THE EFFECT OF MICROBLOGGING ON MIDDLE SCHOOL STUDENT ENGAGEMENT AND CRITICAL THINKING

by

Sondra Shively Singleton

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

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ABSTRACT

The purpose of this study was to examine the effect of microblogging as an authentic real-world technology in a middle school classroom in response to the 2010 Department of Education's call to provide students with more relevant digital experiences. The non-equivalent control group, pretest-posttest design study was used to determine if microblogging used in a writing activity affected middle school students' engagement and critical thinking. This study was important as it addressed the heretofore understudied middle school sector. This research used a convenience sample of 119 sixth-grade and seventh-grade language arts students in a suburban northwest Florida public middle school. Students completed pretests and posttests consisting of the National Center for School Engagement (NCSE) Student Survey and the Cornell Critical Thinking Test (CCTT). Students in the experimental group used microblogging to complete an in-class writing activity, while the control group completed a traditional in-class writing activity without microblogging. The researcher used a mixed analysis of variance (ANOVA) and found statistically significant differences in engagement and critical thinking. It is recommended that additional studies be conducted using microblogging among middle school students.

Keywords: microblogging, technology, communication, social media, engagement, critical thinking, middle school, tweeting.

Dedication

This manuscript is dedicated to my sister, my greatest prayer warrior, and to my son, my greatest encourager. My heartfelt thanks to you both for the wind beneath my wings.

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I wish to express my sincerest appreciation to Dr. Joanne Gilbreath for her guidance and unflappable mastery of technology and also to Dr. Diane Kelley for her selfless commitment to my endeavor.

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List of Abbreviations

Children's Online Protection Privacy Act (COPPA)

Claim, Support, and Evidence (CSE)

Colorado Foundation for Families and Children (CFFC

Cornell Critical Thinking Test (CCTT)

English Language Arts (LA)

Florida State Assessment (FSA)

Institute of Education Services (IES)

Microblogging (MB)

Microblogging in education (MIE)

National Center for School Engagement (NCSE)

National Education Technology Plan (NETP)

No Child Left Behind (NCLB)

School Performance Plan (SPP)

Social media (SM)

Texas Education Agency (TEA)

United States Department of Education (USDOE)

Word of Mouth (WOM)

CHAPTER ONE: INTRODUCTION

Student engagement can be broadly defined as the amount of time and effort a student invests in an educational experience (Astin, 1984; Kuh, 2009). As such, the topic of student engagement in the classroom is important for its direct link to improved academic achievement and social and cognitive skill development (Finn & Rock, 1997; Kuh, 2009; Marks, 2000). Welch and White (2012) cited enhanced graduation completion and higher education pursuit as a result of increased student engagement. In turn, when students are engaged, the probability for positive long-term socio-economic status is increased. This significance swells in importance when viewed from a contemporary, macro context of global economic and technological competiveness (Friedman, 2007).

Student engagement attracted researchers' and administrators' attention alike, following a comprehensive student self-report survey which indicated over 25% of students were *not* engaged in secondary grades (Furlong & Christenson, 2008). For middle school students, disengagement is problematic due to this generation's digital learning characteristics (Thompson, 2013). As the first generation to be immersed in technology since birth (Palfrey & Gasser, 2012), middle school students may be considered *technologically* engaged, yet considered *disengaged* because the technology experiences in their personal lives are often external to their classroom experiences. Engagement fails to permeate the classroom because technological activities are often absent from the classroom environment (Duncan, 2010) or lack relevance. A disjuncture emerges between authentic, technology-driven experiences that engage a student in the student's personal life and the lack of such activities experienced in the classroom (Spires, Lee, & Turner, 2008).

Several theories illuminate this area. The social constructivism learning theory (Vygotsky, 1978) forms the theoretical framework of this proposed study and posits that learning occurs when students are actively engaged in authentic activities or experiences in a social, collaborative setting. Reshaped by globalization and technology (Steinberg & McCray, 2012), learning requires that engagement include authentic, real-world, classroom experiences that teach "ways of knowing that are inherent in innovative professional life" (Spires et al., 2008, p. 497).

As such, there exists a need to examine authentic, technologically-innovative, and collaborative activities that replicate global reality in order to engage students within traditional brick-and-mortar institutions. Specifically, researchers need to examine the effects of these technological activities on student engagement within the middle school population. The degree to which students engage in authentic technology activities within the classroom, reflective of the real-world, is cognitively beneficial. Engaging students through technology in a domain of learning and knowledge specific to the digital age can transfer to higher order critical thinking (Carle, Jaffe, & Miller, 2008).

Critical thinking is the act of synthesizing, analyzing, and evaluating information (Jones, 2012). In application, critical thinking can be thought of as the "reasonable reflective thinking focused on deciding what to believe or do" (Ennis, 1993). The importance of developing these critical thinking skills is intertwined with the current global marketplace, which demands fluid, rapid, and rigorous information analysis while collaboratively solving complex problems with globally diverse groups. The rapid change in pace in how work is accomplished in today's organizations was cited as the leading reason critical thinking has become crucial (American Management Association, 2010). Organizations fully disclose that students, as future job

applicants, can expect evaluation in the area of critical thinking during the hiring process and future performance appraisals.

The theory underpinning critical thinking resides in Siemens' (2006) theory of connectivism. Connectivism proposes that learning now occurs as organizational learning, through collaborative digital networks, communities of practice, and critical thinking knowledge acquired through work-related tasks supplemented by technology. In other words, critical thinking was heretofore conceptualized as mere personal formal logic. With the emphasis on collaboration and technology, however, critical thinking has taken on a dimension triggered by increased importance and use of motivation to engage in thoughtful thinking and its use at opportune times (Ku, 2009).

Traditional educational approaches that either have not integrated social constructivist strategies in the classroom or failed to incorporate cognitive, digital practices risk being ineffective (Galagan, 2010). Educators are increasingly interested in developing and using relevant, digital tools that ensure inquiry, social interaction, and collaboration within the classroom (Powell & Kalina, 2009). Microblogging, as defined by Merriam-Webster (2016), is "blogging done with severe space or size constraints typically by posting frequent brief messages about personal activities." An examination of the use of microblogging is of educational importance, as it represents an authentic learning activity with social, collaborative experience for today's middle school population. This study investigated whether microblogging in education (MIE) among middle school students had any effect on engagement and critical thinking. This study is a crucial component of determining if the next generation of entrants into the global market is being equipped with the necessary skills. This study holds practical significance for educators' ability to identify and utilize the most effective type of digital

resource in financially-challenged environments (Incantalupo, Treagust, & Koul, 2014). This study also serves to guide the integration of effective technology into future middle school educational practices.

Background

It can be said that education as a formal institution has long practiced traditional learning constructs in which students acquire knowledge through instructor-led methodology. Although heavily criticized, the No Child Left Behind Act (NCLB) of 2001 ushered in a new movement focusing on evidence-based education. The subsequent establishment of the Institute of Education Services (IES) by the U.S. Department of Education (USDOE) in 2002 gave impetus to a call for scientifically-based research designed to improve student learning outcomes. This acknowledgement that traditional teaching methodologies were not conducive to evidence-based practices highlighted a renewed commitment to improving education.

Vygotsky (1978) provided a basis for research-based educational practices with the social constructivist theory. His theory cited a social, interactive environment with one's peers engaged in authentic activities as essential elements to learning (Vygotsky, 1978).
The strength of the social constructivism theory lies in the engagement in socially-interactive experiences, which later assists the student in solving similar but more complex problems (Vygotsky, 1978). Vygotsky's (1978) theory placed value on the use of tools in the culture, which allowed a breadth of adaptation and problem-solving. The teacher, as facilitator, was viewed as the conduit for the tools of the culture.

The advent of Web-based technology, however, virtually replaced the teacher as the culture's conduit. Technology, defined as any tangible form of knowledge applied in order to enhance life (Carr, 2011), exponentially transformed the educational paradigm of the constructs

of information, knowledge, learning, and instruction (Greenhow, Robelia, & Hughes, 2009). Information, from technology, became available for nearly three billion people (Miniwatts, 2013), making this event "the most rapid period of technological transformation ever, at least when it comes to information" (Palfrey & Gasser, 2008, p. 3). This wholesale technological availability, occurring just after the second millennium, means that middle school students have experienced digital activities from birth. As such, their construct of real-world digital experiences has been informed within a technologically-fluent context but largely external to the classroom (Greenhow, 2011). For students, technology and its application occupy different contextual spaces than those facilitated by traditional classroom practices. From a pedagogical and learning perspective, a complex challenge exists in providing authentic, real-world, relevant learning experiences using technology within brick-and-mortar institutions, specifically with the intention of engaging students.

For the middle school student informed by technology from birth, the medium of technology has created a new social space or setting. It allows individuals to transcend distance and time to meet, interact, and share with others outside their immediate proximal zone. Social relationships through social media are made possible with any individual, anytime, anywhere by simply connecting. Meyerowitz (1985) studied electronic (social) media's new effect and concluded that this medium has "eliminated walls between social situations," (p. 52) accelerating a rapid change in the ease of social media relationships.

Such social relationship dynamics, achieved through collaborative technology, are often the norm of daily, digital experiences for adolescents (Speak Up National Research Project, 2010). For the middle school population, this poses a different technological schema and social setting for learning. A new theoretical framework for understanding learning within this digital,

virtual environment was introduced by Siemens (2006). Siemens' connectivism theory ascribes that learning occurs when the "learner connects to and feeds information into a learning community" (as cited in Kop & Hill, 2008, p. 4).

The learning community, represented by ubiquitous social relationships made possible through virtual technology, expands digital information and, subsequently, knowledge. The rate of digital information now available in this new virtual social environment continues to expand at a rate referred to as the 'half-life' of information (Siemens, 2006). In the digital environment an individual may no longer be able to individually store, absorb, or learn this vast amount of knowledge internally. Therefore, it could be said that learning morphs into an external process of discovering where to employ the mechanism and tools of technology to locate information.

Such a new domain of learning conceptually reflects a theory specific to the digital age known as the information foraging theory. The information foraging theory (Pirolli & Card, 1999) posits that, in the exponentially-expanding information environment, digital learners will act like foragers collecting, synthesizing, analyzing, and navigating from various sources in order to achieve and evaluate a solution. This foraging concept replicates those cognitive, analytical, evaluation-intensive skills deemed necessary for technology-fluent adolescents to be competitive within the global arena (Friedman, 2007).

Considering the aforementioned characteristics of social constructivism (Vygotsky, 1978), connectivism (Siemens, 2006), and informational foraging theories (Pirolli & Card, 1999; Friedman, 2007), activities employing technology support more of these elements than do traditional activities. This implies that collaborative, contemporary technology-infused activities using microblogging, when compared to traditional activities, may result in more effective

student engagement. Additionally, the information foraging theory (1999) was be used to inform the dependent variable of critical thinking, particularly when using microblogging technology.

Attempts to increase student engagement and critical thinking by replicating real-world experiences of social, collaborative technology initially began with the use of social media tools such as Facebook and Myspace. Although social media began outside of education, academia imported social media into the classroom and found the learning principles embedded in Vygotsky's (1978) social constructivist theory were automatically present (Kelm, 2011). In 2011, a new social media tool, Twitter, received international attention during its interactive use during the Egyptian "Arab Spring" revolution. Twitter, a relatively-new (2006) and popular microblogging platform, allows individuals to exchange rapid, frequent, but short, text-compressed communications. Unlike instant-messaging and texting, Twitter's 140-character restriction has the potential to force users to thoughtfully, cognitively articulate their message in order to accommodate the text limitation (Kassens, 2013). Educators viewed this as a pedagogical opportunity, which provided a framework for critical thinking since users were compelled to synthesize and evaluate what information was essential to be shared (Guardia, Fernandez, & Leiva, 2013; Welch & White, 2012). Microblogging (e.g., Twitter) began to be embraced by higher education in differing contexts. Junco, Heiberger, and Locken (2011) investigated microblogging's effect upon university students' grade point average and engagement. Their results indicated significantly higher grade point averages for the experimental Twitter user group. Andrade, Castro, and Ferreira (2012) studied microblogging's effect via integration with a PowerPoint presentation upon large university lecture classes. The quantitative results indicated a high level of positive pedagogical potential.

Cetintas, Si, Aagard, Bowen, and Cordova-Sanchez (2011) examined microblogging's use in higher education classrooms to analyze questions (via Twitter) that would be judged relevant or significant to be answered by the instructor. Junco, Elvasky, and Heiberger (2012) investigated Twitter's sporadic or incidental effect on student engagement in a large lecture-styled undergraduate educational communications class, but found the results inconclusive of a correlation. Hirsh's community college study (2012) also focused on Twitter's effect on student engagement and academic performance. Although the study revealed no statistically significant difference in academic performance, there was an increase in student engagement.

In a rare study of microblogging in secondary education, Van Vooren and Bess (2013) determined Twitter had a significant effect upon eight-grade science students' academic performance as measured by a test based on California state standards. As California state standards (California Department of Education, 2008) measure student ability to apply, distinguish (analyze), construct (synthesize), and evaluate, such an increase in academic performance by using microblogging (Twitter) supported a possible effect on critical thinking. The significance of this study was not merely that it examined the effect of microblogging on critical thinking, but that it also involved an under-examined adolescent population. Aside from Van Vooren and Bess (2013), few empirical studies have been provided regarding the effect of collaborative microblogging on critical thinking, specifically in the area of adolescence. Thus, this study sought to satisfy this gap and add to the body of literature.

The lack of student engagement and critical thinking remain of educational concern with far reaching economic implications (Friedman, 2007). Since microblogging is a technology tool used by the digitally-connected adolescent generation (Piper-Jaffray, 2014), there is a growing need to address microblogging's use on engagement and critical thinking. A recent survey

(Madden et al., 2013) noted that the use of microblogging among adolescents has increased. Twenty-four percent of this age group uses the microblogging platform Twitter, up from only 16% in 2011 (Madden et al., 2013). This study of microblogging and the effect upon student engagement and critical thinking would augment the research guiding integration of suitable technological applications (Gao, Luo, & Zhang, 2012) in middle school classrooms.

Because of the growing relevance of integrating digital technology into classroom activities to prepare students for globalized workforce skills (Spires et al., 2008), it is important to examine the differences between authentic 21st century activities using microblogging and traditional activities. This effort may assist practitioners and educators to better understand a technology (Twitter) that "crystallizes thought, focuses attention, and makes connections" (National Education Association, n.d.).

Problem Statement

A problem exists in public education because classroom practices fail to mirror the digital activities that students experience outside school in the real-world environment (Speak Up, 2010; USDOE, 2010). Despite massive amounts of funds dedicated to educational technology, a digital disconnect persists between authentic, in-school activities and real-world experiences of global significance (Greenhow, 2011; Shapley, Sheehan, Maloney, & Caranikas-Walker, 2011; Spires et al., 2008). The problem of failing to engage students in relevant experiences places them at a disadvantage (Finn & Zimmer, 2012; Friedman, 2007; Furlong & Christenson, 2008; Greenhow et al., 2009). Traditional brick-and-mortar classroom activities that do not engage students in authentic, real-world technology experiences fail to empower students to develop globally-competitive skills (Duncan, 2010; Shapley et al., 2011; USDOE, 2010).

Although studies (Chen, 2011; Gao et al., 2012) have shown associations between technology use in the classroom and student engagement, the study of the intervention of a specific technology known as microblogging, or Twitter, has been examined predominantly at the higher education level (Junco et al., 2011; Welch & White, 2012; Young, 2010). These studies have varied in terms of microblogging's learning activities and contexts (Gao et al., 2012) with few studies conducted at the middle school level. Empirical evidence of the use of microblogging in other settings, such as K-12 grades, has been insufficient (Gao et al., 2012), as evidenced by only one study with the correlating microblogging and enhanced student performance among eighth-grade students (Van Vooren & Bess, 2010). Therefore, this study addressed a specific gap in microblogging in education (MIE) use among middle school students. It is this technology-infused age group which must be engaged academically in order to develop essential skills, such as critical thinking, in preparation for future employment (Ferriter & Garry, 2010; Friedman, 2007).

The theory of social constructivism (Vygotsky, 1978), connectivism theory, and foraging theory form the framework of this study. Vygotsky's (1978) social constructivism theory proposes that students learn best when interacting and collaborating within their social groups. Microblogging provides these elements of social interaction and collaboration while providing an authentic, technology-rich activity familiar to digital users. Therefore, the applied theory would suggest that microblogging, as web-based learning technology, increases student engagement (Ebner, Lienhardt, Rohs, & Meyer, 2010).

This study has practical relevance and merit, due to student desire to leverage technology (Speak Up, 2010) in which they possess fluency (Friedrich, Peterson, & Koster, 2011). The use of microblogging in the classroom would be expected to promote middle school student

engagement and academic achievement, and empower middle school students for future competitive employment (Speak Up, 2010).

Thus, the problem, which is clearly supported by current literature, is the failure to replicate within the classroom the authentic digital experiences of the real world.

Purpose Statement

The purpose of this quasi-experimental, pretest-posttest, nonequivalent control group study is to examine the effect of microblogging on middle school students' engagement and critical thinking in a suburban public school district in northwest Florida. The independent variable is the type of writing in which the students will engage. The dependent variables are engagement and critical thinking. As engagement represents the investment of time and effort devoted to an educational task, its study implications for adolescents cannot be underestimated. Likewise, the possibility to affect critical thinking, or a student's ability to synthesize, analyze, and evaluate information, through digital experiences such as microblogging could enhance curriculums. Thus, as microblogging use continues to rise among adolescents (Smith & Brenner, 2012), this study contributes to the limited empirical evidence concerning microblogging's impact in educational practices for middle school students. Understanding microblogging's potential will inform and guide educators in future educational activities.

Significance of the Study

The continuing need to examine relevant and evolving classroom pedagogies involving technology that engages students has been widely accepted (Greenhow et al., 2009; Marks, 2000). Likewise, urgency exists to research engaging technology that also promotes critical thinking skills essential for student success in a contemporary, globally-competitive world (Friedman, 2007; Marin & Halpern, 2011). Moreover, investigating the effect of microblogging

within the specific area of middle school has particularly relevance. For middle school adolescents, a life of real-world experiences using authentic technology embedded in unlimited social relationships, made possible through technology's connectedness to forage within a boundless supply of collaborative knowledge, is uniquely different than for any other group or generation. Unlike the preceding digital generation, referred to as the Millennials, or those born between 1980 and 2000, middle school students now are the "first generation that has never known any reality other than that defined and enabled by the Internet, mobile devices, and social networking" (Friedrich et al., 2011, p. 3). It is the intrinsic connectedness of this generation that defines them, so much that they are referred to as the *connected generation* (Friedrich et al., 2011). To this generation, staying connected is simply what they do. It is the connected lifestyle that "this need or desire to always be connected [that] distinguishes this generation from earlier ones" (Steinberg & McCray, 2012, p. 9). The results of this study aid in filling the current gap in the literature by testing the theories of social constructivism, connectivism, and information foraging specifically in a technology-infused generation requiring engagement, social collaboration, and critical thinking skills.

The significance of this study for educators is the classroom pedagogical application of technology with which middle school students feel comfortable and connected. Educators acknowledge that the connectedness of this generation is intense, as "most of them [students] live and die on their computers and cell phones" (Dessoff, 2010, p. 42). Microblogging can be a constructive in-classroom tool, allowing students to stay connected, avoiding boredom and lack of concentration (Autry & Berge, 2011). Microblogging can provide teachers with an unencumbered, collaborative platform for activities in an ever-fluid technological landscape in which they often feel "forced to adapt their teaching approaches without a clear roadmap" (Kop

& Hill, 2008, p. 2). The ease of microblogging may assist educators who are reluctant to use student-preferred technology activities, particularly of the social networking genre. Other educators, predisposed to integrating technology into the classroom, may find microblogging meets students on their connected-turf (Hirsch, 2012; Junco et al., 2011). Regardless, microblogging can provide a new approach to learning with social-media characteristics which include strong engagement, participation, collaborative learning, and critical thinking (Gao et al., 2012).

Research Questions

The following research questions and hypotheses guide this study:

RQ1: Question 1: Is there a statistically significant difference in student engagement as measured by the National Center for Student Engagement (NCSE) Student Survey instrument among middle school students when participating in a microblogging activity as compared to students who participate in a traditional writing activity?

RQ2:Research Question 2: Is there a statistically significant difference in student critical thinking as measured by the Cornell Critical Thinking Level X instrument among middle school students when participating in a microblogging activity as compared to students who participate in a traditional writing activity?

Null Hypotheses

The null hypotheses for this study were:

Ho_1: There is no statistically significant difference in student engagement as measured by the National Center for Student Engagement (NCSE) Student Survey instrument among middle school students when participating in a microblogging activity as compared to students who participate in a traditional writing activity.

Ho_2: There is no statistically significant difference in critical thinking as measured by the Cornell Critical Thinking Level X instrument among middle school students when participating in a microblogging activity as compared to students who participate in a traditional writing activity.

The independent variable in this study is the type of classroom writing activity. The two types of activity are microblogging and traditional writing. For the purpose of this study, Microblogging is defined as a Web 2.0 short messaging service (SMS) text exchange of 140 characters in length, referred to as a Tweet (Van Vooren & Bess, 2013). Traditional writing is any form of writing that is not restricted in sentence length and may utilize conventional paper-and-pencil or electronic word processors.

Variables

This study includes two dependent variables. The first dependent variable, engagement, is defined as a multi-dimensional construct that includes behavioral, emotional, and cognitive time and effort that a student invests in an educational experience (Astin, 1984; Fredericks, Blumenfeld, & Paris, 2004; Kuh, 2009). The National Center for School Engagement (NCSE, 2006) Student Survey instrument will be used to measure student engagement. Developed by The National Center for School Engagement (NCSE), the instrument's survey items were based on Fredricks, et al., (2004) interrelated engagement types of behavioral, cognitive, and emotional. The NCSE questions were piloted and field tested at school sites in Houston, Jacksonville, and Seattle, for reliability and validity (Abrami, Cholmsky, & Gordon, 2001; National Center for School Engagement, 2006). The full National Center for School Engagement Study Survey instrument is located in Appendix I.

The second dependent variable, critical thinking, is defined as the act of synthesizing, analyzing, and evaluating information (Jones, 2012) involving "reasonable reflective thinking focused on deciding what to believe or do" (Ennis, 1993, p. 180). The Cornell Critical Thinking Test (Level X) will be used to measure students' critical thinking. The CCTT (Level X) consists of seventy one items that employ a story for which students must compare, evaluate and analyze the questions' credibility. The fifth edition Level X instrument (2005) was designed for use with advanced-elementary students and middle school students. Several studies on the CCTT (Level X) internal consistence reliability have been reported with adequate results along with the developers' admission of reliance on mainly content validity data for demonstrating test validity (Hughes, 2011; Malcom, n.d.). Sample questions from the Cornell Critical Thinking Test (Level X) instrument are located in Appendix K.

Definitions

The *Cornell Critical Thinking Test* is a test instrument developed by Ennis (1993) to assess general critical thinking ability including induction, deduction, evaluation, observation, credibility of statements, assumptions identification, and meaning.

Critical thinking is the act of synthesizing, analyzing, and evaluating information (Jones, 2012) and the "reasonable reflective thinking focused on deciding what to believe or do" (Ennis, 1993, p. 180).

Engagement is a multi-dimensional construct that includes behavioral, emotional, and cognitive time and effort that a student invests in an educational experience (Astin, 1984; Kuh, 2009).

Microblogging, also known as 'tweeting,' is a Web 2.0 short messaging service (SMS) text exchange of maximum 140 characters in length, slightly longer than the average sentence length in traditional writing (Van Vooren & Bess, 2013).

National Center for School Engagement Student Survey is an instrument to measure student engagement of advanced-elementary to middle school students to include interrelated behavioral, cognitive, and emotional engagement elements (NCSE, 2006).

Traditional writing activity is any style of writing activity that is not limited in length to 140 characters and may use conventional mediums of paper-and-pencil or electronic word processing methods.

Tweet is the action of microblogging by posting a text exchange of 140 characters or less on a social media site.

CHAPTER TWO: REVIEW OF THE LITERATURE

The impetus for this study originated from observing microblogging's power among young users during the 2010 Arab Spring political protests. Recognizing microblogging's potential to impact today's adolescents, which are tomorrow's global workers, the search began to identify literature specific to microblogging and middle school students. Chapter two begins with the relevance for such a study by providing an introduction and brief history of the evolution of young users of social media. This is followed by the theoretical framework which integrates three theories, of which two are specifically relevant to 21st century technology usage. A review of the empirical studies on microblogging, student engagement, and critical thinking follows. Finally, a summary provides an overview of the literature and its application to this study.

Introduction

Near the year 2000, educational paradigms shifted to reflect collaborative and global competition. The new millennium's globalization, as a result of technology's ubiquitous presence, forecast future jobs would go to individuals educated in critical thinking and collaborative skills (Speak Up Project, 2010). Such cognitive, complex skills represent premium, high-demand value as globalization ushered in "value creation so complex that no single individual or department could master this alone" (Friedman, 2007, p. 457). The Partnership for 21st Century Skills stresses that new *in-classroom* concepts and experiences must be initiated to "bridge the gap between how students live and how they learn" (Spires et al., 2008, p. 498), since students' technology activities *outside* the classroom mirror those of current technology in the workforce.

The composite of today's student and tomorrow's job entrant has changed with technology (American Management Association, 2010). With the advent of the second

millennium, a generation of learners has emerged as the first to be totally immersed in technology. Referred to as the Generation Connected, 'Generation C,' or the *connected generation* (Friedrich et al., 2011), these digital learners born around the year 2000 represent a new generation that has never experienced a time or event without technology. In the truest sense of the word, technology for them represents tools and methods that assist individuals to perform tasks with the generic end state of making life more functional, efficient, and easier (Spielvogel, 2005).

Technology's unlimited 24-hour presence and accessibility ensure massive consumption by this age group. A Kaiser Family Foundation (2010) report found adolescents' daily consumption of technology (cell phones, computers, iPods, MP3s, video games, and TV) was seven hours and 38 minutes, with technology media use increasing substantially for the 11-14 year range. Adolescents' approach to technology, therefore, is one of ownership, comfort, and adaptation to personal environment to connect, create, and share. This proactive technology-oriented mindset intuitively assumes control of technology, such that the learner controls the technology, not the reverse. For digital learners, technology is "something much bigger…that affects us individually and socially'' (Dyer, 2009, p. 2). Adolescent learners are characterized by a need to be connected to technology even if only in the peripheral context. A Pew Research Center (Lenhart, Ling, Campbell, & Purcell, 2010) study states that 83% of this age group reported having their cell phones nearby while sleeping. "This need or desire to always be connected distinguishes this generation from earlier ones" (Steinberg & McCray, 2012, p. 9); thus, the moniker, 'Generation Connected.'

The educational movement, to integrate effective technology skills into the classroom to empower a tech-savvy, connected generation to be globally competitive is problematic. The

objective to incorporate technology is generic, but a specific gap exists as classroom experiences fail to engage digital learners in realistic, collaborative, authentic, technology-driven activities typical of those used by industry outside the classroom (Speak Up Project, 2010).

Researchers are in agreement that the required skills are the abilities to effectively "identify, retrieve, evaluate, and use information for a variety of purposes" (U.S. Department of Education, 2010, p. 13). Such cognitive abilities equate to critical thinking skills of "problem solving, creativity, analysis, and synthesis" (Jones, 2012, p. 66), which prepare this generation for future employment.

However, a problem exists in that students must be engaged before critical thinking skills can be learned. Furlong and Christenson (2008) state that over one-quarter of students failed to be engaged while in the classroom. Because of engagement's strong corollary to positive learning (Fredericks et al., 2004), failure to engage students can negatively affect their ability to learn requisite critical thinking skills. Since collaborative, problem-solving skills are valued in the global workforce, students may find themselves at a distinct disadvantage and unable to compete. Specifically, this study focused on the connected, digital generation due to their unique position with technology and future placement in tomorrow's global marketplace.

This study examined the gap of integrating authentic, real-world activities in the middle school classrooms through the use of microblogging and its effect upon engagement and critical thinking. Since the study examined engagement and critical thinking outcomes in peer learning environments, the theoretical framework encompassed the social constructivist theory (Vygotsky, 1978). As the outcome of engagement was associated with the use of digital technology, the theory of connectivism (Siemens, 2006) was utilized to link technology use to student engagement. Finally, Pirolli and Card's (1999) theory of information foraging

underpinned the critical thinking skills associated with information literacy in today's highly competitive world of employment. The interrelated theories formed the theoretical framework to support examination of microblogging's use and potential application for middle school students to become globally competitive.

Theoretical Framework

Social Constructivist theory

Within brick-and-mortar educational institutions, learning can occur independently or through shared experiences. The social constructivist theory (Vygotsky, 1978), that underpins this study's theoretical framework, proposes that learning occurs more effectively as a shared process "in a system of social behavior, directed towards a definite purpose" (p. 31). The basic tenets of social constructivism provide the necessary constructs for redesigning and reforming current classroom activities, experiences, and paradigms (USDOE, 2010).

Social constructivism provides a cognitive bridge for scaffolding to higher levels of thinking which involve abstract concepts necessary to solve more complex problems. The instruction to achieve higher executive functioning and cognition requires active student participation to access knowledge and information which is contextually focused on "ways of knowing that are inherent in innovative professional life" (Spires et al., 2008, p. 497). Learning occurs by acquiring knowledge and constructing meaning within social contexts in an active, collaborative fashion, rather than in individual isolation. Learning that promotes problem-solving skills is a fundamental requirement for students in order to be well prepared to "participate, thrive and compete in the 21st century economy" (Speak Up, 2010, p. 1). Technology interventions that are socially-oriented and innately collaborative by nature may develop problem skills such as analysis, evaluation, and synthesis.

Social constructivism proffers that higher psychological processes, specifically critical thinking, occur more effectively in social interactions through communication with peers and exist as an intrinsic part of learning (Powell & Kalina, 2009). American educational policy is intent on reform, sufficient to enable students to successfully meet the global collaborative challenge. In the National Technology Education Plan (NETP), the U.S. Department of Education (2010) proposes a model of learning based upon application of social constructivism within classroom settings. Supported with technology, learning occurs by providing engaging social environments and constructivist tools (technology), a Vygotsky (1978) hallmark. Any tool or strategy associated with technology and constructivist principles may lead to increased engagement and critical thinking skills.

Researchers have shown constructivist interaction between students and a technology-tooled environment to be related to an increase in learning. Roschelle, Pea, Hoadley, Gordin, and Means (2000) found learning most effective when four constructivist-related elements were present: "active engagement, participation in groups, frequent interaction and feedback, and connections to real world contexts" (p. 80).

Iteration of the general characteristics of the social constructivism classroom is a central theme in the literature (Duncan, 2010; Ebner & Mauer, 2009; Thompson, 2013; Vygotsky, 1978). Since social constructivist learning is viewed as a social and collaborative activity, it would be expected that the social and collaborative activity of microblogging would enhance learning. Another Vygotskian (1978) principle emphasizes school experiences that should mirror real-world experiences (USDOE, 2010) and therefore, microblogging is supported as a suitable constructivist tool.

Thus, a social constructivist environment utilizing the technology of microblogging may lead to effective learning, enabling students to be highly competitive and therefore more employable in a global economy valuing higher cognitive skills associated with effective learning.

Connectivism Theory

For Generation Connected learners, the research community sees information as ubiquitous (Friedrich et al., 2011; Greenhow, 2011). For today's adolescents, however, the ability or means to *connect to* information exceeds the intrinsic value of the information. This is evidenced by the explosion of social media among the population at large, but particularly among young people (Kaiser Foundation, 2010; Madden et al., 2013).

Connectivism, a contemporary learning theory recently introduced (Siemens, 2006), establishes a novel concept of learning specifically relevant to the digital age requiring technology skills. Closely aligned to Vygotsky's (1978) theory of zonal proximal development, connectivism postulates that learning takes place through an individual's contact or 'connection' to others (Siemens, 2006), hence the theory's name. As connections are integral to connectivism's concept of learning, the theory is particularly relevant as seen through today's adolescents' requirement for constant connection (Friedrich et al., 2011; Greenhow, 2011; Kaiser, 2010). Therefore, connectivism underpins today's technology-connected activities.

Connectivism's theory views learning occurring in three dimensions, which involve the cognitive, behavioral, and affective domains (Kop & Hill, 2008). Cognition and motivated engagement are often associated with social interaction characteristics of social media (Junco et al., 2011; Marks, 2000). Microblogging, a social media platform, along with others such as blogging, instant messaging, and text-messaging, typifies cognitive and affective occurrences.

Thus, the use of microblogging has the potential to support engagement and critical thinking through such cognitive occurrences.

Connectivism proposes that although learning occurs within the individual, it is engagement in an external mechanism which implements the learning (Siemens, 2006). The learner interactively and collaboratively engages in social connections through the use of technology. Connecting to a larger community of users and learners (social structure), the learner attempts to find, share, utilize, and then apply knowledge (Siemens, 2006). The cycle repeats as an individual's attempt to find additional information on a new subject. Although knowledge and learning occur often in a structured formal setting, the connectivism theory cites that learning occurs within this context in an informal setting, provided the user is engaged in the connective networks provided through digital social environments (Siemens, 2006). Thus, the connectivism theory informed the dependent variable of engagement. The measurable outcome of engagement is associated with metrics of the behavioral, cognitive, and affective domain which in the connectivism construct is learner-engagement or motivation (Nagowah, 2009).

Social interactions or connections with many of the users within the digital community may be scattered over many tools (devices) and possibly many technology platforms (Twitter, Facebook, and YouTube). This concept is representative of the student's inherent need to remain connected (Greenhow, 2011; Steinberg & McCray, 2012), while processing information in a non-linear manner. The simultaneous multiple applications (Thompson, 2013) of information acquired through engagement with the social community informed the variable measured in the outcome of critical thinking. The use of microblogging, providing a simple one-to-many interactive message platform (Buchem, 2011), could be expected to show an increase in the two dependent variables of engagement and critical thinking.

Connectivism, one of the first theories to take into account technology and networks, provides another perspective of learning occurring in the form of "know-how and know-what being supplemented with the "know-where" (Siemens, 2006). According to Siemens (2006), because of the short span of time from when knowledge is gained until it becomes outdated (referred to as the 'half-life' of knowledge), the individual is required to be in a continual learning process to acquire new, current information. The new information subsequently becomes knowledge. But this continual process necessitates the individual learner to develop skills in learning to know *where* to find new information. In educational constructs, this means the connectivism theory expects additional attributes evolving beyond the affective (engagement) and cognitive (critical thinking) dimensions.

Siemens (2006) expected the developing skills of foraging for information (Pirolli & Card, 1999) and interactive collaboration with others to occur. These skills are informed by another theory, that of information foraging (Pirolli & Card, 1999), which follows. Siemens, however, viewed the aptitudes of engagement and critical thinking, as well as foraging and collaboration, to require new methods of instruction in order to integrate technology with social networks. The U.S. Department of Education (2010) concurred through a proposed National Education Technology Plan (NETP) which sought to leverage emerging technologies, such as social media, with redesigned curricula and instruction. Thus the researcher's proposed examination of the emerging use of the social technology of microblogging in classroom instruction to investigate the effect on student engagement and critical thinking was guided by the connectivism theory.

Information Foraging Theory

Information Foraging Theory (Pirolli & Card, 1999) is relevant because of the pervasiveness of technology in today's society, as well as the focus of this study: middle school students. This is self-descriptive. It is, quite literally, the theory of how individuals forage or seek out information (Pirolli & Card, 1999). Described another way, it is the cognitive acquisition, application, analysis, and evaluation of information that individuals make as they selectively choose digital information (Pirolli & Card, 1999; Sandstrom, 2010). Such cognitive selection elements are regarded as the basis of higher level thinking skills, referred to as critical thinking (Scriven & Paul, n.d.). The theory of information foraging with its underpinnings of cognition informed this study's dependent variable of critical thinking. Because critical thinking can change with motivation (engagement), the theory likewise informed the dependent variable of engagement, albeit to a lesser degree than that of critical thinking.

Literature Review

Technology in Education

A sizable volume of literature exists regarding technology and its educational application. The complexity of technology and associated community of users appears ever-evolving and fluid. Due to the speed at which technology rapidly changes, customary research is rendered outdated, and contradictory findings often emerge (Gao et al., 2012; Greenhow et al., 2009; Siemens, 2006).

In general, technology use in education presents polarizing perspectives (Thompson, 2013). Some educators and researchers alike believe technology use can 'rewire,' potentially altering students' cognitive functioning dependent upon the developing state of neural plasticity (Ebner, 1996). Others fear technology will inhibit learners from critically thinking due to the

characteristically short bytes of information associated with digital technology (Thompson, 2013). Still more educators and researchers unequivocally propose that more "experimental and developmental research is needed to examine the effectiveness of the recommended educational approaches" (Gao et al., 2012, p. 794) regarding technology use in the classroom (Greenhow 2011; Greenhow et al., 2009; Spires et al., 2008; USDOE, 2010). Regardless, educators must be united in their strategic vision to prepare today's young learners in skills compatible with 21st century technology (Sherman & Johnson, 2009; USDOE, 2010). A study to add to the body of literature of effective digital tools, such as microblogging, is warranted.

Technology Efficacy

Although a review of the research identified the existence of an educational gap that fails to "leverage technology to create relevant learning experiences that mirror students' daily lives and the reality of their futures" (USDOE, 2010), it is imperative that the technology selected to fill this gap be effective. The U.S. government annually spends $142 billion on education (U.S.DOE, 2010), of which slightly more than twenty-five percent is earmarked to educational technology. Of this amount, thirty-six percent or $20 billion is dedicated to K-12. This equates to approximately $400 per student (Johnson, 2011). Such a sizable financial investment logically attracts and warrants scrutiny from all communities of interest. Consequently, the need exists for assessment and study to identify and integrate effective current classroom technologies. This study's examination of the use of microblogging technology meets this criterion.

Despite the massive influx of technology funding injected into the educational system, some results have been considered ineffective (Ferriter & Garry, 2010). Research studies have identified teachers' use of technology for *noninstructional* purposes, such as word processing or

power point presentation, as a contributing cause to ineffective application (Ferriter & Garry, 2010). Most technology use occurring inside the classroom was characterized as individual-based and embedded in traditional academic activities such as testing and word processing (Spires et al., 2008). Although qualifying as technology use, this type of unidirectional, non-interactive application fails to neither engage students nor develop higher order collaborative skills which students need to be competitive in the global workforce (Roschelle et al., 2000; Speak Up, 2010; USDOE, 2010).

Secondly, when evidence indicates technology is instituted for instructional purposes, the classroom still follows traditional approaches of utilizing high-quality technology with little or no emphasis on interaction and collaborative engagement or even creativity (synthesis). These three skill inputs require more than mere understanding of the rudiments of technology or "simply reacting in isolation to materials" (Mostmans, Viedguels, & Bannier, 2012, p. 105). Successful use of technology, such as may be provided using microblogging, requires a social process and an environment that offers social engagement with peers through digital social interaction and dialogue.

The empirical consensus is that a requirement exists for a more widespread, sustained, and systematic approach to a consistent lag in "providing media of communication and scaffolding for productive interaction between learners" (Mostmans et al., 2012, p. 110). Digital interaction, characteristic of microblogging's one-to-many output, will replicate real-world experiences. By 2020, real-world experiences (USDOE, 2010) of group interaction used for virtual projects and their fast-paced communication platforms (e.g., Twitter), will be the corporate norm. It is estimated that more than fifty-percent of all employees of large corporations will be expected to be actively engaged in interactive technology (Friedrich et al.,

2011). Such a requirement for these types of technology skills makes providing engaging classroom activities and environments imperative for future success (Spires et al., 2008; USDOE, 2010).

However, socially-interactive technology, such as microblogging, in educational classrooms requires a safe learning environment with one's peers as well as an acceptable comfort level with group work. This is a particularly sensitive issue with the adolescent age group who want to "connect with others who share their academic and career interests" (Greenhow, 2011, p.140). Since research findings suggested less than 10% of teens were relatively unconcerned about access from outside-parties (Madden et al., 2013), technology must accommodate for this oversight. Edmodo (2014), an educational software platform, addresses this problem by providing classroom technology with online safety.

The empirical reviews by some researchers and educators suggest that the lag of technology infusion into the classroom may be a result of the traditional constraints of instructional periods and total day length of a traditional school day (Shapley et al., 2011; USDOE, 2010). Forcing traditional educational paradigms to accommodate nontraditional digital constructs can be problematic, even when trying to phase in incrementally. The Texas Education Agency (TEA), overseeing 1000 Texas school districts, identified this obstacle to effective technology use as "the piecemeal way in which most schools have introduced technology into the educational process" (Shapley et al., 2011).

Constraints can impact the availability of 'traditional' technology (i.e., desk-top style computer labs) for student use. The argument exists that technology can be utilized to solve problems that it unintentionally creates. By incorporating a multitude of technologies of differing digital interfaces and devices (iPads, iPods, netbooks, laptops, smartphones), which

many students currently possess, more flexibility translates to fewer constraints (Friedrich et al., 2011; Spielvogel, 2005). Microblogging provides the flexibility of allowing students to interactively connect beyond the classroom, if desired. This impact supports the variable of engagement, regardless of the physical boundaries of one's person or digital device.

Social Media, Technology, and Microblogging

Although the literature review presents a dichotomous range of the study of technology's effectiveness and variability within education, it underscores the position that the topic's research is still in its infancy. Research survey data from nearly 300,000 K-12 students identified students' choices of digital devices and means used to navigate learning inside and outside the classroom (Speak Up, 2010). Primary on students' list of desired and essential, relevant technology for learning was social-based learning. Social media sites, such as Facebook, were leveraged predominantly outside the classroom by these students since they represented strong bi-directional connection opportunities to explore, exchange, and collaborate on new ideas. Such collaborative and community characteristics of social media (Jensen & Zhang, 2009) are prime attributes valued by both students and global companies.

Thus, the logical progression would be for educators to investigate the social media medium young learners prefer and actively use on a regular basis outside the classroom. Although identified as a networking site, social media such as microblogging has the potential to be used within the classroom environment. Greenhow (2011) found the following:

> There is actually little published empirical work in the educational literature regarding the intellectual and social practices young people demonstrate either in naturally occurring, youth-initiated social media spaces, such as Facebook, or in niche social network sites,

social gaming, or mobile networking applications designed for educational purposes. (p. 141)

Social media represents a broad medium of sites, applications, and communication potential. Social media's concept, however, embodies social constructivist framework (Vygotsky, 1978) positing that learning occurs within a social setting and actively engages the learner with the learning experience. As a networking, communication tool, social media is characterized by its entertainment or social communication features (Spires et al., 2008). However, a correlation exists for the social media use of technology and engagement among students (Chen, 2010; Heiberger & Loken, 2010 as cited in Andrade et al., 2012). But it was a new form of social media known as 'tweets,' which debuted on the social communication platform Twitter, and their association with an international political movement, Jasmine Spring, that generated interest in tweeting as an educational digital tool.

A tweet is a form of social media broadcast using a shorter form of a blog (microblog) in characteristic *micro* or short messages of less than 140 characters (Cheong & Ray, 2011). With its inception in 2006, the social communication service Twitter established itself as the most popular and widely-used microblogging application. A number of other microblogging platforms exist, such as Jaiku, Tumblr, Cif2.net, in addition to Twitter. Regardless of the type of application, microblogging roots originated with the concept of blogs or individual websites that posts an individual's commentary or opinion (Yang & Chang, 2011). Blogs may resemble traditional pen-and-paper journal reflections but serve to portfolio student writing assignments when developed on an electronic platform (Yang & Chang, 2011). Such reflective and critical thinking mechanisms support the constructivist-theory of effective learning through social

sharing and can occur in other electronic formats including emails and electronic discussion boards.

When utilized in an interactive fashion, the social aspect of blogs and their shorter counterpart, microblogs, provides and encourages readers (followers) to share in engaged, one-to- many and many-to-one, bidirectional exchange. Microblogs, because of their restricted 140 character count called 'tweets,' were dubbed electronic word-of- mouth (WOM) (Jensen & Zhang, 2009). This quality differs from its unidirectional predecessor, the blog, which often focused solely on the author. Electronic reciprocity allows microblog users to provide bidirectional feedback which in turn perpetuates attraction and comment. Such perpetual-give-and-take requires engagement. Microblog users, particularly on Twitter, acknowledge their awareness of their audience and that they are "not tweeting into a void" (Marwick & Boyd, 2010). Thus, social engagement is amplified in the microblog context. Microblog's inherent bidirectional nature coupled with its time-sensitivity or rapid electronic currency translates to a rapid lifecycle (Oulasvirta, Lehtonen, Kurvinen, & Raento, 2009) of learning and information that is constantly updated. Updates in real-time applications assist the user in technology's challenge of locating relevant information within the behemoth volume or material that is associated with the Web. Users of Twitter and other microblogging platforms can search for information online as it is produced, instead of waiting for results from a web search that only periodically queries the search index.

Microblogging has a multiplicity factor for engagement beyond the classroom by extending information and sharing beyond the initial participants (bidirectional) in a tweet. This practice is known as 'retweeting,' and it allows the microblog user to spread the original message to other users, who in turn subsequently spread this information again, even using other social

mediums such as Facebook and blogs (Marwick & Boyd, 2010). It is perhaps this mobility and the ease of platform use, particularly on smartphones, that doubled Twitter's (microblog) adoption among 18-24 year olds between 2010 -2012 (Smith, 2012). Likewise, researchers and educators see strong potential within this technology tool for student engagement. The attraction to microblogging (and to its United States-run website, Twitter) has increased exponentially among 12-16 year-olds by default. Facebook, formerly the preferred social territory for teens, has been eclipsed by older users, making the Facebook arena less private in general for teens. Regardless of the reason, the trend indicates teens have found a niche that may have potential in educational application.

Microblogging and Education

Interest in microblogging in education (MIE) began once Twitter, a microblogging service, was launched in 2006 (Gao et al., 2012). Numerous studies (Junco et al., 2012) found that microblogging was introduced into education at the tertiary level. Microblogging was used in professional development programs to increase community presence, particularly among beginning teachers (Wright, 2011). The opportunity afforded by microblogging served as drawing attraction to this pedagogical tool. College faculty were using microblogging (or tweeting) as a digital classroom tool to provide immediate feedback (Hirsch, 2012). In turn, it was hoped this form of communicating could motivate and empower students and ultimately improve student engagement particularly in a collaborative atmosphere.

Despite the enthusiasm, Gao et al., (2012) conducted a critical analysis of twenty-one research studies on microblogging and concluded "relevant research is rather limited…comprehensive and critical review of published research is much needed" (p. 783).

Though Gao et al. (2012) found additional research to be the protocol for MIE, they suggested that a gap existed in the K-12 setting.

Adolescents and Microblogging

Researchers recently noticed a specific generation of connected users emerging. In a heretofore unexamined group, adolescents, there emerged a "variable uptake of different technologies across the adolescent age range" (Thurlow & McKay, 2003, p. 96). It was their inclination to gravitate and use social media that caught researcher's attention, specifically microblogging (Buchem, 2011; Cheong & Ray, 2011; Greenhow, 2011; Kaiser, 2010).

There are inherent limitations and disadvantages of having an adolescent group use a social media microblogging platform such as Twitter. For instance, the Children's Online Privacy Protection Act (COPPA) requires online sites to conform to specific guidelines when their subscribers are younger than age thirteen. Rather than adhering to the necessary accompanying paperwork volume, online service providers often refuse to extend subscriptions (such as Twitter) to those under thirteen. Therefore, enrolling middle school adolescents in many of the popular microblogging sites, even for legitimate research purposes, may prove too cumbersome. Often, rather than adhering to the necessary accompanying paperwork volume, online service providers often refuse to extend subscriptions (such as Twitter) to those under thirteen. Therefore, middle school adolescents may be restricted from enrolling in many of the popular microblogging websites, even for legitimate research purposes.

An alternative to accommodate the COPPA regulation, as well as acquire another protective filter, is to utilize an educationally-dedicated service, such as Edmodo. This free online service is educationally-oriented to the K-12 with over 10 million subscribers. Educators use the social networking site for collaborative assignments. Additionally, teachers can control

the passwords, size of user-group, content and are equipped with the ability to edit or delete inappropriate microblogs (Edmodo, 2012). Although little research has been conducted utilizing the educationally-relevant microblogging platform of Edmodo, this study adds to the body of literature surrounding this technology and its platform.

Engagement

A large body of knowledge exists to support technology's application in education (Carle et al., 2008; Junco et al., 2012; Shapley et al., 2011). More specifically, emerging literature suggests positive results surrounding a particular type of technology, namely *microblogging,* and its use in education (Andrade et al., 2012; Cetintas et al., 2011; Junco et al., 2011; Yang & Chang, 2012). These studies, though, are nearly the exclusive domain of higher education settings and therefore reveal the aforementioned unexamined area of microblogging use among adolescents or middle school students (Marks, 2000; Spires et al., 2008). With increased microblogging usage (Smith & Brenner, 2012), a connection exists to support the concept of engagement.

Engagement can be operationally defined as the behavioral, emotional, and cognitive time and effort that a student invests in an educational experience (Astin, 1984; Kuh, 2009). As such, behavioral, emotional, and cognitive time and effort devoted to the task of microblogging can be interpreted as engagement. Studies showed increased student engagement was related to technology use, as in one-to-one computer use facilitated through the Apple Classrooms of Tomorrow Project (Carle et al., 2008; Junco et al., 2011; Shapley et al., 2012). Similar studies also showed a positive correlation between non-specific social media site use and student engagement (Greenhow, 2011; Junco et al., 2011). Only one study (Junco et al., 2011) examined the use of microblogging and its effect on student engagement. However, the participants

involved were college students, not adolescents or middle school students. Thus, a gap exists due to the scarcity of specific literature examining the effects on middle school student engagement when microblogging is used as an educational activity.

Study of the adolescent developmental period showed engagement in middle school students to be immediately observable and reflective of time on task, study behavior, and class attendance (Mahatmya, Lohman, Matjasko, & Farb, 2012). This behavioral dimension of engagement refers to students' feelings about educational learning activities. It reflects the motivation or desire to learn. Furthermore, because engagement is not solely attributable to the individual student but capable of being altered or influenced, the implications for future study are extensive, particularly if the alterable source is one of microblogging.

Yu-Change & Yu-Hui (2012) demonstrated that the use of microblogging in mobile activities promoted learning by engaging students. Engagement, and subsequently learning, was enhanced by connecting learning activities with the familiar technology of students' everyday lives or promoting learning through authentic contexts. Microblogging's potential effect upon such behavioral engagement can provide another predictor metric for success as research on adolescent behavioral engagement has correlated engagement to dropout rates (Finn & Zimmer, 2012; Fredricks et al., 2004).

Critical Thinking

Although no research has been conducted on the effect of microblogging on critical thinking, deep cognitive processing associated with analysis and evaluation functioning were evaluated indirectly (Luo & Gao, 2012; Shapely et al., 2011). Contradictory results underscore the need for examination of critical thinking as a measurable outcome rather than a peripheral effect. Examination of non-scholarly and scholarly literature also showed mixed reviews. Some

viewed microblogging's 140-character template as a 'sight-byte' (Verre, 2009) while others cited microblogging's potential for increased student-directed learning (Guardia,et al., 2013). The variances appear connected to one's expectations of microblogging. When specifically oriented to an end-state other than informal communication, microblogging's positive aspects appear evident. Microblogging, when used in an authentic, real-world activity could facilitate the deconstruction and rebuilding of ideas that Halpern, Stephenson, & Williams (2009) see as requisite of critical thinking. Kassens (n.d.) noted that microblogging, when used in an undergraduate Economics class, proved it is "more challenging to communicate an argument in 140 characters" (p. 1).

The rationale to study microblogging's effect on critical thinking is due to its inherent challenge to articulate one's thought in 140 characters or less. The ability to precisely and succinctly compress text requires editing all extraneous words, thereby activating the processes of analysis, evaluation, and synthesis, or critical thinking. Interfaced with its social-interaction and real-world technology, microblogging may *directly* affect critical thinking, especially when a purposeful end-state is the objective in a student-directed learning activity. Roschelle et al. (2000) found that engagement, collaborative group work, frequent interaction, and connections to real-world, authentic activities resulted in effective learning. As all four elements are associated with microblogging, this study has strong merit to be conducted in a middle school environment.

Summary

The body of empirical and theoretical literature recognizes that educational paradigms have shifted with the advent of 21st century technology. Technology's ubiquitous and social character is supported by social constructivism (Vygotsky, 1978) in which knowledge is

socially-constructed. Specific technology, such as microblogging, has the potential to exponentially expand this social source, allowing construction of ideas through unlimited social connections which facilitate collaboration and interaction with others (Powell & Kalina, 2009). These social connections reflect the connectivism theory (Siemens, 2006), which views the importance of connecting to others as an engagement factor and as valuable as the knowledge sought. Microblogging would serve to engage a population and facilitate such constructs.

The literature examines microblogging and notes that as a relatively new pedagogical tool, it is concentrated in the higher educational domain. Gaps exist in that there is a lack of study of microblogging in the secondary and middle school environments. A plausible explanation for the middle school group is the age-restrictive policy of certain websites (e.g., Twitter). Since social connections appear to be the domain of the present middle school generation, microblogging may be a technology resource which middle school students would use intuitively.

As related studies of microblogging have shown increased student engagement, albeit at collegiate levels, the study of microblogging's effect on student engagement at the middle school level is appropriate. This is particularly important as engagement has been correlated to school dropout and truancy (Kuh, 2009). Additionally, microblogging's effect on critical thinking skills remains understudied. The significance of such a study would be to advance the knowledge of a social technology whose use may be intuitive to a connected generation, namely middle school students. By so doing, microblogging may provide the skills "required by a society which today most highly values the ability to access and structure information and apply it to solve new problems" (Benjamin et al., 2013). With continued emphasis on student-directed activity, the opportunity to study the effects of such an activity, capable of engaging students to develop

competitive, global-marketplace skills, is feasible. Chapter Three outlines the research procedures and design used to examine the effect of microblogging on middle school student engagement and critical thinking.

CHAPTER THREE: METHODOLOGY

The purpose of this study is to determine the effect of microblogging on middle school student engagement and critical thinking. There is a need for research that examines the effect of integrating specific technology into the classroom which replicates real-world usage. This chapter provides an introduction to the rationale of methodology used in this study. This is followed by design, questions, hypotheses, participants, setting, instrumentation, procedures, and data analysis sections.

Within a social constructivist theoretical framework, this study sought to examine the use of microblogging as an interactive, collaborative-enhancing technology tool and the potential effect upon student engagement and critical thinking. As technology is ubiquitous and its use pervasive among the current generation of middle school students (Friedrich et al., 2011), the U.S. Department of Education (2010) recommended students be immersed in technology which, within the classroom, authentically reflects the real-world, digital experiences which normally occur in the digital world outside the classroom. Equally important to the study of microblogging technology is the intertwined, forward-looking need to engage and empower students in preparation for a globally competitive workplace (American Management, 2010; Speak Up, 2010; USDOE, 2010).

This study specifically examined the use of microblogging, most commonly referred to as Tweeting, and its effect upon engagement and critical thinking among the heretofore unexamined group of adolescents or middle school students.

Design

A quasi-experimental, pretest-posttest, nonequivalent control group design was conducted to examine the effects of the use of microblogging on student engagement and critical

thinking in a middle school population. The intervention group received the microblogging writing activity while the control group used a traditional writing activity, but in an equivalent technology medium (word processor) to control for novelty effect.

This research design was selected because the key objective in a quasi-experimental design is to determine the cause and effect relationship between the intervention (manipulation of the independent variable: type of writing activity) and the target population. This is completed by exposing one group (intervention group) to a manipulation (microblogging) of the independent variable (type of writing activity) and observing the results of this manipulation on the dependent variables (student engagement and critical thinking). The remaining group (control group) received no intervention, and results were compared to those of the intervention group.

The quasi-design is the best fit as randomization of the middle school population is not possible due to the educational setting and the disruption such randomization would cause (Gall, Gall, & Borg, 2011). As true randomization is precluded, statistical analyses was conducted to control for prior differences in student engagement and critical thinking (dependent variables), thereby strengthening the study's internal validity (Campbell & Stanley, 1963; Gall et al., 2010).

A review of the research has identified technology use and student engagement relationships, but little empirical research has been conducted linking specific microblogging (social media) use to student engagement, a dependent variable in this study (Chen, 2011; Junco et al., 2011, p. 120). As microblogging is a contemporary social-media technology tool that has the potential to engage, it warrants study (Andrade et al., 2012; Dunlap & Lowenthal, 2009; Madden et al., 2013), particularly in the adolescent age group (USDOE, 2010).

Microblogging, commonly referred to as 'tweeting', uses a text-limitation of 140 characters in electronic communications. The shortened message-design "forces the user to share only essential information" (Guardia et al., 2013). Deciding what constitutes essential information to be communicated to others in order to convey a satisfactory message in only 140characters requires the transmitter of the message to use progressive, hierarchical cognitive processes of acquisition, application, analysis, evaluation, and synthesis (Scriven & Paul, n.d.). These cognitive skills can be reflective of critical thinking, the second dependent variable.

In this study, the middle school research participants were pre-assigned to specific ELA class periods subject to a maximum capacity of 24 students pursuant to Florida law (http://laws.flrules.org/2003/391). Such pre-assignment precludes true randomization, and thus, the strongest design deemed possible is the quasi-experimental design (Gall et al., 2011). Such designs are often necessary in educational research when a true experimental design is not possible given the nature of pre-assigned classes. Although random assignment would strengthen internal validity, there is the ethical consideration of withholding educational intervention from a group (Glatthorn & Joyner, 2005).

The participants were sixth-grade and seventh-grade level participants in six language arts advanced classes. Class placement was independently determined by students' prior standardized reading and writing assessments scores (Florida Comprehensive Assessment Test). A pretest and posttest, the National Center for Student Engagement (NCSE) Student Survey and the Cornell Critical Thinking Level X instrument were given to all participants to determine if the intervention of microblogging in the type of writing activity had any effect on student engagement and critical thinking. The pretest was used as a control variable (covariate) to control for the selection threat to validity (Gall et al., 2007).

Research Questions

The following research questions and hypotheses guided this study:

RQ1:Research Question 1: Is there a statistically significant difference in student engagement, as measured by the National Center for Student Engagement (NCSE) Student Survey instrument, among middle school students when participating in a microblogging activity, as compared to students who participate in a traditional writing activity?

RQ2:Research Question 2: Is there a statistically significant difference in student critical thinking, as measured by the Cornell Critical Thinking Level X instrument, among middle school students when participating in a microblogging activity, as compared to students who participate in a traditional writing activity?

Null Hypotheses

The following were the null hypotheses:

Ho_1: There is no statistically significant difference in student engagement, as measured by the National Center for Student Engagement (NCSE) Student Survey instrument, among middle school students when participating in a microblogging activity, as compared to students who participate in a traditional writing activity.

Ho_2: There is no statistically significant difference in critical thinking, as measured by the Cornell Critical Thinking Level X instrument, among middle school students when participating in a microblogging activity, as compared to students who participate in a traditional writing activity.

Participants

The population for this study was sixth-grade and seventh-grade students from six advanced English Language Arts classes at a public middle school in northwest Florida. This study occurred during a four-week period of the 2014-15 academic year. The study represents a

convenience sampling that accounts for nearly all of the sampling utilized in social sciences research as well as ease of accessibility for this researcher (Gall et al., 2011). Since students are part of pre-existing classes, the study's sampling is non-randomized. However, the sixth-grade and seventh-grade level students are identified as representative of individuals born after 2000 and, therefore, are part of the first generation exposed, connected, or plugged-in to technology from birth. Thus, this study group may be considered the most applicable to the U.S. Department of Education's concept of students experiencing and utilizing real-world technology daily outside the classroom (Duncan, 2010). Results from this population may generalize for future studies of middle school students.

With 119 participants, an adequate sample size was achieved for the statistical analysis (Campbell & Stanley, 1963), satisfying a minimum control group size of 15 and a minimum test group size of 15 (Gall et al., 2011) for a statistically relevant study.

All participants in the study were advanced English Language Arts students whose prior standardized test results from the Florida Comprehensive Test (FCAT) and Discovery Education Assessment (DEA) placed them in the accelerated classes. These tests illustrated the students' above-grade level reading abilities (as measured by the Lexile Framework for Reading tool), higher level critical thinking skills, and proficient language skills that ensured homogeneity in the control and intervention groups. These additional controls added to the validity of this study, since the results were attributed to the microblogging intervention, and not to differences in reading, critical thinking, and language skills.

Setting

Overview of the School

The school setting is a public middle school located in the northwestern panhandle of Florida, and was built in the late 1960's. The middle school is the second smallest of the five middle schools in the southern end of the county school district within a ten mile radius. Four other middle schools operate in the northern end of the county school district, but are geographically removed due to the presence of a military installation and facilities (ballistic firing ranges) separating the two areas by 18 miles. During the 2014-15 academic school year, the school served 632 sixth-grade through eighth-grade students. The student population represents an economically-challenged demographic area, which is evidenced by 49% of students eligible for free or reduced breakfast and lunch. Over the past few years, the middle school has experienced an increase in minority students, particularly Hispanic students, which has been reflected in increased ESOL accommodations and 504 plans. Table 1 provides pertinent demographic data of all students in the school.

Table 1

Participant Demographics

	Race		
	Population	Intervention Group (4)	Control Group (2)
Caucasian	64%	65%	62%
Multiracial	21%	23%	16%
Black	9%	4%	22%
Asian	5%	7%	0%
Other	1%	1%	0%

Note. N = 632, Intervention Group n= 81, Control Group n= 36

The principal of the middle school takes a highly proactive posture to continually provide the students with relevant and achievement-enabling strategies and resources. Thus, the school

acquired several portable computers-on-wheels-systems (COWS) of 25 laptops, which were transported to the classrooms to be utilized on a daily basis primarily by language arts and science teachers to support technology integration within the classroom. The computer-on-wheels-systems were the source for the electronic microblogging activities during this study.

Class Periods

Students daily attended six different classes, which include four core subject areas (mathematics, social sciences, physical sciences, and English language arts) and two electives. Each class was 53 minutes in duration.

English Language Arts (ELA) Classroom

The study took place over a four-week period in an ELA classroom. The classroom was a self-contained, autonomous physical space typical of an open-campus classroom facility built in the 1960s. The ELA classroom was configured as a student-centered environment, with singular desks grouped in clusters of four (Figure 1). This configuration allowed students to work either collaboratively or disengage desks from the cluster and work independently. In the ELA student-centered classroom, the students were placed in an active role with the teacher as the facilitator. Each ELA class was 53 minutes in duration and began with the teacher spending the first few minutes of class modeling the concept. Students were then given an activity that reinforces the concept introduced, and they were expected to explore and enlarge their understanding of the concept while the teacher ensured that students remained on task while providing guidance to both individuals and/or groups.

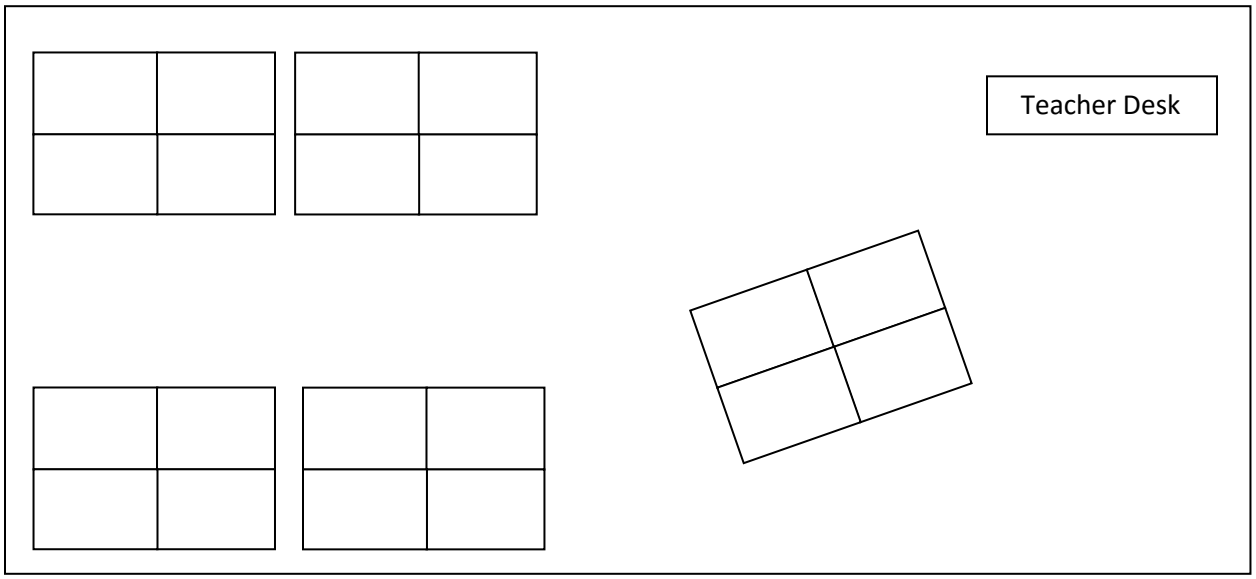

Figure 1. Arrangements of student desk clusters in ELA physical classroom.

ELA Curriculum

The ELA curriculum is a requirement of the school system and the Florida Department of Education. It is guided by the School Performance Plan (School Performance Plan 2014), the focus of which is reading and writing through the Close Reading and Student Talk protocol (Figure 2). ELA classes develop students' reading, writing, speaking, and listening skills according to a protocol which are assessed during the year end Florida State Assessment (FSA). ELA students are required to successfully pass this assessment to be promoted.

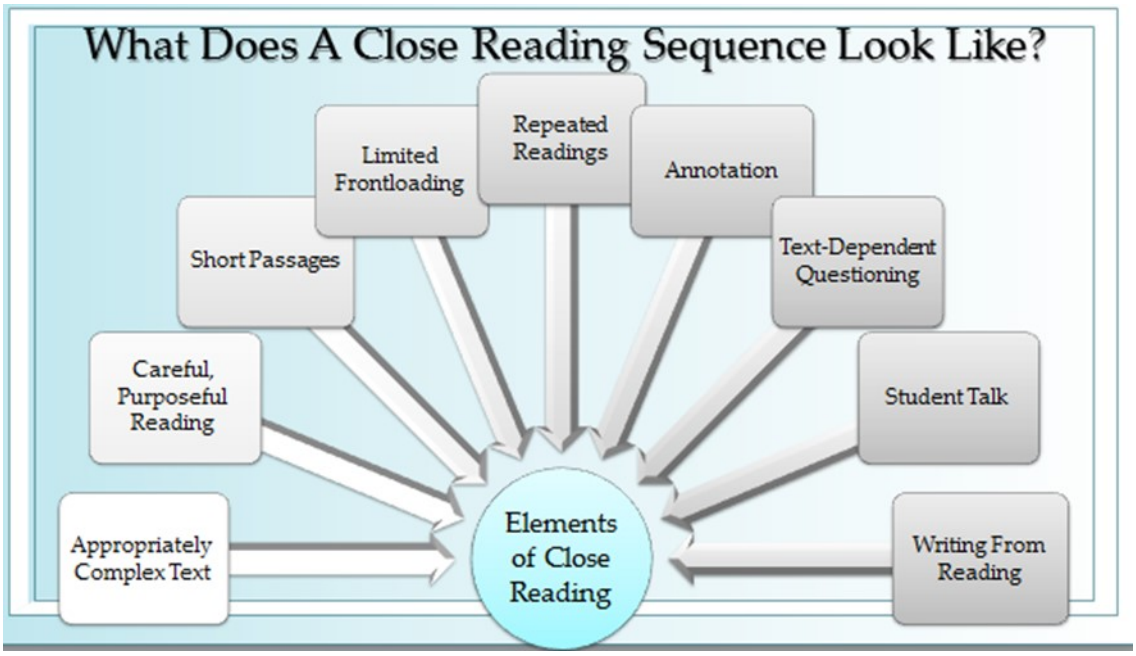

Figure 2. Illustration of Close Reading Protocol

This study took place during the second semester of the 2014-15 academic year, in which the curriculum requires mastery of ELA benchmarks of language conventions, informational text analysis, media integration, craft, structure, and literary text complexity (ELA Standards, 2014).

ELA students used the consumable text *Performance Assessment* (Houghton, Mifflin & Harcourt, 2015) to develop the skills to craft (four) argumentative essays over the duration of the study, as shown in Table 2. The SPP and FSA guided curriculum were held constant during the study's duration. Students used the *Performance Assessment* text to analyze the argumentative essay model (Step 1), practice the argumentative essay task (Step 2), and perform the task of producing an argumentative essay given a specific prompt (Step 3). Between steps two and three, the intervention group *only* exchanged collaborative tweets (microblogging), using the educational platform Edmodo, prior to the development of the final product (argumentative essay).

Table 2

Assigned Non-Fiction Stories and Associated Writing Prompts

Research Week	Assigned Reading:	Assigned Prompt:
1	*Flesh and Blood So Cheap: The Triangle Fire and Its Legacy* by Albert Marrin	Should the owners of a building be held responsible for a fire in their building even if it was not their fault?
2	*Number the Stars* by Lois Lowry	Do we have a duty to risk our own safety in order to protect the powerless?
3	*Boy in Striped Pajamas* by John Boyne	Should a 93-year-old Auschwitz guard, Oskar Groening, be on trial for 300,000 counts of murder, over 70 years after it happened?
4	*Number the Stars* by Lois Lowry	Is it ever okay to break the law, even if the law hurts people?

(Houghton, Mifflin, & Harcourt, 2015).

Table 3

Argumentative Essay Writing Activity Prompts

Research Week	Argumentative Essay Prompts
1	Should the owners of a building be held responsible for a fire in their building even if it was not their fault?
2	Do we have a duty to risk our own safety in order to protect the powerless?
3	Should a 93-year-old Auschwitz guard, Oskar Groening, be on trial for 300,000 counts of murder, over 70 years after it happened?
4	Is it ever okay to break the law, even if the law hurts people?

(Houghton, Mifflin, & Harcourt, 2015).

Classroom Teacher

The classroom teacher for this research study was a fourth year, certified highly-effective English Language Arts educator. She taught sixth-grade and seventh-grade advanced students in her classroom. Sixth-grade advanced ELA students were in this classroom during periods one, three, and four, while seventh-grade advanced ELA students were present during periods two,

five, and six. The intervention group included sixth-grade participants in periods one and three, while seventh-grade participants included periods two and five. The control group included sixth-grade participants in period four and seventh-grade participants in period six.

Table 4

Identification of Intervention and Control Groups by Grade Level and Period

Class Period	Grade	Control Group	Intervention Group
First (1)	6		x
Second (2)	7		x
Third (3)	6		x
Fourth (4)	6	x	
Fifth (5)	7		x
Sixth (6)	7	x	

Note: All students are advanced level.

Classroom Activities

As stated previously, this study used four weekly readings and subsequent argumentation language arts writing prompts (see Tables 2 and 3) utilizing the applicable grade level textbook *Performance Assessment* (Houghton et al., 2015). Argumentative writing assignments are customary to ELA classes and had been practiced since the start of the school year, thereby reducing any novelty effect.

After completing the weekly one to two pages assigned reading in the consumable textbook *Performance Assessment, s*tudents in the intervention group collaboratively responded to one another in a 140 character limit microblogging format (tweet) to an argumentative writing prompt. Using laptops as computer-mediated devices, the intervention group 'tweeted' members within their specific class period during the class activity, citing their argumentative position or claim to the prompt. Each individual within this intervention membership posted one tweet,

dialoging with other members of the specific class period about his/her argumentative position, citing the required elements of argumentation writing (claim, support, evidence presented in the assigned reading). Each member of the intervention group of the specific class period then responded in-kind to at least one tweet. Students 'tweeting' used the review tab of Microsoft Word to accurately track the word count (with spaces), simulating the characteristics of a tweet.

As students dialogued with one another via the tweets, it was expected that students would share more information, widening their exposure to diverse opinions or thoughts. Although students in the intervention group were encouraged to (electronically) interact, dialogue, and collaborate, the teacher provided no feedback. At the conclusion of the established the tweeting activity period, students individually completed a formally written argumentative essay, and then submitted it with no further collaboration.

Students in the control group had the identical reading assignment and the same argumentative writing prompt as the intervention group. However, the control group activity did *not* use microblogging, but used traditional writing, which was *not* restricted to 140 characters in length. The control group students completed the argumentative writing prompts in the traditional writing manner, employing a computer-mediated device for word processing.

Although the control group students were not engaged in microblogging, they also collaborated prior to the traditional writing activity (argumentative essay), but in a verbal, face-to-face manner within their class period to control for the effect of collaboration. The teacher in this traditional activity provided no feedback to the control group. The control group members completed the formally written argumentative essay as well, with no further collaboration. The electronically submitted essay for both intervention and control groups met the required

standards of application of language arts argumentation writing skill towards mastery of writing from sources (ELA Standards, 2014).

Instrumentation

Student Engagement

Student engagement, the first dependent variable, has been conceptualized in a number of different ways to include behavior, emotion, and cognitive elements. Numerous assessments and survey instruments exist to measure student engagement. In this study, student engagement was quantitatively measured using the National Center for School Engagement (National Center for School Engagement, 2006) survey instrument for both the pretest and posttest. The self-report served as the covariate.

Each NCSE assessment contains 49 questions in which the student responds to a question using a five-point Likert psychometric response scale (See Appendix A). The Likert scale has a history of being the most widely used scale in survey research (Salkind, 2000). A composite score was used for the NCSE self-report survey instrument.

Reliability

Reliability is an important indicator that the survey items are indeed measuring similar desired characteristics (Gall et al., 2011). The typical acceptable reliability score, known as Cronbach's Alpha, is considered .70 in social sciences research (Gall et al., 2011). The NCSE Student Survey produced this score as a minimum consistently in all three of the subscales: behavioral, cognitive, and emotional. As the NCSE Student Survey was piloted in three locations, the following table (Table 5) lists the results for the engagement subscale and the survey locations.

Table 5

Engagement Reliability Results

Emotional Engagement

Survey Location	Sample Size	Cronbach's α
Houston	57	0.884
Jacksonville	39	0.895
Seattle	39	0.902

Cognitive Engagement

Survey Location	Sample Size	Cronbach's α
Houston	66	0.904
Jacksonville	41	0.992
Seattle	43	0.867

Behavioral Engagement

Survey Location	Sample Size	Cronbach's α
Houston	72	0.797
Jacksonville	46	0.489
Seattle	47	0.793

(National Center for School Engagement, 2005).

In summary, with the exception of one location and one event, the Cronbach's Alpha score ranged from .79 to .92 exceeding minimum acceptable values for reliability (Salkind, 2000). Reliability may be ensured in the sample through the retest method in which the same test (NCSE and CCTT) is given to the same group after a period of four weeks, which was done in this study. Therefore the reliability was measured, and subsequently examined for consistency of responses between the pretest and posttest for each instrument (Salkind, 2000).

Validity

The NCSE instrument was developed and validated by the Colorado Foundation for Families and Children (CFFC) research and validation team by collaboratively selecting engagement scales from published data sources (some of which were identified as school district climate surveys), journal articles (Fredricks, et al., 2004), School Integration Index (National Longitudinal Study of Adolescent Health, 2008), and the Core Measures book (Center for

Substance Abuse Prevention, 2012). The NCSE selected convergent-related validity in order to examine the degree to which the test measured the construct(s) for which it was designed (Gall et al., 2010). The instrument was found to be valid based on the parameters set in the convergent-related validity.

Critical Thinking

The second dependent variable was critical thinking was operationally defined as the act of synthesizing, analyzing, and evaluating information (Jones, 2012) in order to execute a decision. Critical thinking was measured using the Cornell Critical Thinking Test (Level X), designed specifically for use among middle school students (Ennis, Millman, & Tomko, 1993). The Level X Cornell Critical Thinking Test (CCTT) measures constructs of critical thinking based upon the conception of critical thinking as reasonably reflecting and deciding or evaluating what to do (Ennis, et al., 1993). The Level X test required 50 minutes to complete the 71 items. The highest possible score for the Cornell Critical Thinking Text X is 71.

Validity

Seven subcategories exist in the CCTT, measuring three types of inferences (induction, deduction, and value judging) and assessing four types of bases for these inferences (results of other inferences, observations, statements to others, and assumptions). The Level X demonstrates a strong interdependence perspective of the aspects of critical thinking utilized in its assessments.

Construct validity for the CCTT Level X was achieved through review of various convergent and divergent reliability studies. Content validity for the Level X CCTT was supported by a large quantity of items testing the elements of induction, deduction, observation,

credibility, and assumptions which conceptually are associated with the critical thinking definition as reflecting and deciding what to do (Ennis, et al., 1993).

Reliability

Cronbach alpha coefficient reliability scores for the Level X were reported at .67 to .90, which marginally approaches or exceeds social sciences reliability scores of .70. As the CCTT was administered twice (pretest and posttest) four weeks apart, this served to ensure reliability as a retest method for reliability to further support the acceptable Cronbach Alpha estimations of reliability.

Procedures

In order to implement this study, IRB approval was required. Protocol dictated that the superintendent of the school district, as well as the principal of the engaging school, be contacted. Once approval from the school had been established, a consult with the teacher conducting the intervention was held. A training period for the intervention and measurement took place with the researcher training the ELA teacher over a period of one school week during after-school hours. Training included the identification of instrumentation dates, proper completion of consent and assent forms, confirmation of argumentative essay prompts, and proper completion of pretest and posttest of NCSE and CCTT instruments through the administrator's manual. A consent form was also sent to parents of control and intervention groups advising of the study; this information included the option to withdraw participation at no penalty to the student.

Beginning in the second semester of the 2014-15 school year, the ELA teacher administered the pretest NCSE Student Survey report instrument to both intervention and control groups during their respective daily language arts class periods. This test was completed within

one 53-minute class period (which allowed adequate time for the 49 Likert-scale questions). Administering the pretest engagement self-report instrument to the intervention and control groups allowed for statistical adjustment for the mean scores, as the two groups are considered nonequivalent groups due to convenience sampling and inability to randomize (Gall et al., 2011). In order to preclude test fatigue, the CCTT Level X instrument was administered two days after the NCSE instrument. However, the CCTT Level X instrument required two consecutive 53-minute class periods to allow adequate time for completion of the 71 items.

Administration of the four-week intervention period began on the day following the CCTT Level X pretest. Following the pretest and during one ELA class period, the ELA teacher introduced the intervention group to microblogging (tweeting). The intervention group completed one practice session on the laptop computers with the teacher reviewing the procedures for Edmodo. As Edmodo served as the platform for this study, each respective intervention class period received a discrete code for that particular class period membership. Students at the participating middle school site had a fluent knowledge of Edmodo as it was previously used as a software tool.

Following the two pretests and the Edmodo training, both control and intervention groups received weekly argumentative writing assignments on Tuesdays for the four-week study. Both control and intervention groups read an identical sixth-grade and seventh-grade above-grade-level text from *Performance Assessment*. Each group then received an identical writing prompt (question) to which they constructed an argumentative response. As an argumentative response consists of claim, evidence or support, and explanation (CSE), this particular assignment lends itself to the microblogging format.

The intervention group used microblogging to electronically respond, dialogue, interact, and collaborate with their respective class peers using a maximum of 140 characters on a computer-mediated device (laptop) within the Edmodo platform. Each member of the intervention group posted one tweet and responded to a tweet within the respective class membership for the duration of two class periods. Following the two class periods, the collaborative tweeting activity ceased for that week's assignment. During the week's remaining class period, each member of the intervention group individually crafted and submitted the completed argumentative essay.

The control group collaborated face-to-face within their respective class period regarding the argumentative reading and prompt for the same two class-period duration. The control group did *not* use microblogging. Following the subsequent two class periods, the control group experienced a traditional writing activity by crafting and submitting the argumentative essay on a computer-mediated device by the week's end.

Intervention continued for a four-week period. Following the four-week intervention period, the NCSE Student Survey and CCTT Level X posttests were administered and were identical to the pretests. Testing schedule protocol for administration of the posttest remained unchanged from the pretest period. Data from the posttest was collected, analyzed, and subsequently transmitted to the researcher by personal delivery.

Threats to Validity

Student attendance and attrition were threats to internal validity, but could have been controlled by a statistical intervention; however, no students were absent during the study. The threat of maturation and history were controlled by including a control group in the study's design. The threat of pretest and posttest replication was controlled by a control group inclusion.

The threat of selection was controlled through use of standardized test score placement; language arts students with near-equivalent standardized test scores were paired together.

An external threat to validity was the participants' knowledge of this study's purpose, and was controlled by the accustomed use of the shared portable computer carts for language arts writing activities. Any placebo effect was controlled for, as students in both intervention group and control group understood that the presence or absence of the computer usage is routinely variable. Construct validity was addressed as representative questions for each of the sections of the instruments were evaluated against desired outcome by a licensed psychologist.

Data Analysis

Research Question One

A mixed analysis of variance (ANOVA) using SPSS Statistics was conducted to analyze the data and examine the null hypothesis: There is no statistically significant difference in student engagement as measured by the National Center for Student Engagement (NCSE) Student Survey instrument among middle school students when participating in a microblogging activity as compared to students participating in a traditional writing activity. The type of writing activity (microblogging using 140 characters versus traditional unrestricted characters) served as the independent variable. Student engagement, measured by the NCSE Student Engagement Survey, served as the dependent variable with a within-subjects factor of time and a between-subjects factor or condition. No subscales within the student engagement survey were identified.

A mixed ANOVA procedure was determined to be the most appropriate choice to analyze if an interaction existed between the within-subjects factor (time) and the between-subjects factor (condition) on the dependent variable of engagement. This procedure provided

more information to address the research question of possible difference in engagement than a procedure restricted to analyzing only one group before and after an intervention or to two groups after two different interventions. The mixed ANOVA procedure combined data derived from different subjects serving under different intervention levels, as well as the means from same subjects tested repeatedly on the same dependent variable at different time periods. Each subject served as its own control (Howell & David, 2011). The repeated measures design element provided the advantage of controlling for random prior differences within each group, thereby differentiating subject differences from error. This achieved a more powerful study through greater statistical power relative to the sample size and thereby reducing type I error (Howell & David, 2011)

An initial analysis of variance (ANOVA) was performed to determine if gender, grade, and ethnicity were significant factors. Gender, grade, and ethnicity did not significantly contribute to variability in the dependent variable of engagement. Because the ANOVA statistical procedure controlled for initial differences between groups (Gall et al., 2010), the effect of the dependent variable was then tested.

Preliminary assumption testing for a valid mixed ANOVA study design was completed. The dependent variable (engagement) for research question one was measured at the continuous level (score) using a measure of central tendency (mean). The within-subject factor (time) consisted of two categorical levels in which the same groups were measured on the same dependent variable on two separate occasions (pre and posttest). The between-subjects factor of condition involved two categorical independent groups, intervention and control. A box plot visually detected two data points which failed to follow the usual pattern. As these two data points were identified by SPSS as exceeding 1.5 box lengths from the edge of their box, they

were classified as outliers (Laerd, 2013). As their scores were reexamined and appeared not to be a part of the normal population, they were discarded from pretest and posttest data with no loss of generalizability of results (Tabanichhk & Fidell, 2001). This adjustment prevented distortion of the differences on engagement scores between the matching pairs, thereby increasing the accuracy of the study's results (Green & Fredricks, 2011).

The assumption of normality was evaluated using the Shapiro-Wilk's test. The *p* value was found to be greater than $p = .05$; therefore, the null hypothesis was not rejected, indicating that the dependent variable (engagement) was normally distributed for each of the populations, for within-subject factor groups and between-subjects factor groups (Green & Salkind, 2011).

The assumption of homogeneity of population variances was tested using Levene's Test and $\alpha = .05$. The null hypothesis that the variance of the dependent variable is equal across within-subjects groups at each time point was not violated and therefore found tenable (Green & Salkind, 2011)

Homogeneity of covariances was tested using Box's test of Equality of Covariances Matrices with a significance level of $p = .001$. Mauchly's test of sphericity was not applicable as there existed only two levels of the within-subject factor (Green & Salkind, 2011). No post hoc tests were applicable due to the existence of only two levels and the test's design intention to identify main effects, not interactions.

Effect size was calculated using the η^2 (partial eta squared) to determine how much the dependent variable variance can be attributed to the factors (time, condition). Cohen's *d* was used to report the difference between two means, or the size of such difference with the conventional values of .01, .06, and .14, interpreted as small, medium, and large effect sizes,

respectively (Green & Salkind, 2011). The $p = .05$ significant level which is the generally accepted social sciences criteria was utilized to determine whether the null hypothesis should be rejected (Green & Salkind, 2011).

Research Question Two

A mixed analysis of variance (ANOVA) was used to analyze the null hypothesis: There will be no statistically significant difference in critical thinking as measured by the Cornell Critical Thinking Test (CCTT) instrument among middle school students when participating in a microblogging activity as compared to students who participate in a traditional writing activity. Because the differences in mean scores were examined between groups in which the same participants were being tested more than once to analyze possible interaction as well as testing within groups, a mixed ANOVA was appropriate (Salkind, 2000).

Visual inspection of the box plot for the dependent variable indicated data points outside normal values. Further investigation eliminated possibilities of the data points representing incorrect data entry, missing value codes or erroneous population member. In order to prevent distortion, the outliers were therefore eliminated for all relative groups. Normality was tested using Shapiro-Wilk's test for treatment and control groups' pretest and posttest CCTT data. Conventional use of alpha of $p = .05$ applied. Evaluation of homogeneity of variances used Levene's test and a significance level of $p = .05$. Homogeneity of covariances was tested using Box's test of equality of covariances matrices with a significance level of $p = .001$. As only two levels of within-subjects factor existed, no sphericity test was applicable (Green & Salkind, 2011), and likewise, no post hoc tests were conducted.

As in the analyses of Research Question 1, the effect size (the magnitude and significance of the intervention) of the intervention on critical thinking was calculated as eta squared (η^2). The

p = .05 significant level was utilized to determine whether the null hypothesis should be rejected (Green & Salkind, 2011).

CHAPTER FOUR: FINDINGS

Research Questions

The following research questions were investigated:

RQ1: Is there a statistically significant difference in student engagement as measured by the National Center for Student Engagement (NCSE) Student Survey instrument among middle school students when participating in a microblogging activity as compared to students who participate in a traditional writing activity?

RQ2: Is there a statistically significant difference in student critical thinking as measured by the Cornell Critical Thinking Level X instrument among middle school students when participating in a microblogging activity as compared to students who participate in a traditional writing activity?

Null Hypotheses

The following were the corresponding null hypotheses:

H_o1: There is no statistically significant difference in student engagement as measured by the National Center for Student Engagement (NCSE) Student Survey instrument among middle school students when participating in a microblogging activity, as compared to students who participate in a traditional writing activity.

H_o2: There is no statistically significant difference in critical thinking as measured by the Cornell Critical Thinking Level X instrument among middle school students when participating in a microblogging activity, as compared to students who participate in a traditional writing activity.

Demographics

The demographics of the participants involved in the study are discussed in the following paragraph and summarized in Table 6. The students were enrolled in an accredited suburban, public middle school in northwest Florida. All participants were pre-assigned to pre-existing sixth-grade and seventh-grade English Language Arts (ELA) classes determined by academicplacement and teacher recommendation. The ELA classes were advanced and under the instruction of one certified highly-effective ELA educator. The total number of participating responses was reduced due to the removal of two outliers identified in the initial analysis. Within the intervention group, n = 81 and within the control group, n =36. The demographics of the participants are summarized in Table 6.

Table 6

Participant Demographics

Responses	
Total Responses	Valid Responses
119	117
Gender	
Female	Male
68	51
Grade Level	
Sixth-grade	Seventh-grade
55	64
Ethnicity	
Caucasian	77
Multiracial	25
African-American	11
Asian	6

Descriptive Statistics

The *n* for this analysis was 117. Two cases were removed from the data due to extreme outliers. The descriptive statistics for the engagement pretests data are presented in Table 7. Additionally, descriptive statistics for the Engagement and Critical thinking posttests data are presented in Table 8.

Table 7

Pretest Scores of Dependent Variables Engagement and Critical Thinking

Factor	Group	*n*	*M*	*SD*
	Control	36	178.47	22.13
Engagement	Intervention	81	184.83	19.52
	Control	36	27.39	9.70
Critical Thinking	Intervention	81	29.1	9.58

Table 8

Posttest Scores of Dependent Variables Engagement and Critical Thinking

Factor	Group	*n*	*M*	*SD*
	Control	36	168.75	19.20
Engagement	Intervention	81	183.53	22.15
	Control	36	24.83	11.45
Critical Thinking	Intervention	81	31.56	10.38

Results

Null Hypothesis One

A mixed ANOVA analyzed null hypothesis one (**H_o1**): There is no statistically significant difference in student engagement as measured by the National Center for Student Engagement (NCSE) Student Survey instrument among middle school students when participating in a microblogging activity, as compared to students participating in a traditional writing activity.

The researcher used SPSS software for the statistical analyses. A mixed analysis of variance (ANOVA) examined whether there was a significant effect of the type of writing activity (condition) on engagement. Such analysis compared the mean differences between the two groups to investigate if an interaction existed between the two factors of time and condition on the dependent variable of engagement. Before running the analyses, the researcher first ran a variety of tests to make sure that the underlying assumptions of ANOVA were not violated (such as homogeneity of variance and normality). There were no violations of the underlying assumptions. The results for each assumption are summarized in Table 9. Specific information on each test follows the table.

Table 9

Assumption Testing for Engagement Data

Assumption	Test Used	Intervention	Control
Outliers	Boxplot	Normality met	Normality met
	Histograms	Normally distributed	Normally distributed
Normality	Shapiro Wilk	Not violated	Not violated
Homogeneity of Variances	Levene's test	Not Violated	Not violated

Assumption Tests Results for Null Hypothesis One

Outliers.

The existence of outliers was examined through the construction of a box plot. A visual inspection indicated there were several outliers in the engagement data. However, as seen in Figure 3 below, no values greater than 1.5 box-lengths were identified from the edge of the box, and therefore outliers were retained as part of the population (Laerd, Lund Research, 2013).

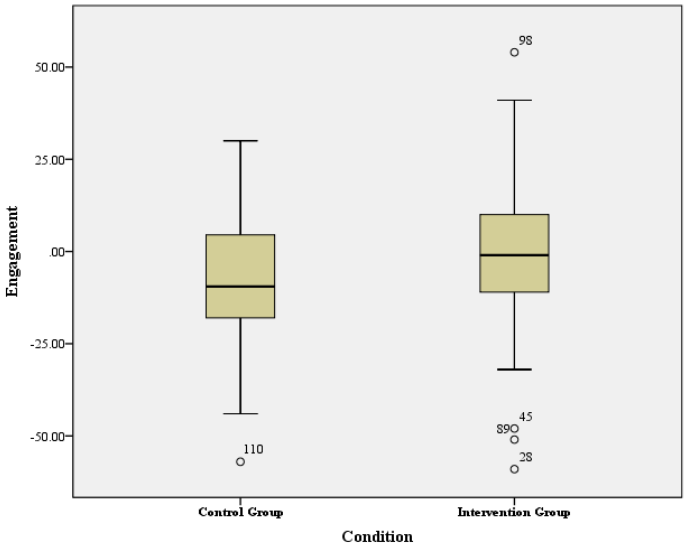

Figure 3. Box and Whisker Plot of Engagement Scores. This figure shows that the outliers in the data remain within reasonable parameters.

Normality.

Normality testing was conducted through construction of histograms. As illustrated in Figure 4, engagement scores normally distributed for the control group.

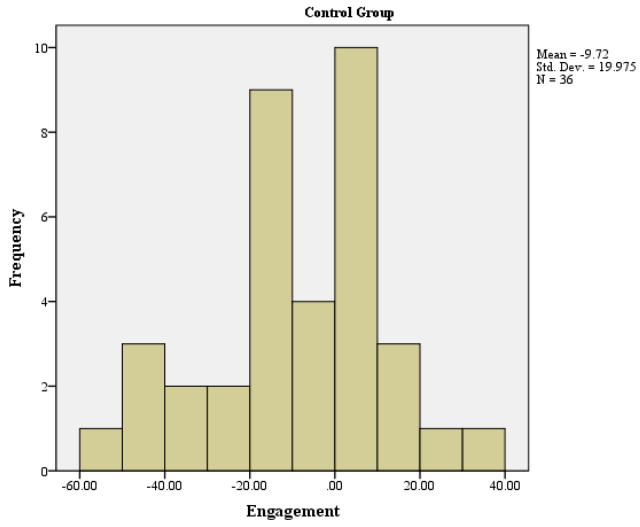

Figure 4. Control Group Engagement Histogram. This figure shows normal distribution of the control group data.

For normality demonstrated in the intervention group, Figure 5 illustrates the histogram results with a slightly positive kurtosis, but still within conventional values for normality (Laerd, 2013).

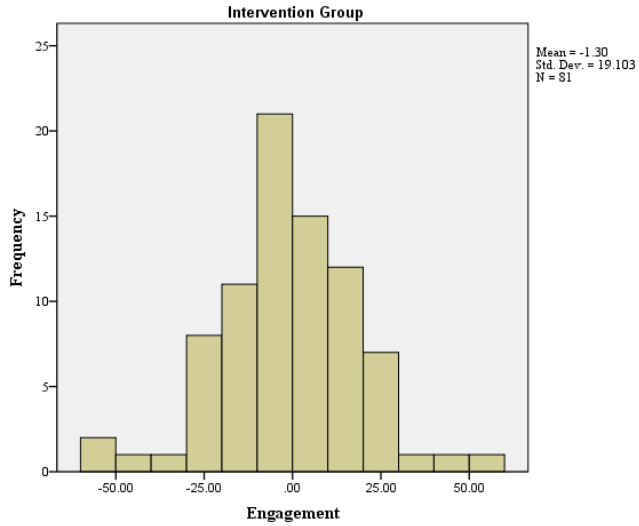

Figure 5. Intervention Group Engagement Histogram. This figure shows normal distribution of the intervention group data.

Variance.

The assumption of homogeneity of variance for the Engagement data was examined with Levene's Test. The test assessed that the variances of the populations were equal at each level of time (pretest and posttest). As demonstrated in Table 10, all values had a $p > .05$, and therefore both groups had similar variances.

Table 10

Levene's Test of Equality of Error Variances for Engagement Data

Source	*F*	*df1*	*df2*	*Sig*
Pretest	.988	1	115	.322
Posttest	.467	1	115	.496

Note. α = .05 and $p > .05$.

Additional Test of Normality

Normality was further assessed using Shapiro-Wilk test (Green & Salkind, 2011) and determined that both intervention and control groups in engagement did not violate the assumption of normality. A summary of the Shapiro-Wilk test in shown in Table 11.

Table 11

Shapiro-Wilk Test of Normality for Engagement Data

Source	*Statistic*	*Df*	*Sig*
Control	0.975	36	0.573
Intervention	0.981	81	0.274

Sphericity

The test for sphericity was not applicable, as there were only two levels of each group.

Analysis of Null Hypothesis One

The mixed ANOVA demonstrated that there was a statistically significant interaction between type of writing activity (condition) and repeated measure factor of time (pretest/posttest) on student engagement at an $\alpha = .05$ level , $F(1,115) = 4.715$, $p = .032$, partial eta square = .039, with an observed power of 0.577. Table 12 summarizes the results for Null Hypothesis One.

Table 12

Results of Null Hypothesis One

α	*F*	*p*	*Partial eta squared Value*	*Effect Size*	*Observed power*	*Outcome*
0.05	(1,115) = 4.715	0.032	.039	Small	0.577	Reject Null

Results of Null Hypothesis One

The first null hypothesis stated that there is no statistically significant difference in student engagement as measured by the National Center for Student Engagement (NCSE) Student Survey instrument among middle school students when participating in a microblogging activity, as compared to students who participate in a traditional writing activity. The statistical results of this study indicated that upon initial analysis, the first null hypothesis was rejected as $p < .05$ (see Table 12 above).

The rationale of using a mixed ANOVA proved evident in its ability to tease out precisely the areas in the study where significant differences occurred. The mixed ANOVA revealed several statistically significant interactions of factors regarding engagement.
The first statistically significant interaction is illustrated in Table 13 (below), identifying a statistically significant difference within groups measured solely by the repeated measures factor

of time and $p = .032$. In other words, the factor of time alone would have resulted in an effect on engagement.

Table 13

Tests of Within-Subjects Effects - Factor of Time on Engagement

Test	*Type III Sum of Squares*	*Df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Sphericity Assumed	1512.927	1	1512.927	8.062	0.005	0.066
Greenhouse Geisser	1512.927	1	1512.927	8.062	0.005	0.066
Huynh-Feldt	1512.927	1	1512.927	8.062	0.005	0.066
Lower-bound	1512.927	1	1512.927	8.062	0.005	0.066

Note. Computed using $\alpha = .05$

A second interaction tested in the mixed ANOVA was for differences in engagement between the groups without the factor of time (or, by condition only). Table 14 illustrates that there was a statistically significant difference in engagement, regardless of the time point between the intervention and control groups at an $\alpha = .05$ level, $F(1,115) = 8.062$, $p = .005$.

Table 14

Tests of Within-Subjects Effects of Condition on Engagement

Test	*Type III Sum of Squares*	*Df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Intercept	6380994	1	6380994	9387.006	0.000	.988
Condition	5556.845	1	5556.845	8.189	0.005	0.066
Error	78173.42	115	679.769	8.062		

Note. Computed using $\alpha = .05$

Finally, the mixed ANOVA test identified that the interaction between the factors of time (repeated measures) and condition had a significant effect on engagement. Table 15 illustrates the significance; since $p = .032$ was less than the alpha value of .05, the effect was significant.

Table 15

Tests of Within-Subject Effects of Time and Condition on Engagement

Test	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	Sig.	*Partial Eta Squared*
Sphericity Assumed	884.722	1	884.722	4.715	0.032	0.039
Greenhouse Geisser	884.722	1	884.722	4.715	0.032	0.032
Huynh-Feldt	884.722	1	884.722	4.715	0.032	0.039
Lower-bound	884.722	1	884.722	4.715	0.032	0.039

In addition to the statistically significant differences in engagement as interactions of time and condition, Table 16 (below) illustrates a measure of the mean differences between the engagement scores of the control group and the intervention group.

Table 16

Between-Subjects Factors Engagement Scores

Table 16

Between-Subjects Factors Engagement Scores

Condition	Pretest Mean	Posttest Mean	Change	Percentage Change	Mean Differences Condition Dependent	Mean Differences Time Dependent
Control	178.47	168.75	(-9.72)	-5.44%	-10.57	-5.509
Intervention	184.83	183.53	(-1.24)	-0.67%	-10.57	-5.509

Table 16 shows a significant change (decrease) in engagement in both the control and the intervention groups. However, the mean decrease in engagement was far more for the control group (M= -9.72) than the intervention group (M = -1.24). Stated another way, the decrease in student engagement was far less for the microblogging group than the control group (traditional writing). Furthermore, the mean differences between the intervention and control groups as a possible effect of condition was -10.57. The mean differences between the intervention and control groups as a possible effect of time (pretest/posttest) was -5.509.

Figure 6 visually demonstrates the result of engagement versus time and condition factors. The non-flat slope for both intervention and condition groups indicates a possible effect of time (pretest/posttest). The difference in slope degree between intervention and condition groups indicates a possible effect of condition. Engagement shows significant decline for both

groups; however, engagement declined significantly more for the control group than the intervention group.

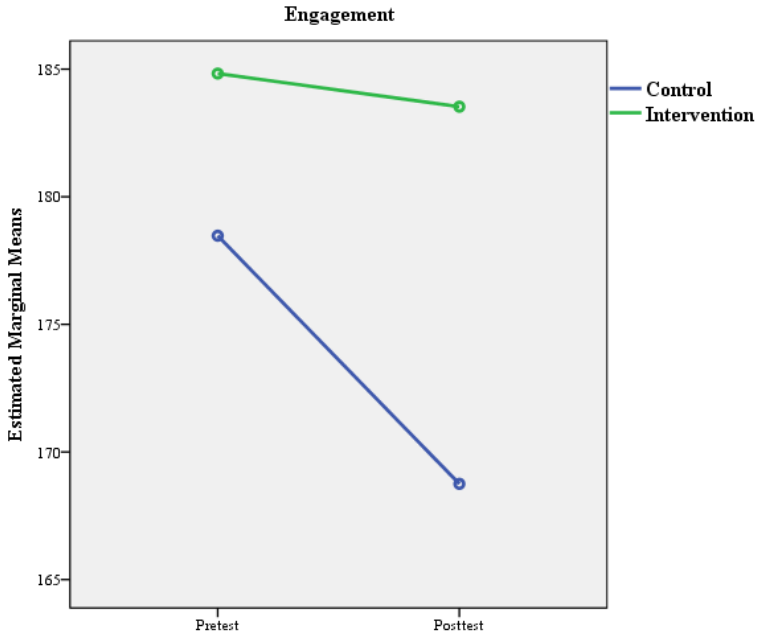

Figure 6. Estimated Marginal Means of Engagement.

Null Hypothesis Two

A mixed ANOVA was used to analyze null hypothesis two (**$H_0$2)**: There is no statistically significant difference in student critical thinking as measured by the Cornell Critical Thinking Test (CCTT) instrument among middle school students when participating in a microblogging activity, as compared to students who participate in a traditional writing activity.

The mixed ANOVA examined whether there was a significant effect of the type of writing activity on critical thinking. As in the examination of the factor of engagement in research question one (engagement), the mixed ANOVA again enabled identification of any interactions between the factors of time (repeated measures) and condition (intervention or control) on critical thinking. The assumption tests are summarized in Table 17.

Table 17

Assumption Testing for Critical Thinking Data

Assumption	Test Used	Intervention	Control
Outliers	Boxplot	Normality met	Normality met
	Histograms	Normally distributed	Normally distributed
Normality	Shapiro Wilk	Not violated	Not violated
Homogeneity of Variances	Levene's test	Not Violated	Not violated

Outliers.

Examination of the SPSS-generated box plot identified two potential outliers in the control group. The two data points exceeded the 1.5 box length criterion and their aggregate data were discarded. The two participants' responses indicated 'straight-line' responses and thus were not a part of a normal population's responses. This adjustment prevented distortion of the

differences on critical thinking scores between the matching pairs, thereby increasing the accuracy of the study's results (Green & Salkind, 2011). Figure 7 illustrates the box plot following the outliers' removal.

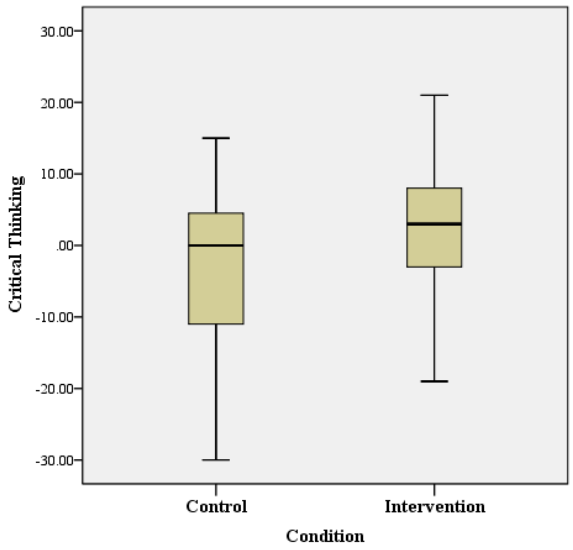

Figure 7. Boxplot Testing for Critical Thinking Data.

Normality.

The assumption of normality was verified through construction of histograms. Figure 8 illustrates that the critical thinking scores were normally distributed for the control group, as well as the intervention group (see Figure 9).

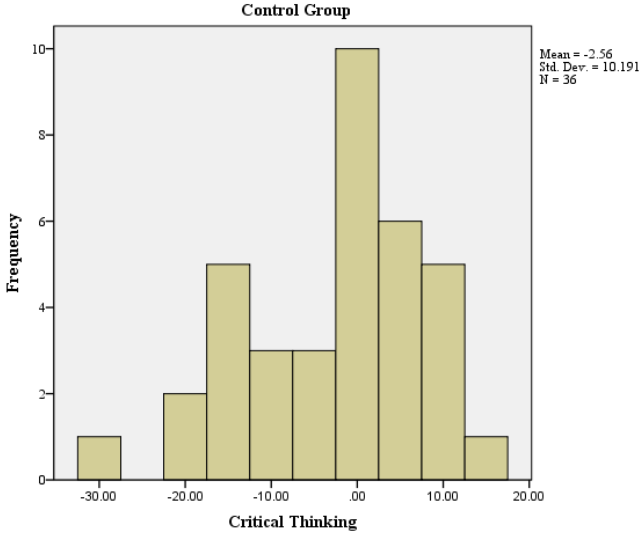

Figure 8. Control Group Critical Thinking Histogram. This figure shows relatively normal distribution of the control group data.

For the control group, Figure 9 illustrates the histogram results with a slightly positive kurtosis, but within conventional values for normality (Laerd, 2013). For the intervention group, the histogram results found in Figure 10 also illustrate a slightly positive kurtosis, but again, are within conventional values for normality (Laerd, 2013).

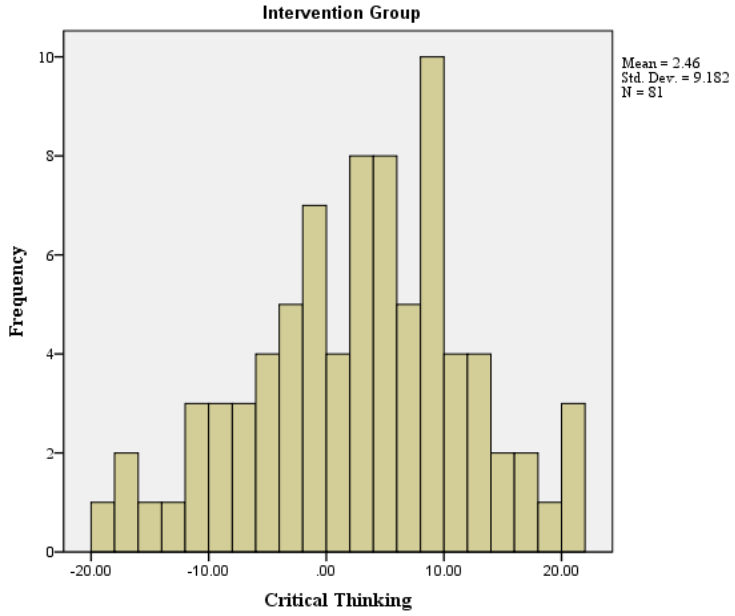

Figure 9. Intervention Group Critical Thinking Histogram. This figure shows the relatively normal distribution of the intervention group data.

Variance.

The assumption of homogeneity of variance for the Critical Thinking data was examined with Levene's Test. The test assessed the variances across groups for pretest and posttest regarding the dependent variable critical thinking. As demonstrated in Table 18, the Sig. value (*p*) for both groups exceeded alpha value of .05 and were considered insignificant. Therefore the assumption of homogeneity of variances was met.

Table 18

Levene's Test of Variance for Critical Thinking Data

Table 18 *Levene's Test of Variance for Critical Thinking Data*				
Source	*F*	*df1*	*df2*	*Sig*
Pretest	.005	1	115	.945
Posttest	1.113	1	115	.294
Note. α > .05				

Additional Test of Normality

The Shapiro-Wilk's test for normality was used to assess that critical thinking scores were normally distributed. As the sig values for the intervention group and control group were greater than the alpha value, the null hypothesis of normal distribution was not rejected and therefore, the data distribution was considered equal to a normal distribution (Gall et al., 2010). A summary of the Shapiro-Wilk test results is shown in Table 19.

Table 19

Table 19 *Shapiro-Wilk Test of Normality for Critical Thinking Data*			
Source	*Statistic*	*df*	*Sig.*
Control	0.961	36	0.234
Intervention	0.985	81	0.447

Sphericity

The test for sphericity for critical thinking data was not applicable as there were only two levels of each group.

Analysis of Null Hypothesis Two

The mixed ANOVA demonstrated that there was a statistically significant interaction between type of writing activity (condition) and repeated measure factor of time (pretest/posttest) on student critical thinking at an $\alpha = .05$ level , $F(1,115) = 6.983$, $p = .01$, partial eta square = .057, with an observed power of 0.743. Table 20 summarizes the results.

Table 20

Results of Null Hypothesis Two

Table 20 *Results of Null Hypothesis Two*						
α	*F*	*p*	*Partial eta squared value*	*Effect Size*	*Observed Power*	*Outcome*
0.05	(1,115) = 6.938	0.010	.057	small	0.743	Reject Null

Results of Hypothesis Two

The second hypothesis stated that there is a statistically significant difference in student critical thinking as measured by the Cornell Critical Thinking Test (CCTT) instrument among middle school students when participating in a microblogging activity, as compared to students who participate in a traditional writing activity. The statistical results of this study indicated that the second null hypothesis was rejected as $p < .05$ (see Table 20).

As in the previous hypothesis regarding engagement, the mixed ANOVA identified areas of significant interactions of factors regarding critical thinking. The first statistically significant interaction seen in Table 21 (below) occurred between groups measured solely by the condition,

and $p = .021$, which is less than $\alpha = .05$. In other words, the factor of the condition alone, microblogging or traditional activity, resulted in an effect on critical thinking.

Table 21

Tests of Between-Subjects Effects of Condition on Critical Thinking

Table 21 *Tests of Between-Subjects Effects of Condition on Critical Thinking*							
Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*	*Observed Power*
Intercept	158773.9	1	158773.9	979.28	.000	.90	1.00
Condition	886.02	1	886.02	5.47	.021	.05	.64
Error	18645.27	115	18645.27				

A second significant interaction occurred between the factors of repeated measures of time and condition noted in Table 22.

Table 22 *Tests of Within-Subjects of Time and Condition on Critical Thinking*							
Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*	*Observed Power*
Intercept	158773.9	1	158773.9	979.28	.000	.90	1.00
Condition	886.019	1	886.02	5.47	.021	.05	.64
Error	18645.27	115	18645.27				

However, the mixed ANOVA tests revealed that the repeated measures as a sole factor did not have a significant effect upon critical thinking as the value of $p = .959$ was more than $\alpha = .05$. Table 23 illustrates the results of time on critical thinking.

Table 23

Tests of Within-Subjects Effects - Factor of Time on Critical Thinking

Test	*Type III Sum of Squares*	*Df*	*Mean Square*	*F*	*Sig.*	*Partial Eta Squared*
Sphericity Assumed	.12	1	.12	.00	.96	.000
Greenhouse Geisser	.12	1	.12	.00	.96	.000
Huynh-Feldt	.12	1	.12	.00	.96	.000
Lower-bound	.12	1	.12	.00	.96	.000

In addition to the statistically significant interaction of time and condition and their effect on critical thinking, Table 24 illustrates a measure of the mean differences between the critical thinking scores of the control group and the intervention group.

Table 24

Between-Subjects Factors Critical Thinking Scores

Condition	Pretest Mean	Posttest Mean	Change	Percentage Change
Control	27.39	24.83	- 2.56	- 9.33

Intervention	29.1	31.56	+2.55	+ 8.78

Table 24 shows a 9.3% decrease in critical thinking occurred in the control group, while the intervention group saw a nearly 8.8% increase in critical thinking. A visual representation of the significant interaction between time and condition on critical thinking is illustrated in Figure 10. Critical thinking showed significant decline in the control group, but showed significant increase in the intervention group over time.

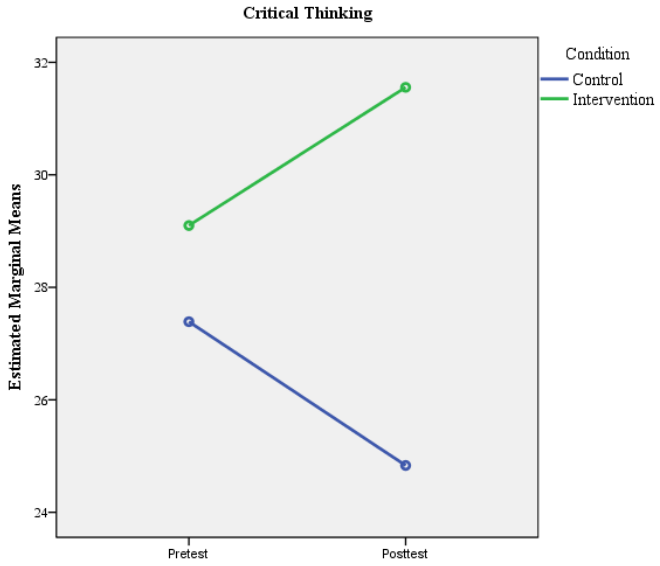

Figure 10. Interaction Effect of Condition and Time on Critical Thinking.

Additional Analysis

Summary

Statistical results of the study indicated that the first null hypothesis was rejected and therefore a statistical significant difference in engagement existed among middle school students participating in a microblogging activity, as compared to those participating in a traditional writing activity. Inspection of the mean scores of the engagement posttests indicated a significant difference between the two groups. Both groups' engagement scores declined over

time. However, the intervention group's decline in engagement was less than the control group's decline.

It must be mentioned that although engagement in both student groups declined, definitive student engagement was observed and noted by the teacher of the students engaged in the microblogging activity. Empirical observations made by the teacher of the students included student's enthusiastic reaction to the microblogging activity (e.g., "can we do more of this?"). Additionally, quantitative analysis indicated a greater-than-required number of tweets communicated between students during the microblogging activity. This observation could provide the basis of a future study.

Similar to the first null hypothesis regarding engagement, the second null hypothesis was also rejected, and therefore a statistical significant difference in critical thinking existed among middle school students participating in a microblogging activity, as compared to those participating in a traditional writing activity. Although students in the microblogging activity were required to collaborate and communicate in tweets restricted to only 140 characters, this intervention had an effect upon their critical thinking. The group which collaborated and discussed the prompts face-to-face followed by a traditional writing activity experienced a decline in the measure of critical thinking. Chapter five discusses rationales and implications for the results of both factors of engagement and critical thinking.

CHAPTER FIVE: DISCUSSION

Introduction

The purpose of chapter five is to review and discuss the results of this quantitative research study regarding the effect of microblogging on middle school students' engagement and critical thinking. The chapter is divided into the following sections: statement of the problem, discussion section of the findings for each hypothesis, conclusions, an implications section, study limitations, and recommendations for future research.

Statement of the Problem

Utilizing the conceptual frameworks of social constructivism, connectivism, and information foraging theories, this quasi-experimental study sought to determine the effect of microblogging (tweeting) on middle school students' engagement and critical thinking as measured by the National Center for Student Engagement (NCSE) Student Survey instrument and the Cornell Critical Thinking (CCT) Level X instrument.

The independent variable in this study was the type of writing activity, microblogging or traditional. Students in the intervention group employed microblogging (tweeting), or short online messages to other students restricted to 140 characters or less. For obvious security purposes, microblogging students utilized the educationally-secure site Edmodo to simulate a social media microblogging site. Conversely, the control group used traditional writing (or a style unrestricted in sentence length or expression).

The dependent variables were middle school student engagement and critical thinking. Although engagement is multi-faceted, this study framed engagement as the time and effort invested in an educational experience. Critical thinking was identified as the higher-order cognitive functions such as analysis, evaluation, and synthesis involved in an educational

experience. A convenience sample of 117 sixth-grade and seventh-grade English Language Arts students from a suburban middle school in Northwest Florida participated in this quasi-experimental research study**.**

Discussion of Findings

Research Hypothesis One

The study's first purpose was to determine if there was a statistically significant difference in student engagement among middle school students when participating in a microblogging activity, as compared to students participating in a traditional writing activity. The results of a mixed ANOVA test indicated that there was a statistically significant difference between the two groups.

The statistically significant results between the intervention (microblogging) group and the control group (traditional writing) confirmed previous scholarly research that students and faculty demonstrated a difference in engagement when using microblogging in the classroom (Hirsch, 2012; Junco et al., 2011). Previous research, however, was concentrated in higher education, not among middle school students. Although social media as an aggregate has been studied within the middle school environment, the specific sentence-restricted messaging tool of social media, known as Twitter, has incurred little examination. Thus, the middle school population became the impetus for this study. Therefore, this study's results of microblogging's significant effect upon middle school student's engagement supported previous research involving higher education participants. The results also validated other K-12 educators whose empirical observations cited a difference among students engaged in microblogging.

Despite the difference between the intervention and control groups, a decline in engagement occurred among the intervention participants, although far less than the decrease

among the control group. This result does not support the social constructivism of Vygotsky (1978). The intervention group's social settings for the study did not change from previous classroom settings. The intervention group was computer-literate, as well as comfortable with the available computers. They also were familiar with the Edmodo platform, used to replicate social media's Twitter platform, as Edmodo was a mainstay of the school. Therefore, the decline in engagement in the intervention group's social media interaction could be a factor of the late time period in the academic year in which this study took place.

The four-week study was conducted during the final five weeks of school when students had a heightened awareness of the impending school year end. Although parental approval for participant study was completed much earlier, the research schedule was forced to await IRB approval from Liberty University, the local school administrator, and the district level administrative board. This factor turned out to be an unexpected limitation. Subsequent delays occurred as state-mandated computer-mediated testing occupied all available hardware and bandwidth, rendering any elective computer use impossible for any research study. Following this intense testing period, students were understandably reluctant to undertake additional tests, even if for a seemingly benign research study dealing with social media (microblogging).

Research Hypothesis Two

The second purpose of the research study was to determine if there would be a statistically significant difference in critical thinking as measured by the Cornell Critical Thinking Level X instrument among middle school students when participating in a microblogging activity as compared to students who participate in a traditional writing activity.

The identical convenience sample of 117 sixth-grade and seventh-grade English Language Arts students participated. A mixed ANOVA analysis found a statistically significant

difference between the two groups. Students who microblogged (tweeted) had a higher critical thinking score than students who participated in the traditional writing activity regardless of academic grade. This finding supports previous literature addressing a potential increase in critical thinking when using microblogging. However, there have been few studies and the limited research has been concentrated in higher education (Dunlap & Lowenthal), leaving the middle school sector unaddressed. The research facilitator posited that the microblogging activity forced the students to intently focus to meet the 140 character maximum of a tweet. This meant that the microblogging group had to forage and retrieve information from background knowledge or the text content. The requirement to actively seek out and capture much-needed information supports the information foraging theory (Pirolli & Card, 1999). Although not a part of the methodology, students in the microblogging activity often cited the text when responding as part of the Close Reading Protocol curriculum. One such tweet illustrates a student foraging and retrieving information from the text regarding the discussion of whether a building owner should be held responsible for a building fire: "They did disobey sometimes, but the text stated we will never know what caused it (fire)."

After foraging and retrieving but before being able to tweet, students had to exercise yet more cognitive rigor. Microblogging required that they summarize the foraged and retrieved information into a compressed format, deconstruct the text, evaluate the quantity of text required, and finally, reconstruct the newly created text into a product called a tweet. Thus the microblogging activity integrated an immense amount of rigor.

The microblogging activity was instrumental in focusing the discussions while its familiar digital medium facilitated these conversations. It can be said that the microblogging discussions made metacognitive connections as it forced 'thinking about one's thinking' as well

as ‘thinking about others’ thinking’ in order to respond to the prompt and the tweets. The microblogging activity facilitated focus and critical thinking by breaking complex content or thought into bite-sized pieces or ‘chunking.’ These bite-sized or digital ‘byte-sized’ pieces of information known as chunks serve the same purpose as the paper mind-maps students traditionally use to visually connect ideas.

The microblogging student used the chunks or concepts made by connecting with others to segue into another thought or into the final argumentative essay. Each connected chunk scaffolded into yet another idea or thought even for the receiver of this tweet.

Conclusions

Overall, it could be said that on a macro level this study was about the business of education in the classroom executed differently. It was an endeavor to integrate a concept, informed by traditional and contemporary theories, with social media technology embraced by the middle school population into a meaningful, authentic classroom activity.

Statistically significant differences in student engagement and critical thinking occurred between the middle school microblogging and traditional writing participants. Engagement decreased for both groups, but engagement in the microblogging group decreased less than in the traditional activity group. Since engagement is related to the time invested in a task or activity and both the microblogging group and the traditional writing group had the same class time of 53 minutes, it appears that time was not a sole determinant of engagement. This means element(s) besides time should be identified that may contribute to middle school engagement; specifically, this study addressed engagement utilizing one specific digital mode, microblogging. This is especially significant as the research facilitator (teacher) observed students were unquestionably

engaged in the microblogging activity even though the survey instrument cited a decline in engagement in both groups.

In the future, it may be prudent to reevaluate what constitutes engagement among adolescents based upon their revelations (Finn & Zimmer, 2012). A recent comprehensive study of media use by teens and tweens identified 14% of their total daily digital consumption was for communication through social media or video chat (Common Sense, 2016). Communication digitally through microblogging rather than face-to-face may illuminate classroom redesign to elicit engagement through some form of social media communication. The micro-blogging group had higher levels of measured engagement, thus supporting this suggestion. It should also be noted that the microblogging students were interacting in direct, real time which is often the case of students using their digital devices. Educators could reassess the educational paradigm to harness and direct such digital peer-to-peer communication. The research facilitator for this study was so impressed by the observations of the microblogging students being engaged that she affirmed she will be implementing microblogging in future curriculum activities.

This study utilized the discipline of English Language Arts and Florida's educational benchmark to answer an argumentative writing prompt with textual evidence. The text was non-fiction based, and the argumentative writing prompt was created by the teacher to align with the content. The design of an argumentative prompt inherently forces the writer to take a position on a subject and this act subsequently evokes emotion, one of the identified elements of engagement. Even though both groups were provided the same textual content and the same writing prompt, the teacher observed more engagement from the microblogging participants than from the traditional writing participants; this observation was underscored by the quantitative data. As educational standards push for more rigor, collaboration, and effective writing, this

aspect of communication can serve as a conduit, replacing the industrialized educational model. Indeed, this study altered the teacher's role from conduit to that of facilitator.

It is unknown if other disciplines' content would illicit similar responses to microblogging activity. Social studies content could easily produce such argumentative prompts such as, "Was Hitler insane or a shrewd leader?" while Science could use microblogging to engage students to answer argumentative prompts such as, "Would altering DNA ever be considered beneficial to society?"

Regardless of discipline, microblogging's structure allows the background-impoverished students to tap into a pool of others' opinions, thoughts, and statements. A reticent student with underdeveloped imagination can scaffold on another's thought, using it to formulate the start of an essay.

Like similar microblogging studies on student engagement that varied in context, content, and results, this study supports the literature by illustrating that microblogging has the potential to foment participation, reflection, and collaboration. This potential may be seen in the results that although student engagement decreased in both groups, the decrease in engagement in the intervention group was less than the decrease in engagement for the control group, hence the statistically significant differences between the groups. Because engagement is but one facet of the aggregate concept of learning, this study's findings may require a more complex metric in order to support the social constructivist theory that learning occurs more effectively in such a purposeful, social environment. Student engagement, in this study, was assessed as a whole and not as the three dimensional construct of behavioral, cognitive, and emotional.

Critical thinking results, like engagement results, were statistically significant. In this situation, the microblogging group's critical thinking scores increased while the control group's

decreased. Since earlier research established a strong corollary between failure to engage and a negative impact upon critical thinking, it could be said that conversely the evidence of critical thinking in this study could be the result of engagement that was observed and present but not manifested by the study's metric, the NCSE.

It is plausible that external factors influenced the engagement results and possibly the critical thinking scores since the study occurred during the final five weeks of the academic year. Previous to this period, students had completed the new computer-based state standardized tests (to include a field test) that required five separate days of testing. Thus, another test, regardless of its benign character as merely a survey instrument, may not have been well received by the students.

The study's participants were a mixture of sixth-grade and seventh-grade advanced English Language Arts students. However, there was a difference in engagement pretest scores of 6.36 points between the intervention group (M = 184.83) and the control group (M = 178.47). This is opposed to the pretest scores for the critical thinking component, which incurred a smaller difference in scores between intervention (M = 29.10) and control group (M = 27.39). In both instances, the intervention group began with higher scores, though all students met similar academic and reading score criterion for advanced English Language Arts placement. Possible explanations could be that one of the two control groups experienced a 'split' class period in which their class period is interrupted by a lunch break, after which they resume class for an additional 25 minutes. Such interruption to the learning period may have an impact upon engagement. Additional intangibles such as class dynamics or personality can lead to uniquely cohesive (or not) classes which may have influenced scores.

The Critical Thinking scores were a result of a "correction-for-guessing" method of scoring suggested by the test creators. This operational feature could have influenced score outcomes since the test directions advised students not to guess wildly and to leave the answer blank if the student had no idea of the answer. The posttest critical thinking mean (29.49) of the intervention group, though, was compared to a middle school study of fourth-, fifth-, and sixth-grade students in an integrated, predominantly middle-class suburban school system (Ennis, Millman, & Tomko, 2005). The participants' mean score was eight points above the mean of the comparative school (21.1) (Ennis et al., 2005). When further compared to other meta-summary statistics, such as all eighth-grade students in 11 central schools in upstate New York, the mean of the critical thinking posttest was 7.09 points above the New York school's mean score of 22.4. The highest possible score for the Cornell Critical Thinking Text X is 71.

Finally, this study examined a heretofore under-studied adolescent population, specifically sixth- and seventh-graders. This population experiences accelerated physical and personal development. Such changes may explain the variance of scores among this study's participants and those of the meta-summary participants provided by the test authors.

Implications

Although the study revealed much about the effect of microblogging, an interview with the research facilitator identified three specific revelations with strong implications for an educational system striving to effectively meet contemporary challenges.

Vygotsky (1978) identified that it was the social environment that enhanced learning. The social aspect of the classroom appeared less relevant than the social digital tools used by the intervention students. In this study the social tool (microblogging) was viewed as an 'app' (application) and therefore held relevance and applicability for the students. Coupled with the

compressed character of microblogging (140 characters) and the abbreviated digital language with which students are accustomed, this combination may have been a familiar mix in which the students thrived. For educators, this may prove a relatively simple instructional tool to illicit diverse student responses while simultaneously placing the onus for thinking on students. The implication of this study is that educators must assess what now constitutes the social environment for students in a fluid, connected, and digital world.

Study Limitations

Many limitations existed for this study. Random selection was not possible and would have strengthened the study by ensuring all individuals had equal chance of selection for participation in this study. However, selection of the six class periods as either control or intervention group was completely randomized.

Generalization is a limitation of this study. Although it was assumed that the sample population of the study's sixth-graders and seventh-graders would be representative of all middle school sixth-graders and seventh-graders, this may not be the case. Although a preliminary ANOVA tested for the possibility of covariant factors of ethnicity, the ethnicities noted were not sufficient to be considered factors. The sample of this study may not accurately represent other populations having larger and more diverse ethnicities leading to external threats of validity.

The complexity of the study was also a limitation as it required a large commitment on behalf of the research facilitator (English Language Arts teacher) to conduct repetitive measure testing, implement and monitor the assignments over a period of four weeks, while maintaining technology functionality for six classes. Another limitation was the required justification to the school district to use two days to administer repetitive measure tests in lieu of instructional time. Utilizing two hours for research testing incurred a 1.1% loss in instructional time per Florida

State Department of Education's mandate of 180 hours of instructional time per student. The request was approved after review by all school district board members and the IRB committee. As stated earlier, parental approval for participant study was complete, but the research schedule was delayed awaiting IRB approval from Liberty University, the local school administrator, and the district level administrative board.

Although the computer hardware was a requirement for this study, it was a limitation as it received low priority in terms of scheduling. As the hardware was portable (COW: Computer on Wheels), and available to the school campus at large, it was often difficult to schedule and impossible to do so during the time period of the Florida state standardized assessments.

As the researcher could not be devoid of all bias coming from an interest in the study of microblogging, the researcher avoided all conversations regarding technology or the study with any of the study's participants. The researcher could not be present during any of the periods of research, which helped ensure participants were not biased.

Finally the survey instrument and the assessment tools used for the study were deemed the best available at the time, although limited. An engagement survey instrument that did not reflect engagement specifically to the use of technology is seen as a limitation.

Recommendations for Future Research

Additional research is recommended due to limited studies regarding the target population of middle school students. This is especially important as a current study (Common Sense Media, 2015) identified a surge in media use among middle school students of 6-8 hours per day, not inclusive of media used at school. The social interaction aspect of their devices (i.e., texting) accounted for 50% of their usage while doing homework assignments. The time spent daily on social media for tweens was only 0:11 minutes, while teenagers spent 1 hour 11 minutes

(Common Sense Media, 2015). Such an extreme leap in usage warrants further investigation and underscores the social element of digital interaction.

It is recommended that the study be conducted at a different time period in the academic year. It would be preferable to schedule the study during the midpoint of the academic year when routines have stabilized. Special attention should be directed at avoiding scheduling the study at the end or the beginning of the academic year. In this particular study, use of the computers (COWS) was dictated by the campus master schedule. Despite attempting to keep scheduling consistent with specific days of the week, the microblogging study was impacted by the state standardized testing which preempted use of the computers. Advanced planning for this type of testing could avoid future conflicts, ensuring a smoother and more robust study.

The Edmodo platform used in this study was a safe education-specific platform but was not able to limit the character count to 140 as Twitter would. The function of counting characters in order to replicate Twitter was cumbersome but necessary. External software provided some relief, enabling the study to be more exact. The ideal situation would be an integration of Edmodo and word count software.

A remaining consideration is that even if federal legislation removes age restrictions [COPPA] for social media websites, there still exists the element of safety that can never be overstated. Thus, an education-safe site such as Edmodo or Google classroom may still be in the best interest of all participants in order to acquire full parental consent when dealing with middle school students.

While this study gave positive results based on critical thinking, it is suggested that microblogging among middle school students be examined through use of an experimental

design in lieu of a quasi-experimental design. Such a design would increase the study's validity and strength.

Finally, based upon the Department of Education's 2010 mandate to engage students in relevant experiences in the classroom such as demonstrated in this study, it is recommended that additional research be conducted using microblogging among middle school students.

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APPENDIX A

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

May 8, 2015

Sondra S. Singleton
IRB Approval 2167.050815: Effect of Microblogging on Middle School Student Engagement and Critical Thinking

Dear Sondra,

We are pleased to inform you that your above study has been approved by the Liberty IRB. This approval is extended to you for one year from the date provided above with your protocol number. If data collection proceeds past one year, or if you make changes in the methodology as it pertains to human subjects, you must submit an appropriate update form to the IRB. The forms for these cases were attached to your approval email.

Thank you for your cooperation with the IRB, and we wish you well with your research project.

Sincerely,

[redacted]

Fernando Garzon, Psy.D.
Professor, IRB Chair
Counseling

(434) 592-4054

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APPENDIX B

INFORMED CONSENT FORM

Effect of Microblogging on Middle School Student
Engagement and Critical Thinking Skills

To the parent/guardian of _____:

Your student is invited to be in a research study examining the effect of using microblogging ('tweeting') on middle school students' engagement and critical thinking skills. Your student's participation in this research study may be helpful to increase understanding of the effect of collaborating using an authentic activity such as microblogging (commonly known as 'tweeting' or making an online comment of 140 characters or less) in a middle school class setting.

Your student was selected as a possible participant because he/she may fit the criteria for this study as a middle school student enrolled in a class using microblogging ('tweeting') as a means of communication with peers.

This informed consent addresses the details, involvement, and consequences of the research study. I ask that you read this form and ask any questions you may have. Upon reading, understanding, and signing this document, you are giving consent for your student to participate in this research study.

Researcher:

Sondra Shively Singleton, Ed.S., Doctoral Candidate, Liberty University School of Education

Inquiries:
The researcher will be happy to address questions regarding the research study. Please address all inquiries to sssingleton2@liberty.edu.

Procedures:

If you decide to allow your child's voluntary participation, your child will be asked to complete a simple survey about student engagement and a simple test on critical thinking skills. The first survey on student engagement will require 15-20 minutes of student class time and be administered two times; once at the beginning of the study and once at the completion of the six week study. The test on critical thinking skills contains 76 questions and may be completed in one class period of 52 minutes. Your student will also engage in 'tweeting' or online communication with other in-class students regarding three writing assignments required to be completed in the language arts class during this six week period.

During the online computer activity, your child's contact will be safely restricted to his/her language arts peers through the use of an online educational platform Edmodo. As the language arts teacher will be using Edmodo, access to this activity will be limited by code and restricted to the teacher and participants only.

Participant Risks:

The study may involve risks, but these risks are considered minimal and no more than the participant would encounter in everyday campus life. There is a possibility of your student being identified as a participant in relation to a survey or test result. However, this risk is minimized by only the language arts teacher knowing who the participants are and the researcher only knowing the results of the surveys and test by a number coded to a list of students which only the language arts teacher holds.

Further, none of the surveys, tests, scores, or results will have any identifying features in regard to student names or identification. Any published report of the results will supply pseudonyms for the actual names.

Participant Benefits:

Participants may benefit from engaging in classroom activities (such as collaboration, critical thinking, and engagement) that duplicate experiences found in authentic, real world situations using microblogging. Participants, faculty, and education community may also benefit from the possible publication of the study's findings as an educational tool to increase engagement and critical thinking skills.

Compensation:

You student will not receive payment or any other type of compensation for participation in this study.

Confidentiality:

All precautions will be taken to protect confidentiality and privacy through the use of coded numbers. At no time, will the researcher identify the participants by name. The surveys, tests, and computer-mediated activities (microblogging) will be provided to the participants by the language arts teacher and conducted on a computer in the language arts classroom. Only the researcher will have the results of this study without reference to any names; these results will be kept private in a locked file cabinet by the researcher for a period of three years and then will be destroyed by shredding.

The computer-mediated activity (microblogging) will occur through the use of an access code to the educational platform Edmodo with a portal dedicated exclusively to each group within a language arts class. Only the language arts teacher and respective group of students will have

this discrete access code to the site. As our computers are serviced by an external server host, it is conceivable that the company could require access for maintenance purposes, though this is extremely unlikely. The language arts teacher would store all protected access codes in a sealed envelope which would be given to the researcher and locked in the secure file cabinet.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not for your student to participate will not affect your student's grade in the language arts class. If you decide to participate, you are free to not answer any question or have your student withdraw at any time without any penalty or hardship.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd, Suite 1837, Lynchburg, VA 24502 or email at irb@liberty.edu.

You will be given a copy of this information to keep for your records.

Statement of Consent:

I have read and understood the above information. I have had an opportunity to address any questions or concerns and receive answers. I hereby give my voluntary consent for my student to participate in the study.

Student Name (Print):_____

Parent/Guardian Signature: _____ Date: _____

Parent/Guardian Name (print): _____ Date: _____

Signature of Investigator: _____ Date: _____

IRB Code Numbers:

IRB Expiration Date:

APPENDIX C

REMINDER FOR RETURN OF LETTER OF CONSENT

REMINDER

FOR

RETURN OF LETTER OF CONSENT

Date:

Dear Parent/Guardian:

Hello again and thank you for your support in allowing me to initiate a study on microblogging which, with your consent, will involve your student.

If you have returned the consent form, please accept my sincere thanks.

If you have yet to return the consent form, it would be very appreciated if you could attend to this at your earliest opportunity. In order to have a valid research study, it is important that all forms be returned.

Sincerely,

Sondra S. Singleton, Doctoral Candidate, Liberty University

6th Grade World History Educator

W. C. Pryor Middle School

201 Racetrack Rd.

Ft. Walton Beach, FL 32547

APPENDIX D

The Liberty University Institutional Review Board has approved this document for use from 5/8/15 to 5/7/16 Protocol # 2167.050815

Letter of Assent of Student (Child) to Participate in a Research Study

What this study is about and who is doing this study:
The study is about middle school students using a form of social media known as microblogging or more commonly known as "tweeting." The study is being completed by Mrs. Singleton, a World History teacher at W. C. Pryor Middle School and also an online doctoral candidate in the School of Education at Liberty University.

Why we are doing this study:
We are interested in studying how "tweeting" to one another in certain classroom activities might affect your engagement (interest) and your ability to reason (critical thinking).

Why we are asking you to be in this study:
You are being asked to be in this study because you are a middle school student in a language arts class that has the opportunity to use "tweeting" (microblogging).

If you agree, here's what will happen:
If you agree to be in this study, you will receive normal classroom instruction in your language arts class. You will then be asked to complete a short survey about how you feel about your class and school.

If you are a student in the *treatment* group classroom, you will complete three (3) separate writing assignments in a time period of four (4) weeks using Edmodo software (which you currently use in your English Language Arts class). During these writing assignments you will collaborate with your classroom peers and post comments or "tweets" to them before submitting your final paper electronically.

If you are a student in the *control* group classroom, you will likewise complete 3 separate writing assignments in the four week period using Edmodo but will have the opportunity to collaborate with your peers face to face in the classroom. You will *not* be posting comments or "tweets" before submitting your final paper electronically.

Regardless of which group you are in , you will be asked to take this survey again at the end of the four weeks of this study. Finally you will be asked to take a test which will **not count** for a grade at the very end of the study.

If you don't want to be in the study:
You do not have to participate in this study. If you do not want to be in the study, merely tell your language arts teacher. It is OK to say "No, I don't want to be in the study". You may even decide to be in the study and then change your mind and say no. This will be OK, also.

Questions you might have:
If you have a question, you can ask your language arts teacher at any time. The language arts teacher will be giving you the surveys and tests. If you think of a question at a later time, you may even ask it then.

APPENDIX E

MIS 1117
Rev. 3/2015

SCHOOL DISTRICT OF OKALOOSA COUNTY
120 Lowery Place, SE
Fort Walton Beach, FL 32548

RESEARCH REQUEST FORM

Please submit in triplicate to the Program Director of Student Intervention Services for review by the Research Request Committee.

1. Name and address of person requesting research: SONDRA SINGLETON
W.C. PRYOR MS 201 RACETRACK RD. FT WALTON BEACH, FL 32547 Date. 10 MAR 2015
Telephone: Cell (850) 621-5085 or

Type of Research:
X Test CORNELL CRITICAL THINKING TEST (CCTT) — Questionnaire — Other
X Survey STUDENT ENGAGEMENT SURVEY — Checklist

School record to be used:
— Cumulative folders — Statewide test results
— County test results X Other GENDER, ETHNICITY, DEA SCORES, FCAT

State problem or title of study: THE EFFECTS of MICROBLOGGING ON MIDDLE SCHOOL STUDENTS' ENGAGEMENT & CRITICAL THINKING

Purpose of study: STUDY USE of TECHNOLOGY IN MICROBLOG FORMAT (140 CHARACTERS OR LESS) TO DETERMINE ITS POTENTIAL EFFECT ON 6TH & 7TH GRADE ENGLISH LANGUAGE ARTS ADVANCED STUDENTS SENSE of ENGAGEMENT & CRITICAL THINKING SKILLS.

Additional pertinent information: RESEARCH FACILITATOR WILL BE CATHY BENDOLIN (TEACHER OF YEAR - OCSD) IN HER SIX ELA CLASSES.

II. Procedure (a 1-2 page narrative should accompany this form with a more thorough description of the proposal):
Date of administration of test: FINAL 9-WEEK PERIOD PERIOD ACADEMIC YEAR 2014-15 PRE-TEST, 1) SURVEY INSTRUMENT POST TEST Kind: 2) CRITICAL THINKING TEST
Time required for administering: PRE-TEST/POST TEST - 1 CLASS PERIOD EACH / MICROBLOGGING - 1 CLASS PERIOD
Amount of school time involved: TOTAL - 6 CLASS PERIODS IN CONJUNCTION WITH ASSIGNMENTS IN CLASS
What levels: 6/7 GRADE
Number involved: Schools: W.C. PRYOR (ONLY) Students: APPROX 113
How administered: In groups: 2 TREATMENT GROUPS PER GRADE + 1 CONTROL GROUP / GRADE
Description of population to be used: ADVANCED ELA STUDENTS
Method of sampling to be used: CONVENIENCE SAMPLING
Time students will be taken out of regular class work: 1½ class periods

Findings will be made available to the Okaloosa County School District.

[redacted]
Signature of Applicant

LIBERTY UNIVERSITY / Ed. D. DOCTORATE DEGREE
University/Level of Degree Sought

III. Approval.

[redacted]
Major University Professor

[redacted]
Chairman, Research Committee

Chief Officer for Quality Assurance & Curriculum

cc Superintendent of Schools

APPENDIX F

Research Request and Proposal Description

A study is requested by Sondra Singleton, OCSD Educator and Doctoral Candidate, to examine the effect of microblogging in a classroom activity on middle school students' engagement and critical thinking. A quantitative, quasi-experimental, pretest-posttest, nonequivalent control group design study will be used. A convenience sample of one hundred and twelve sixth-grade and seventh-grade advanced language arts students at W.C. Pryor Middle School will complete a pretest consisting of the National Center for School Engagement (NCSE) Student Survey and the Cornell Critical Thinking Test (CCTT). Students in the experimental group will use microblogging to complete an in-class activity securely facilitated through the Edmodo educational platform. Students in the control group will complete a traditional in-class activity not utilizing microblogging. Both groups will receive a posttest from which data will be analyzed using an analysis of covariance (ANCOVA).

This study investigates the potential use of microblogging, a form of electronic communication limited to 140 characters (known more commonly as 'tweeting') which is prevalent in real-world global, electronic-media interactions. As Student Performance Plans call for increased rigor in the protocol of Student Speak and Student Writing, the use of microblogging to enable students to electronically interact and share ideas with peers could increase student engagement. Additionally, the requirement to compress one's thoughts and then express these thoughts using a maximum of 140 characters may increase critical thinking.

The research design requires the participants involved in the study to read an assigned article about a particular topic. Following the reading, students will be required to address a selected writing prompt. Students in the treatment group (microblogging) will then post 'tweets' as to their thoughts regarding the prompt. For example, one article relates to outdoor enthusiasts

and the subsequent writing prompt is "Should outdoor adventurists who require rescue be required to reimburse agencies for the rescue costs?" Following the students' 'tweets' to one another, they begin their individual writings for assignment completion. Students who are in the control group will interact face-to-face or use a traditional web map to share thoughts but will not microblog ('tweet'). The control group will then individually complete the writing assignment.

The study involves six total advanced English Language Arts classes, composed of three sixth-grade and three seventh-grade classes. Two of the three sixth-grade classes will receive the microblogging intervention with the third class serving as the control group. The three seventh grade classes will replicate this design. This study will conclude after four separate articles and respective reading prompts have been addressed. Following this, post tests will be administered to measure student engagement and critical thinking skills.

APPENDIX G

Singleton, Sondra

From: Schroeder, Teresa
Sent: Wednesday, April 01, 2015 1:15 PM
To: Singleton, Sondra
Cc: Kelley, Dr. Diane (Carver Hill); Meyer, Grant; Hudson, Cynthia; Butler, Gregory; Beaudoin, Catherine
Subject: Research Request Response

Ms. Singleton,

Your research request has been approved by the Research Advisory Committee. Please make sure that you have discussed your proposal with Mr. Meyer and that he is fully on board with your moving forward with the research.

The committee will look forward to reviewing your findings at the completion of the study. Best of luck as you move forward toward your Doctorate degree!

Sincerely,

[redacted]

Teri Schroeder, M.Ed., BSN, RN
Program Director, Student Intervention Services
Okaloosa County School District
(850) 833-5861 Office, (850) 301-3055 Fax

"People don't care how much you know, until they know how much you care."

APPENDIX H

NCSE School Engagement Questionnaire

From: Jodi Heilbrunn <jodi.heilbrunn@sumedu.net>
To: sondrapilot <sondrapilot@aol.com>
Date: Fri, Apr 8, 2016 4:57 pm

Hi Sondra,

You're at the finish line! Congratulations are in order. Will you send me your dissertation or a summary, when you are done? I'd love to learn about your findings.

I hope that this note will suffice to indicate that you had permission to use the NCSE School Engagement Survey, and you have permission to reproduce it in your dissertation.

However, please do not write in your dissertation that the survey is free, because that is no longer true. We were getting so many requests and inquiries that we began charging a small fee about a year ago. That fee did not apply to you, since you used the survey before that time. (If you plan to use the survey again, we would appreciate it if you would pay our modest $50/year fee at this link: http://schoolengagement.org/school-engagement-services/school-policy-reform#Question.)

Jodi Heilbrunn

--
Jodi Heilbrunn
Director, National Center for School Engagement

APPENDIX I

NATIONAL CENTER FOR STUDENT ENGAGEMENT SURVEY INSTRUMENT

We would like to find out a little more about you and how you feel about school. Your answers to the following questions will help do this. It will take you about 15 minutes to complete this survey. If you are unsure of how to answer a question, please answer it as best you can. All the information you provide is confidential. It will only be used to help learn about how to keep students interested in school.

	Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
1. When I came to school today I thought my school was good.	☐	☐	☐	☐	☐
2. When I came to school today I thought my school was friendly.	☐	☐	☐	☐	☐
3. When I came to school today I thought my school was too hard.	☐	☐	☐	☐	☐
4. When I came to school today I thought my school was interesting.	☐	☐	☐	☐	☐
5. I get along with my teachers.	☐	☐	☐	☐	☐
6. I pay attention in school.	☐	☐	☐	☐	☐
7. I get my homework done.	☐	☐	☐	☐	☐
8. I get along with other students.	☐	☐	☐	☐	☐
9. I believe education is very important.	☐	☐	☐	☐	☐
10. Getting good grades is very important.	☐	☐	☐	☐	☐
11. The things learned in school are going to be important to me later in life.	☐	☐	☐	☐	☐

	Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
12. It's important to attend school every day.	☐	☐	☐	☐	☐
13. It's important to go to college.	☐	☐	☐	☐	☐
14. It's important to have a good job or career after finishing school.	☐	☐	☐	☐	☐
15. I feel close to people at my school.	☐	☐	☐	☐	☐
16. I feel like I belong in my school.	☐	☐	☐	☐	☐
17. I am happy to be at my school.	☐	☐	☐	☐	☐
18. The teachers at my school treat students fairly.	☐	☐	☐	☐	☐
19. I feel safe at my school.	☐	☐	☐	☐	☐
20. I am happy to be at my school.	☐	☐	☐	☐	☐
21. I like most of my teachers at school.	☐	☐	☐	☐	☐
22. The students at this school don't like students who are different.	☐	☐	☐	☐	☐
23. I am getting a good education at my school.	☐	☐	☐	☐	☐
24. I will graduate from high school.	☐	☐	☐	☐	☐
25. I want to go to college.	☐	☐	☐	☐	☐
26. I am not interested in school.	☐	☐	☐	☐	☐
27. Most of my classes are boring.	☐	☐	☐	☐	☐
28. Most of my teachers care about how I'm doing.	☐	☐	☐	☐	☐
29. Most of my teachers know the subject well.	☐	☐	☐	☐	☐

	Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
30. I learn a lot from my classes.	☐	☐	☐	☐	☐
31. There is an adult at school that I can talk to about my problems.	☐	☐	☐	☐	☐
32. I respect most of my teachers.	☐	☐	☐	☐	☐
33. School is a waste of my time.	☐	☐	☐	☐	☐
34. Most of my teachers are always telling me what to do.	☐	☐	☐	☐	☐
35. Most of my teachers understand me.	☐	☐	☐	☐	☐
36. Most of my teachers expect too much of me.	☐	☐	☐	☐	☐
37. I feel excited by the work in school.	☐	☐	☐	☐	☐
38. I am interested in the work I get to do in my classes.	☐	☐	☐	☐	☐
39. My classroom is a fun place to be.	☐	☐	☐	☐	☐
40. I study at home even when I don't have a test.	☐	☐	☐	☐	☐
41. I try to watch TV shows about things we are doing in school.	☐	☐	☐	☐	☐
42. I talk with people outside of school about what I am learning in class.	☐	☐	☐	☐	☐
43. I check my schoolwork for mistakes.	☐	☐	☐	☐	☐
44. If I don't know what a word means when I am reading, I do something to figure it out, like look it up in the dictionary or ask someone.	☐	☐	☐	☐	☐

	Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
45. I read extra books to learn more about things we do in school.	☐	☐	☐	☐	☐
46. If I don't understand what I read, I go back and read it over again.	☐	☐	☐	☐	☐
47. Most of my teachers praise me when I work hard.	☐	☐	☐	☐	☐
48. I try my best at school.	☐	☐	☐	☐	☐
49. I feel I can go to my teacher(s) with the things that I need to talk about.	☐	☐	☐	☐	☐

APPENDIX J

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Marketing@CriticalThinking.com • www.CriticalThinking.com

4/7/2016

Dear Sandra Singleton,

This letter grants you permission from The Critical Thinking Co.™ to publish your findings in regards to the use of the Cornell Critical Thinking Test for your dissertation.

You do not have permission to make available the test in its complete format or the answers in any research or thesis paper where other academics may be able to reproduce the test.

You do have permission to showcase the example questions found in the Cornell Critical Thinking Test in your research or thesis paper, as well as your test group results, statistical data, and comparisons to normative data found in the Cornell Critical Thinking Test Manual.

[redacted]

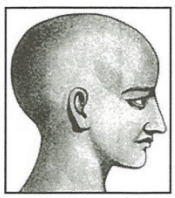
Michael Baker
Title: President
Email: michaelb@criticalthinking.com
Phone: 800-458-4849 x 106
Fax: 800-458-4195

APPENDIX K

CORNELL CRITICAL THINKING TEST LEVEL X

FIFTH EDITION

ROBERT H. ENNIS
JASON MILLMAN



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EXPLORING IN NICOMA

The year is 2052. It is the middle of June. Imagine yourself to be in the second group from Earth to land on the newly discovered planet Nicoma. Nothing has been heard from the first group, which landed on Nicoma two years earlier. Your group has been sent to make a report about what happened to the first group.

In this booklet, you will be told about some things learned on Nicoma by your group. Then you will be given problems that call for clear thinking. Answer these problems as if the things you are told are true.

Do not guess wildly at any answer. If you have no idea what the answer is, leave a blank. If you have a good idea, even though you are not positive, answer the problem.

The test has four parts. In the first two parts you must not go back to a problem once you have passed it.

Now wait until you are asked to begin.

SECTION I
WHAT HAPPENED TO THE FIRST GROUP?

The first job of your group is to find out what happened to the first group of explorers. Your group has landed on Nicoma and has just discovered the metal huts put up by the first group. From the outside, the huts appear to be in good condition. It is a warm day, and the sun is shining. The trees, rocks, grass, and birds make Nicoma appear like much of North America.

You and the health officer are the first to arrive at the group of huts. You call out, but you get no answer.

The health officer suggests, *"Maybe they're all dead."* You try to find out if he is right.

Listed below are some facts you learn. You must decide whether each fact supports the health officer's idea *or* suggests that the health officer's idea is mistaken—*or* neither.

For each fact, mark one of the following on your answer sheet:

A. This fact **supports** the health officer's idea that everyone in the first group is dead.
B. This fact **goes against** the health officer's idea.
C. **Neither**: this fact does not help us decide.

Here is an example of the kind of problem in this part of the test:

1. You go into the first hut. Everything is covered by a thick layer of dust.

Is this fact **for** or **against** the health officer's idea, or **neither**? It certainly isn't enough to prove him right, but it does give some support. If a fact supports the health officer's idea, you should mark **A** on your answer sheet. Mark **A** for Number 1.

Mark your answer for this next example:

2. Other members of your group discover the first group's rocket ship nearby.

The answer is **C**. Knowing that the first group's rocket ship has been discovered doesn't help you decide one way or the other. Since this fact doesn't help you decide whether the health officer is right or wrong, **C** is correct.

GO ON TO THE NEXT PAGE.