elbow" or sharp change in direction, this indicates the number of factors shown (Grace-Martin & Sweet, 2011). Using the second method of utilizing a scree plot, the researcher could reduce the number of factors to 3. After the third factor, eigenvalues decreased at a steady rate between 1.05 and 0.084, while above the 3rd factor eigenvalues decrease by 6.451, 5.767, and 4.437. Since the 3 factors demonstrated the variability within the data set the second method of utilizing a scree plot was used and 3 factors were used for further analysis (Grace-Martin & Sweet, 2011).

Utilizing the Total Variance Explained Table generated by SPSS, the researcher eliminated items from the factor to minimize the variance in each factor. As a result of this process of examining the percentage of variance, t items for Factor 1 with eigenvalues below |0.597| were removed to decrease the variance in the responses. This process reduced the number of items in Factor 1 from 54 to 18. For Factor 1 items with eigenvalues below |0.5| were removed, reducing Factor 1 from 45 to 14. The researcher removed factor 3 items with eigenvalues below |0.514|, reducing factor 3 from 33 to 12. The researcher labeled the remaining items the Blended Learning Assessment Scale of Transactional Distance (BLASTD) and used these items for further analysis.

Table 4.01

Blended Learning Assessment Scale of Transactional Distance (BLASTD).

Statements
1. There is a space for me to get individual help "face-to-face" with an instructor.
2. There are multiple ways to communicate with my instructor.
3. The technology in this class is easy to understand.
4. The digital portions of this class help me meet my goals as a learner.
5. The digital portions of this class are nice to look at.
6. The digital portions of this class are easy to use.
7. My class' "face-to-face" facilities are organized.
8. My class' "face-to-face" facilities are nice to look at.
9. I use the same technologies in this class as in the real world.
10. I use a variety of media (e.g. text, photos, video, and audio) in this class.
11. I learn more when I work alone.
12. I learn more when I am working in groups.
13. I know when I have met my goal as a learner in this class.

14. I know what my goals as a learner are for this class.
15. I know how to use the technology for this class.
16. I find additional resources outside of class.
17. I feel welcomed when I come to my class' "face-to-face" facilities.
18. I feel that my opinion matters to my instructor in this class.
19. I feel that my instructor treats me as a person.
20. I feel that my instructor helps me through this class.
21. I feel that my instructor cares about my opinions about this class.
22. I feel that my instructor cares about me.
23. I feel that my instructor and I both know my progress to reaching my goals as a learner.
24. I feel that my class is a community.
25. I feel that I can meet my learning goals for this class.
26. I feel that I am close with other students in my class.
27. I feel that I am close to my instructor.
28. I feel that being at a physical distance from my instructor rather than in a regular classroom does not affect my learning in this class.
29. I do not need to have an instructor to meet my goals as a learner in my class
30. I do not need to have an instructor to learn in my class.
31. I communicate with other students in this class at least twice a week.
32. I communicate with my instructor through blended learning class.
33. I communicate with my instructor at least twice a week.
34. I can decide how to use the "face-to-face" facilities to learn.
35. I can decide how to use technology to learn.
36. I can control how I learn in this class.
37. I ask other students for help to understand the instructions to activities.
38. I ask my instructor questions about the class content that we are learning about in this class.
39. I ask my instructor questions about assignments to get clearer instructions.
40. I ask my instructor for help to understand the instructions to activities.
41. I ask my instructor for help to understand class concepts.

42. I am on my own when it comes to learning in my class.
43. Communicating with other students is important for my success in
44. Communicating with other students in this blended learning class is an important part of my learning.

Results of Step 5: Internal consistency assessment. A Cronbach's coefficient alpha α, an internal consistency estimate of reliability, was computed for the three factors, all three showed strong internal reliability. Using SPSS, each factor demonstrated an acceptable level, .70 or higher of reliability. Factor 1 had Cronbach alpha of 0.927, demonstrating a high degree of internal reliability. Factor 2 also demonstrated a high degree of internal reliability with a Cronbach alpha of 0.909. Factor 3 received a Cronbach's alpha of 0.747, meeting the threshold for an acceptable level of reliability.

Table 4.02

Initial BLASTD Items and Subscale and Reliabilities

Factor	*n* items	Items	Cronbach's alpha (α)
Structure	18	I know when I have met my goal as a learner in this class. I can decide how to use technology to learn. I can control how I learn in this class I know what my goals as a learner are for this class. I use a variety of media (e.g. text, photos, video, and audio) in this class. The digital portions of this class are easy to use. The technology in this class is easy understand. I know how to use the technology for this class. The digital portions of this class are nice to look at. The digital portions of this class help me meet my goals as a learner. I use the same technologies in this class as in the real world. I can decide how to use technology to learn. There are multiple ways to communicate with my instructor. My class' "face-to-face" facilities are organized.	0.927

		My class' "face-to-face" facilities are nice to look. There is a space for me to get individual help "face-to-face" with an instructor. I feel welcomed when I come to my class' "face-to-face" facilities. I can decide how to use the "face-to-face" facilities to learn.	
Dialogue	14	Communicating with other students is important for my success in this class. Communicating with other students in this blended learning class is an important part of my learning. I communicate with other students in this class at least twice a week. I ask other students for help to understand the instructions to activities. I communicate with my instructor through the blended learning class. I ask my instructor for help to understand class concepts. I ask my instructor for help to understand the instructions to activities. I communicate with my instructor at least twice a week. I ask my instructor questions about the class content that we are learning about in this class. I ask my instructor questions about assignments to get clearer instructions. I feel that my opinion matters to my instructor in this class. I feel that I am close to my instructor. I feel that I am close with other students in my class. I feel that my class is a community.	0.909
Learner Autonomy	12	I learn more when I work alone. I learn more when I am working in groups I find additional resources outside of the class. I do not need to have an instructor to learn in my class. I do not need to have an instructor to meet my goals as a learner in my class. I feel that my instructor treats me as a person. I feel that my instructor helps me through this class. I feel that my instructor cares about me. I feel that I can meet my learning goals for this class. I feel that I am close to my instructor. I feel that being at a physical distance from my instructor rather in a regular classroom does not affect my learning for this class.	0.747

Results of Step 6: Construct validity. To ensure that the 45-item survey were in fact measuring elements for Moore's theory of transactional distance responses of the remaining pilot study survey items were compared using a Pearson product-moment correlation coefficient or "r" coefficient. All three factors showed strong partial construct validity with the selected portions of the Huang et al. (HCDCS) Survey (2015). The remaining 45 pilot study survey items constituted the Blended Learning Assessment Scale of Transactional Distance (BLASTD).

For this study, correlations with a significance level $r = 0.6$ was used to support that the new tool is a valid measurement of transactional distance in blended learning environments and describes a strong correlation between the two data sets (Huck et al., 2007).

Statements from Factor 1 of pilot study aligned to structure. The researcher found median responses from both the HCDCS survey and pilot study survey item pool for each respondent and used these to correlate the two data sets. These median values became an order pair for use in the Pearson product-moment correlation coefficient. The researcher first used the new order pairs to create a scatterplot to determine the whether the relationship was linear.

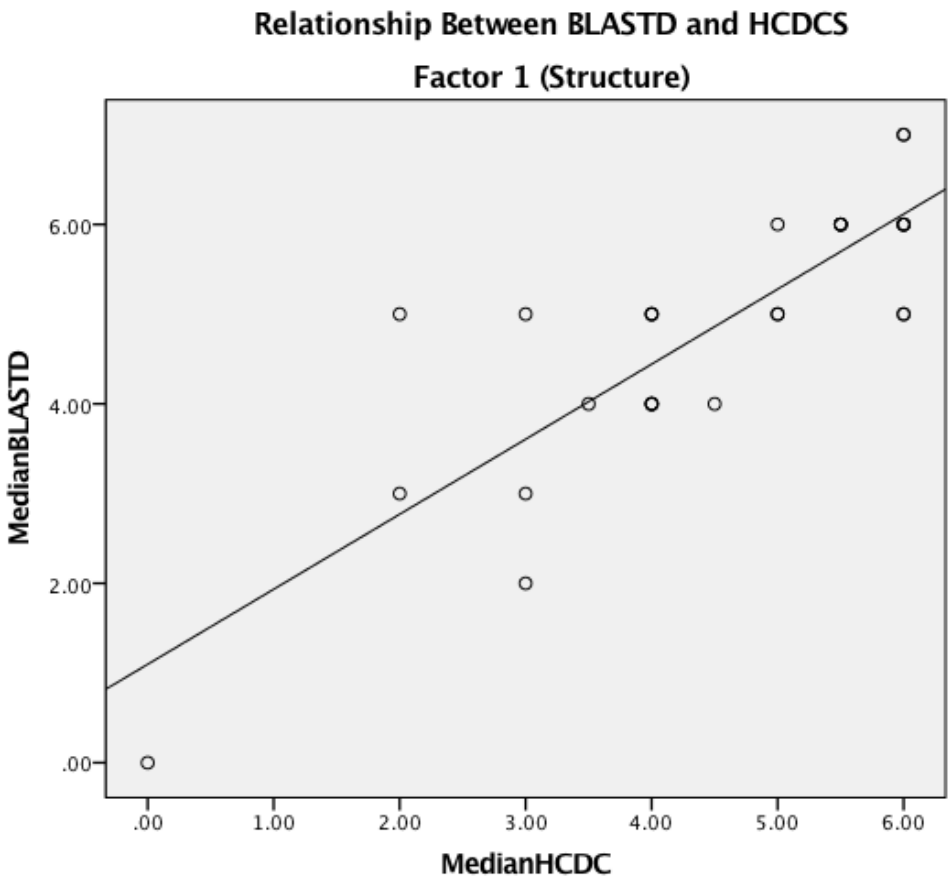

Figure 4.02. Linear relationship between BLASTD Survey and HCDCS Survey for Factor 1 (Structure).

The researcher generated a Pearson product-moment correlation coefficient for the relationship between the Median HCDCS Survey and pilot study survey item pool for Factor 1. Factor 1 demonstrated a correlation coefficient of $r = 0.842$, and is described as having a strong correlation between the two data sets.

Like Factor 1, items from Factor 2 of pilot study aligned to dialogue. Median responses from both the HCDCS survey and pilot study survey item pool was found for each respondent, and were used correlate the two data sets. These median values became an order pair for use in the Pearson product-moment correlation coefficient. The new order pairs were first used to create a scatterplot to determine the whether the relationship was linear.

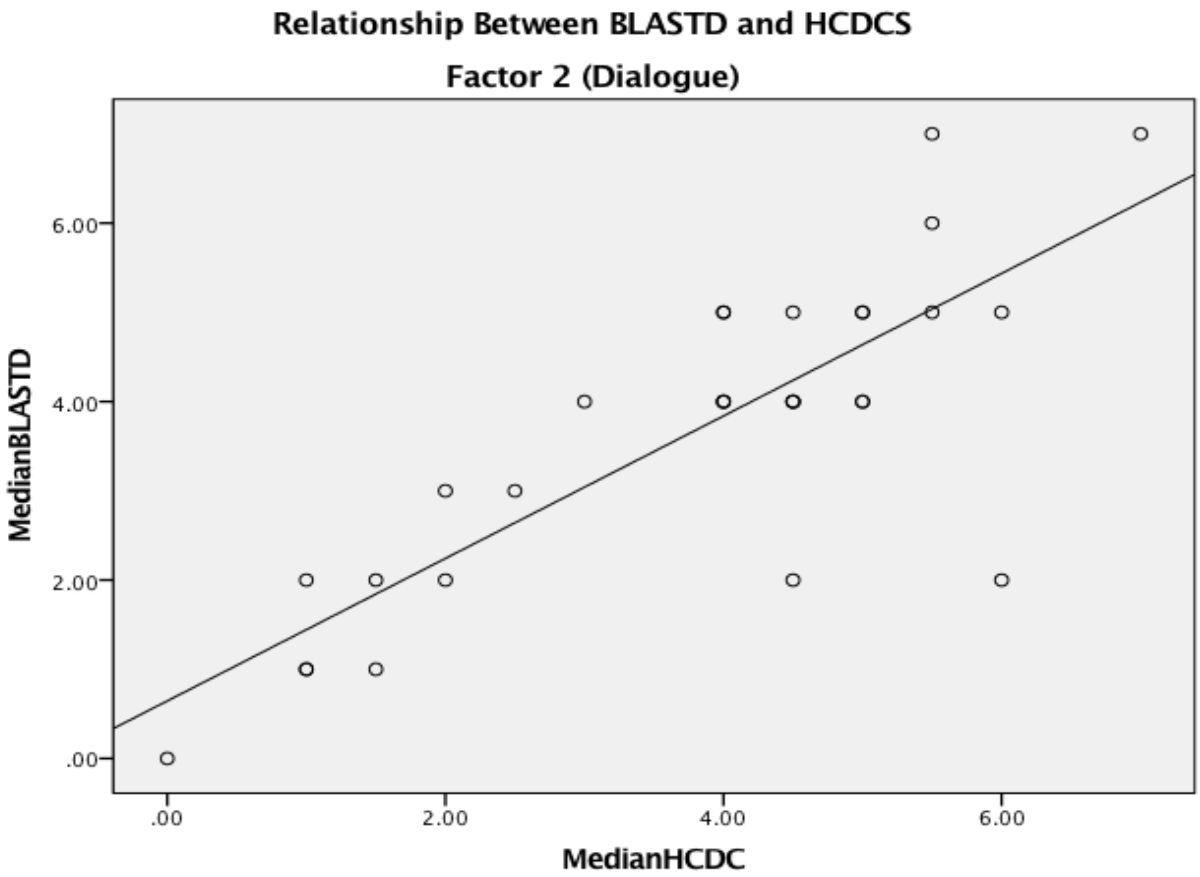

Figure 4.03. Linear relationship between BLASTD survey and HCDCS survey for Factor 2 (Dialogue).

The researcher generated a Pearson product-moment correlation coefficient for the relationship between the Median HCDCS Survey and pilot study survey item pool for Factor 2. Factor 2 demonstrated a correlation coefficient of $r = 0.815$, and is described as having a strong correlation between the two data sets.

Finally, items from Factor 3 of pilot study were aligned to learner autonomy. The researcher found median responses from both the HCDCS survey and pilot study survey item pool for each respondent and used these to correlate the two data sets. These median values became an order pair for use in the Pearson product-moment correlation coefficient. The new

order pairs were first used to create a scatterplot to determine the whether the relationship was linear.

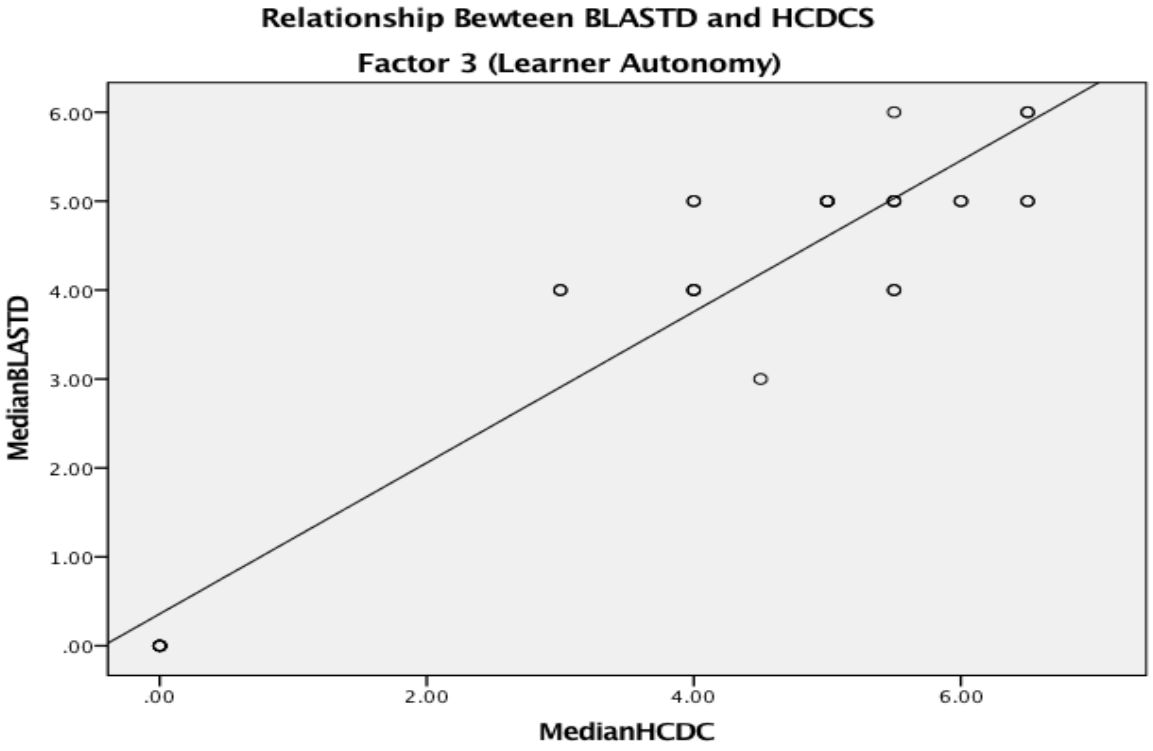

Figure 4.04. Linear relationship between BLASTD survey and HCDCS survey for factor 3 (Learner Autonomy).

The researcher generated a Pearson product-moment correlation coefficient for the relationship between the Median HCDCS Survey and pilot study survey item pool for Factor 3. Factor 2 demonstrated correlation coefficient of $r = 0.942$, and is described as having a strong correlation between the two data sets.

All three factors of the pilot study survey item pool indicate a strong correlation with the HCDCS survey. Since only portions of the HCDCS survey were used to establish the validity of the construct only a partial congruency can be established. With an established partial congruency with the HCDCS survey, the pilot survey item pool was given the Blended Learning

Assessment Scale of Transactional Distance (BLASTD) survey and was used in a large replication study.

Results of Step 7: Survey replication. The larger replication phase, using the BLASTD survey instrument, yielded 190 survey responses. The researcher analyzed the dimensionality of 45 items of the BLASTD using a second factor analysis and Cronbach alpha test to ensure the reliability and validity of the BLASTD. To determine adequacy of the sample size for the replication study a Bartlett's test of sphericity. A Bartlett's test of sphericity $\chi^2 (990) = 4118.295$ $p < .001$, indicated that correlations between items were sufficiently large for principal component analysis and, the Kaiser-Meter-Olkin (KMO) that measures the adequacy was 0.841, also indicating that the sample size was adequate for factor analysis. The researcher ran an initial analysis to obtain eigenvalues for each component of the data. 10 components had eigenvalues over Kaiser's criterion of 1 and in combination explained 65% of the variance. Three criteria determine the number of factors to rotate: the scree test, the hypothesis that the BLASTD Survey is unidimensional, and the interpretability of the factor solution. The scree plot showed changes in eigenvalues that would justify retaining two components. The scree plot indicated that the hypothesis that the item pool was unidimensional should be rejected. Additionally, as the results of the pilot study demonstrated, the scree plot for the replication study also indicated that there were three factors to be rotated using the Varimax rotation.

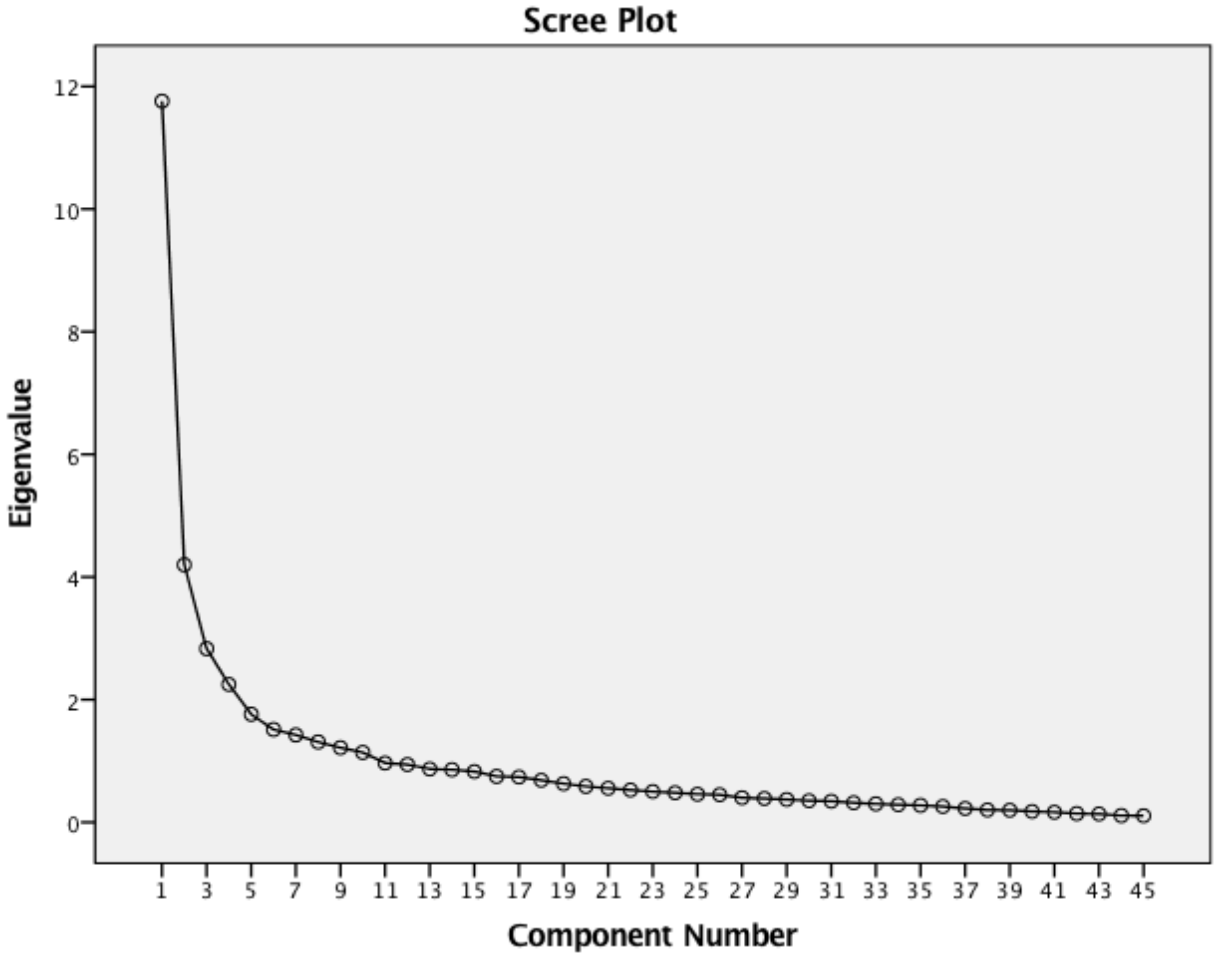

Figure 4.05. BLASTD survey responses scree plot.

The items that clustered on the same factors suggest that Factor 1 represents transactional distance and its underlying variables of dialogue and structure, Factor 2 learner autonomy. The factor *transactional distance* accounted for 26% of item variance, the learner autonomy factor accounted for 35.5% of the variance.

Table 4.03

BLASTD survey responses correlations.

Statement	Factor 1	Factor 2	Factor 3	Targeted Variable
Q27. I feel welcomed when I come to my class' "face-to-face" facilities.	0.731	0.179	-0.153	Structure
Q43. I feel that my instructor cares about my opinions about this class.	0.718	0.155	-0.356	Transactional Distance
Q40. I feel that my instructor helps me through this class.	0.703	0.013	-0.375	Transactional Distance
Q41. I feel that my instructor and I both know my progress to reaching my goals as a learner.	0.702	0.117	-0.09	Transactional Distance
Q42. I feel that my opinion matters to my instructor in this class.	0.672	0.141	-0.176	Transactional Distance
Q39. I feel that my instructor treats me as a person.	0.67	0.224	-0.263	Transactional Distance
Q7. I ask my instructor for help to understand class concepts.	0.663	-0.088	-0.064	Dialogue
Q14. I know what my goals as a learner are for this class	0.645	0.23	0.185	Structure
Q24. My class' "face-to-face" facilities are organized.	0.644	0.114	0.16	Structure
Q38. I feel that my instructor cares about me.	0.644	0.198	-0.304	Transactional Distance
Q45. I feel that I can meet my learning goals for this class.	0.642	0.174	0.108	Transactional Distance
Q25. My class' "face-to-face" facilities are nice to look at.	0.638	0.013	0.124	Structure
Q8. I ask my instructor for help to understand the instructions to activities.	0.637	-0.117	-0.135	Dialogue
Q35. I feel that I am close to my instructor.	0.626	0.109	-0.239	Transactional Distance

Q6. I communicate with my instructor through blended learning class.	0.621	0.11	-0.274	Dialogue
Q28. I can decide how to use the "face-to-face" facilities to learn.	0.618	0.061	0.093	Structure
Q37. I feel that my class is a community.	0.614	-0.27	0.049	Transactional Distance
Q11. I ask my instructor questions about assignments to get clearer instructions.	0.606	-0.161	-0.219	Dialogue
Q23. There are multiple ways to communicate with my instructor.	0.586	0.145	0.119	Structure
Q26. There is a space for me to get individual help "face-to-face" with an instructor.	0.582	0.087	0.018	Structure
Q20. The digital portions of this class help me meet my goals as a learner.	0.573	0.278	0.116	Structure
Q10. I ask my instructor questions about the class content that we are learning about in this class.	0.54	-0.04	0.01	Dialogue
Q12. I know when I have met my goal as a learner in this class.	0.539	0.259	0.096	Structure
Q9. I communicate with my instructor at least twice a week.	0.532	-0.1	-0.146	Dialogue
Q5. Other students provide feedback that helps me learn.	0.497	-0.487	0.122	Dialogue
Q21. I use the same technologies in this class as in the real world.	0.491	0.267	0.229	Structure
Q18. I know how to use the technology for this class.	0.425	0.245	0.468	Structure
Q1. Communicating with other students is important for my success in my blended learning class.	0.328	-0.691	0.262	Dialogue
Q4. I ask other students for help to understand the instructions to activities.	0.366	-0.638	0.188	Dialogue

Q2. Communicating with other students in this blended learning class is an important part of my learning.	0.428	-0.605	0.221	Dialogue
Q30. I learn more when I am working in groups.	0.355	-0.568	0.158	Learner Autonomy
Q36. I feel that I am close with other students in my class.	0.337	-0.561	0.315	Transactional Distance
Q3. I communicate with other students in this class at least twice a week.	0.35	-0.543	0.254	Dialogue
Q29. I learn more when I work alone.	0.003	0.596	0.278	Learner Autonomy
Q33. I do not need to have an instructor to learn in my class.	-0.164	0.406	0.504	Learner Autonomy
Q34. I do not need to have an instructor to meet my goals as a learner in my class.	-0.048	0.365	0.51	Learner Autonomy
Q44. I feel that being at a physical distance from my instructor rather than in a regular classroom does not affect my learning in this class.	0.224	0.327	0.247	Transactional Distance
Q17. The technology in this class is easy to understand.	0.343	0.29	0.346	Structure
Q15. I use a variety of media (e.g. text, photos, video, and audio) in this class.	0.379	0.235	0.196	Structure
Q22. I can decide how to use technology to learn.	0.385	0.177	0.355	Structure
Q31. I am on my own when it comes to learning in my class.	-0.199	0.16	0.46	Learner Autonomy
Q19. The digital portions of this class are nice to look at.	0.05	-0.087	0.286	Structure
Q13. I can control how I learn in this class.	0.069	-0.122	0.124	Structure
Q32. I find additional resources outside of class.	0.355	-0.169	0.19	Learner Autonomy
Q16. The digital portions of this class are easy to use.	0.121	-0.181	0.267	Structure

The two factors also underwent an internal consistency assessment using a Cronbach's alpha test. The stronger the correlation closer correlation coefficient will approach 1. Any result above .70 indicates that the survey response in each factor demonstrate an acceptable level of reliability (Hinkin et al., 1997). Values for a Cronbach's alpha test range from -1 to 1. The researcher used SPSS to run the Cronbach's alpha test and found that Factor 1 returned a value of 0.935 which is a strong indication of internal consistency or reliability. Factor 2 returned a value of 0.826 and is a good indication of the reliability of the items assigned to Factor 2.

Once these two tests were completed, the BLASTD Survey could be again reduced down and items that did not align to the two factors eliminated. As a result, the 45 survey items used in the replication study was reduced to 35 items. Ten items were eliminated from the final version of the BLASTD Survey.

Table 4.04

BLASTD Survey (Final Version).

Statement
1. I ask my instructor for help to understand class concepts.
2. I ask my instructor for help to understand the instructions to activities.
3. I communicate with my instructor through blended learning class.
4. I ask my instructor questions about assignments to get clearer instructions.
5. I ask my instructor questions about the class content that we are learning about in this class.
6. I communicate with my instructor at least twice a week.
7. Other students provide feedback that helps me learn.
8. Communicating with other students in this blended learning class is an important part of my learning.
9. I ask other students for help to understand the instructions to activities.
10. I communicate with other students in this class at least twice a week.
11. Communicating with other students is important for my success in my blended learning class.

12. I learn more when I am working in groups.
13. I learn more when I work alone.
14. I do not need to have an instructor to learn in my class.
15. I feel welcomed when I come to my class' "face-to-face" facilities.
16. I know what my goals as a learner are for this class
17. My class' "face-to-face" facilities are organized.
18. My class' "face-to-face" facilities are nice to look at.
19. I can decide how to use the "face-to-face" facilities to learn.
20. There are multiple ways to communicate with my instructor.
21. There is a space for me to get individual help "face-to-face" with an instructor.
22. The digital portions of this class help me meet my goals as a learner.
23. I know when I have met my goal as a learner in this class.
24. I use the same technologies in this class as in the real world.
25. I know how to use the technology for this class.
26. I feel that my instructor cares about my opinions about this class.
27. I feel that my instructor helps me through this class.
28. I feel that my instructor and I both know my progress to reaching my goals as a learner.
29. I feel that my opinion matters to my instructor in this class.
30. I feel that my instructor treats me as a person.
31. I feel that my instructor cares about me.
32. I feel that I can meet my learning goals for this class.
33. I feel that I am close to my instructor.
34. I feel that my class is a community.
35. I feel that I am close with other students in my class.

Chapter 4 Summary of Reliability, Validity, and Constructs the Scale Measures

The results of the study demonstrate provide evidence for a valid survey instrument. The researcher set out to create a survey instrument that would accurately measure Moore's theory of transactional distance in a secondary blended learning environment. The study began with the creation of a 118-survey item pool that was assessed by experts in blended learning, education technology, and transactional distance. The panel of experts found that survey item pool adequately represents the variables of dialogue, structure, learner autonomy, and transactional distance were then used in a pilot study in a blended learning environment in a rural Oregon school district.

The pilot study survey responses were then analyzed using a factor analysis to eliminate items were not statistically relevant. The remaining items were then aligned to their appropriate factors using eigenvalues and analyzed for internal consistency with a Cronbach's alpha test. The factors were then compared to responses from a survey designed to measure transactional distance in the higher education setting, the HCDCS survey. Using a Pearson product-moment correlation coefficient, comparing responses of portions of HCDCS survey and pilot study survey item pool, the researcher was able to determine that the survey items measured the constructs of transactional distance and thus the survey item pool were valid.

The remaining items were then used to create the Blended Learning Assessment Scale of Transactional Distance (BLASTD) Survey. The BLASTD Survey was used in the same location for larger replication study. The researcher analyzed the results with a Bartlett's test of sphericity, and found that the variation in responses warranted further factor analysis. Utilizing a factor analysis of the BLASTD Survey responses the researcher found that two factors were statistically represented in the data. Factor 1 represented items measuring transactional distance

and its underlying variables structure and dialogue, and Factor 2 which represented items measuring learner autonomy.

These two factors align with Moore's theory of transactional distance. Transactional distance is the psychological or emotional separation a learner feels within a distance learning setting (Moore, 1973). Transactional distance is the product structure or flexibility of the learning environment to adapt to the learner (Moore, 1993, 2006), and dialogue. Dialogue is the availability and quality of the communication within a learning environment (Moore, 2006). In response to learning environments with large transactional distance, students must have a high degree of learner autonomy to be successful (Moore, 1973).

Chapter 5: Discussion and Conclusion

Introduction

The researcher designed this study to develop a survey instrument to measure transactional distance in secondary blended learning environments. In the present chapter, the researcher will discuss the findings of the study. The chapter includes an overview of the study, i.e., a brief summary of the research procedures, including the purpose, methods, participants, findings, data analysis used and the statistical significance of the findings. The results of the study will be discussed in detail and related to prior literature, along with the implications of the results of the research for policy and practice, along with the current theories of blended learning and transactional distance. The chapter will conclude with a review of the main findings of the research and recommendation future research.

Summary of the Results

John Dewey's progressive model of education is a foundational component of this research study's conceptual framework. In the late 19th and early 20th, John Dewey called for the replacement of the traditional educational model with a more transactional and progressive model. Dewey (1997) described the education system of his time as being "traditional" and indicated that its aim was to instill the ideas of the past into modern students. In his era, Dewey (1997) saw an educational system that was more concerned with instilling cultural beliefs and the ideas, theories, and rules of previous generations than fostering students' own abilities to learn about the world around them and build their own understanding of it.

In a traditional educational setting, the educator is the dispenser of knowledge through textbooks and compartmentalized subjects (Dewey, 1997). In contrast, within Dewey's progressive model, a transaction occurs between a student and instructor—an educator guides

and responds to the student's experiences so the type of learning and meaning is student-driven (1897, 1990, 1997). This transaction between the learner and instructor reflects the society and the social life of schools, the transaction is built upon communication to construct shared meaning in the classroom (Moore, 1973).

Dewey's (1938, 1952) progressive educational model was an expression of his general pragmatism and the earlier work of C. S. Peirce and described that when an idea has been evaluated to be useful it becomes tool or instrument to understand the world. Dewey called his own personal brand of pragmatism "instrumentalism" and argued that learners create tools that are useful in navigating the world around them (Hickman, 1990).

Many contemporary educational leaders are calling for a new disruptive force in education that reflects Dewey's progressive education and increased focus on educational transactions (Christensen, 2011). Like Dewey before them, Clayton Christensen (2011) and others are calling for a disruption of "monolithic" or "wholesale" traditional education models that push student through a "one size fits all" education system. In its place, Christensen (2011) argues for a personalized system that allows for learners to control the type of learning, the subjects, the scope, the pace, and direction of the learning.

Christensen (2011) argues for a disruptive education model that utilizes elements of digital technology for transactions between students and teachers. A digital learning environment is characterized by decentralized communication, personalized learning, and linked content and concepts (Carr, 2010; Christensen, 2011). Learners can use the internet and digital communication tools such as social media and email to connect with fellow learners and educators electronically, thus decentralizing the very nature of teacher-student relationships (Turkle, 2011).

In *My Pedagogical Creed*, Dewey (1897) contended that the classroom should mirror the society around it. In examining our current educational environment, it is increasingly obvious the world is being shaped by the prevalence of digital technology. Some educators have called current generation of learners "digital natives," because they have grown up with easy access to the internet and a life mediated by technology (Maton & Kervin, 2008; Palfrey & Gasser, 2008; Tapscott, 2009). These students look for a school environment that echoes the abilities of the digital society they have grown up in (Christensen, 2011).

The blended learning model arose as an innovative approach to education in the early 2000s. Adherents of the model were responding to new digital technologies, but were influenced by Dewey's 20th century progressive education model, which continued to have relevance for modern learning environments (Staker & Horn, 2012). The blended learning model mixes aspects of distance digital learning with aspects of traditional face-to-face education (Staker & Horn, 2012). Distance education has been a part of the education setting early 1890s (Crobett, 2010). Distance education is an educational approach where the learning is accomplished without the need for a physical school environment (Barbour & Reeves, 2009; Johnstone, 2003; Moore, 1973). In a blended learning model, some elements of the traditional education environment remain, such as a physical location of the classroom or face-to-face interactions with an educator. (Staker & Horn, 2012).

Starting in the 1970s, Michael G. Moore began exploring the distance-learning environment and how educators and students were creating transactional learning environments. Moore (1997) found that,

> distance education is not simply a geographic separation of learners and teachers, but, more importantly, is a pedagogical concept . . . with separation there is a

> psychological and communications space to be crossed, a space of potential misunderstanding between the inputs of instructor and those of the learner. (p. 28)

Moore labeled the physical distance along with psychological distance between learner and instructor *transactional distance*. Moore adopted Dewey's concept of the transaction, which Dewey had developed to describe how individuals build meaning from experiences (Dewey, 1997). Moore noted that learning occurs as transaction between the learner and experience, the learner and context of the experience, and learner and the educator (Giossos et al., 2009; Moore, 1972, 1973, 1997).

Transactional distance was the result of two factors, dialogue and structure. The researcher defined *dialogue* as purposeful constructive interaction between learners and educators (Moore, 1997). The researcher defined *structure* as the ability for the learning to be customized and tailored to the learner (Moore, 1973). Moore (1997) described structure by saying that it "expresses the rigidity or flexibility of the program's educational objectives, teaching strategies, and evaluation methods. It describes the extent to which an education program can accommodate or be responsive to each learner's individual needs" (p. 30).

As transactional distance increases students need a greater level of autonomy to be successful in the educational environment (Moore, 1973). Moore (1997) defined learner autonomy as "the extent to which in the teaching/learning relationship it is the learner rather than the teacher who determines the goals, the learning experiences, and the evaluation decisions of the learning program" (p. 34).

Since the theory of transactional distance was first published in the early 1970s, researchers have explored its impact in various environments and distance education models.

The distinctive attributes of blended learning environments allow for a unique and relatively unexplored application of the Moore's theories on transactional distance.

In this research study, the researcher set out to investigate the blended learning environment through the lens of transactional distance and to answer the following four questions:

1. How does the Blended Learning Assessment Scale of Transactional Distance compare to Moore's theory of transactional distance?
2. Does the Blended Learning Assessment Scale of Transactional Distance developed in this study demonstrate a level of validity and reliability that meets or exceeds research standards for social science research?
3. Are there significant differences between Blended Learning Assessment Scale of Transactional Distance and other survey instruments developed to investigate transactional distance in higher education settings?
4. What is the relationship between responses to the variables of learner autonomy, structure, dialogue, to the responses for transactional distance?

To answer these questions, the researcher developed an initial survey item pool that contained 118 items that would describe significant aspects of Moore's theory of transactional distance. The statements were written using language that would be accessible at a lexile appropriate for 8th graders. The survey items were reviewed by a panel of experts and based on the responses from the experts' statements that did not that did not adequately reflect the appropriate transactional distance variable were removed. Five statements were eliminated from the item pool during the expert review and the remaining 118 items. Twelve statements from the Huang et al. (2015) (referred to as the HCDCS) Survey, a previously validated transactional distance

survey written for higher education students, were added to item pool for the initial pilot study. The HCDCS Survey items were later used to establish the BLASTD survey's validity.

There were a few challenges to recruiting the needed respondent pool for the initial pilot study. Despite a 2-month recruitment period that included multiple visits to the research site to hand out consent and assent forms to parents and students, only 40 students out of 320 enrolled students agreed to participate. Of the 40 students recruited for the instrument pilot, only 32 completed the survey. The researcher collected those 31 survey responses and analyzed them using a factor analysis. The researcher analyzed pilot study responses using a multivariable factor analysis to generate a scree plot and each survey items received a correlated eigenvalue. This process revealed that the statements correlated to three overarching factors. The researcher then rotated the statements using a Varimax rotation. The researcher then removed items to reduce the variation in the factor. After the factor analysis, 45 statements remained. Those 45 statements constituted the initial Blended Learning Assessment Scale of Transactional Distance (BLASTD) Survey.

The researcher then analyzed responses to the BLASTD Survey to determine the survey's reliability using a Cronbach's alpha. The Cronbach's alpha value represents the dispersal of the responses to the survey items assigned to each factor. The internal consistency assessment of the three factors of BLASTD survey was strong and represented a reliable instrument, a detailed presentation was provided in chapter 4.

The responses to the BLASTD survey item pool were then compared to respondents' responses to selections of the HCDCS survey. The comparison between two survey tools established a partial congruency and demonstrate that the constructs of the BLASTD survey were valid. The comparison utilized a Pearson product-moment correlation coefficient to find a

value of "r". An "r" value of 1 or -1 represent a perfect correlation or negative correlation. The three factors found in the initial BLASTD Survey responses showed a strong "r" and demonstrated a correlation between the two survey instruments. This established a partial congruency between the tool scale instruments since only a selection of the HCDCS survey was used.

Using the BLASTD Survey, whose initial validity and reliability testing had met the research standards for social science research, a larger replication study was conducted. Due to the challenges of recruitment in the initial recruitment for the pilot survey, changes were made and approved by the Concordia University Institutional Review Research Board to the consent/assent process. In place of the traditional consent/assent form, students prior to the survey being administered, brought home a brochure that outline the goals, risks, and benefits of the survey. Parents could opt out their child if they wanted by initialing the brochure and returning it with their child to the site. Additional students could opt out of the survey through the opening page of the survey. As a result of the new streamlined process, 192 respondents completed the survey.

The results of replication study were analyzed using the same analysis techniques that had been applied to the pilot study results. The responses were first analyzed using a Bartlett's test of sphericity to ensure that the response have equal variance to continue with a factor analysis. The Bartlett's test of sphericity showed that responses were in for variance and that factor analysis could proceed.

A factor analysis was conducted again, which produced a scree plot. The scree plot and the correlated factors demonstrated that the responses were associated with two factors. The statements written for transactional distance, dialogue, and structure were associated with

Factor 1. Statements written for learner autonomy were associated with Factor 2. These two factors were then rotated using a Varimax rotation and were evaluated using their associated eigenvalues and their effect on the variance of the factor. This process reduced the BLASTD Survey from 45 survey items to 35 survey items. The two resulting factors were then analyzed using a Cronbach's alpha to reveal their reliability. The Cronbach's alpha for both factors reported an acceptable level or reliability. The remaining items were used to create the final Blended Learning Assessment Scale of Transactional Distance.

Table 5.01

Final BLASTD Items and Subscale and Reliabilities

Factor	*n* items	Items	Cronbach's alpha (α)
Transactional Distance	18	I know when I have met my goal as a learner in this class. I know what my goals as a learner are for this class. I know how to use the technology for this class. The digital portions of this class help me meet my goals as a learner. I use the same technologies in this class as in the real world. I can decide how to use technology to learn. There are multiple ways to communicate with my instructor. My class' "face-to-face" facilities are organized. My class' "face-to-face" facilities are nice to look. There is a space for me to get individual help "face-to-face" with an instructor. I feel welcomed when I come to my class' "face-to-face" facilities. I can decide how to use the "face-to-face" facilities to learn. I communicate with my instructor through the blended learning class. I ask my instructor for help to understand class concepts. I ask my instructor for help to understand the instructions to activities. I communicate with my instructor at least twice a week.	0.935

		I ask my instructor questions about the class content that we are learning about in this class. I ask my instructor questions about assignments to get clearer instructions. I feel that my opinion matters to my instructor in this class. I feel that I am close to my instructor. I feel that I am close with other students in my class. I feel that my class is a community. I feel that my instructor treats me as a person. I feel that my instructor helps me through this class. I feel that my instructor cares about me. I feel that I can meet my learning goals for this class. I feel that I am close to my instructor.	
Learner Autonomy	12	I learn more when I work alone. I learn more when I am working in groups I do not need to have an instructor to learn in my class. Communicating with other students is important for my success in this class. I ask other students for help to understand the instructions to activities. Communicating with other students in this blended learning class is an important part of my learning. I communicate with other students in this class at least twice a week.	0.826

Discussion of the Results

The blended learning environment is a mixture of traditional "brick-and-mortar" or "face-to-face" teaching models combined with elements of digital distance learning. The present research study was designed to create a tool that could accurately measure transactional distance. An accurate measure of this phenomenon could assist researchers and educators in understanding student experiences within blended learning environments. The research was guided by four research questions. In what follows the researcher will discuss the results and provide answers to the four research questions.

Research question 1: How does the Blended Learning Assessment Scale of Transactional Distance compare to Moore's theory of transactional distance? The Blended

Learning Assessment Scale of Transactional Distance (BLASTD) Survey demonstrates a strong similarity with Moore's theory of transactional distance. The relationships between the statistical factors of the pilot study and replication study align to transactional distance and its underlying variable; as well as show, how students respond to transactional distance with learner autonomy. The BLASTD demonstrates strong correlations with Moore's theory of transactional distance through its theoretical foundations and grounding in research, the assessment of independent experts who reviewed the item pool for congruency with the theory of transactional distance, and the relationships between the factors and correlating survey items found through a factor analysis.

The item pool was written around the variables of Moore's theory of transactional distance. The survey item pool initially contained 118 survey items that were written as extension of the variables: transactional distance, dialogue, structure, and learner autonomy. The survey item writing process began with a detailed review of Moore's theory of transactional distance along with his other work on learner autonomy. Moore's work became the foundation that the statements were written from. In addition to Moore's work, additional research into transactional distance was also referenced, including previous surveys as presented by Giossos et al., (2009). From this foundation of transactional distance the item pool was created.

The 118-item pool was evaluated by 5 independent experts for its congruency with Moore's theory of transaction. The experts came from backgrounds in distance education, blended learning, education technology, and transactional distance. Statements that received median scores from the expert panel at or below "4" on a seven-point Likert scale on the degree to which the statement represented the appropriate variable, were removed from the item pool.

The expert panel found, that out of the 118 purposed survey items all but 5 aligned to the variable and represented an aspect of Moore's theory of transactional distance.

The BLASTD Survey is not only reflective of the transactional distance because of the variables that the survey items were written and evaluated in relation to, but also the survey instrument demonstrates the relationships between the dialogue, structure, learner autonomy and transactional distance found through the analysis of the survey responses. This is explored in the following section, which discusses the second research question.

Research question 2: What is the relationship between responses to the variables of learner autonomy, structure, dialogue, to the responses for transactional distance? The Blended Learning Assessment Scale of Transactional Distance demonstrated the interdependent relationship between Moore's constructs of dialogue, structure, learner autonomy and transactional distance. The BLASTD also demonstrated how students report a degree of learner autonomy in response to transactional distance.

At the beginning of the development and testing of the BLASTD, the researcher expected that the researcher would find 4 distinct variables that echoed the theory of transactional distance. These factors would be isolated and made up largely of the statements that were written targeting the one of Moore's variables, dialogue, structure, learner autonomy, and transactional distance.

In step 4 of the research methodology, the responses to pilot study were analyzed using a principal component analysis and factor analysis. It was predicted that moving into the factor analysis, the results of the principal component analysis and scree plot would produce 4 factors that matched Moore's theory. In fact, the factor analysis produced a scree plot that showed 3 statically significant factors. Each survey item was then grouped into each factor based upon

their eigenvalues. Eigenvalues above |0.4| are considered to demonstrate a minimum level of correlation. Survey items that showed correlations across multiple factors were placed with the factor that demonstrated the highest eigenvalue. Through this process, it was found that Factor 1 contained survey items originally written for structure and a portion of the survey items written for transactional distance. Factor 2 contained survey items originally written for dialogue and a portion of the survey items written for transactional distance, while Factor 3 contained statements for learner autonomy.

Additionally, the reduction of the transactional distance as a separate variable shows agreement with Moore's theory of transactional distance. For Moore (1997), transactional distance was the result of two factors, dialogue and structure. Moore (1973, 1997) argues that when an educational environment processes a structure that is not flexible or changeable to a student's needs and the degree or quality of communication does not allow for the learner or instructor to seem accessible, then the learner experiences transactional distance. A students' sense of separation and emotional distance is the result of both, structure (Factor 1) or flexibility of the learning environment to personalize to the learner, and dialogue (Factor 2) or the degree and quality of the communication between the learner and the instructor (Moore, 1997).

The pilot study findings demonstrate that while Factor 1 and 2 were a mixture of transactional distance and dialogue or structure, learner autonomy was alone in Factor 3. This supports Moore's theory of transactional distance in the following way. Moore (1973) argued that in response to the transactional distance of a learning environment a student must respond with a degree of learner autonomy. Learner autonomy is the outcome for students in educational environments with high transactional distance, and this is matched the resulting pilot study factors; Factor 1 and 2 show strong relationship to each other through sharing survey items

written for transactional distance while factor of learner autonomy stands alone in relationship to the other two factors.

The similarities between the relationships of the factors in the BLASTD and Moore's variables in transactional distance are received additional confirmation through the analysis of the larger replication study. The pilot study responses (n = 30) were analyzed using principal component analysis and factor analysis, and the responses to the replication study (n = 190) were analyzed using the same analysis techniques. The BLASTD Survey contained 45 statements that were used to generate a scree plot and associated eigenvalues. Using the scree plot, 2 factors were found from the responses to the replication study. Factor 1 of the replication study contained all statements written for transactional distance, structure, dialogue; these statements were found in the pilot studies Factors 1 and 2. This again reflects Moore's theory of transactional distance that transactional distance is a result of the relationship between dialogue and structure. The combination of items that were original written to target dialogue and structure into a single variable illustrates that both constructs led to a single effect, a sense of transactional distance. This factor analysis demonstrated that the BLASTD survey is measuring the transactional distance of the learning environment. Factor 2 contained all statements written for learner autonomy.

It was expected that the BLASTD survey would produce 4 distinct factors that were identical to the theory of transactional distance and its underlying variables, but the factor analysis of both the pilot study as well as the replication study did not produce identical factors. Instead the factors produced in the factor analysis demonstrate the relationships between dialogue, structure, transactional distance, and learner autonomy. The research demonstrates strong relationships between dialogue, and structure, resulting in transactional distance. The

same relationship is how Moore (1997) describes dialogue, structure, and transactional distance. The research shows a factor of learner autonomy that is in response to factors of transactional distance, Moore (1997) also describes this relationship. Therefore, within this study, the statistical factors of the Blended Learning Assessment Scale of Transactional Distance Survey not only show a congruency of content with Moore's theory of transactional distance but also reflect the relationships between the variables of transactional distance.

Research question 3: Does the Blended Learning Assessment Scale of Transactional Distance developed in this study demonstrate a level of validity and reliability that meets or exceeds research standards for social science research? The statistical analysis of the results presented for the Blended Learning Assessment Scale of Transactional Distance demonstrates a level of validity and reliability that meets or exceeds standards for social science research.

Responses to the pilot study item pool survey were analyzed using a factor analysis to find the number of factors and reduce the number of items. The item pool was correlated using a scree plot to three factors. Statements were reduced from item pool to decrease variability. Factor loadings or eigenvalues below 0.40 indicate that the responses for that instrument statement have an unacceptable degree of variability and maybe measuring another factor (Hinkin, 1995). Once statements were reduced from each factor to decrease variance, each factor showed strong correlations through eigenvalues to their correlated factor. Statements for Factor 1 (structure and a portion of transactional distance) showed eigenvalues above 0.628, Factor 2 (dialogue and a portion of the transactional distance) showed eigenvalues above 0.59, and Factor 3 (learner autonomy) showed eigenvalues above 0.514. The resulting eigenvalues show a strong correlation between the statements and variables of Moore's theory of transactional distance, above the accepted standards for social science.

The factors and the remaining factors were then analyzed with a Cronbach's alpha test. The research standard for social science, as found in the literature, is that results above .70 indicate acceptable levels of reliability (Hinkin et al., 1997). Utilizing SPSS, Factor 1 demonstrated a Cronbach's alpha of 0.927, Factor 2 Cronbach's alpha = 0.909, and Factor 3 Cronbach's alpha = 0.747. The Cronbach's alpha values are all above the 0.70 research standard to indicate acceptable levels of reliability.

During the replication study, results to the BLASTD Survey were also analyzed using factor analysis to generate a scree plot and associated eigenvalues. The 45 statements were aligned to two factors using eigenvalues. Again, eigenvalues below 0.40 indicate unacceptable degree of variability wand represent statements that reduce the overall validity of the associated factor (Hinkin, 1995). Statements that remained in Factor 1 in the replication study were above and an eigenvalue 0.425. Statements that remained in Factor 2 were above an eigenvalue of 0.406. All statements that remained in the BLASTD demonstrated a degree of validity that meets or exceeds the research standard for social science research.

The remaining factors of the replication study were analyzed using a Cronbach's alpha test to measure reliability. The research used the accepted research standard for social science research to demonstrate reliability of a value for a Cronbach's alpha test above 0.70 to indicate an acceptable level of reliability. Factor 1 of the replication study found a Cronbach's alpha of 0.935 well above the accepted 0.7 research standard. Factor 2 of the replication study found a Cronbach's alpha of 0.826 well above the accepted 0.7 research standard.

Given the statistical analysis accomplished during the pilot study and replication study, the Blended Learning Assessment Scale of Transactional Distance meets or exceeds all research standards for social science research for validity and reliability.

Research question 4: Are there significant differences between Blended Learning Assessment Scale of Transactional Distance and other survey instruments developed to investigate transactional distance in higher education settings? The Blended Learning Assessment Scale of Transactional Distance showed a partial congruency with another survey, the survey instrument developed by Huang et al. (2015) (referred to as the HCDCS). The analysis could only establish a partial congruency between the two instruments because only a selection of the survey statements from the HCDCS survey were used.

Respondents to the pilot study item pool also answered 12 questions selected from the HCDCS survey. The HCDCS survey was written utilizing language aimed at population of higher education students, both undergrad and graduate levels. As a result, language in many of the HCDCS items would not have been accessible to most secondary students. Due to the degree of language difficulty in the HCDCS items only four items from each variable: dialogue, structure, and learner autonomy, were administered to students.

The responses of the 12 HCDCS survey items were compared to their analogous BLASTD factor response. To ensure that the pilot study survey item pool was in fact measuring elements for Moore's theory of transactional distance responses of the remaining pilot study, survey items were compared using a Pearson product-moment correlation coefficient. The *r* values range between 1 and -1, with positive values showing a positive correlation and negative values denoting a negative correlation (Huck et al., 2007) or this study, correlations with a significance level $r = 0.6$ was used to support that the new tool is a valid measurement of transactional distance in blended learning environments and describes a strong correlation between the two data sets (Huck et al., 2007).

All three factors showed a strong correlation between the HCDCS survey and the BLASTD survey. Factor 1 structure, demonstrated an *r* value of 0.842, and is described as having a strong correlation between the two data sets. Factor 2 demonstrated an *r* value of 0.815, and is described as having a strong correlation between the two data sets. Factor 3 demonstrated an *r* value of 0.942, and is described as having a strong correlation between the two data sets.

The resulting Pearson product-moment correlation coefficients support the conclusions that there are strong similarities between the survey instrument developed by Huang et al. (2015) to measure transactional distance in higher education blended learning environment and the Blended Learning Assessment Scale of Transactional Distance to measure transactional distance in secondary blended learning environments.

Limitations

There were a few obstacles in the research may have changed the outcome of the research. The blended learning environment encompasses four different models that utilize digital learning tools in different ways. The rotation model utilizes digital learning tools to augment the traditional classroom setting; students are participants in a traditional brick-and-mortar setting but use digital tools to aid the traditional setting (Horn & Staker, 2015). The flex model utilizes a brick-and-mortar setting with a physical instructor but the majority of the learning occurs with digital learning tools (Horn & Staker, 2015). The self-blend model students have the flexibility to select courses are even activities in either digital or traditional formats (Horn & Staker, 2015).

While the research site had a mixture of all four models of blended learning outline by Horn and Staker (2015). All of the survey responses came from the flex and enhanced virtual academy. These two models share the most in common with distance education compared to the

other blended learning environments. Given this relationship, the research is limited in its application to other blended learning models that show a greater commonality with the traditional physical education setting.

Given the digital distance component of the research site and blended learning environment, an obstacle to the research was the recruiting for the initial pilot study. Despite multiple and varying attempts to obtain students' assent and parents' consent to participate in the survey, it was difficult to recruit a large enough sample to make the analysis of the survey statistically significant. The process of gaining both parents' and students' permissions was plagued by communication breakdowns. As a result, many of the students who participated in the pilot study survey were over the age of 18 and could give their own consent to participate. This resulted in the pilot study having a disproportionate number of 12th graders, who only represent 21% of the secondary population at the research site.

Both the pilot study and the replication study took place at the same site, which may introduce an unknown restriction on the level generalizability to the blended learning setting in other areas. It is assumed that the chosen research site is representative of the larger community in that it contains a variety of socioeconomic, ethnic, and cultural background that reflect the larger school district population, but there may be outside circumstances at differing geographic, cultural, and socioeconomic settings.

The composition of the survey item also proved to be a limitation. Both the survey item pool along with the BLASTD had a limited number of survey items pointed at learner autonomy. Eighteen statements were originally developed to measure learner autonomy in the survey item pool and the final version of the BLASTD survey included only 3 of the original survey items. During the final factor analysis of the BLASTD 5 other items were found to correlate to learner

autonomy but 8 survey items is still a relatively small survey tool to measure Learner Autonomy.

Implication of the Results for Practice, Policy, and Theory

The research study produced a statistically valid survey instrument; this tool can be used by educators in a blended learning environment better understand students' experiences. As real and tangible tool, educators can use Blended Learning Assessment Scale of Transactional Distance Survey to see how the digital distance portions of the learning environment are effecting the student experience. By utilizing the tool in the practice of education, educators can make informed decisions about students' experiences and adjust learning environment to accommodate those student's needs. Educators can make informed decisions about the degree and quality of the communication taking place within the learning setting. Educators can see students' perceptions of the personalization or flexibility of the learning environment, as well as a student's perception of emotional distance from the learning. Results from the use of this survey could be used to derive insights into the students' degree of autonomy and if used in a blended learning environment may be able to match students' skills in self autonomy with educational activities. The BLASTD Survey offers educators a valid and reliable tool that can be used to support the creation of learning environments that are better suited to students' needs. It allows for the assessment of existing learning environments, and perhaps adjustment of those environments in response to measurement of student experiences.

This research also has implications for theories that undergird the blended learning model and transactional distance. Since this research study at this stage has produced a statistically valid survey instrument that measured transactional distance, it strengthens the ties between the modern blended learning environment and traditional distance education. All the obstacles and characteristics of the distance learning environment illustrated in Moore's work can be found in

the blended learning environment.

The research also provides further evidence that the theory of transactional distance can be applied to the blended learning environment. Since its creation in the early 1970s, transactional distance has been applied to a variety of distance education models (Giossos et al., 2009; Moore, 1972, 1973, 1997). This research study has shown that the secondary blended learning environment also can be included in furthering Moore's theory. Thus, transactional distance provides a paradigm for future understanding of digital teacher-to-student relationships.

Recommendations for Further Research

There are several recommendations for future research based upon this study. While this study utilized the survey tool, the Blended Learning Assessment Scale of Transactional Distance (BLASTD) Survey, at a single site, utilizing the tool at larger and more geographically diverse sites could provide additional insight in the blended learning environment. The blended learning environment encompasses a variety of models that offer differing degrees of physical separation between learners and instructors, many of these models have not been explored in the light of transactional distance. While this research study focused on blended learning models that mostly resembled traditional distance education, many of the subtler blends of digital learning in the brick and mortar classroom were explored as a part of this research study.

This research produced a single snapshot of students' perceptions of transactional distance in a blended learning environment. A longitudinal study that follows students over the progression of a single course could provide valuable insight into a blended learning environment's characteristics. The BLASTD Survey or another transactional distance centered tool could also be used to help guide a case study research or mix methodology research to closely investigate students' experiences in a blended learning environment.

There are a variety of student metrics that this study did not compare to the data produced by the BLASTD Survey. These student metrics include, student success and completion rates which could be compared to transactional distance. A research study using a survey instrument and student outcome data could also provide insight in the blended learning environment.

The secondary learning environment encompasses grades 6 through 12, and students between ages 11 and 18. This large developmental spectrum may most likely result in differing experiences in the blended learning environment. A research study could be developed that looked specifically at the middle school, early secondary classes, grades 6, 7, and 8 could provide unique insight to the middle school blended learning experience. On the other hand, the same efforts could be used to investigate high school, grades 9 through 12 as a unique population of learners in the blended learning environment. Research could also be expanded beyond secondary school into primary and early childhood learning environments.

Conclusion

John Dewey, in the late 19th and 20th century, set out to build an educational model on the individual student and their transaction with an educator and their environment (Dewey, 1997). The designers of the blended learning environments share Dewey's goals of a student-centered experience. In order to accomplish the goal, this model blends elements of traditional "face-to-face" education with elements of digital distance learning (Christensen, 2011). Distance education offers new and unique challenges since the educator and learners are separated not only geographically but also psychologically and emotionally (Moore, 1973). Moore (1973, 1997) developed the theory of transactional distance to describe the how the transactions in Dewey's education model were changed when physically separated in distance education. This research yielded a valid and reliable survey instrument to investigate the blended learning

environment through the lens of transactional distance. The survey instrument can be used to better understand the student experience in blended learning environment and help build better blended learning models in the future.

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Appendix A: Statement of Original Work

I attest that:

1. I have read, understood, and complied with all aspects of the Concordia University-Portland Academic Integrity Policy during the development and writing of this dissertation.

2. Where information and/or materials from outside sources has been used in the production of this dissertation, all information and/or materials from outside sources has been properly referenced and all permissions required for use of the information and/or materials have been obtained, in accordance with research standards outlined in the *Publication Manual of The American Psychological Association.*

_____

Digital Signature

Dennis G. Lane

Name (Typed)

May 25th, 2017

Date

Appendix B: Consent Form

CONSENT FORM

Research Study Title: Scale development to measure transactional distance in secondary blended learning environments.
Principle Investigator: Dennis Lane
Research Institution: Concordia University
Faculty Advisor: Marty A. Bullis, Ph.D.

Purpose and what you will be doing:

This research study is designed to create a survey tool that educators can use to understand and measure student and teacher interactions in a blended learning environment. A blended learning environment is where students learn using digital or internet based activities but still maintain some degree of contact with a face-to-face instructor. By participating in this study, your child will be helping educators better understand the student experiences in a blended digital learning environment. This portion of the study will measure how accurate the survey is and help ensure that the tool measures what it is designed to measure. We expect approximately 240 volunteers to participate in this study and will end enrollment on July 1st, 2017. A portion of the volunteers will participate in a small initial pilot study of the survey and the remaining volunteers will participate in a second round of the survey.

To participate in this study, your child will be emailed a link to an online survey, that they will be able to complete without providing personally identifying information. This survey is made up of statements about your child's experiences in their current blended learning environment. To complete each answer on the survey the child will choose a number from one to seven that indicates the degree that they agree with the statement about their feelings about their blended learning environment. Participating in this survey should take less then 30 minutes of your childs's time but the information provided to the research is invaluable.

Risks:

It is important to note that the goals of the research are not to evaluate a student, teacher, or school but to develop a survey tool that can be used later to understand and improve digital learning. There are no risks to participating in this study other than providing your personal information during the consent process. However, we will protect your and your child's personal information. Any personal information you provide will be coded so it cannot be linked to you or your child. Any name or identifying information you give will be kept securely via electronic encryption or locked in a secure filing cabinet accessible only to the researcher. When the researcher looks at the survey data from your child, none of the data will have their name or identifying information attached to it. All survey data will be reviewed in aggregate. The researcher will not identify you or your child in any publication or report. Your and your child's personal information will be kept private at all times and then all study documents will be destroyed 3 years after the conclusion of this study.

Benefits:
Information you provide will help educators find better tools and resources for students in the blended learning or virtual school settings. The survey's intent is give educators a measure of the sense of separation or psychological distance between themselves and students, as well as between students. Blended learning has unique challenges in that students are physically separated from the educator and that can lead to sense of isolation. By participating in this survey you are helping in the creation of tool to asses this sense of isolation. This could lead to better, more supported, and student-centered blended learning environments.

Confidentiality:
This information will not be distributed to any other agency and will be kept private and confidential. The only exception to this is if you tell us of abuse or neglect that makes us seriously concerned for your immediate health and safety.
Right to Withdraw:
Your participation is greatly appreciated, but we acknowledge that the questions we are asking are personal in nature. You or your child are free at any point to choose not to engage with or stop the study. Your child may skip any questions they do not wish to answer. This study is not required and there is no penalty to you or your child for not participating. If at any time you or your child experience a bad emotion from answering the questions in the survey they may stop taking the survey.

Contact Information:
You will receive a copy of this consent form. If you have questions you can talk to or write the principle investigator, Dennis Lane at the following email: dlane@cu-portland.edu. If you want to talk with a participant advocate other than the investigator, you can write or call the director of our institutional review board, Dr. OraLee Branch (email obranch@cu-portland.edu or call 503-493-6390).

Your Statement of Consent:
I have read the above information. I asked questions if I had them, and my questions were answered. I give consent for my student to participate in this study.

_____ _____
Participant Name Date

_____ _____
Participant's Legal Parent/Guardian Name Date

_____ _____
Participant's Legal Parent/Guardian Signature Date

_____ _____
Investigator Name Date

_____ _____
Investigator Signature Date

Appendix C: Assent Form

ASSENT FORM

Research Study Title: Scale development to measure transactional distance in secondary blended learning environments.
Principle Investigator: Dennis Lane
Research Institution: Concordia University
Faculty Advisor: Marty A. Bullis, Ph.D.

Purpose and what you will be doing:

This research study is designed to create a survey tool that educators can use to understand and measure student and teacher interactions in a blended learning environment. A blended learning environment is where students learn using digital or internet based activities but still maintain some degree of contact with a face-to-face instructor. By participating in this study, your child will be helping educators better understand the student experiences in a blended digital learning environment. This portion of the study will measure how accurate the survey is and help ensure that the tool measures what it is designed to measure. We expect approximately 240 volunteers to participate in this study and will end enrollment on July 1st, 2017. A portion of the volunteers will participate in a small initial pilot study of the survey and the remaining volunteers will participate in a second round of the survey.

To participate in this study, your child will be emailed a link to an online survey, that they will be able to complete without providing personally identifying information. This survey is made up of statements about your child's experiences in their current blended learning environment. To complete each answer on the survey the child will choose a number from one to seven that indicates the degree that they agree with the statement about their feelings about their blended learning environment. Participating in this survey should take less then 30 minutes of your childs's time but the information provided to the research is invaluable.

Risks:

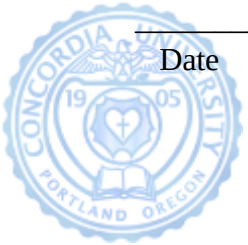
It is important to note that the goals of the research are not to evaluate a student, teacher, or school but to develop a survey tool that can be used later to understand and improve digital learning. There are no risks to participating in this study other than providing your personal information during the assent process. However, we will protect your and your child's personal information. Any personal information you provide will be coded so it cannot be linked to you or your child. Any name or identifying information you give will be kept securely via electronic encryption or locked in a secure filing cabinet accessible only to the researcher. When the researcher looks at the survey data from your child, none of the data will have their name or identifying information attached to it. All survey data will be reviewed in aggregate. The researcher will not identify you or your child in any publication or report. Your and your child's personal information will be kept private at all times and then all study documents will be destroyed 3 years after the conclusion of this study.

Benefits:
Information you provide will help educators find better tools and resources for students in the blended learning or virtual school settings. The survey's intent is give educators a measure of the sense of separation or psychological distance between themselves and students, as well as between students. Blended learning has unique challenges in that students are physically separated from the educator and that can lead to sense of isolation. By participating in this survey you are helping in the creation of tool to asses this sense of isolation. This could lead to better, more supported, and student-centered blended learning environments.

Confidentiality:
This information will not be distributed to any other agency and will be kept private and confidential. The only exception to this is if you tell us of abuse or neglect that makes us seriously concerned for your immediate health and safety.
Right to Withdraw:
Your participation is greatly appreciated, but we acknowledge that the questions we are asking are personal in nature. You or your child are free at any point to choose not to engage with or stop the study. Your child may skip any questions they do not wish to answer. This study is not required and there is no penalty to you or your child for not participating. If at any time you or your child experience a bad emotion from answering the questions in the survey they may stop taking the survey.
Contact Information:
You will receive a copy of this assent form. If you have questions you can talk to or write the principle investigator, Dennis Lane at the following email: dlane@cu-portland.edu. If you want to talk with a participant advocate other than the investigator, you can write or call the director of our institutional review board, Dr. OraLee Branch (email obranch@cu-portland.edu or call 503-493-6390).

Your Statement of Assent:
I have read the above information. I asked questions if I had them, and my questions were answered. I give assent for my student to participate in this study.

_____	_____
Participant Name	Date
_____	_____
Participant's Legal Parent/Guardian Name	Date
_____	_____
Participant's Legal Parent/Guardian Signature	Date
_____	_____
Investigator Name	Date
_____	_____
Investigator Signature	Date



Appendix D: Research Brochure

Concordia University

The Blended Learning Assessment Scale of Transactional Distance

Starting in the early 1970s, education researcher Michael E. Moore explored distance education. He found that when students were physically separated from the classroom, fellow students, and the teacher, there was a psychological distance. He called this *Transactional Distance*. Since then computers and the internet have allowed educators to create classrooms that are a blend of traditional physical classrooms and elements of online distance learning.

I am conducting a research study to develop a survey tool that educators can use to understand and measure Moore's Transactional Distance in a blended learning environment.

The Investigator

Dennis Lane

I am a doctoral student at Concordia University Portland, as well as a public middle school science teacher in Oregon. I have seen how technology has affected my classroom and students and I am interested in how educators can help students thrive in the digital and real world. Thank you for your time.

Contact Information

If you have questions you can talk to or write the principle investigator, Dennis Lane at the following email: dlane@cu-portland.edu. If you want to talk with a participant advocate other than the investigator, you can write or call the director of our institutional review board, Dr. OraLee Branch (email obranch@cu-portland.edu or call 503-493-6390).

The Blended Learning Assessment Scale of Transactional Distance

An investigation to develop a survey that helps educators better understand a student's experience in a classroom that utilizes a mixture of traditional and digital learning tools

Take a Voluntary Survey

Participating in this research study is completely voluntary. To participate you or your child will be emailed a link to a short survey. This survey is made up of statements about the blended learning environment. To complete each answer on the survey, your child will choose a number from one to seven that indicates the degree that they agree with the statement about their feelings about their blended learning environment. Participating in this survey should take less then 30 minute but the information provided to the research is invaluable.

Choosing to not participate

This study is not required and there is no penalty to you or your child for not participating. A student may choose to not participate and opt out of the survey.

Your Rights and Confidentiality

A student can withdraw.
At any point, your child can not start or can stop taking the survey. Questions can be skipped.

Confidentiality

Individual survey information will not be distributed to any other person or agency and will be kept private and confidential. Personal information along with the responses to the survey are given a unique code. Responses to the survey cannot be linked to a specific student. The researcher will not identify you or your child in any publication or report.

Risks

This survey does not evaluate a school, teacher, or student. There are no risks to participating in this study other than the risk of being on your computer to take a survey. All study documents will be destroyed 3 years after the conclusion of this study.

Benefits

Information you provide will help educators find better tools and resources for students in the blended learning or virtual school settings. By participating in this survey you are helping in the creation of tool to assess transactional distance in blended learning classrooms. This could lead to better, more supported, and student-centered blended learning environments.

If you DO NOT want to participate

Please return this form with this checked box marked, or you can email contact me at dlane@cu-portland.edu.

Opt -out

Check this "opt-out" box if you do not want your child to be able to take the survey.

You can return this paper, with your child, to the classroom. Or, you can email me. If you so indicate, I will not email the survey link.

If you want to participate,

you do not need to do anything. You and your child will receive email link to the survey. The survey will start with a question that asks whether or not your child wants to take the survey.

Appendix E: Survey Item Pool

Select the number that reflects your feelings towards the statements.

Strongly Disagree			Neutral			Strongly Agree
1	2	3	4	5	6	7

Dialogue

Learner to learner.

1. I communicate often with other students in my blended learning class.
2. Communicating with other students is important for my success in this class.
3. Communicating with other students is important for their success in this class.
4. Communicating with other students in this blended learning class is an important part of my learning.
5. I communicate with other students in this class at least twice a week.
6. Other students need my input to be successful in this class.
7. The communication between me and other students is positive.
8. The communication between me and other students helps me learn.
9. I ask other students for help to understand class concepts.
10. I ask other students for help to understand the instructions to activities.
11. I ask other students for help with questions about assignments
12. I ask other students for help with learning activities.
13. Other students available to communicate with me.

14. I see and meet with other students “in-person” or “face-to-face” about this blended learning class.
15. I communicate with other students through email, chat, SMS text, social media, or with other tools.
16. Other students in this class listen to what I think.
17. Other students respond to questions and comments from me quickly.
18. I enjoy interacting with the other students in this class.
19. Other students provide feedback that helps me learn.

    Learner to instructor.
20. I communicate often with my instructor in my blended learning class.
21. I communicate with my instructor through email, chat, SMS text, social media, or with other tools.
22. I see and meet with my instructor “in-person” or “face-to-face” about this blended learning class.
23. My instructor in this class listens to what I think.
24. I ask my instructor for help to understand class concepts.
25. I ask my instructor for help to understand the instructions to activities.
26. I ask my instructor for help with questions about assignments or other learning activities.
27. My instructor provides feedback that helps me learn.
28. I communicate with my instructor at least twice a week.
29. I ask my instructor questions about the class content that we are learning about in this class.
30. I ask my instructor questions about assignments to get clearer instructions.

31. I enjoy interacting with my instructor in this class.

32. My instructor responds to questions and comments from me quickly.

33. My instructor's communication is helpful in understanding this class.

34. The communication between the instructor and me is positive.

35. The communication between the instructor and me helps me learn.

36. Communicating with my instructor is an important part of my learning.

37. Communicating with my instructor is important for my success in this class.

38. My instructor is available to communicate with me.

Structure

Learner-content.

39. I have the ability to ask questions in this class.

40. I receive useful answers in this class.

41. I set my goals as a learner in this class.

42. I know when I have met my goal as a learner in this class.

43. The activities can change to meet my goals as a learner in this class.

44. The assignments can change to meet my goals as a learner in this class.

45. The class content can change to meet my goals as a learner in this class.

46. I can control what I learn in this class.

47. I can control how I learn in this class.

48. I can control the speed the speed that I learn in this class.

49. I can control where I learn in this class.

50. What I am learning in this class helps me understand the real world.

51. My instructor changes the types of lessons and assignments based upon my needs.

52. When I need extra help my instructor is able to change what I am learning.

53. When I need extra help my instructor is able to change my learning activities.

54. When I need extra help my instructor is able to change my assignments.

55. I can identify the requirements in this class.

56. I understand the requirements in this class.

57. I know what my goals as a learner are for this class.

58. My instructor has changed the class to fit my needs.

59. In this class, There are a wide variety of learning activities in this class.

60. My instructor understands me as an individual.

Learner-interface.

61. I use a variety of media (e.g. text, photos, video, and audio) in this class.

62. The digital portions of this class are easy to use.

63. The technology in this class is easy to understand.

64. I know how to use the technology for this class.

65. The digital portions of this class are organized.

66. The digital portions of this class are nice to look at.

67. The digital portions of this class help me meet my goals as a learner.

68. I use the same technologies in this class as in the real world.

69. I can decide how to use technology to learn.

70. The instructor provides a variety of digital resources and websites.

71. There are multiple ways to communicate with my instructor.

72. There are multiple ways to communicate with other students.

73. I have been trained on how to use the digital portions of this class.

74. My class' "face-to-face" facilities are organized.

75. My class' "face-to-face" facilities are nice to look at.

76. There is a space for me to get individual help "face-to-face" with an instructor.

77. I feel welcomed when I come to my class' "face-to-face" facilities.

78. I know how to use the "face-to-face" facilities.

79. The "face-to-face" facilities help me meet my goals as a learner.

80. I can decide how to use the "face-to-face" facilities to learn.

81. I have been trained on how to use the "face-to-face" facilities.

Learner Autonomy

---

82. I learn more when I work alone.

83. I enjoy working with other students.

84. I learn more when I am working in groups.

85. I enjoy discovering things on my own.

86. I am responsible for meeting my learning goals in my class.

87. I am on my own when it comes to learning in my class.

88. I am on my own when it comes to completing assignments in my class.

89. I find additional resources outside of class.

90. I do not need to have an instructor to learn in my class.

91. I do not need to have an instructor to meet my goals as a learner in my class

92. Assignments can be completed without working with other students in my class.

93. I can learn what I need about an assignment without an instructor's help in my class.

94. I can learn what I need about an assignment without working with other students in my class.

95. I enjoy my class because I don't have to work with other students.

96. I enjoy my class because I don't have to work closely with my instructor.

97. I enjoy my class because I control the pace that I learn at.

98. I enjoy my class because I control the types of learning activities.

99. I am in control of what I am learning.

Transactional Distance

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100. I feel that I am close to my instructor.

101. I feel that I am close with other students in my class.

102. I feel that my class is a community.

103. I feel that my class is a good fit for me as a learner.

104. I feel that my instructor cares about me.

105. I feel that my instructor treats me as a person.

106. I feel that my instructor helps me through this class.

107. I feel that other students help me in this class.

108. I feel that other students in my class care about me.

109. I feel that my instructor and I have the same goals for my learning.

110. I feel that my instructor and I both understand the class content.

111. I feel that my instructor and I both understand the assignments.

112. I feel that my instructor and I both know my progress to reaching my goals as a learner.

113. I feel that my opinion matters to my instructor in this class.

114. I feel that my instructor cares about my opinions about this class.

115. I feel that other students share the same goals for learning.

116. I feel that being at a physical distance from my instructor rather than in a regular classroom does not affect my learning in this class.
117. I feel that being at a physical distance from other students rather than in a regular classroom does not affect my learning in this class.
118. I feel that I can meet my learning goals for this class.

Appendix F: Results From the Content Adequacy Assessment

Results from the content adequacy assessment.

Survey Statement	Median score
Dialogue	
1. Communicating with other students is important for my success in this class.	6
2. Communicating with other students is important for their success in this class.	6
3. Communicating with other students in this blended learning class is an important part of my learning.	6
4. I communicate with other students in this class at least twice a week.	7
5. Other students need my input to be successful in this class.	*5*
6. The communication between me and other students is positive.	6
7. The communication between me and other students helps me learn.	6
8. I ask other students for help to understand class concepts.	6
9. I ask other students for help to understand the instructions to activities.	6
10. I ask other students for help with questions about assignments.	6
11. I ask other students for help with learning activities.	6
12. Other students available to communicate with me.	**4**
13. I see and meet with other students "in-person" or " face-to-face" about this blended learning class.	6

14. I communicate with other students through email, chat, SMS text, social media, or with other tools.	**4**
15. Other students in this class listen to what I think.	**3**
16. Other students respond to questions and comments from me quickly.	5
17. I enjoy interacting with the other students in this class.	6
18. Other students provide feedback that helps me learn.	5
19. I communicate often with my instructor in my blended learning class.	6
20. I communicate with my instructor through email, chat, SMS text, social media, or with other tools.	6
21. I see and meet with my instructor "in-person" or "face-to-face" about this blended learning class.	6
22. My instructor in this class listens to what I think.	6
23. I ask my instructor for help to understand class concepts.	6
24. I ask my instructor for help to understand the instructions to activities.	6
25. I ask my instructor for help with questions about assignments or other learning activities.	6
26. My instructor provides feedback that helps me learn.	6
27. I communicate with my instructor at least twice a week.	7
28. I ask my instructor questions about the class content that we are learning about in this class.	6
29. I ask my instructor questions about assignments to get clearer instructions.	6
30. I enjoy interacting with my instructor in this class.	6
31. My instructor responds to questions and comments from me quickly.	6

32. My instructor's communication is helpful in understanding this class.	6
33. The communication between the instructor and me is positive.	6
34. The communication between the instructor and me helps me learn.	6
35. Communicating with my instructor is an important part of my learning.	6
36. Communicating with my instructor is important for my success in this class.	6
37. My instructor is available to communicate with me.	6
Structure	
38. I have the ability to ask questions in this class.	6
39. I receive useful answers in this class.	5
40. I set my goals as a learner in this class.	6
41. I know when I have met my goal as a learner in this class.	6
42. The activities can change to meet my goals as a learner in this class.	5
43. The assignments can change to meet my goals as a learner in this class.	5
44. The class content can change to meet my goals as a learner in this class.	5
45. I can control what I learn in this class.	5
46. I can control how I learn in this class.	5
47. I can control the speed the speed that I learn in this class.	5
48. I can control where I learn in this class.	6
49. What I am learning in this class helps me understand the real world.	5
50. My instructor changes the types of lessons and assignments based upon my needs.	5
51. When I need extra help my instructor is able to change what I am learning.	6

52. When I need extra help my instructor is able to change my learning activities.	6
53. When I need extra help my instructor is able to change my assignments.	6
54. I can identify the requirements in this class.	5
55. I understand the requirements in this class.	6
56. I know what my goals as a learner are for this class.	6
57. My instructor has changed the class to fit my needs.	6
58. In this class, there are a wide variety of learning activities in this class.	6
59. My instructor understands me as an individual.	6
60. I use a variety of media (e.g. text, photos, video, and audio) in this class.	6
61. The digital portions of this class are easy to use.	6
62. The technology in this class is easy to understand.	6
63. I know how to use the technology for this class.	6
64. The digital portions of this class are organized.	6
65. The digital portions of this class are nice to look at.	6
66. The digital portions of this class help me meet my goals as a learner.	6
67. I use the same technologies in this class as in the real world.	5
68. I can decide how to use technology to learn.	5
69. The instructor provides a variety of digital resources and websites.	6
70. There are multiple ways to communicate with my instructor.	6
71. There are multiple ways to communicate with other students.	6
72. I have been trained on how to use the digital portions of this class.	6
73. My class' "face-to-face" facilities are organized.	6

74. My class' "face-to-face" facilities are nice to look at.	5
75. There is a space for me to get individual help "face-to-face" with an instructor.	6
76. I feel welcomed when I come to my class' "face-to-face" facilities.	6
77. I know how to use the "face-to-face" facilities.	6
78. The "face-to-face" facilities help me meet my goals as a learner.	6
79. I can decide how to use the "face-to-face" facilities to learn.	6
80. I have been trained on how to use the “face-to-face” facilities.	6
Learner Autonomy	
81. I learn more when I work alone.	6
82. I enjoy working with other students.	6
83. I learn more when I am working in groups.	6
84. I enjoy discovering things on my own.	6
85. I am responsible for meeting my learning goals in my class.	6
86. I am on my own when it comes to learning in my class.	6
87. I am on my own when it comes to completing assignments in my class.	6
88. I find additional resources outside of class.	6
89. I do not need to have an instructor to learn in my class.	6
90. I do not need to have an instructor to meet my goals as a learner in my class	6
91. Assignments can be completed without working with other students in my class.	6

92. I can learn what I need about an assignment without an instructor's help in my class.	6
93. I can learn what I need about an assignment without working with other students in my class.	6
94. I enjoy my class because I don't have to work with other students.	6
95. I enjoy my class because I don't have to work closely with my instructor.	6
96. I enjoy my class because I control the pace that I learn at.	6
97. I enjoy my class because I control the types of learning activities.	6
98. I am in control of what I am learning.	6
Transactional Distance	
99. I feel that I am close to my instructor.	6
100. I feel that I am close with other students in my class.	6
101. I feel that my class is a community.	6
102. I feel that my class is a good fit for me as a learner.	6
103. I feel that my instructor cares about me.	6
104. I feel that my instructor treats me as a person.	6
105. I feel that my instructor helps me through this class.	6
106. I feel that other students help me in this class.	5
107. I feel that other students in my class care about me.	**3**
108. I feel that my instructor and I have the same goals for my learning.	6
109. I feel that my instructor and I both understand the class content.	6
110. I feel that my instructor and I both understand the assignments.	6

111. I feel that my instructor and I both know my progress to reaching my goals as a learner.	6
112. I feel that my opinion matters to my instructor in this class.	6
113. I feel that my instructor cares about my opinions about this class.	6
114. I feel that other students share the same goals for learning.	6
115. I feel that being at a physical distance from my instructor rather than in a regular classroom does not affect my learning in this class.	6
116. I feel that being at a physical distance from other students rather than in a regular classroom does not affect my learning in this class.	**4**
117. I feel that I can meet my learning goals for this class.	6

Appendix G: Item Bank Correlation Factors

Item Bank Correlation Factors

Statement	Factors		
	1	2	3
1. There are multiple ways to communicate with my instructor.	**0.831**	0.292	0.164
2. My class' "face-to-face" facilities are organized.	**0.82**	0.294	-0.041
3. I know what my goals as a learner are for this class.	**0.814**	0.219	-0.268
4. I can decide how to use the "face-to-face" facilities to learn.	**0.811**	0.095	0.119
5. The digital portions of this class are nice to look at.	**0.81**	-0.315	0.056
6. The digital portions of this class help me meet my goals as a learner.	**0.799**	-0.116	-0.04
7. The technology in this class is easy to understand.	**0.797**	-0.146	0.34
8. I know how to use the technology for this class.	**0.793**	-0.208	0.205
9. I can decide how to use technology to learn.	**0.787**	-0.295	0.006
10. My instructor responds to questions and comments from me quickly.	**0.754**	0.391	0.34
11. I feel that my opinion matters to my instructor in this class.	**0.743**	-0.068	0.216
12. The digital portions of this class are easy to use.	**0.729**	-0.29	0.354

13. I am responsible for meeting my learning goals in my class.	**0.724**	-0.24	-0.03
14. There is a space for me to get individual help "face-to-face" with an instructor.	**0.703**	0.249	0.133
15. I feel that my instructor and I both know my progress to reaching my goals as a learner.	**0.694**	-0.161	0.186
16. My class' "face-to-face" facilities are nice to look at.	**0.691**	0.424	-0.067
17. I know when I have met my goal as a learner in this class.	**0.655**	0.053	0.237
18. I ask other students for help to understand class concepts.	**-0.648**	0.469	-0.096
19. I use the same technologies in this class as in the real world.	**0.647**	-0.023	0.086
20. I feel that my instructor cares about my opinions about this class.	**0.641**	-0.046	0.431
21. Assignments can be completed without working with other students in my class.	**0.628**	-0.307	-0.035
22. I can control how I learn in this class.	**0.628**	0.093	0.027
23. My instructor's communication is helpful in understanding this class.	**0.622**	0.434	-0.172
24. The communication between the instructor and me helps me learn.	**0.614**	0.297	0.282

25. I feel welcomed when I come to my class' "face-to-face" facilities.	**0.612**	0.471	-0.116
26. The communication between me and other students helps me learn.	**-0.61**	0.283	-0.143
27. I can identify the requirements in this class.	**0.598**	0.355	-0.281
28. I feel that I can meet my learning goals for this class.	**0.597**	-0.114	-0.382
29. The digital portions of this class are organized.	**0.58**	-0.331	-0.128
30. I receive useful answers in this class.	**0.571**	0.55	0.125
31. I have the ability to ask questions in this class.	**0.57**	0.412	0.509
32. I feel that my instructor and I both understand the assignments.	**0.564**	-0.153	0.207
33. I enjoy interacting with my instructor in this class.	**0.553**	0.074	0.527
34. The communication between the instructor and me is positive.	**0.544**	0.224	-0.047
35. My instructor understands me as an individual.	**0.539**	0.037	0.466
36. I can learn what I need about an assignment without working with other students in my class.	**0.482**	-0.436	-0.006
37. My instructor is available to communicate with me.	**0.466**	0.143	0.147
38. I feel that other students share the same goals for learning.	**0.465**	-0.114	-0.427
39. I enjoy discovering things on my own.	**0.464**	-0.119	-0.321
40. I communicate with my instructor through email, chat, SMS text, social media, or with other tools.	**0.446**	-0.364	-0.189

41. I am on my own when it comes to completing assignments in my class.	**0.423**	-0.331	-0.02
42. My instructor provides feedback that helps me learn.	**0.412**	-0.14	0.381
43. I ask my instructor for help to understand the instructions to activities.	-0.268	**0.823**	0.063
44. I ask my instructor questions about assignments to get clearer instructions.	-0.178	**0.786**	-0.09
45. I ask my instructor for help to understand class concepts.	-0.191	**0.766**	0.126
46. I ask my instructor questions about the class content that we are learning about in this class.	-0.309	**0.75**	-0.017
47. The class content can change to meet my goals as a learner in this class.	0.075	**0.732**	-0.235
48. Communicating with other students in this blended learning class is an important part of my learning.	-0.479	**0.702**	0.156
49. I communicate with my instructor at least twice a week.	-0.087	**0.691**	0.403
50. I communicate with other students in this class at least twice a week.	-0.204	**0.689**	0.297
51. The activities can change to meet my goals as a learner in this class.	-0.011	**0.679**	-0.158
52. I communicate with my instructor through blended learning class.	-0.08	**0.664**	0.249

53. I feel that I am close with other students in my class.	-0.259	**0.632**	0.145
54. I am in control of what I am learning.	0.019	**0.619**	-0.075
55. The assignments can change to meet my goals as a learner in this class.	0.115	**0.613**	-0.088
56. I feel that my class is a community.	-0.334	**0.61**	0.093
57. Communicating with other students is important for my success in	-0.49	**0.607**	0.135
58. I know how to use the "face-to-face" facilities.	0.486	**0.606**	-0.323
59. I ask other students for help to understand the instructions to activities.	-0.345	**0.59**	0.186
60. The "face-to-face" facilities help me meet my goals as a learner.	0.556	**0.574**	-0.146
61. I enjoy my class because I control the types of learning activities.	0.437	**0.572**	-0.118
62. My instructor has changed the class to fit my needs.	0.036	**0.571**	0.085
63. When I need extra help my instructor is able to change what I am learning.	0.439	**0.569**	-0.043
64. I ask other students for help with questions about assignments.	-0.291	**0.567**	0.103
65. I feel that my class is a good fit for me as a learner.	-0.004	**0.561**	-0.152
66. When I need extra help my instructor is able to change my learning activities.	0.531	**0.544**	-0.218

67. My instructor changes the types of lessons and assignments based upon my needs.	0.289	**0.543**	-0.008
68. I ask my instructor for help with questions about assignments or other learning activities.	-0.026	**0.537**	0.276
69. Communicating with other students is important for their success in this class.	-0.551	**0.523**	0.017
70. When I need extra help my instructor is able to change my assignments.	0.466	**0.51**	-0.054
71. I see and meet with other students "in-person" or "face-to-face" about this blended learning class.	-0.48	**0.488**	-0.077
72. The instructor provides a variety of digital resources and websites.	0.413	**0.487**	-0.291
73. I enjoy my class because I control the pace that I learn at.	0.37	**0.468**	-0.278
74. I set my goals as a learner in this class.	0.347	**0.463**	-0.269
75. Other students need my input to be successful in this class.	-0.356	**0.428**	0.225
76. I feel that my instructor cares about me.	0.231	-0.135	**0.823**
77. I feel that I am close to my instructor.	0.161	-0.045	**0.777**
78. I have been trained on how to use the "face-to-face" facilities.	0.255	0.019	**-0.763**
79. My instructor in this class listens to what I think.	0.474	0.091	**0.758**

80. I feel that being at a physical distance from my instructor rather than in a regular classroom does not affect my learning in this class.	0.237	0.017	**-0.755**
81. I do not need to have an instructor to meet my goals as a learner in my class	0.258	0.047	**-0.67**
82. I find additional resources outside of class.	0.357	-0.041	**0.665**
83. I understand the requirements in this class.	0.401	0.427	**-0.65**
84. I feel that my instructor treats me as a person.	0.157	-0.126	**0.615**
85. I communicate often with my instructor in my blended learning class.	0.41	-0.036	**0.613**
86. I feel that my instructor helps me through this class.	0.117	0.18	**0.611**
87. In this class, there are a wide variety of learning activities in this class.	0.165	0.474	**0.579**
88. I do not need to have an instructor to learn in my class.	0.32	-0.223	**-0.574**
89. I have been trained on how to use the digital portions of this class.	0.38	-0.401	**-0.573**
90. I can learn what I need about an assignment without an instructor's help in my class.	0.388	0.114	**-0.56**
91. I am on my own when it comes to learning in my class.	0.256	0.499	**0.549**
92. I communicate often with other students in my blended learning	-0.469	-0.018	**0.543**

93. I learn more when I work alone.	0.167	0.356	**-0.528**
94. I use a variety of media (e.g. text, photos, video, and audio) in this class.	0.207	0.186	**0.527**
95. I learn more when I am working in groups.	-0.2	0	**0.514**
96. I feel that my instructor and I both understand the class content.	0.389	-0.127	**0.505**
97. I enjoy my class because I don't have to work with other students.	0.318	0.169	**-0.493**
98. Other students available to communicate with me.	0.133	0.21	**0.473**
99. I feel that my instructor and I have the same goals for my learning.	0.393	-0.174	**0.46**
100. I enjoy my class because I don't have to work closely with my instructor.	0.255	0.211	**-0.449**
101. I enjoy working with other students.	-0.265	0.185	**0.435**
102. Communicating with my instructor is an important part of my learning.	0.289	0.206	**0.412**
103. I enjoy interacting with the other students in this class.	-0.024	-0.001	0.212
104. My instructor's communication is helpful in this class.	0.396	0.261	0.291
105. The communication between me and other students is positive.	-0.302	0.307	0.095

106. Other students respond to questions and comments from me quickly.	0.059	0.176	-0.139
107. Other students provide feedback that helps me learn.	-0.409	0.17	0.396
108. I can control the speed the speed that I learn in this class.	-0.033	0.213	-0.058
109. What I am learning in this class helps me understand the real world.	0.187	0.039	0.233
110. I can control where I learn in this class.	0.033	0.048	0.235
111. There are multiple ways to communicate with other students.	0.266	0.339	-0.396

Appendix I: Institutional Review Board Approval

DATE:	August 22, 2016
TO:	Dennis Lane
FROM:	Concordia University - Portland IRB (CU IRB)
PROJECT TITLE:	[931267-1] The development of a scale to measure transactional distance in secondary blended learning environments.
REFERENCE #:	EDD-20160717-Bullis-Lane
SUBMISSION TYPE:	New Project
ACTION:	APPROVED
APPROVAL DATE:	August 11, 2016
EXPIRATION DATE:	August 11, 2017
REVIEW TYPE:	Expedited Review

Thank you for your submission of New Project materials for this project. The Concordia University - Portland IRB (CU IRB) has APPROVED your submission. This approval is based on an appropriate risk/ benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

There is a condition of approval. Your project includes research that will be conducted within an institution that is not Concordia University. As such, you need to have that institution's approval to conduct research. You are responsible for contacting and following the procedures and policies of Concordia University and any other institution where you conduct research. You cannot begin recruitment or collection of data until you receive approval from that institution.

This submission has received Expedited Review based on the applicable federal regulations.

Attached is a stamped copy of the approved consent form. You must use this stamped consent form.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by a signed consent form. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require that each participant receives a copy of the consent document.

Please note that any revision to previously approved materials must be approved by this committee prior to initiation. The form needed to request a revision is called a Modification Request Form, which is available at www.cu-portland.edu/IRB/Forms.

All UNANTICIPATED PROBLEMS involving risks to subjects or others (UPIRSOs) and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. Please email the CU IRB Director directly, at obranch@cu-portland.edu, if you have an unanticipated problem or other such urgent question or report.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

This project has been determined to be a Minimal Risk project. Based on the risks, this project requires continuing review by this committee on an annual basis. Please use the appropriate forms for this procedure. Your documentation for continuing review must be received with sufficient time for review and continued approval before the expiration date of August 11, 2017.

You must submit a close-out report at the expiration of your project or upon completion of your project. The Close-out Report Form is available at www.cu-portland.edu/IRB/Forms.

Please note that all research records must be retained for a minimum of three years after the completion of the project.

If you have any questions, please contact Dr. OraLee Branch at 503-493-6390 or irb@cu-portland.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Concordia University - Portland IRB (CU IRB)'s records. August 22, 2016

CONCORDIA
UNIVERSITY
-PORTLAND, OREGON-

DATE:	January 20, 2017
TO:	Dennis Lane
FROM:	Concordia University - Portland IRB (CU IRB)
PROJECT TITLE:	[931267-2] The development of a scale to measure transactional distance in secondary blended learning environments.
REFERENCE #:	EDD-20160717-Bullis-Lane
SUBMISSION TYPE:	Amendment/Modification
ACTION:	APPROVED
APPROVAL DATE:	January 20, 2017
EXPIRATION DATE:	August 11, 2017
REVIEW TYPE:	Administrative Review

Thank you for your submission of Amendment/Modification materials for this project. The Concordia University - Portland IRB (CU IRB) has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission. Attached is an approved copy of the brochure that leads the participants to take the on-line survey, where there will be inferred consent obtained in the electronic format.

This submission has received Administrative Review based on the applicable federal regulations.

Please remember that informed consent (even when no written signed documented consent is required) is a process beginning with a description of the project and insurance of participant understanding. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require that each participant receives a copy of the brochure and implied consent statement.

Please note that any revision to previously approved materials must be approved by this committee prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others (UPIRSOs) and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. Please use the appropriate reporting forms for this procedure.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

This project has been determined to be a Minimal Risk project. Based on the risks, this project requires continuing review by this committee on an annual basis. Please use the appropriate forms for this

procedure. Your documentation for continuing review must be received with sufficient time for review and continued approval before the expiration date of August 11, 2017.

Please note that all research records must be retained for a minimum of three years after the completion of the project.

If you have any questions, please contact Dr. OraLee Branch at 503-493-6390 or irb@cu-portland.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Concordia University - Portland IRB (CU IRB)'s records. January 20, 2017