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K-12 Virtual Students: Relationships Between Student Demographics, Virtual Learning Experience, and Academic Achievement

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A dissertation

presented to

the faculty of the Department of Educational Leadership and Policy Analysis

East Tennessee State University

In partial fulfillment

of the requirements for the degree

Doctor of Education in Educational Leadership

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by

Jamie Hilton Whiting

August 2013

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Dr. Bethany H. Flora, Chair

Dr. Donald Good

Dr. Jasmine Renner

Dr. Jack Rhoton

Keywords: Virtual Learning, Online Education, Online Learning, eLearning

## ABSTRACT

### K-12 Virtual Students: Relationships Between Student Demographics, Virtual Learning Experience, and Academic Achievement

by

Jamie Hilton Whiting

The purpose of this study was to identify significant differences in academic achievement among virtual students of various backgrounds, demographics, and virtual learning environments. The study also sought to identify factors that may predict the academic achievement, as defined by final course grade, of virtual students. This study examined those relationships for the 476 students enrolled in virtual courses between January 2010 and January 2013 in Sullivan County Schools, TN. These students were in grades 7-12 during the time the courses were taken. Independent variables in Phase I of the study included gender, race/ethnicity, socio-economic status, prior number of virtual courses completed, and existing student grade point average. Independent variables in Phase II of the study included instructional dialogue in the virtual course, structure of the virtual course, and autonomy of the learner allowed in the virtual course. The researcher investigated the relationships between these independent variables and the dependent variable, academic achievement, as determined by final virtual course grade. The statistical methods used to answer the research questions included bivariate correlations, independent samples t-tests, and bivariate regression analysis.

Two of the independent variables in Phase I of the study were found to be significant. Students identified as being economically disadvantaged tended to perform better academically in virtual courses than students identified as non-economically disadvantaged, as determined by final virtual course grade. A statistical significance was also found between existing student GPA and academic achievement in virtual environments. Students with a higher GPA prior to taking a virtual course tended to receive higher grades than those with lower existing GPAs. Using bivariate regression, existing GPA accounted for 25% of the variance in student academic achievement in virtual courses.

All three of the independent variables in Phase II of the study were found to have a significant relationship with student academic achievement as determined by final virtual course grade. Students who reported high levels of instructional dialogue (frequency of teacher-student interactions, teaching presence, content interactions) tended to perform significantly higher than those reporting lower levels of instructional dialogue. Students who reported high levels of structure (instructional support, navigation, course design) tended to perform significantly higher than those reporting lower levels of structure in the course. Students who reported higher levels of autonomy (student ability to determine goals, learning experiences, and evaluation decisions) tended to perform significantly better academically than those who reported lower levels of autonomy.

## DEDICATION

This dissertation is dedicated to my children, my husband, my parents, and my late grandmother, Dorothy Davenport. My family has been a constant source of love, support, and encouragement.

My parents, J.W. and Mitzie Hilton, have cared for my children and provided the love and encouragement needed to see this through.

My wonderful husband Andrew has provided constant love, solid support, and continuous encouragement. Without you this would not have been possible.

My children have all watched my love of learning since birth. Drew, Jay, Dottie, and Jessie, you have brought laughter, hugs, kisses, and fun to each and every day. I am so thankful God blessed me with all of you. I pray each of you will be lifelong learners.

Finally, this dissertation is dedicated to my grandmother Dorothy Davenport. She always encouraged the love of learning, hard work, and perseverance. I have fondly thought of her through this process and hope she is smiling down now that it is complete.

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To my wonderful family: Andrew Whiting, Mitzie and J.W. Hilton, Lois Gilbert Corbin, and Justin and Kimberly Hilton. Thank you for taking such great care of my children so I could focus on what needed to be done. Drew, Jay, Dottie, and Jessie, I just thank you for being your perfect selves. Thank you for your pictures, hugs, songs, laughter, and patience. I love you all so very much.

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# CHAPTER 1

## INTRODUCTION

Virtual learning in K-12 schools has grown from an estimated 40,000 to 50,000 students in 2002 to an estimated total of 1,500,000 students engaged in some form of virtual or blended learning program during the 2009-2010 school year (McLester, 2002; Wicks, 2010). The types of virtual education programs include state virtual schools, charter virtual schools, multi-district, single-district, multi-state, university-run, blended, global, and consortium-based programs. Forty-eight of the 50 states provide students with some form of virtual program and 38 states have implemented statewide virtual programs (Watson, Murin, Vashaw, Gemin & Rapp, 2010; Watson & Ryan, 2007; Wicks, 2010).

Researchers of virtual schooling have evolved from an implementation focus to a pedagogical focus. In other words the conversation has changed from whether to implement virtual learning to how learning may best be facilitated in a virtual environment (Glass & Sue, 2008). With the continued increase in adoption and investment in virtual options for K-12 education, instructors and administrators face challenges in establishing conditions that will enhance student learning in virtual environments (Sheridan & Kelly, 2010). Factors that may influence student learning in a virtual environment include course design, virtual learning components, interactions, and instructor presence. Course design describes the navigation, visual layout, and types of technology incorporated in the virtual course. Virtual learning components include the channels used in the course for instructional delivery, such as interactive game-like

learning activities, PowerPoint presentations, eBooks, or immersion in virtual world environments. Interactivity is considered by many to be the defining characteristic of virtual courses (Bolter, 1991; Landow, 1992; Murray, 1997; Swan, 2001). Three types of interactivity have been identified that may affect student learning in virtual courses: student interaction with content, student interaction with instructors, and student interaction with peers (Moore, 1989; Swan 2001). Instructor presence is the direct and indirect roles of a virtual teacher that foster a meaningful experience for students (Anderson, Rourke, Garrison, & Archer, 2001). The critical variables that affect student learning in virtual environments include student motivation, course interactivity, and content presentation (Allen & Seaman, 2003).

#### Statement of the Problem

Due to the continuing increase in demand and options for virtual learning in K-12 education, it is important to understand the predictors for academic achievement in virtual courses. Therefore the purpose of this study was to examine the relationships between student backgrounds, virtual learning experiences, and academic achievement in the K-12 virtual environment. This study was divided into two phases: Phase I focused on the student demographic data and academic achievement; Phase II utilized the Distance Education Learning Environments Survey (See Addendum A) to explore the virtual learning environment and academic achievement for students enrolled in virtual learning courses in Sullivan County (TN) Schools. Three overarching constructs were used to classify the variables in this study: (1) student background characteristics, (2) virtual learning environment, and (3) student academic achievement. The first construct, student background characteristics, was defined as: gender, race/ethnicity, grade level,

socio-economic status, and Grade Point Average (GPA) upon entering the virtual course. The second construct, virtual learning environment, included three major components: instructional dialogue, structure, and autonomy of the learner. Instructional Dialogue comprises the types of frequency of teacher-student interactions, the number of students in the class, and the nature of the class content. Structure comprises: type of platform, characteristics of teachers, characteristics of learners, and constraints of the platform. Autonomy of the Learner comprises: the extent to which the teaching/learning relationship involves the learner in determining goals, learning experiences, and evaluation decisions. Lastly, the third construct, student academic achievement, was defined as the final grade in the virtual course.

### Research Questions

This study focused on the demographic data and survey responses of students enrolled in virtual learning courses in Sullivan County (TN) Schools. For the purposes of studying the relationship of virtual learning environments and student academic achievement, the virtual learning environment has been divided into three domains: instructional dialogue, structure, and autonomy of the learner. The Instructional Dialogue domain comprises the types of frequency of teacher-student interactions, the number of students in the class, and the nature of the class content. The Structure domain comprises: type of platform, the characteristics of teachers, the characteristics of learners, and the constraints of the platform. The Autonomy of the Learner domain comprises: the extent to which the teaching/learning relationship involves the learner in determining

goals, learning experiences, and evaluation decisions. This study was conducted in two phases and focused on the following research questions:

Phase I: Background Characteristics and Demographics and Student Achievement

RQ1: Is there a significant difference in academic achievement between males and female students in virtual learning environments?

RQ2: Is there a significant difference in academic achievement in virtual learning environments as compared by student race/ethnicity?

RQ3: Is there a significant relationship between academic achievement in virtual learning environments and students in different grade levels (7-12)?

RQ4: Is there a significant difference in academic achievement in virtual learning environments as compared by student socio-economic status?

RQ5: Is there a significant difference in academic achievement in virtual learning environments for students taking a virtual course for the first time as compared to students who have prior experience in virtual courses?

RQ6: Is there a significant relationship between academic achievement in virtual learning environments in relation to existing grade point average (GPA)?

RQ7: If there is a significant relationship between academic achievement in virtual learning environments in relation to existing GPA, to what extent can existing GPA predict academic achievement in virtual learning environments?

## Phase II: Virtual Learning Environment and Student Achievement

RQ8: Is there a significant relationship between academic achievement in virtual learning environments and Instructional Dialogue scores?

RQ9: Is there a significant relationship between academic achievement in virtual learning environments and the structure of the virtual learning environment?

RQ10: Is there a significant relationship between student achievement in virtual learning environments and the Autonomy of the Learner scores?

### Definitions of Terms

The following terms are defined for the purpose of this study.

1. Asynchronous: “[C]ommunication exchanges which occur in elapsed time between two or more people. Examples are email, online discussion forums, message boards, blogs, podcasts, etc.” (iNACOL, 2011, p. 3).
2. Autonomy of the Learner domain: The extent to which the teaching/learning relationship involves the learner in determining goals, learning experiences, and evaluation decisions.
3. Blended course: “[A]ny course that combines two modes of instruction, online and face-to-face” (iNACOL, 2011, p. 3).
4. Blended learning: A hybrid model that combines traditional brick-and-mortar education with virtual learning. The student completes a portion of his or her learning online with some student control over time, place, and/or pacing. (Horn & Staker, 2011).



5. Brick and mortar schools: “[T]raditional school or traditional school building, as contrasted with an online school” (iNACOL, 2011, p. 3).
6. Charter school: Public schools established with a charter; a performance contract detailing the school’s mission, program, goals, students served, methods of assessment, and ways to measure success (Treetops School International, 2011).
7. Engagement: “Active participation in a course to promote retention and understanding for deeper learning” (iNACOL, 2011, p. 5).
8. Full-time virtual program: A program that provides an education for students who are primarily enrolled in the virtual school. The virtual school is responsible for student assessment data (Watson et al., 2010).
9. Instructional Dialogue domain: Domain that measures the frequency of teacher-student interactions, the number of students in the class, and the nature of the class content.
10. Virtual learning: Learning based on instruction and content are delivered primarily over the Internet (Watson & Kalmon, 2005). The term is used interchangeably with online learning, cyber learning, and e-learning. For this study, virtual learning is restricted to entirely virtual programs and excludes any type of blended courses in which a face-to-face component exists.
11. Part-time virtual program: A program that “... allows students to take less than a full load of online courses, as defined by local or state legal entities. Sometimes refers to a ‘supplemental online program’” (iNACOL, 2011, p. 8).

12. State virtual schools: Virtual schools created, administered, and/or funded by legislation or by a state-level agency for the purpose of providing virtual learning opportunities state-wide (Watson et al., 2010).
13. Structure domain: Domain that comprises type of platform, the characteristics of teachers, the characteristics of learners, and the constraints of the platform.
14. Synchronous learning: “Online learning in which the participants interact at the same time and in the same space” (iNACOL, 2011, p. 9).
15. Teacher of record: Often “... the same as the online teacher. However in some states, when the online teacher is not an employee of the student’s school, educational code requires the teacher of record to be from the student’s school. In this case, it is the person who holds the appropriate teaching certification and is responsible for certifying the final grade for the course” (iNACOL, 2011, p. 9).
16. Virtual class: “A group of students assigned to the same online course” (iNACOL, 2011, p. 9)

### Limitations and Delimitations

This study was limited to students in grades 7-12 in the Sullivan County School System in Tennessee. Surveys were distributed by email addresses. One of the limitations of the study was access to student or parent email addresses if email addresses changed since completing the virtual course. A second limitation of the study was the selection of questions from the DELES survey to create domain areas for the purpose of exploring the effects of virtual environments on student achievement. A third limitation for this study was the inability to match the registration documents to the DELES student

survey responses. Despite these limitations, the study was important because of the limited research on factors influencing student achievement in virtual courses.

All research studies have delimitations, creating boundaries between what was examined in the study and what was not examined. This narrowing of focus provides insight and also offers justifications for the parameters that were explored.

One such delimitation of this study is that virtual courses were defined as only those courses that were delivered in an entirely online format and did not include blended courses. This sampling decision was made because it is important to understand the factors influencing student achievement in virtual courses where students have no face-to-face contact with instructors. Blended courses introduce confounding variables that could skew results; thus, the blended course environment should be examined separately.

### Overview of the Study

Chapter 1 presents an introduction, the statement of the problem, research questions, definitions of the terms used in this study, and limitations pertaining to the study. Chapter 2 presents the findings from the review of literature including the theoretical framework on which the study is based, a history of distance and virtual learning, learning perspectives and characteristics in virtual courses, benefits and challenges of virtual learning, barriers to virtual learning, types of virtual learning found in the K-12 learning environment, and student achievement in virtual courses. Chapter 3 focuses on the methods and procedures used in the study to determine the relationships between student demographics, virtual learning experience, and student achievement. Chapter 4 presents the findings evaluated from the study. Chapter 5 contains a

summary, findings of the research questions, conclusions, and recommendations for further research and implications.

## CHAPTER 2

### REVIEW OF THE LITERATURE

#### Introduction

The emergence of virtual learning in the K-12 environment represents the merging of many factors, including the expansion of and increasing access to the Internet along with the integration of technology throughout education. The growth of K-12 virtual learning is increasing at such a rapid pace, many publications refrain from including specific statistics because the data are at risk of being outdated before publication (Watson et al., 2010). The Sloan Consortium is considered one of the best sources of national data in the United States regarding K-12 virtual course participation (Wicks, 2010). The consortium estimated 1,030,000 students were enrolled in some form of virtual learning during the 2007-2008 school year (Picciano & Seaman, 2009). Despite the increasing demand for virtual options, there is limited availability of literature or models of best practice in virtual schooling and the need for additional research in this area is evident (Bain, 2004; Cavanaugh, Barbour, & Clark, 2009; Hoffman, 2005).

#### Historical and Pedagogical Foundations of Virtual Learning

Virtual learning is the latest form of distance learning, which has existed in several forms since the correspondence courses of the 1700s (Jeffries, 2002). Various definitions have been created for distance education and distance learning with no concrete consensus. The U.S. Department of Education defines distance learning as “the acquisition of knowledge and skills through mediated information and instruction.

Distance learning is used in all areas of education, continuing education, corporate training, military and government training, and telemedicine (Gilbert, 2001, p. 17). Other definitions of distance learning include “simply learning from a distance, usually from home, or from a conveniently located off-campus site” (Laws, 2000, p. 2); “planned learning that normally occurs in a different place from teaching and as a result requires special techniques of course design, special instructional techniques, special methods of communication by electronic and other technology, as well as special organizational and administrative arrangement” (Moore & Kearsley, 1996, p. 2). Distance learning has evolved over time from distance learning (first and second generation where students and faculty interacted from a distance) to virtual learning (third and fourth generation where students and faculty interact from a distance using web-based platforms).

#### First Generation of Distance Learning Through Asynchronous Correspondence Courses

The first generation of distance learning included slow asynchronous communication between the student(s) and instructor. Students and instructors communicated through postal mail. Almost all learning was individualized study with little or no communication among students in the same course. Advantages for students were convenience, access, and flexibility. Typically the cost was very low for both the institution as well as to the student. However, the dropout rate was high (Archer, 1999; Garrison, 1985; Garrison & Archer, 2000; Matheos, Rogoza, & Hamayil; 2009).

During the first generation of distance learning, technology limited the richness of two-way communication and interaction among and between students and instructors. Teleconferencing was the first technological advancement that enabled two-way

communication; however, the cost and logistical complexities associated with teleconferencing prohibited widespread adoption and use (Matheos & Archer, 2004). Thus communication during the first generation remained almost exclusively asynchronous. First generation virtual pedagogy, to some degree, was driven by this slow asynchronous model of teacher and student interaction.

In this first generation, distance education pedagogy was primarily cognitive-behaviorist. The premise behind behavioral learning is the acquisition of new behaviors as a result of an individual's response to stimuli. Behavioral instructional designs are evident in the virtual learning examples of computer-assisted instruction, instructional systems designs, and the Keller Plan with the essential features of flexible pacing, mastery-based learning, repeatable testing, peer tutoring, and on-demand course content (Anderson & Dron, 2011; Keller & Sherman, 1974). During this time cognitive models of learning began to emerge adding consideration for motivation, attitudes, and mental barriers that are not included in behavioral learning models. Learning was still considered an individual process, however the focus changed from stimulating changes in student in behavior to fostering changes in knowledge, attitudes, and student capacity to store and recall information. The locus of control in a cognitive-behaviorist learning model was the teacher. In cognitive-behaviorist models, structured processes were used to stimulate learner interest, learning objectives were clearly stated, and then the learner was tested and reinforced for knowledge acquisition (Anderson & Dron, 2011). Virtual instruction from a cognitive-behavioral viewpoint addresses issues like learner attention, awareness of course objectives, recall of prior knowledge, exposure to new stimulus

material, course guidance, academic achievement, constructive feedback, performance assessments, and application of knowledge (Anderson & Dron, 2011; Gagne, 1965).

In many ways the cognitive-behavioral instructional practices in virtual education in this first generation mimicked pedagogical approaches employed in early century classrooms where teachers used behavioral and basic cognitive approaches to facilitate learning. The major difference between first generation virtual learning and first generation classroom learning was the expansion of geographic access and flexibility for students to complete assignments outside of the normal school hours. Although first generation virtual learning could be delivered at a lower cost than traditional classroom education, cognitive-behavioral instruction in distance education provided for maximum access and student freedom at a lower cost than traditional education; instructor presence was greatly limited. Indeed, instructor presence was primarily limited to the transmission of content. Although some have argued that instructor presence could be developed via printed text through “guided didactic interaction,” even this type of presence was rare (Holmberg, 1983, 1989; McKerlich, Anderson, Riis, & Eastman, 2011). The time required for distance communication and lack of interactivity that characterized the first generation distance education course led to the second generation (Anderson & Dron, 2010; Matheos et al; 2009; Mckerlich et al., 2011).

### Second Generation of Distance Learning Through Television and Radio Courses

The second generation of distance learning evolved into synchronous communications between students and instructor, typically by audio and/or video conferencing. Instruction shifted from an individual focus to group instruction



occasionally supplemented with individual consultations by telephone. The synchronous format somewhat compromised the flexibility for students to attend classes around their own schedule by requiring students to attend at a designated remote location. The synchronous model was considerably more expensive, especially for institutions providing multi-site videoconferencing. Pedagogical approaches in the second generation were similar to traditional face-to-face instruction since instructors were interacting with students synchronously. Therefore second generation distance programs attracted the same types of students as would be attracted to brick and mortar programs (Archer, 1999; Garrison, 1985; Garrison & Archer, 2000, Matheos et al., 2009).

During the second generation of distance learning, the synchronous interactions between instructor and student enabled a pedagogical shift from the cognitive-behaviorist strategies to social constructivist approaches. Although many cognitive-behaviorist aspects were foundational practices in most courses, learning activities evolved into incorporating personal construction of knowledge, influenced by the educational psychology developments under scholars such as Piaget, and social interaction theorists including Vygotsky and Dewey (as cited in Anderson & Dron, 2011; Piaget, 1970). Some of the common aspects of social-constructivist models include: new knowledge builds upon prior knowledge, context, active learning, construction of knowledge through language and other social tools, metacognition and evaluation of learning, learner-centered learning environment, and the discussion, validation, and real-world application of knowledge (Anderson & Dron, 2011; Honebein, 1996; Jonassen, 1991; Kanuka & Anderson, 1999). This generation of distance learning positively addressed the isolation of the learner in the prior generation but negatively impacted student flexibility in time

and location. The synchronous format reintroduced the issues found in face-to-face delivery models including teacher domination and passive delivery of lecture (Anderson & Dron, 2011). As synchronous distance learning was combined with asynchronous delivery, learners regained much of the flexibility that had previously been lost while retaining the benefits of group interaction. This led to a transition to combined synchronous and asynchronous delivery models. Additionally the use of the internet in education shifted from simply content delivery to flexible courseware in the mid-1990s, which introduced the possibilities for richer interactions among learners, leading to the development of the community of inquiry model – hallmark of the third generation of distance learning (Garrison, Anderson, & Archer, 2000; Keengwe & Kidd, 2010; McKerlich et al., 2011).

### Third Generation of Distance Learning Through Web-Enhanced Courses

The third generation of distance learning emerged when synchronous distance learning was combined with fast asynchronous methods of communication. New technologies allowed for synchronous and asynchronous communication via the Internet (Matheos et al., 2009). One example of this type of model is the cohort-based virtual learning course where a group of students work through a combination of asynchronous online activities and scheduled synchronous web conferences. In the third generation, learners regained the flexibility enjoyed by learners in the first generation, as they worked asynchronously and submitted assignments from any location with Internet access. This model of virtual learning has a high start-up cost for institutions and potentially for students; however, the long-term cost is comparable to face-to-face instructional models.

The dropout rate is typically low for third generation (Garrison, 1985; Archer, 1999; Garrison & Archer, 2000, Matheos et al., 2009). Technologies such as virtual worlds and social networks developed in the third generation to support synchronous communication contributed to the transition to the fourth generation of distance learning.

#### Fourth Generation of Distance Learning

The emerging fourth generation of distance learning is strongly based in constructivism, and has been termed connectivist pedagogy. Connectivism views learning as the process of building networks of information, contacts, and resources that may then be applied to authentic problems (Anderson & Dron, 2011; Downes, 2007; Mckerlich et al., 2011; Siemens, 2005). The learner's role in a connectivist model is not to memorize and regurgitate information; instead it is understood that information is plentiful and easily accessed in a digital and networked world. The role of the learner is to find and apply content knowledge when it is needed (Anderson & Dron, 2011). Connectivist learning activities include the creation and contribution of knowledge by all learners and are heavily dependent upon the Internet and digital tools (McKerlich et al., 2011). In the fourth generation, both instructor and student presence is high. Instructors and students may convene synchronously in virtual worlds using avatar interaction (McKerlich et al., 2011). One of the most significant drawbacks of connectivism is the lack of structure toward a learning goal. Students often report feeling lost and confused toward the beginning of a course that employs a connectivist model (Anderson & Dron, 2011; Hall, 2008). This generation is still emerging and more research is needed to define the roles of teachers in this environment, balance of structure, and means of

establishing controlled networked learning environments (Anderson & Dron, 2011). The changing role of the learner in this fourth generation also introduces many changes for the instructor. Instructors must become increasingly technologically savvy, in addition to maintaining content or disciplinary expertise that is supplemented by strong pedagogical methods. One lauded approach in the current generation of virtual learning is the importance of fostering an online learning community.

### Learning Communities and Characteristics of Effective Virtual Courses

“Successful online instructors realize that building a sense of ‘community’ in the online classroom is necessary for successful learning outcomes” (Woods & Ebersole, 2003, Introduction section, para. 1). Building a community of learners in an online environment is often a goal for virtual courses as a way to enhance the learning process. Virtual learning communities have developed from social theories of learning and social presence research (Swan & Shea, 2005).

### Characteristics of Effective Virtual Courses

Virtual learning is a subset of learning in general and thus contains many of the same issues found in traditional learning environments (Anderson, 2004; Garrison & Shale, 1990). Effective learning environments, virtual and traditional, are found at the convergence of four lenses: (1) learner centered, (2) knowledge centered, (3) assessment centered, and (4) community centered (Bransford, Brown, & Cocking, 1999). Each of these four lenses of effective learning must be considered in virtual learning environments.

Learner-centered learning includes an awareness of what students bring to the learning environment including unique cognitive structures, perspectives, and prior knowledge (Anderson, 2004; Bransford et al., 1999). From a learner-centered perspective, instructors understand students' prior knowledge, misconceptions, and learning styles. In virtual applications, instructors have an additional challenge in determining these important and unique characteristics of individual learners. Effective virtual instructors employ icebreaker activities and other means for students to introduce themselves (Anderson, 2004). Likewise it is important for virtual instructors to determine what predispositions and preconceptions learners have about the actual virtual learning environment as the virtual world. Instructors must determine the technological literacy levels of each learner and articulate expectations for appropriate communication in a virtual learning environment. Attempts to quantify these skills have been made by researchers to determine psychological aspects of the digital divide between experienced internet users and beginners; these assessments may assist instructors in determining the various skill levels and needs of their students (Eastin & LaRose, 2000).

Knowledge-centered learning focuses on the importance of the instructor to set the direction of learning. This is important "because the ability to think, reflect, and solve problems is strengthened by the access to ideas, assumptions, and conceptions of others arranged in meaningful ways" (Riel, 2001, p. 22). Virtual learning environments do not hold any advantages or disadvantages to traditional learning environments in regard to knowledge-centered learning because internet resources, including refereed journals, electronic libraries, and learning communities provide nearly limitless access to information regardless of whether a student is enrolled in a virtual or traditional course.

The essential role of the instructor, especially in virtual environments, is to provide guidance in navigating the overwhelming amount of information available and evaluating the credibility and merit of this limitless information (Anderson, 2004).

Assessment-centered learning emphasizes the importance of formative and summative assessments to determine student attainment, achievement, and expectations. In virtual formative assessments, ongoing, prescriptive assessment provides valuable information that helps drive instruction (Bransford et al., 2002). Effective online environments include a variety of formative assessments to encourage students to self-assess and continually reflect upon learning, provide collaborative work and assessment to inform and engage the virtual learning community, as well as to provide teachers with valuable information on individual student needs (Anderson, 2004). Quality formative assessments include questions that go beyond recall and engage students in providing coherent explanations, generating plans for problem solving, implementing solution strategies, and monitoring and adjusting their activities (Baxter, Elder, & Glaser, 1996). Summative assessment practices in virtual environments evaluate learning at the end of lessons, units, or courses (Sewell, Frith, & Colvin, 2010). In the virtual environment some of the assessment tools include computer-marked assessments of simulation exercises, virtual labs, automated assessments, collaborative group assessments, learning management system (LMS) rubric tools, assignment drop boxes, discussion forums, and latent semantic analysis software tools that have the ability to score complicated work such as essays (Anderson, 2004; Bransford et al., 2002; Sewell et al., 2010). Whether formative or summative, exemplary assessments are meaningful and engaging, motivate students, and guide students through the learning process (Huba & Freed, 1999;

Walvoord & Anderson, 2011). Exemplary assessments are: authentic, challenging, coherent, engaging, respectful, responsive, rigorous, and valid (Huba & Freed, 1999).

Community-centered learning emphasizes the importance of a community of learners who come together sharing an interest in a topic, task or problem; respect the diversity of perspectives within the community; bring a range of skills and abilities; share in the opportunity and commitment to work as a team; provide tools for sharing multiple perspectives; and share the goal or outcome of producing new knowledge (Bransford et al., 2002). The community-centered lens acknowledges the importance of learning as a social activity. The community model of social learning has been constructed from Vygotsky's concepts of social cognition to the expanded community of inquiry and responsibility of learning participants over time (1978; Garrison, Anderson, & Archer, 2000; McKerlich & Anderson, 2007; Rourke & Kanuka, 2009; Wilson, 2001). Characteristics of virtual courses are found in the theoretical frameworks relative to virtual learning.

### Theoretical Frameworks

In the literature related to virtual learning, four primary theoretical frameworks arise consistently: social learning theories, the community of inquiry framework, transactional distance theory, and the concept of communication immediacy (Garrison, 2007; Mehrabian, 1971; Moore, 1973). These frameworks each provide a perspective through which effective virtual learning and teaching may be considered.

Social learning theory is the overarching body of theoretical literature related to virtual learning (Bransford, Brown & Cocking, 1999; Swan & Shea, 2005). The second

theoretical perspective related to virtual learning is the community of inquiry framework that highlights interrelations and interactivity of virtual community members (Garrison, 2007). Third, the theoretical perspective of communication immediacy considers the behaviors that bring people closer (Mehrabian, 1971). Finally, the transactional distance theory considers the structure of virtual courses and the interactions within those courses as related to the relationship between instructor and student (Moore, 1993). Each of these theoretical frameworks will be considered in light of their indications for virtual teaching and learning practices.

### Social Learning Theories

Most contemporary educational researchers assert that learning is fundamentally a social activity that always involves interactions among people on some level (Bransford, Brown & Cocking, 1999; Swan & Shea, 2005). Three common themes can be found among the social learning theories and include: cognition is situated in particular social contexts, knowing is distributed across groups, and learning takes place within communities (Swan & Shea, 2005). These three themes will be reviewed and considered in relation to virtual learning.

The first theme, cognition is situated in particular social contexts, has been coined situated cognition or situated learning and is based primarily on the works of Vygotsky, Leontiev, Dewey, and Lave (Brown, Collins, & Duguid, 1989; Herrington & Oliver, 1995). Situated learning posits that all learning is situated within the physical and social contexts in which it occurs (Brown, Collins & Duguid, 1989; Herrington & Oliver, 1995; Lave & Wenger, 1991; McLellan, 1994; Swan & Shea, 2005). In situated learning, the



activities that enable the learner to develop and apply knowledge cannot be separated from the learning itself; rather the activities are also an integral part of the knowledge that has been gained (Dawley & Dede, in press; Swan & Shea, 2005). Proponents of situated learning encourage embedded authentic learning activities that engage learners in apprentice-type situations and contrasts greatly from the typically contrived practice found in most traditional classrooms (Bruner, 1986; Brown, Collins & Newman, 1989; Herrington & Oliver, 1995; Swan & Shea, 2005). Some examples of situational learning activities are internships, externships, and clinical experiences. Although situated learning encourages authentic, real-world experiences, many researchers believe that the simulation of these experiences through virtual worlds may foster apprentice-like learning in the virtual world (Bransford, Vye, Kinzer & Risko, 1990; Burkle, 2010; Chiou, 1992; Dawley & Dede, in press; Herrington & Oliver, 1995; Jonassen, Mayes & McAleese, 1993; Klein & Hoffman, 1993; McClellan, 1991; Young, 1995; Zucchermaglio, 1993). While knowledge must take place within context, that context may be found in either the actual work setting, a virtual representation of the actual work environment, or a multimedia program (McLellan, 1994). Several programs are in development to allow employees to complete virtual apprenticeships in order to update their skills in response to the need for these learners to have access to content without leaving their workplace (Burkle, 2010). One example of this is the Southern Alberta Institute of Technology Polytechnic Institution's Welding and Electrician Programs in Calgary, Canada. These programs offer students virtual courses that focus on hands-on training in a virtual apprenticeship format (Burkle, 2010). Thus single programs in institutions utilize virtual situational learning applications, as well as major entities or

organizations. For example many military training programs today utilize virtual simulations in situational learning applications (Falconer, 2012). The United States Air Force uses the virtual world *Second Life* for various training and educational purposes (Falconer, 2012; Second Life, 2012). In addition to the theme of situational learning, interactive learning is likewise a prevalent theme in the literature related to social learning theory.

The second theme identified in the literature related to social learning is the theme of knowledge distribution across groups. Knowledge distribution across groups is defined by learning interactions and cognitive tools where knowing and learning is not developed in isolation, but rather accomplished through interactions with other people supported through cognitive tools that enable interactions (Swan & Shea, 2005). The premise of distributed cognition is that the cooperation between humans and technologies create a genuine cognitive process that differs from the individual cognitive process of the human or the technology alone. This cognitive process results from humans and technologies working together to maintain and manipulate representational states and carry out processes that solve problems (Harris, n.d.).

In educational practice, the distribution of learning occurs in three predominant ways: physically, socially, and symbolically (Dieterle & Clarke, 2007; Pea, 1993; Perkins, 1993). The physical distribution of learning is found in virtual learning environments. For example virtual notebooks require the physical interactions for learners to record notes, track data, submit answers, and post reflections. Other online tools such as virtual microscopes, virtual lab tools and equipment, interactive maps, and digital artifacts require the physical distribution of learning. Social distribution of

cognition occurs when learners and instructors engage in collaborative virtual learning experiences. Some examples include collaborative projects within immersive virtual environments, asynchronous discussion, or synchronous chat. The symbolic distribution of cognition occurs through representative systems including mathematical operations, specialized vocabulary, acronyms, concept maps, other representational diagrams, and identity representations such as avatars (Dieterle & Clarke, 2007; Perkins, 1992). In summary, distributed cognition through the use of physical, social, and symbolic interaction, is an important theme within social learning theory, particularly as it relates learning in virtual environments.

The third and final theme prevalent in social learning literature is the theme of community-based learning. Community-based learning posits that communities emerge when individuals share values, beliefs, languages, and customs in the acquisition of knowledge. Furthermore, in community-based learning, knowledge is inseparable from the community in which knowledge acquisition occurs (Bransford, Brown, & Cocking, 1999; Swan & Shea, 2005). Authentic learning communities are often characterized by mutual engagement, joint enterprise, shared repertoire, and negotiated meaning (Swan & Shea, 2005; Wenger, 1997). The origins for virtual learning communities can be traced to a research project in Computer Supported Intentional Learning Environments (later called Knowledge Forums) (Scardamalia, 2004). In this project learning environments were designed to require student products of knowledge within learning communities. The products were openly evaluated, examined, and revised by the community of learners as a whole. Although virtual learning communities contain many features in common with face-to-face learning communities, one major difference in the virtual environment

is the lack of verbal and nonverbal cues that contribute meaning, such as body language, voice, pace, and pauses (Poce, 2010). This difference makes it essential that participants in asynchronous virtual learning communities communicate clearly. Poce found that clear communication in asynchronous virtual learning communities allowed extended time for students to consider and articulate information. The Knowledge Forum, an early cooperative learning environment built on social constructivist conceptions, encourages continual revision as ideas evolve and new problems and issues are raised. The Knowledge Forum is “a multimedia database designed as to maximize the ability of a community of users to create and improve both its content and organization. Thus the database itself is an emergent, representing at different stages in its development the advancing knowledge of the community” (p.51). Due to the proven effectiveness of the Knowledge Forum over time, other virtual environments attempt to emulate it in order to strengthen student learning abilities, problem solving skills, and assessment. A present-day example of this type of community-based learning is evidenced by the widespread use and interaction on a website called Wikipedia where a group of interested individuals contribute collectively to define, change, and create a virtual encyclopedia (Kittur, Suh, Pendleton, & Chi, 2007). In summary social learning theory has been applied to studies of virtual learning and the themes of situational learning, distributed learning, and community-based learning emerge from the literature related to this robust topic. In addition to the theoretical underpinnings of virtual learning, numerous scholars have studied the characteristics of effective virtual courses.

## Community of Inquiry

The community of inquiry framework is grounded in social constructivism with Dewey's (1938) practical inquiry theory at its core. The framework seeks to define, describe, and measure elements that support the development of online learning communities. In order to do this, three principal elements have been identified: social presence, cognitive presence, and teaching presence (Garrison et al., 2000; Swan & Ice, 2010).

Social presence is a factor in virtual learning that directly relates to building a community of learners (Aragon, 2003; Bibeau, 2001; Garrison et al., 2000; Rovai, 2002; Tu & McIsaac, 2002). Social presence includes: emotional expressions through affective responses, open communication found in interactive responses, and group cohesion as determined by cohesive responses (Rourke, Anderson, Garrison, & Archer, 2001). The extent to which a participant feels part of the community may be an important factor in interactions, participation, and overall learning. Some researchers assert that social presence is vital and must be established early in virtual courses (Aragon, 2003). Social presence is directly related to the activities found in virtual learning environments. When social presence is high in a course, learners feel that they are communicating with real people despite the technologies mediating the communication (Kear, 2010; Swan & Shih, 2005). Social presence fosters the development of mutual trust and respect, leading to robust interactions, idea exchanges, dialogue, and debate. Social presence creates an environment that encourages inquiry, analysis, and discussion (Garrison & Anderson, 2003; Kear, 2010).

Cognitive presence has been defined as “the extent to which learners are able to construct and confirm meaning through sustained reflection and discourse in a critical community of inquiry” (Garrison et al., 2001, p. 11). A model of practical inquiry revised from Dewey’s (1933) concept operationalized cognitive presence in order to study its application to the virtual environment (Garrison et al., 2001). This model of practical inquiry includes four phases: triggering event, exploration, integration, and resolution. Within the social-constructivist perspective, cognitive presence focuses on the critical inquiry processes of learners, specifically those of higher-order thinking. It involves both the internal cognitive process as well as the external contexts in which those cognitive processes occur (Garrison, 2007; Garrison et al., 2001). In asynchronous virtual learning environments the two properties that most greatly shape cognitive presence are reflection and collaboration (Garrison, 2007). Teachers facilitate student reflection and collaboration to guide them through the learning process; thus, teaching presence is another vital element in the community of inquiry model.

Teaching presence influences the cognitive presence and social presence in virtual courses as teachers guide students through the course. Three components comprise teaching presence including: instructional design and organization, facilitating discourse, and direct instruction (Anderson et al., 2001; Garrison et al., 2001). A teacher’s role in virtual courses is quite different from that in traditional courses. Teachers organize and design courses to help students navigate through the required material; engage students in discussion forums, chats, and other types of discourse; and provide direct instruction either through synchronous web conferencing or individualized conferencing. In many ways teachers take on the role of facilitator, guiding students through the learning process

(Kanuka & Anderson, 1998). Teaching presence is also connected to instructor immediacy, a construct that has been studied in connection to instructional communication and student preferences in online courses (Witt, Wheelless, & Allen, 2004).

Instructor immediacy is closely tied to social presence and teaching presence in a virtual learning environment. Immediacy is the communication behaviors that enhance close interaction and include verbal and nonverbal communications (Griffiths & Graham, 2010; Rovai, 2002). Interaction is considered an essential part of effective learning in virtual and traditional environments (Picciano, 2002; Rodriguez, Plax, & Kearney, 1996; Smart & Cappel, 2006; Swan, 2002; Wantstreet, 2006). Instructor immediacy is also attributed to increasing student motivation, active learning, participation, and student achievement (Du, Havard, & Li, 2005; Tu, 2005). Current research on instructor immediacy has established a positive correlation to student cognition and can be accomplished even when mediated through technology (Arbaugh, 2001; Baker, 2004; McAlister, 2001; O'Sullivan, Hunt, & Lippert, 2004). Instructor immediacy can be framed within two areas of research: transactional distance theory (Moore, 1973; Moore & Kearsley, 1996) and communication immediacy (Mehrabian, 1971).

### Transactional Distance Theory

The third theoretical perspective found in the literature on virtual learning is transactional distance theory. Transactional distance theory posits that effective teaching is not contingent upon geographic distance between teacher and student; rather, pedagogy and transactional distance is “a psychological and communications space to be crossed, a

space of potential misunderstanding between the inputs of the instructor and those of the learner” (Moore, 1993, p. 23). The pedagogical distance between instructor and learner can be bridged through structure and dialogue (Moore, 1989; Moore & Kearsley, 1996). The structure of the course is largely determined by the design of the course in navigation, layout, and tools used for communication. Dialogue between instructor and learner or among learners may be in the form of two-way communication (synchronous or asynchronous), or in the form of didactic conversation (Holmberg, 1983, 1989). Didactic conversation may include thinking aloud, text elaboration, or other forms of internalizing learning conversations (Holmberg, 1983, 1989). Another consideration in transactional distance theory is learner autonomy. Autonomy is learner initiative and self-directedness. The more a learner takes control of learning by setting objectives and pacing, the higher level of learner autonomy (Moore, 1989; 1993; Moore & Kearsley, 1996). Learner autonomy is correlated with transactional distance, greater transactional distance leads to higher learner autonomy. Conversely less transactional distance leads to more teacher control and reduced learner autonomy (Moore, 1993).

The primary variables found in transactional distance theory are dialogue, structure, transactional distance, and learner autonomy. The relationships among these four variables are as follows: transactional distance and dialogue are inversely proportional; structure and dialogue are inversely proportional; structure and transactional distance are directly proportional, learner autonomy and transactional distance are directly proportional (Gorski & Caspi, 2005). The relationships among variables have caused some researchers to call the validity of the theory into question (Giossos, Koutsouba, Lionarakis & Skavantzios, 2009; Gorski & Caspi, 2005). Other



researchers defend the theory stating variables cannot be truly controlled in the open systems in which humans function and the theory carries elements that are present in all other existing theories regarding distance education (Giossos et al., 2009; Gokool-Ramdoos; 2008). The conflicting findings among these research studies present a compelling need to further explore the variables and characteristics of the virtual learning environment and how these variables impact student achievement. The fourth and final body of theory found in the literature related to virtual learning is the communication immediacy perspective.

### Communication Immediacy

Communication immediacy refers to behaviors, verbal and nonverbal, that reduce the physical and psychological distance between individuals (Mehrabian, 1971). Verbal behaviors that provide immediacy include praise, discussion, humor, and frequent use of student name. Nonverbal behaviors that encourage immediacy include touch, eye contact, and facial expressions. Immediacy is positively correlated with student affect, cognitive learning, student perception of instructor, motivation, attitude, participation, attendance, and communication (Chesebro & McCroskey, 2001; Christophel, 1990; Pogue & AhYun, 2006; Thomas, Richmond, & McCroskey, 1994; Titsworth, 2001). Immediacy has recently been studied in relation to instructional effectiveness in virtual courses. Verbal immediacy may be most relevant in virtual courses as there is limited physical instructor presence in which to provide nonverbal, physical cues. Research has found verbal immediacy behaviors to be significantly associated with student satisfaction and learning in virtual courses. The behaviors include the use of humor, personal

examples, encouragement of student expression and discussion, and addressing students by name (Arbaugh, 2001; Swan, 2001). Other research suggests that faculty training in immediacy can increase instructor use of desired immediacy behaviors thus increasing student satisfaction and achievement (Jensen, 1999). Communication immediacy directly relates to the instructor presence construct found in the community of inquiry theory as well as the dialogue construct in transactional distance theory. Thus, the proper use of communication immediacy in virtual courses may positively impact student satisfaction and achievement in virtual courses. Increased student achievement is one of the many reported benefits of virtual learning.

### Benefits of Virtual Learning

Many of the benefits of virtual learning have been reported in studies of students and instructor perceptions of virtual learning environments. Several benefits of virtual learning were cited by elementary and secondary students, including: individualized instruction that meets the specific needs and learning styles of students, flexible scheduling, flexibility for students in time and location, opportunities for homebound and other students who cannot attend a brick and mortar school, and higher levels of student motivation (Kellogg & Politoski, 2002). Berge and Clark (2005) identified similar benefits to students including expanded access to education, high-quality learning opportunities, improved student outcomes and skills, and increased education choice. Additional studies list similar benefits including accessibility, convenience, flexibility, increased course selection, social equity, multimedia-rich contents, acceleration, and

student choice (Bates, 2005; Killion, 2009; Rosenberg, 2001). Individualized instruction and student achievement are two of the cited benefits of virtual learning.

### Individualized Instruction and Student Achievement

Students enrolled in virtual classes that combine synchronous and asynchronous delivery methods are provided with several ways to exchange information and collaborate. Some students experience greater academic success in this atmosphere than they would in traditional learning environments. The student-centered, collaborative learning environment created in many virtual courses allows students to self-pace their learning, improve individual achievement through active and constructive learning, deep processing of information while also improving communication and listening skills, and increasing knowledge stores (Abrami & Bures, 1996; Cho, Schmelzer, & McMahon, 2002; Sigala, 2002). Students may also develop social attitudes, collaborative spirits, increase motivation to learn, and improve critical thinking and diversity of ideas (Flynn, 1992). Robert and Dennis (2005) also theorized that asynchronous communication found in virtual environments increase a learner's ability to process information because no immediate answer is expected. In addition to individualized instruction and increased student achievement, a third additional benefit of virtual learning is the expansion of educational access.

### Expanding Educational Access

Expanding educational access is one of the most often cited benefits to virtual learning. Rural schools and school districts often use virtual environments to provide

courses that they would otherwise be unable to provide (Cavanaugh, 2001). This often includes higher-level math and science courses, Advanced Placement courses, foreign language courses, and other specialized courses (Cavanaugh, 2001; Zucker, 2005). In planning for the University of California's College Prep Initiative, a national survey was conducted to determine the audiences that would benefit from virtual schools (Freedman, Darrow, Watson & Lorenzo, 2002). The audience identified for these virtual learning experiences included students from all backgrounds and characteristics; high achievers needing courses not offered for college entry, to low achievers needing access to courses in order to complete graduation requirements or re-take courses that were not successfully completed. The audience included adult learners without a high school education as well as home-school students (Freedman et al., 2002). In addition to these groups, the Center on Education Policy also identified students who were unable to attend brick and mortar schools due to hospitalization, homebound, suspension, assignment to alternative programs, incarceration, or home situation (Fulton, 2002a).

### High-Quality Learning Opportunities

High-quality learning opportunities is another benefit of virtual learning (Berge & Clark, 2005). Although the Southern Regional Education Board and National Education Association have developed rigorous policies and standards to ensure quality in virtual school courses, studies show that not all virtual programs are of high quality (Fulton, 2002b; Thomas, 2003). The benefit rests in the potential of virtual learning environments to provide high-quality learning opportunities that would otherwise be unavailable to students. Khan (1997) posited that a well-designed virtual program has the

potential to address pedagogical, technological, institutional, ethical, and organizational issues. The flexibility of virtual courses allows designers to represent and cultivate all of the learning intelligences including linguistic, logical-mathematical, spatial, kinesthetic, musical interpersonal, intrapersonal, and the naturalist. (Gardner, 1983; Nelson, 1998). Student retention is another potential benefit for school systems implementing virtual learning

### Student Retention

Implementing virtual learning has helped some school systems reverse the trend of increased drop-out rates as well as preventing student withdrawal from traditional programs to attend full-time virtual programs offered outside the school system. Michigan implemented a virtual school option for students identified as at-risk for dropping out of school and saw a 1.7% reduction in dropout rate even with increased enrollment (Umpstead, 2010). Because funding is tied to attendance and enrollment, schools may preserve funding by providing an online option for students who are likely to drop-out entirely or transfer to full-time virtual schools. Some predict that increasing budget constraints, overcrowding, and stakeholder demand will persuade more schools to provide virtual options for students (Moe & Chubb, 2009). Retaining students in the system is one benefit of virtual learning; however, withdrawal from courses is a challenge in the virtual atmosphere. Additional challenges and barriers in the literature are addressed in the section below.

## Challenges and Barriers to Virtual Learning

Virtual learning has become increasingly popular despite ongoing concerns and challenges. Funding, start-up costs, student readiness, student retention, completion rates, lack of research, accessibility issues, accreditation, and resistance to change are a few of the challenges and drawbacks to virtual learning (Clark & Berge, 2005). Although virtual learning programs are growing quickly in the United States, many schools and school systems face challenges in creating, maintaining, and funding quality virtual programs.

### Funding

Funding the use of instructional technology, virtual learning programs, and virtual schools is a great challenge for public institutions (Clark & Berge, 2005). The International Association for K-12 Online Learning lists five categories of costs for virtual programs: management, instruction, course development, technology set up, and technology personnel (Anderson, Augenblick, DeCesare, & Conrad 2006). These costs are determined by several other variables including program governance, teacher salaries, student-teacher ratio, student population, student location, course completion rates, quality assurance, research and development, program size, and program growth (Anderson et al., 2006). The start-up costs alone are prohibitive for many virtual schools and programs. These high costs are attributed to the need to develop or purchase course content, develop or lease a means to deliver content, and staff administration, faculty, and technology support (Moore, 2001). States, school systems, and corporations find various ways to address funding issues with virtual schools and programs.

Virtual Schools and programs are funded many different ways. Some states provide full funding as a budget item for state-supported virtual schools and programs. Others use a funding formula based on student enrollment. Yet other programs receive funding directly from a school district budget. Although different funding models exist, a common element of each is that funding is rarely based on the actual cost to operate the virtual school, irrespective of public or private, non-profit or for-profit. There exists little data to determine the actual cost for operating a virtual school or program (Barth, Hull, & St. Andrie, 2012). The Fordham Institute stated in the report “The Cost of Online Learning” that the estimated per-pupil cost of a virtual school or program falls between \$5,100 and \$7,700. These estimates were generated from interviews with virtual school operators (Battaglino, Haldeman, & Laurans, 2011). In addition to funding challenges associated with virtual schools, a second set of challenges is student access, readiness, success, and retention.

### Student Readiness, Success, and Retention

Student readiness, success, and retention are areas that present a challenge to successful virtual learning programs. Although many systems begin a virtual program to provide opportunities to students who lack such high-quality educational opportunities (i.e., rural, at-risk, and underserved populations), studies indicate that it is the most advantaged students who receive the greatest benefits in virtual learning environments (Davis & Roblyer, 2005; Roblyer & Davis, 2008; Roblyer & Marshall, 2003). Thus, student readiness is a challenge since underserved and marginalized populations need virtual programming whereas high functioning students are the ones who benefit the most

in this environment. Furthermore, student success and retention in virtual environments present many complex challenges. The dropout and failure rates for virtual courses are almost always higher than the rates for traditional face-to-face courses (Bernard, Abrami, Lou, Borokhovski, Wade, Wozney, Wallet, Fiset, & Huang, 2004; Watson & Ryan, 2007; Zucker & Kozma, 2003;). Studies indicate that success rates for minority students enrolled in virtual courses lag behind those of their majority peers (Florida TaxWatch, 2007).

Some virtual schools and programs purposely target students who have higher aptitudes and achievement. The Virtual High School, a consortium of high schools that collaborate to offer virtual courses, was founded to serve “a fairly narrow range of students, those who were academically advanced and college bound” (Espinoza, Dove, Zucher, & Kozma, 1999, p. 48). The majority of students who enroll in virtual courses are higher achieving students with overall grade point averages in the A or B range (Mills, 2003; Watkins, 2005; Wigent & Oswalt, 2004). Student completion rate in the first year of the Illinois Virtual High School was 54% and rose to 80% in the second year. However, students that were “highly motivated, high achieving, self-directed” were those typically successful in the program (Clark, Lewis, Oyer & Schreiber, 2002, p. 41). Additionally, over half of Florida Virtual School students who completed courses received a grade of A with less than 10% receiving a failing grade. The success of students, as determined by A grades, is somewhat misleading since during a two year period up to half of the students dropped virtual courses instead of completing them (Bigbie & McCarroll, 2000). Researchers speculate that virtual success rate data is inflated due to the majority of low-achieving students dropping out of courses prior to



completion (McLeod, Hughes, Brown, Choi & Maeda, 2005; Moore, 2001). These results indicated that further research is needed to help identify and find ways to support at-risk virtual thereby increasing student success.

Several studies have shown successful virtual students are typically those who have the ability to work independently, have high intrinsic motivation, and possess strong skills in time management, literacy, and technology (Cavanaugh, 2001). The preferred characteristics of successful students in K-12 virtual environments are students who are highly motivated, self-disciplined, self-directed, independent learners with strong literacy and technology skills (Haughey & Muirhead, 1999). In an effort to predict achievement in virtual courses, Roblyer and Marshall (2003) developed the Educational Success Prediction Instrument (ESPRI), a survey instrument to ascertain student characteristics. Discriminant analysis of the seventy items thought to be related to virtual student success indicated that the instrument was successful at predicting student success or student failure. The four primary constructs identified were: (1) achievement and self-esteem beliefs, (2) responsibility and risk taking, (3) technology skills and access, and (4) organization and self-regulation. The first construct, achievement and self-esteem beliefs, considers the locus of control and self-efficacy beliefs of the student and their influence on self-motivation. The second construct, responsibility and risk taking, focuses on student initiative and sense of responsibility for personal behavior and actions. The third construct, technology skills and access, considers the degree of access to and competency in using needed technology. Finally, the fourth construct, organization and self-regulation, focuses on student study skills and self-direction. Teachers also cited good parental support as a contributor to student success (Roblyer & Marshall, 2003).

Even students who exhibit the characteristics of successful virtual students sometimes describe the virtual experience to be isolating, difficult, and discouraging (Rice, 2006).

Student supports may help increase student success for all students. For inexperienced virtual students, researchers suggest having the procedures, software, materials, and expectations explained explicitly prior to the start of the virtual course, preferably in a more familiar face-to-face environment. Students should also be made aware of the self-direction, time-management, and other important characteristics to maximize success (Haverila, Emirates, & Barkhi, 2012). In addition to these student-challenges, the quality of available virtual courses is another challenge for virtual learning.

### Virtual Course Quality

Rigorous policies and standards have been issued by the SREB and NEA for virtual courses; however, not all virtual programs are of high quality (Fulton, 2002b; Thomas, 2003). One problem with quality is the lack of research focusing on the principles of virtual course design for secondary school students (Barbour, 2005). For courses that are well designed by curriculum and technology experts, course quality is typically very high. One example of this is the Florida Virtual School (FLVS) course design process. FLVS uses a team consisting of instructors, subject matter experts, web development specialists, project managers, and external instructional designers (Barbour, 2012; Johnston, 2004). In this model, each specialist focuses on his or her own area of expertise. Courses are designed to be user-friendly for students, include engaging activities that accomplish the goals of the course, and include a variety of web tools to

ensure all learning styles are addressed. Courses are based on the nine events of instruction, are founded in the information processing model, and include three phases: preparing for learning, acquisition and performance, and transfer of learning (Flynn, 1992; Gagne & Briggs, 1974). The events are gain attention, inform learners of objectives, stimulate recall of prior learning, present the content, provide learning guidance, elicit performance, provide feedback, assess performance, and enhance retention and transfer to the job (Gagne & Briggs, 1974). Student learning is focused on analysis, synthesis, and evaluation as described by Bloom's taxonomy (Barbour, 2012; Friend & Johnston, 2005). Unfortunately this type of course design process is the exception rather than the norm (Barbour, 2012). Most high school virtual courses are designed by individual teachers, a small group of teachers, or within departments.

In a study on issues in building quality courses at Nova Southeastern University, the quality of content determined student satisfaction with the courses (Deubel, 2003). Students noted that some courses did not translate well to a virtual format and some would benefit from more use of multimedia within the course. One determinant of high quality content was student participation that continued after the course concluded. The creation of virtual courses ranges from large teams of specialists working together on a single course to individual instructors who are commissioned to create the courses they teach. This variance contributes to the wide differences in quality of content found among virtual courses and providers.

Some argue that the primary issue with virtual course quality is the criteria used to measure the quality of virtual courses. Some measure virtual course quality based on business quality models, which do not translate perfectly to educational contexts due, in

part, to the variance in business and educational goals. Others measure virtual course quality based on student satisfaction, which also lacks in providing a true picture of quality (Barbera, 2004). Overall, more research is needed on virtual courses, ways to determine their quality, and best practices in design and delivery. The quality of course delivery also impacts the virtual learning experience.

The method of course delivery varies greatly in and among virtual programs. Some courses utilize all asynchronous activities, some include a combination of synchronous and asynchronous activities, and others exist entirely in immersive virtual learning environments (Faloon, 2011). Although much of the literature supports the importance of interaction in a virtual course, there is no consensus on the best way to facilitate this in virtual courses (Gunawardena & McIssac, 2004). Studies show that both synchronous and asynchronous interactions promote student achievement. Synchronous interactions can more effectively provide social interaction and a sense of community among learners while asynchronous interactions are more suited to the delivery of content and allows students needed “think” time (Groeling, 1999; McReary, 1989; Newman, Johnson, Webb & Cochrane, 1997; Wang & Newlin, 2001;). These differences in interactions and expectations often result in instructor confusion and hesitancy when faced with the opportunity to develop and deliver a virtual course. Resistance to change is an additional limitation to virtual learning.

Instructors are often hesitant to transition from traditional courses to virtual courses. The resistance has been attributed to a lack of support, increased workload, lowered course quality, lessened student contact, and lack of training (Allen & Seaman, 2008; Keengwe, Kidd, & Kyei-Blankson, 2009; Nelson & Thompson, 2005). Virtual

instructors have cited that support for developing instructional materials, developing interaction, and applying new technology to their courses are inherent to successful delivery of courses (Rockwell, Schauer, Fritz & Marx, 1999). Virtual instructors training and best practices may vary greatly depending upon the type of virtual learning situation in which they teach. There are many types of virtual learning in K-12 and post-secondary education.

### Types of K-12 Virtual Learning

Many forms of virtual learning options have been made available for K-12 students. These include state virtual schools, charter virtual schools, multi-district, single-district, multi-state, university-run, blended, global, and consortium-based programs (Wicks, 2010). Within these program types, there are options for full-time, part-time, and rolling enrollments. Full-time enrollment programs work with students for whom the virtual school serves as their primary school. Student scores on state and national tests are reported on the virtual school (INACOL, 2011). Part-time enrollment allows students to take less than a full load of online courses. Students in part-time programs are enrolled in another school full-time (INACOL, 2011). Rolling enrollment allows students to begin a course at any time instead of being constrained to semester start and end dates (INACOL, 2011). These options provide flexibility for students in virtual programs.

The first state-established virtual school in the United States was the Florida Virtual School. Florida Virtual School offered courses to students, both nationally and internationally (Clark, 2001). The state of Florida funded the school as a line item for

four years to provide time for research and implementation. Florida Virtual School was founded as a free public school available as an option for any student in the state of Florida (Berge & Clark, 2005).

Virtual charter schools are typically created under the charter school legislation (Clark, 2001). Charter schools may be public or private; however, public charter schools can be exempt for the rules and regulations of regular public schools. College and university-based virtual schools are typically independent university high schools. College and university-based programs can also apply to courses where the content and delivery are university-sponsored (Clark, 2001). An example is the University of California College Prep Online (Cavanaugh et al., 2009). Consortium-based virtual schools are those operated by a group of schools or school districts within a region (Clark, 2001). An example is the Virtual High School, a global consortium of high schools.

Single-district virtual schools are typically offered by individual districts for students residing within that district (Watson, Winograd, & Kalmon, 2004). Multi-district virtual schools are operated within an individual school district, but they enroll students from other districts (Watson, et al., 2004). The largest area of growth in the K-12 market is currently in multi-district virtual schools (Cavanaugh et al., 2009).

Blended schools include some combination of virtual learning and face-to-face instruction. Blended learning occurs “any time a student learns at least in part at a supervised brick-and-mortar location away from home and at least in part through virtual deliver with some element of student control over time, place, path, and/or pace” (Horn

& Staker, 2011). The type of virtual program may influence student satisfaction and preferences in virtual courses.

### Student Satisfaction and Preferences in Virtual Courses

The literature on student satisfaction with virtual learning presents mixed results. Some research indicates learner-centered activities produce the highest levels of student satisfaction (Ellis & Cohen, 2005; Glass & Sue, 2008). Yet, other research indicates student preference of mixed instructional strategies including active and passive instructional models (Cuthrell & Lyon, 2007). Researchers promote a balance of approaches as necessary in virtual education so that students will experience a variety of modes of instruction. Passive strategies have been found to produce superficial learning while more interactive technology in the courses produced “Aha” moments (Cuthrell & Lyon, 2007).

The best virtual environments promote interactivity, synchrony, ease of use, and sense of community (Parker & Martin, 2010). Interactivity is a vital component of virtual learning that provides a deep engagement in the learning process (Northrup, 2001). Interactivity in the virtual classroom consists of student interactions with other students, teachers, and online activities and resources in the course (Parker & Martin, 2010).

Synchrony is provided through technologies that connect users at the same time and simulates an exchange that could be experienced in a face-to-face setting (Gilmore & Warren, 2007). Synchronous activities are typically scheduled with certain requirements of student participation. These activities provide a real-time element that have been found to positively affect student learning (McBrien, Cheng, & Jones 2009). Students in

synchronous studies found real-time sessions offer a variety of modes of communication including audio, text chat, and interactive white board. Some students found the three modes of simultaneous communication to be distracting. In general, however, the student responses in the project affirmed that the real-time communication positively affected student involvement in virtual learning (McBrien et al., 2009).

Virtual learning environments are developed based on the belief that learning should happen within communities (Allen & Seaman, 2007). Thus, a sense of community is important for students in virtual courses. Four elements that are essential for a sense of community include membership, influence, integration, and fulfillment of needs and shared emotional connection (Parker & Martin 2010).

Most virtual courses include some form of discussion board requirement; however studies have found that most students do not value the discussion portion of the class. In a 2009 study, students rated the Blackboard discussion board element of the course last overall in preferred activities for the course (Glass & Sue, 2008). Students in this study appreciated the ability to review examples and problems being worked out via the whiteboard element of the course. The highest preference in activities was the ability to complete and submit homework online and view grades (Glass & Sue, 2008).

In a study that focused specifically on student perceptions regarding teaching presence, social presence, and cognitive presence, findings indicated that students perceive learning in the virtual world as a “rich educational experience that includes elements of all three presences in the community of inquiry” (McKerlich et al., 2011). The use of avatars in virtual worlds accommodates some of the elements often found missing in other virtual environments, such as the ability to portray nonverbal cues and



emotions. The study indicated that students preferred direct instruction and strong teaching presence found in the virtual world learning environment that utilized avatars (Mckerlich et al., 2011). Student preference, satisfaction, and achievement may be tied to the three primary domains that provide information about virtual learning environments.

### Conceptual Framework Guiding Virtual Learning Environments

Three separate domains elicit information about the virtual learning environment. These domains include: Instructional Dialogue, Structure, and Autonomy of the Learner. Scholars have found evidence that indicates these domains may contribute to student success in virtual courses.

The Instructional Dialogue domain comprises the types and frequency of teacher-student interactions, the number of students in the class, and the nature of the class content. This domain may be considered regarding the Community of Inquiry Model of virtual learning, where teaching presence relates to teacher-student interactions, social presence relates to the number of students in the class and the interactions among them, and cognitive experience relates to the nature of the class content (Rourke et al., 2001). Many studies have found that student success is directly related to instructor interaction, or teaching presence, in virtual courses. This includes perceived interactions by students, clear and frequent feedback, and the overlapping of instructor and content interactions (Anderson et al., 2001; Fuller, Norby, Pearce, & Strad, 2000; Picciano, 1998; Jiang & Ting, 2000; Richardson & Ting, 1999). Social presence, or interactions with other students, has been found to be one of the most influential pieces of virtual courses (Swan, 2001). Student discussions in synchronous and asynchronous formats have shown

correlations to higher course grades, particularly where instructor directions for discussion were clear and discussion activities were graded (Jiang & Ting, 2000; Picciano, 1998). Janick and Liegle (2001) compiled ten concepts from existing studies that are believed to support effective interaction with content. These include instructor as facilitator, variety of presentation styles, multiple exercises, hands-on activities, learner control of pacing, frequent assessment, clear feedback, consistent layout, clear navigation, and available technology help. These aspects of Instructional dialogue to some extent depend upon the structure of the virtual course.

The Structure domain comprises type of platform, the characteristics of teachers, the characteristics of learners, and the constraints of the platform. One of the primary determinants of course structure is the learning management system (LMS) on which the course is hosted. Bersin and Associates (as cited in McIntosh, 2012) found that nearly 50% of the LMS market in the United States is controlled by the six largest LMS vendors. These vendors include SumTotal, Saba, Meridian, Outstart, Plateau, and Learn.com. In the education sector specifically, Blackboard, Desire2Learn, Moodle, and Instructure Canvas are major LMS vendors (McIntosh, 2012). The primary ways an LMS may impact the student learning experience in a virtual course include usability features, such as ease of navigation and formats of communication with instructors and other students. These features may significantly impact student satisfaction with the course (Johnston, Killion, Oomen, 2005; Sun, Tsai, Finger, Chen & Yeh, 2008). For the purpose of this study, students used one of the following LMS platforms: Moodle, Brainhoney or Desire2Learn. The Structure domain also encompasses the characteristics of learners and teachers. These characteristics are addressed through the seven scales of

the Distance Education Learning Environment Survey (DELES). Student satisfaction is one scale included in DELES. The other six DELES scales are instructional support, student interaction and collaboration, personal relevance, active learning, authentic learning, and student autonomy. The final scale, student autonomy, is encompassed in the Autonomy of the Learner domain (Insight System, n.d.).

The Autonomy of the Learner domain comprises the extent to which the teaching/learning relationship involves the learner in determining goals, learning experiences, and evaluation decisions. Five of the DELES survey statements relate directly to student autonomy. Research indicates that students who are responsible for their own learning tend to be successful, engaged, self-regulated, self-assessing, and motivated (Jones, Valdez, Nowakowski, & Rasmussen, 1994). These characteristics of learner autonomy are considered in this study alongside the other aspects of virtual learning environments. Conflicting evidence exists regarding the efficacy of different types of virtual learning environments. More research is needed to better understand the variables within virtual environments and which variables provide the best atmosphere for students in grades 7-12 enrolled in virtual courses.

### Conclusion

The body of knowledge regarding virtual learning best practices is robust, yet still emerging, with the primary focus resting in the higher education arena. Few empirical studies regarding the effectiveness of virtual learning for K-12 students have been published. In those studies that have concentrated on K-12 virtual students, the effectiveness of virtual learning experiences appears broad regardless of specific subject

or learner characteristics (Barbour & Mulcahy, 2006, 2008a, 2008b; Barbour & Reeves, 2009; Cavanaugh, 2001; Florida TaxWatch, 2007; Patrick & Powell, 2009; Roblyer & Davis, 2008). However, high dropout and failure rates are found in most all virtual programs. Some virtual schools have addressed this issue through student selectivity, required orientations, increasing drop windows up to one month, and increased student monitoring (Pape, Revenaugh, Watson, & Wicks, 2006; Roblyer & Davis, 2008). Several studies presented conflicting findings related to the characteristics of effective virtual environments. More research is needed to address these issues and to better understand K-12 student background characteristics and virtual learning environments.

Many studies have examined student background characteristics and virtual learning. Current grade point average (GPA) is the only background characteristic that has consistently been correlated to student achievement in virtual courses (Bell, 2007; Bernard, Brauer, Abrami, & Surkes., 2004; Cheung & Kan, 2002; Dupin-Bryant, 2004; Gerlich et al., 2009; Gibson & Graff, 1992; Peters, 2000; Roblyer & Davis, 2008). Studies have yielded mixed results concerning academic background and number of virtual courses taken as well as age, race, and ethnicity. Some studies have shown that students who have previously taken virtual courses are more likely to be successful in subsequent virtual courses, while others show no significant difference (Bell, 2007; Lu, Yu & Liu, 2003). Some studies show that race and ethnicity are not related to student achievement and success in virtual environments while other studies indicated that data suggests that success rates drop significantly for minority students enrolled in virtual courses (Florida TaxWatch, 2007; Lu et al., 2003). Studies examining the variable of student age in virtual courses also reveal conflicting findings. Some scholars have

identified that virtual students are more successful after age 25 (Roblyer & Davis, 2008) whereas others show no significant variance in academic achievement based on age (Carr, 2000; Digilio, 1998; Dutton et al., 2002; Gerlich et al., 2009; Lu et al., 2003; Roblyer & Davis, 2008; Tucker, 2000; Yukselturk & Bulut, 2007). The present study considered the following student background characteristics: gender, race/ethnicity, grade level/age, socio-economic status, prior number of virtual courses taken, and grade point average. This study was important because more research is needed, especially in the K-12 arena, to understand the dynamic interplay between student background characteristics and the virtual learning environment.

Chapter 3 details the research methodology and procedures for conducting this study. The study research questions, null hypotheses, population, instrumentation, data collection, and data analysis are presented. Independent samples t-tests, bivariate correlations, and, where appropriate, multiple regression analysis were used to analyze the hypotheses for the research questions in this study.

## CHAPTER 3

### METHODS AND PROCEDURES

This chapter introduces the research methodology and procedures for the study, including research questions, null hypotheses, population, instrumentation, data collection, and data analysis. This study was conducted using non-experimental, quantitative methodology with a correlational design. The study was conducted similarly to a higher education study conducted by Bell in 2007 that investigated the relationship of twelve variables, including GPA, to predict student achievement in a variety of asynchronous internet-based virtual courses. A correlation was conducted with the students' final virtual course grade and each of the twelve variables. Multiple regression was conducted after finding all correlations to be significant.

This study was conducted in two phases. In the first phase, demographic data and background characteristics were collected from registration documents. In the second phase, electronic, internet-based surveys were sent to all middle and high school students who were involved in virtual learning programs in Sullivan County Schools between January 2010 and January 2013.

The purpose of this study was to examine the relationships between student backgrounds, virtual learning experiences, and academic achievement in the K-12 virtual environment. Academic achievement was defined as final virtual course grade.

Independent variables included:

- gender
- grade level at time virtual course was taken

- race/ethnicity
- socio-economic status, as determined by participation in meal assistance programs
- GPA at the time the course was requested
- number of prior virtual courses taken
- Instructional Dialogue (the amount of dialogue between instructor and student)
- Structure (the organization, activities, and learning experiences in the virtual course)
- Autonomy of the Learner (the extent to which the learner controls his/her own learning)

The researcher investigated the relationships between these independent variables and the dependent variable, academic achievement, as determined by final virtual course grade.

### Research Questions and Null Hypotheses

The study addressed several research questions in two phases. The first phase research questions investigated differences and determined relationships between student background characteristics and demographics and academic achievement in virtual courses. The second phase research questions determined relationships between each of the three domains found in virtual learning environments (Instructional Dialogue, Structure, and Autonomy of the Learner) and academic achievement in virtual courses.

#### Phase I: Background Characteristics and Demographics and Student Achievement

RQ1: Is there a significant difference in academic achievement between male and female students in virtual learning environments?

H<sub>0</sub>1: There is no significant difference in academic achievement between male and female students in virtual learning environments.

RQ2: Is there a significant difference in academic achievement in virtual learning environments as compared by student race/ethnicity?

H<sub>0</sub>2: There is no significant difference in academic achievement in virtual learning environments as compared by student race/ethnicity.

RQ3: Is there a significant relationship between academic achievement in virtual learning environments and students in different grade levels (7-12)?

H<sub>0</sub>3: There is no significant relationship in academic achievement in virtual learning environments and students in different grade levels (7-12).

RQ4: Is there a significant difference in academic achievement in virtual learning environments as compared by student socio-economic status?

H<sub>0</sub>4: There is no significant difference in academic achievement in virtual learning environments as compared by student socio-economic status.

RQ5: Is there a significant difference in academic achievement in virtual learning environments for students taking a virtual course for the first time as compared to students who have prior experience in virtual courses?

H<sub>0</sub>5: There is no significant difference in academic achievement in virtual learning environments for students who are taking a virtual course for the first time as compared to the achievement of students who have prior experience in virtual courses.

RQ6: Is there a significant relationship between academic achievement in virtual learning environments in relation to existing grade point average (GPA)?



H<sub>0</sub>6: There is no significant relationship between academic achievement in virtual learning environments in relation to existing GPA.

RQ7: If there is a significant relationship between academic achievement in virtual learning environments in relation to existing GPA, to what extent can existing GPA predict academic achievement in virtual learning environments?

H<sub>0</sub>7: Student GPA cannot predict academic achievement in virtual learning environments.

#### Phase II: Virtual Learning Environment and Student Achievement

RQ8: Is there a significant relationship between academic achievement in virtual learning environments and Instructional Dialogue scores?

H<sub>0</sub>8: There is no relationship between academic achievement in virtual learning environments and Instructional Dialogue scores.

RQ9: Is there a significant relationship between academic achievement in virtual learning environments and the structure of the virtual learning environment?

H<sub>0</sub>9: There is no significant relationship between academic achievement in virtual learning environments and the structure of the virtual learning environment.

RQ10: Is there a significant relationship between student achievement in virtual learning environments and the Autonomy of the Learner scores?

H<sub>0</sub>10: There is no significant relationship between student achievement in virtual learning environments and the Autonomy of the Learner scores.

## Population

The sample for this study included students in grades 7-12 who were enrolled in virtual courses through Sullivan County Schools in Tennessee between January 2010 and January 2013. Sullivan County Schools is located in upper east Tennessee near the bordering states of Virginia and North Carolina. The United States Census Bureau estimated the population of Sullivan County to be 156, 786 in 2012. Of that, 20.3% were under the age of 18, 51.6% were female, and 95.4% were Caucasian (U.S. Census Bureau, 2013). In 2012, Sullivan County Schools served 10, 620 students in grades Pre-Kindergarten through 12. Of those students, 52% were male, 53.7% were economically disadvantaged, and 97.7 percent were Caucasian (Tennessee Department of Education [TNDOE], 2013). The students in the sample for Phase I of this study included all students from this population who participated in virtual courses between January 2010 and January 2013.

## Sample

### Sampling Strategy

The sampling strategy of this study was a non-probability convenience sample, often used in educational action research. Action research was chosen for this study so this researcher may study in her own professional practice with the immediate goal to assess, develop, and improve the practice (Zeni, 1998). The ability to make generalizations based on this study will be limited; however, it will provide valuable information regarding the specific sample for this study (Cohen, Manion, & Morrison, 2011). Action research in education is accepted as an important means to improve both

teaching and learning (Carr & Kemmis, 1986; Elden & Chisholm, 1993; Van Eynde & Bledsoe, 1990).

### Phase I Sample

Virtual courses were available to any high school student who had met prerequisites for the course. Middle school students were eligible for virtual courses by individualized education plan (IEP) referral only. Using enrollment reports and registration documents provided by the Director of Schools, in the window of January 2010 through January 2013, 450 high school students and 17 middle school students were enrolled in virtual courses.

Table 1 below provides demographic information for the participants included in this phase of the study.

Table 1

#### *Phase I Participant Demographics*

Grade	Male	Female	White	Black	Hisp.	P.I.	Asian	E.D.
7	4	0	4	0	0	0	0	1
8	12	1	13	0	0	0	0	3
9	80	40	118	1	1	0	0	47
10	50	71	117	2	2	0	0	34
11	44	74	114	1	3	0	1	47
12	57	43	92	1	4	1	2	29
Total	247	229	458	5	10	1	3	161

Note: Hisp. = Hispanic, P.I. = Pacific Islander, E.D. = Economically Disadvantaged

### Phase II Sample

The 476 students who completed a virtual course between January 2010 and January 2013 were sent an email inviting them to complete the electronic survey based on the DELES scales in order to explore the relationship between the virtual learning

environment and student academic achievement. From this sampling frame of 476 students, 414 students had verifiable email addresses and were eligible to be included in the sample. Additionally, 8 students were dropped from the original sampling frame due to parental request that they not be included in the study, resulting in a total of 406. Of those 406, 166 responded to the survey, resulting in a response rate of 41%. This response rate is well above the average online survey response rate of 33.3% (Watt, Simpson, McKillop, & Nunn, 2002).

### Instrumentation

Data for the study came from two sources: student demographic data from registration records and an electronic internet-based survey. Student demographic data compiled for this study included gender, race/ethnicity, socio-economic status, prior number of virtual courses taken, student grade point average, and final virtual course grade. This study also used a survey that was adapted with permission from the DELES survey in order to gather information about the virtual learning environment.

The survey (see Appendix A) was adapted with permission from the Distance Education Learning Environment Survey (DELES). The adapted survey was divided into two parts: Part I consisted of basic student demographic information. Part II consisted of the 34 statements adapted from the DELES survey regarding virtual course practices followed by eight statements adapted from the DELES survey regarding student opinions about virtual learning. In Part II, a five-point Likert scale was used with answers that ranged from Never to Always. The first eight questions in Part II related to Instructional

Dialogue, the next 17 questions related to the Structure of the virtual course, and the final 19 questions related to the Autonomy of the Learner.

The original DELES instrument included 56 items and was tested for validity among 680 responses from 13 countries. The items were reduced to 42 after factor analysis and internal consistency reliability analysis were conducted. Content validity of the original scales included in the instrument were reviewed by a 14-person panel of distance education researchers and practitioners while individual items were reviewed by an eight-person panel (Walker, 2003). Construct validity was investigated “using principal component factor analysis with varimax rotation and Kaiser normalization” (Walker, 2003, p. 84). Reliability of the original instrument was measured using Cronback’s alpha coefficient with findings of internal consistency reliability ranging from 0.75 to 0.94.

The DELES statements were revised with permission (Appendix B) to increase understanding among middle and high school students by using language commonly used in their schools. Revisions included replacing the terms “instructor” with “teacher,” “course” with “class,” and “online or distance” with “virtual.” The original instrument was designed for college students.

### Data Collection

Approval to conduct this study was obtained from the Institutional Review Board of East Tennessee State University (Appendix C) and from the Director of Sullivan County Schools (Appendix D). Student demographic data were collected from student registration documents. Anonymous survey data were collected using an internet survey.

An email (Appendix E) was sent to each parent email address provided on registration forms to request permission for student participation in the study. The email explained the purpose of the study and provided a pdf copy of the survey. Parents were given one week to request their student be excluded from the study. Of the 406, eight parents requested their student be excluded. An email (Appendix F) was sent to all students who were not excluded using the student email address provided on registration forms during course registration. The email explained the purpose of the study and included a hyperlink to the Internet address where the questionnaire was located. Two weeks later, a second email was sent to the individuals who had not responded to the email. No incentives were provided to students and consent was implied when students clicked on the survey link.

### Role of the Researcher

This study was conducted as educational action research based on Creswell's definition of practical action research in which educators use research to "enhance the practice of education through the systematic study of a local problem (Creswell, 2005). This researcher is the virtual learning coordinator for Sullivan County Schools. This position includes hiring virtual teachers, selecting virtual learning platforms and courses, and working with teachers, guidance counselors, parents and students to place students in appropriate virtual courses and support them throughout the course. This position allows the researcher to use the results of this study to enact change to better serve the students in Sullivan County, a typical outcome of action research in education (Creswell, 2005; Gay & Airasian, 2003).

### Data Analysis

Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS) Version 21. Descriptive statistics were generated on the population and inferential statistics, including independent samples *t*-tests, bivariate correlations and multiple regression analyses, were used to investigate relationships between independent variables and academic achievement in virtual courses. The independent variables in the study included gender, grade level at time virtual course was taken, race/ethnicity, socio-economic status, GPA at the time the course was requested, number of prior virtual courses taken, instructional dialogue in the course, structure of the course, and the amount of autonomy of the learner in the course. The dependent variable was academic achievement in the virtual course as determined by the final course grade. A significance level of .05 was established for data analysis. The results of the data analysis are in Chapter 4.

The study was divided into two groups of research questions. The first group of research questions considered the relationships between background characteristics, demographics, and academic achievement in virtual courses. Research question 1 was analyzed using an independent samples *t*-test. The independent variable was gender (1=Male, 2=Female) and the dependent variable was final virtual course grade.

Research question 2 was analyzed using an independent samples *t*-test. The independent variable was race/ethnicity (1=White, non-Hispanic, 2=all other races/ethnicities) and the dependent variable was final virtual course grade.

Research question 3 was analyzed using a bivariate correlation. The predictor variable was student grade level at the time the virtual course was taken. The criterion variable was final virtual course grade.

Research question 4 was analyzed using an independent samples *t*-test. The independent variable was student socio-economic status (1=Economically Disadvantaged, 2=Non-Economically Disadvantaged) and the dependent variable was final virtual course grade.

Research question 5 was analyzed using an independent samples *t*-test. The independent variable was the number of prior virtual courses taken( 1= No Prior Virtual Courses Taken, 2=One or More Prior Virtual Courses Taken). The criterion variable was final virtual course grade.

Research question 6 was analyzed using a bivariate correlation. The predictor variable was student GPA at the time the course was requested. The criterion variable was final virtual course grade.

If needed, research question 7 was analyzed using multiple regression. The predictor variable was existing student GPA. The criterion variable was final course grade.

The second group of research questions considered the relationships between virtual learning environment and academic achievement in virtual courses. Research question 8 was analyzed using a bivariate correlation. The predictor variable was the instructional dialogue included in the virtual course. The criterion variable was final virtual course grade.



Research question 9 was analyzed using a bivariate correlation. The predictor variable was the structure of the virtual course. The criterion variable was final virtual course grade.

Research question 10 was analyzed using a bivariate correlation. The predictor variable was the amount of autonomy of the learner allowed in the virtual course. The criterion variable was final virtual course grade.

### Summary

Chapter 3 reported the research methodology and procedures for conducting this study. The study research questions, null hypotheses, population, instrumentation, data collection, and data analysis were presented. The study investigates the relationship between background characteristics, demographics, virtual learning environment characteristics, and academic achievement in virtual courses. Independent samples t-tests were used to analyze the hypotheses for research questions 1, 2, and 4. Bivariate correlations were used to analyze the hypotheses for research questions 3, 5, 6, 8, 9, and 10. If needed, multiple regression analysis was used to analyze the hypothesis for research question 7. The results of the data analyses are detailed in Chapter 4.

## CHAPTER 4

### RESULTS

The purpose of this study was to identify significant differences in academic achievement among virtual students of various backgrounds, demographics, and virtual learning environments. The study also sought to identify factors that may predict the academic achievement, as defined by final course grade, of virtual students.

The study population included students in Sullivan County Schools, TN who had taken a virtual course between January 2010 and January 2013. The study was done in two parts. The first part used data from student registration documents, including 476 students. This part investigated the relationships between student background characteristics, demographics, and academic achievement in the virtual learning environment, as determined by final virtual course grade. The second part of the study included a survey, which was emailed to the email address provided by all 476 students upon registration. Of those 476 students, 53 email addresses were no longer operational and 8 parents requested their student be excluded from the study. Of the 406 students that received the email invitation to participate in the study, 166 responded for a response rate of 41%, well within an acceptable response rate for internet surveys (Watt et al., 2002).

Independent variables included gender, race/ethnicity, socio-economic status, prior number of virtual courses completed, existing student grade point average, instructional dialogue in the virtual course, structure of the virtual course, and autonomy of the learner allowed in the virtual course. The researcher investigated the relationships

between these independent variables and the dependent variable, academic achievement, as determined by final virtual course grade. Chapter 4 provides a statistical analysis of the research questions and associated hypothesis. Significance in this study was determined at an alpha level of .05. This chapter addresses the major findings of the study.

### Phase I: Background Characteristics and Demographics and Student Achievement

#### Research Question 1

The first group of research questions investigated the relationships among background characteristics, demographics, and academic achievement in virtual environments. For this set of questions, information provided on registration documents was used for 476 participants in grades 7 through 12. The first research question in this study was to determine if there is any significant difference in academic achievement between male and female students in virtual learning environments. The mean Final Grade in this data set was 2.70 with a standard deviation of 2.60. Out of the 476 participants, 247 were males and 229 were females.

An independent samples t test was used to determine the difference in academic achievement in virtual courses between male and female students as determined by final virtual course grade. The grouping variable was gender and the test variable was final course grade. The test was not significant  $t(474) = 1.247, p = .213$ . Therefore the null hypothesis  $H_0$  was not rejected. There was no significant statistical difference in final course grade for male students ( $M = 2.48, SD = 1.52$ ) as compared to female students ( $M = 2.66, SD = 1.53$ ).

Table 2

*A Comparison of Final Course Grades for Male and Female Students*

Final Course Grade	N	M	SD	t	df	p
Male	247	2.48	1.52	1.247	474	.213
Female	229	2.66	1.53			

*Note:* Equal variances were not assumed for this comparison.

Research Question 2

The second research question was to determine if there is any significant difference in academic achievement among students in virtual learning environments as compared by race/ethnicity. The mean Final Grade in this data set was 2.70 with a standard deviation of 2.60. Out of the 476 participants, 456 were white, 5 were black, 10 were Hispanic, 1 was Pacific Islander, and 4 were Asian.

An independent samples t test was used to determine the difference in academic achievement, as determined by final virtual course grade, between White, non-Hispanic students and students of all other races/ethnicities. The grouping variable was race/ethnicity and the test variable was final course grade. The test was not significant  $t(474) = 1.637, p=.102$ . Therefore the null hypothesis  $H_0$  was not rejected. There was no significant statistical difference in final course grade for White, non-Hispanic students ( $M=2.56, SD=1.82$ ) as compared to students of all other races/ethnicities ( $M=3.26, SD=1.597$ ).

Table 3

*A Comparison of Final Course Grades for White, non-Hispanic Students and Students of all other Races/Ethnicities*

Final Course Grade	N	M	SD	t	df	p
White, non-Hispanic	457	2.56	1.82	-1.637	474	.102
All other races/ethnicities	19	3.26	1.97			

*Note:* Equal variances were assumed for this comparison.

### Research Question 3

The third research question was to determine if there is any significant relationships in academic achievement among students in virtual learning environments as compared by the grade level in which they are enrolled while taking the course. The mean Final Grade in this data set was 2.70 with a standard deviation of 2.60. Out of the 476 participants, 4 took the virtual course while in 7<sup>th</sup> grade, 13 while in 8<sup>th</sup> grade, 120 while in 9<sup>th</sup> grade, 121 while in 10<sup>th</sup> grade, 118 while in 11<sup>th</sup> grade, and 100 while in 12<sup>th</sup> grade.

Correlation coefficients were computed for the variables using the Bonferroni approach to control for Type I error, a p value of less than 0.05 was required for significance. The results of the correlational analysis were  $r(471) = .41, p=.38$ . Therefore the null hypothesis  $H_{03}$  was not rejected indicating there is no significant relationship between student grade level and academic achievement in virtual courses.

### Research Question 4

The fourth research question was to determine if there is any significant difference in academic achievement among students in virtual courses as compared by socio-economic status. Final Grades were considered on the scale A = 4, B = 3, C = 2, D

= 1, and F = 0. The mean Final Grade in this data set was 2.70 with a standard deviation of 2.60. Socio-economic status was determined by self-reported enrollment in a free or reduced lunch program at school. Out of the 476 participants, 161 students reported they were participating in a free or reduced lunch program while 315 students reported they were not participating in the program.

An independent samples t test was used to determine the difference in academic achievement in virtual courses, as determined by final virtual course grade, between students identified as economically disadvantaged and those not identified as economically disadvantaged. The grouping variable was socio-economic status and the test variable was final course grade. The test was significant  $t(471) = 3.445, p=.001$ . Therefore the null hypothesis  $H_04$  was rejected. Students identified as being economically disadvantaged ( $M=3.00, SD=1.93$ ) tended to perform significantly better academically in virtual courses than students identified as non-economically disadvantaged ( $M=2.39, SD=1.75$ ), as determined by final virtual course grade.

Table 4

*A Comparison of Final Course Grades for Economically Disadvantaged Students and Non-Economically Disadvantaged Students*

Final Course Grade	N	M	SD	t	df	p
Disadvantaged	161	3.00	1.93	3.445	471	.001
Non-Disadvantaged	312	2.39	1.75			

*Note:* Equal variances were assumed for this comparison.

#### Research Question 5

The fifth research question was to determine if there is any significant difference in academic achievement among students in virtual learning environments as compared

by the prior number of virtual courses taken. The mean Final Grade in this data set was 2.70 with a standard deviation of 2.60. Out of the 476 participants, 388 students were taking a virtual course for the first time, 55 had previously taken one virtual course, 21 had previously taken 2 virtual courses, 8 had previously taken 3 virtual courses, and 2 had taken four virtual courses prior to the course considered in this study.

An independent samples t test was used to determine the difference in academic achievement in virtual courses, as determined by final virtual course grade, between students taking a virtual course for the first time and students with prior experience taking a virtual course. The grouping variable was prior virtual course and the test variable was final course grade. The test was not significant  $t(474) = 1.418, p = .157$ . Therefore the null hypothesis  $H_0$  was not rejected. Students identified as having no prior virtual course experience ( $M = 2.65, SD = 1.88$ ) had no significant difference in academic achievement as determined by final virtual course grade than those students with prior virtual course experience ( $M = 2.33, SD = 1.57$ ).

Table 5

*A Comparison of Final Course Grades for First Time and Experienced Virtual Students*

Final Course Grade	N	M	SD	t	df	p
First Time	390	2.65	1.88	1.418	474	.157
Prior Virtual Course	86	2.33	1.56			

*Note:* Equal variances were assumed for this comparison.

### Research Question 6

The sixth research question was to determine if there is any significant relationship in academic achievement among students in virtual courses as compared by GPA at the time of course enrollment. The mean Final Grade in this data set was 2.70 with a standard deviation of 2.60. Existing GPA ranged from a minimum of 0.11 to a maximum of 4.0 with a mean of 2.88.

Correlation coefficients were computed for the variables using the Bonferroni approach to control for Type I error, a p value of less than 0.05 was required for significance. The results of the correlational analysis,  $r(474) = -.397$ ,  $p < .001$  show a statistical significance at the 0.01 level with a Pearson Correlation of -0.40 between existing student GPA and academic achievement in virtual environments. Therefore the null hypothesis  $H_{06}$  was rejected and research question 7 was investigated to determine the extent to which GPA may be used to predict student academic achievement in virtual courses.

### Research Question 7

Due to the significant relationship found between academic achievement in virtual environments in relation to existing student GPA, research question seven was investigated. This research question was to determine the extent that existing student GPA can predict academic achievement in virtual courses. A bivariate linear regression analysis (Table 6) was conducted to determine the extent existing GPA may predict academic achievement in virtual courses ( $N = 476$ ,  $F(1, 474) = 160.87$ ,  $p < .001$ ). The regression equation for predicting virtual course grades was, *Virtual Course Final Grade*



=  $5.28 - 0.93(GPA)$ . The coefficient of determination was 0.25, indicating that 25% of the variation in final course grades may be explained by existing student GPA.

Table 6

*Summary of Regression Analysis for GPA (N=476)*

Variable	B	SE B	$\beta$
Constant	5.28	.224	
GPA	-.933	.074	-.504

## Phase II: Virtual Learning Environment and Student Achievement

### Research Question 8

The eighth research question is the first of the research questions investigating the relationship between virtual learning environment and academic achievement in virtual courses. This research question was to determine if there is any significant relationship in academic achievement among students in virtual courses by Instructional Dialogue. Using an adapted version of the DELES scales, there were 8 questions related to instructional dialogue. Students answered the questions with Never = 0, Seldom = 1, Sometimes = 2, Often = 3, and Always = 4. Table 7 (N=166) indicates the descriptive statistics for Instructional Dialogue ( $M= 3.15$ ,  $SD = .88$ ). The mean Final Grade in this data set was 3.54 with a standard deviation of 0.88.

Correlation coefficients were computed for the variables using the Bonferroni approach to control for Type I error, a p value of less than .05 was required for significance. The results of the correlational analysis were  $r(164) = .22$ ,  $p=.004$ . Therefore the null hypothesis  $H_{08}$  was rejected indicating a positive significant

relationship between the amount of instructional dialogue and student academic achievement in virtual courses.

Table 7

*Bivariate Correlation Test of VLE Domains and Final Virtual Course Grade (N=476)*

		Final Grade
I.D.	Pearson Correlation	.221**
	Sig. (2-tailed)	.004
Structure	Pearson Correlation	.310**
	Sig. (2-tailed)	.000
A.L.	Pearson Correlation	.379**
	Sig. (2-tailed)	.000

Note: VLE=Virtual Learning Environment, I.D.=Instructional Dialogue, A.L.=Autonomy of the Learner

### Research Question 9

The ninth research question was to determine if there is any significant relationship in academic achievement among students in virtual courses by the Structure of the virtual learning environment. Using an adapted version of the DELES scales, there were 17 questions related to structure. Students answered the questions with Never = 0, Seldom = 1, Sometimes = 2, Often = 3, and Always = 4. Table 7 ( $N=166$ ) indicates the descriptive statistics for Structure ( $M= 2.15$ ,  $SD = .73$ ). The mean Final Grade in this data set was 3.54 with a standard deviation of .88.

Correlation coefficients were computed for the variables using the Bonferroni approach to control for Type I error, a p value of less than .05 was required for significance. The results of the correlational analysis were  $r(164) = .31$ ,  $p<.001$ . Therefore the null hypothesis  $H_0$ 9 was rejected indicating a significant positive

relationship between the structure of the course and student academic achievement in the virtual course.

#### Research Question 10

The tenth research question was to determine if there is any significant relationship in academic achievement among students in virtual courses by the Autonomy of the Learner in the virtual learning environment. Using an adapted version of the DELES scales, there were 19 questions related to autonomy of the learner. Students answered the questions with Never = 0, Seldom = 1, Sometimes = 2, Often = 3, and Always = 4. Table 7 ( $N=166$ ) indicates the descriptive statistics for Autonomy of the Learner ( $M= 2.72$ ,  $SD = .57$ ). The mean Final Grade in this data set was 3.54 with a standard deviation of .88.

Correlation coefficients were computed for the variables using the Bonferroni approach to control for Type I error, a p value of less than .05 was required for significance. The results of the correlational analysis were  $r(164) = .38$ ,  $p < .001$ . Therefore the null hypothesis  $H_{010}$  was rejected indicating a significant positive relationship between the autonomy of the learner and student academic achievement in the virtual course.

#### Summary

This chapter provided the statistical analysis of the research questions and associated hypotheses of the study. Ten research questions and null hypotheses were tested using independent samples  $t$ -tests, bivariate correlations, and multiple regression

analyses to identify significant relationships between student background characteristics, demographics, virtual learning environment, and student achievement in virtual courses. Five out of 10 research questions had statistically significant findings. A summary of these findings, conclusions from the study, implications for practice, and recommendations are presented in the following chapter.

## CHAPTER 5

### SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

#### Introduction

This chapter provides a summary of the data analyses and results presented in Chapter 4, implications for practice, and recommendations for future research. The purpose of this study was to identify significant differences in academic achievement among virtual students of various backgrounds, demographics, and virtual learning environments. The study also sought to identify factors that may predict the academic achievement, as defined by final course grade, of virtual students. This study examined those relationships for the 476 students enrolled in virtual courses between January 2010 and January 2013 in Sullivan County Schools, TN. These students were in grades 7-12 during the time the courses were taken. Independent variables included gender, race/ethnicity, socio-economic status, prior number of virtual courses completed, existing student grade point average, instructional dialogue in the virtual course, structure of the virtual course, and autonomy of the learner allowed in the virtual course. The researcher investigated the relationships between these independent variables and the dependent variable, academic achievement, as determined by final virtual course grade. The statistical methods used to answer the research questions included bivariate correlations, independent samples t-tests, and multiple regression analysis.

## Summary of Findings

### Phase I: Background Characteristics and Demographics and Student Achievement

The first group of research questions investigated the relationships among background characteristics, demographics, and academic achievement in virtual environments. For this set of questions, information provided on registration documents was used for 476 participants in grades 7 through 12.

#### Research Question 1

Is there a significant difference in academic achievement between male and female students in virtual learning environments?

An independent samples t test was used to determine the difference in academic achievement in virtual courses between male and female students as determined by final virtual course grade. There was no significant statistical difference in final course grade for male students as compared to female students, which is consistent with the findings of other studies on the effects of gender on achievement in online courses (Daymount & Blau, 2008; Dutton, Dutton & Perry, 2002; Friday, Friday-Stroud, Green, & Hill, 2006; Gerlich, Mills, & Sollosy, 2009;).

#### Research Question 2

Is there a significant difference in academic achievement in virtual learning environments as compared by student race/ethnicity?

An independent samples t test was used to determine the difference in academic achievement, as determined by final virtual course grade, between White, non-Hispanic

students and students of all other races/ethnicities. There was no significant statistical difference in final course grade for White, non-Hispanic students as compared to students of all other races/ethnicities. This finding is inconsistent with comparable studies in the literature that indicated success rates for minority students enrolled in virtual courses lag behind those of their majority peers (Florida TaxWatch, 2007). However, this may be due to the small percentage of students in the study who were not White, non-Hispanic. This study population was 95.8% White, non-Hispanic which is slightly lower than the overall percentage of the student population of Sullivan County Schools, which is 97.7% white (TNDOE, 2013).

### Research Question 3

Is there a significant relationship between academic achievement in virtual learning environments and students in different grade levels (7-12)?

Correlation coefficients were computed for the variables using the Bonferroni approach to control for Type I error, a p value of less than 0.05 was required for significance. No statistical significance was found between student grade level and academic achievement in virtual environments. This finding is consistent with previous studies that found no significance based on student age (Carr, 2000; Digilio, 1998; Dutton et al., 2002; Gerlich et al., 2009; Lu et al., 2003; Roblyer & Davis, 2008; Tucker, 2000; Yukselturk & Bulut, 2007). Several studies considering demographic factors related to student achievement in virtual courses omitted age or grade level (Daymount & Blau, 2008; Friday et al., 2006). Students in middle school grades (7-8) did significantly outperform all other students; however, only students identified as gifted with the

provision on their Individual Education Plan (IEP) are allowed to take high school virtual courses while still in middle school in Sullivan County Schools.

#### Research Question 4

Is there a significant difference in academic achievement in virtual learning environments as compared by student socio-economic status?

An independent samples t test was used to determine the difference in academic achievement in virtual courses, as determined by final virtual course grade, between students identified as economically disadvantaged and those not identified as economically disadvantaged. Students identified as being economically disadvantaged tended to perform better academically in virtual courses than students identified as non-economically disadvantaged, as determined by final virtual course grade. Although there are no directly comparable studies found in the literature, research literature has established that economically disadvantaged students do not perform as well on standardized tests, are more often retained, have lower educational outcomes, and have a lower high school graduation rate (Perry & McConney, 2010; Rouse & Barrow, 2006). One factor that may contribute to this outcome is that all virtual courses in Sullivan County Schools are free to all students enrolled in the school system. Further research is needed to explore the relationship between socio-economic status and academic achievement in virtual courses.



### Research Question 5

Is there a significant difference in academic achievement in virtual learning environments for students taking a virtual course for the first time as compared to students who have prior experience in virtual courses?

An independent samples t test was used to determine the difference in academic achievement in virtual courses, as determined by final virtual course grade, between students taking a virtual course for the first time and students with prior experience taking a virtual course. Students identified as having no prior virtual course experience had no significant difference in academic achievement as determined by final virtual course grade than those students with prior virtual course experience. This is consistent with previous studies that found no significance based on prior courses taken (Bell, 2007).

### Research Question 6

Is there a significant relationship between academic achievement in virtual learning environments in relation to existing grade point average (GPA)?

Correlation coefficients were computed for the variables using the Bonferroni approach to control for Type I error, a p value of less than 0.05 was required for significance. A statistical significance was found between existing student GPA and academic achievement in virtual environments. Students with a higher GPA prior to taking a virtual course tended to receive higher grades than those with lower GPAs. This significance is consistent with previous studies that considered existing GPA and student academic achievement in virtual courses (Artino, 2007; Bell, 2007; Gerlich et al., 2009). Due to the significant relationship found between academic achievement in virtual

environments in relation to existing student GPA, research question seven was investigated.

#### Research Question 7

If there is a significant relationship between academic achievement in virtual learning environments in relation to existing GPA, to what extent can existing GPA predict academic achievement in virtual learning environments?

A bivariate linear regression analysis was conducted to determine the extent existing GPA may predict academic achievement in virtual courses. The accuracy of using GPA to predict final grades in virtual courses is moderate with a coefficient of determination of 0.25 suggesting that 25% of the variation in final course grades may be explained by existing student GPA.

#### Phase II: Virtual Learning Environment and Student Achievement

The research questions in Phase II investigate the relationship between virtual learning environment and academic achievement in virtual courses. For this set of questions, an adapted version of the DELES survey was sent electronically to 406 students. Of those students, 166 responded for a response rate of 41%, well within an acceptable response rate for Internet surveys (Watt et al., 2002).

#### Research Question 8

Is there a significant relationship between academic achievement in virtual learning environments and Instructional Dialogue scores?

Using an adapted version of the DELES scales, there were 8 questions related to instructional dialogue. Correlation coefficients were computed for the variables using the Bonferroni approach to control for Type I error. There was a significant relationship between academic achievement and Instructional Dialogue. Students who reported high levels of instructional dialogue (frequency of teacher-student interactions, teaching presence, content interactions) tended to perform significantly higher than those reporting lower levels of instructional dialogue. This is consistent with findings that student success is directly related to instructor interaction, including perceived interactions by students, clear and frequent feedback, and the overlapping of instructor and content interactions (Anderson et al., 2001; Fuller, Norby, Pearce, & Strad, 2000; Jiang & Ting, 2000; Picciano, 1998; Richardson & Ting, 1999).

#### Research Question 9

Is there a significant relationship between academic achievement in virtual learning environments and the structure of the virtual learning environment?

Using an adapted version of the DELES scales, there were 17 questions related to structure. Correlation coefficients were computed for the variables using the Bonferroni approach to control for Type I error. There was a significant relationship between academic achievement and the Structure of the course. Students who reported high levels of structure (instructional support, navigation, course design) tended to perform significantly higher than those reporting lower levels of structure in the course.

Although directly comparable studies were not found in the literature, this finding is

consistent with higher levels of student satisfaction found in courses with higher levels of structure (Johnston et al., 2005; Sun et al., 2008).

#### Research Question 10

Is there a significant relationship between student achievement in virtual learning environments and the Autonomy of the Learner scores?

Using an adapted version of the DELES scales, there were 19 questions related to autonomy of the learner. Correlation coefficients were computed for the variables using the Bonferroni approach to control for Type I error. A statistically significant relationship was found between the autonomy of the learner and academic achievement in the virtual course. Students who reported higher levels of autonomy (student ability to determine goals, learning experiences, and evaluation decisions) tended to perform significantly better academically than those who reported lower levels of autonomy. This is consistent with research that indicates students who are responsible for their own learning tend to be successful, engaged, self-regulated, self-assessing, and motivated (Jones et al., 1994).

#### Implications for Policy, Practice, and Future Research

The purpose of this study was to investigate differences and determine relationships between academic achievement among virtual students of various backgrounds, demographics, and virtual learning environments in Sullivan County Schools (TN). The study also sought to identify factors that may predict the academic achievement, as defined by final course grade, of these virtual students. The results of this research have

several important implications for policy, such as course enrollment policies; practice, such as teaching practices and student support practices; and future research, such as expanding sample sizes and examining specific course content.

### Implications for Policy

Three implications for policy based on the findings of this study include:

1. Because students with higher existing GPAs tended to perform significantly better in virtual learning environments than those with lower existing GPAs, virtual course enrollment policies should include algorithms that factor in students with lower GPAs. For example, course enrollment sizes could be adjusted as students with lower GPAs enroll with the assumption that fewer enrollments will result in greater opportunities for virtual teacher-student interactions and increased student interactions.
2. All three areas of the virtual learning environment (Instructional Dialogue, Structure, and Autonomy of the Learner) were positively correlated to student academic achievement in virtual courses. Policymakers would be wise to incorporate professional development policies that encourage virtual teachers to expand their content and pedagogical knowledge in these important areas.
3. Because the interactivity and course design are integral to the three areas of the virtual learning environment (Instructional Dialogue, Structure, and Autonomy of the Learner), policymakers should incorporate course development and purchasing policies that certify courses meet the appropriate standards to maximize the learning environment for virtual students.

### Implications for Practice

Four implications for practice based on the finding of this study include:

1. Teachers should maintain high levels of instructor dialogue within the virtual course, including a high frequency of teacher-student interactions, consistent teaching presence, and content interactions.
2. Courses should be chosen that are very structured and include ease of navigation, many forms of communication options (discussion boards, chats, email, synchronous video), and interactive content features.
3. Courses should provide students with high levels of autonomy, including the ability to make choices in assignments, learning goals, pace, and learning experiences.
4. Data should continue to be collected in this area with future virtual students in Sullivan County and other school systems to further analyze these relationships and refine teaching and learning in virtual courses.

### Implications for Future Research

This quantitative study was conducted within the parameters and limitations outlined in Chapter 1. Four recommendations for future research include:

1. A study using the same independent factors but stratified by course (looking at each course independently) may provide greater information about achievement in specific virtual courses.

2. Including previous virtual course failures, previous virtual course withdrawals, and end of course scores as independent variables in a future study would provide more information on student achievement.
3. Similar studies in comparable school systems (similar student population, student demographics, and virtual program) could determine if some of the findings of this study are specific only to Sullivan County Schools, TN.
4. Replicating this study over time including same-course sections taught by different instructors and in multiple school systems to determine if any generalizations may be made regarding student achievement in high school virtual courses.

### Conclusion

The purpose of this study was to identify significant differences in academic achievement among virtual students of various backgrounds, demographics, and virtual learning environments. The study also sought to identify factors that may predict the academic achievement, as defined by final course grade, of virtual students. The findings of this study are encouraging in that the majority of the significant factors in virtual student achievement (Instructional Dialogue, Structure, and Autonomy of the Learner) are controllable factors. Policymakers and practitioners may make informed decisions relative to virtual course purchasing, design, and best practices to positively affect student achievement. Future research on specific virtual course subjects and additional background characteristics may provide additional information to help improve teaching and learning in the virtual environment.

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# APPENDICES

## APPENDIX A

### Adapted DELES Survey

#### Sullivan County Virtual Course Survey

---

What school do you attend? \*

Birth Date \*

Month

Day

Year

Gender \*

- Male  
 Female

Grade \*

- 7  
 8  
 9  
 10  
 11  
 12

Which virtual course(s) have you taken or are you currently taking? \*

What grade did you make in this class? (or what grade do you expect to make)

What grade(s) did you make on those

On what platform are taking your virtual course? \*

Where are you taking this course? \*

- At home only  
 In a virtual lab at school  
 At school but not in a virtual lab  
 At home and at school

**Please respond to the following questions.**

---

If I have a question, my teacher finds time to respond. \*

- Never
- Seldom
- Sometimes
- Often
- Always

The teacher helps me identify problem areas in my study. \*

- Never
- Seldom
- Sometimes
- Often
- Always

The teacher responds promptly to my questions. \*

- Never
- Seldom
- Sometimes
- Often
- Always

The teacher gives me valuable feedback on my assignments. \*

- Never
- Seldom
- Sometimes
- Often
- Always

The teacher adequately addresses my questions. \*

- Never
- Seldom
- Sometimes
- Often
- Always

The teacher encourages me to participate. \*

- Never
- Seldom
- Sometimes
- Often
- Always

It is easy to contact the teacher. \*

- Never
- Seldom
- Sometimes
- Often
- Always

The teacher provides me positive and negative feedback on my work. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I work with others. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I relate my work to others' work. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I share information with other students. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I discuss my ideas with other students. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I collaborate with other students in the class. \*

- Never
- Seldom
- Sometimes
- Often
- Always

Group work is a part of my activities. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I can relate what I learn to my life outside of school. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I am able to pursue topics that interest me. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I can connect my studies to activities outside of this class. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I apply my everyday experiences in class. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I learn things about the world outside of school. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I link class work to my life outside of school. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I apply my out-of-class experiences. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I study real cases related to the class. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I use real facts in class activities. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I work on assignments that deal with real world information. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I work with real examples. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I enter the real world of the topic of study. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I explore my own strategies for learning. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I seek my own answers. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I solve my own problems. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I make decisions about my learning. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I work during times I find convenient. \*



- Never
- Seldom
- Sometimes
- Often
- Always

I am in control of my own learning. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I play an important role in my learning. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I approach learning in my own way. \*

- Never
- Seldom
- Sometimes
- Often
- Always

**The following items refer to your satisfaction with virtual learning.**

---

Virtual courses are stimulating. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I prefer virtual courses. \*

- Never
- Seldom
- Sometimes
- Often
- Always

Virtual courses are exciting. \*

- Never
- Seldom
- Sometimes
- Often
- Always

Virtual courses are worth my time. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I enjoy learning in virtual courses. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I look forward to learning virtually. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I would enjoy my education more if all my courses were virtual. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I learn as well in virtual courses as in traditional courses. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I learn more in virtual courses than I do in traditional courses. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I learn less in virtual courses than I do in traditional courses. \*

- Never
- Seldom
- Sometimes
- Often
- Always

I am satisfied with this class. \*

- Never
- Seldom
- Sometimes
- Often
- Always

Do you have any suggestions that would make this virtual course better? \*

Do you plan to take another virtual class in the future? \*

- Yes
- No
-

## APPENDIX B

### Permission Letter to Use and Adapt DELES Survey

#### Distance Education Learning Environments Survey (DELES) Application for Usage Permission

All rights to the Distance Education Learning Environments Survey, hereafter referred to as the DELES, are held by Scott L. Walker, ScEdD and are protected under the United States Copyright Act of 1976. Permission to use the DELES must be granted in writing by Scott L. Walker, who may assign agreed upon usage rights to those persons requesting to use the DELES per the Usage Policy below. There is a US\$20 administrative fee associated with processing your request for use of the DELES (see Administrative Fee below).

#### DELES Usage Policy

##### Academic Research Use by Individual Students or Faculty

The DELES may be used free of charge, with written permission from Scott L. Walker, by individual university students for the purposes of thesis or dissertation study or research. Students who use the DELES must agree to provide an electronic summary of, or hypertext Web link to, the resulting thesis or dissertation to share with the research community. Students may provide an electronic scholarly paper, document (i.e. conference presentation), or hypertext Web link to an electronic document in which the DELES was utilized in lieu of a full thesis or dissertation.

##### Administrative Fee

Due to the high demand for the use of the DELES by students and researchers, a fee of US\$20 is required to process your permission letter. If you do not qualify for use of the DELES this fee will not be assessed and you will be notified that you do not qualify. Fees may be charged to a VISA, Mastercard, or Discover account. Paypal may be used in lieu of credit or debit cards. Paypal payments shall be sent to walkstx@gmail.com.

In order to be granted permission to use the DELES, students must complete and return the following form.

<b>Student/Faculty Information</b> <span style="float: right;">*optional</span> First Name: <b>Jamie</b> Family Name: <b>Whiting</b> E-Mail Address: <b>jamie.whiting@sullivank12.net</b> *Personal Web Page Address: Level of Study/Teaching <input type="checkbox"/> Masters <input checked="" type="checkbox"/> Doctorate <input type="checkbox"/> Other. Please specify: Country from which you are studying/teaching: <b>United States</b>
<b>Institution Information</b> Name of University: <b>East Tennessee State University</b> Department or Faculty: <b>Educational Leadership &amp; Policy Analysis</b> Department or Faculty Web Page Address: <b>http://www.etsu.edu/coe/elpa/</b> For students... Name of Primary Dissertation or Thesis Advisor: <b>Dr. Bethany Flora</b> E-Mail Address of Advisor: <b>FLORAB@mail.etsu.edu</b> Telephone Number of Advisor: <b>(423) 439-4430</b>
<b>Study/Research Information</b> Working Title of Study: <b>Virtual Students: Relationships between Student Demographics, Virtual Learning Experience, and Academic Performance</b> Brief Description of (Proposed) Study: <b>My research will be quantitative studying the relationship between student backgrounds, virtual learning experiences, and academic performance in the K-12 virtual environment. A correlational design will be used to study the relationship of the student background variables (gender, GPA, socio-economic status, etc), the virtual learning experience (platform, learning activities, self-paced/paced), and the students' final online course grade (high achieving, average achieving, low achieving, fail/withdraw). My population will be students in the 15 school systems that are part of the Northeast Tennessee College and Career Ready Consortium who have participated in virtual courses.</b>
Anticipated Completion Date: <b>December 2012</b> Will the DELES be distributed electronically? <input checked="" type="checkbox"/> yes <input type="checkbox"/> no

If yes, please explain, included anticipated numbers to be distributed and how (e-mail, Web page, etc.): **email linked to an electronic form**

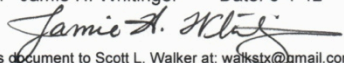
**Administrative Fee Credit Card Information**

Pay by credit/debit \_\_\_ Pay by PaPal **X** (send to [walkstx@gmail.com](mailto:walkstx@gmail.com))  
**Paypal payment will be sent from [jwhiting@chartertn.net](mailto:jwhiting@chartertn.net)**

Credit Card Number: Expiration Date (Month/Year):  
Cardholder Name: Card Security Code ([explain](#)):  
Cardholder Billing Street Address: Cardholder Billing Zip Code:

By completing this form and submitting it to Scott L. Walker, I hereby agree to use the DELES only for the purposes of academic research and not for commercial purposes. I agree to submit to Scott L. Walker, [walkstx@gmail.com](mailto:walkstx@gmail.com), an electronic version of my study or a Web page address (URL) where the study or its derivative(s) can be found online. I also agree to give appropriate citation to Scott L. Walker in my study and I agree to all the above information being posted on the World Wide Web site for the DELES. Finally, I agree to affix the following phrase to any reproduction of the DELES and/or its derivatives: © 2004-2012 Scott L. Walker Used with permission.

**X** yes, I agree      Name: Jamie H. Whiting      Date: 5-1-12  
\_\_\_ no, I do not agree



Upon completion, save and submit this document to Scott L. Walker at: [walkstx@gmail.com](mailto:walkstx@gmail.com). If all of the information is correct and verifiable, and upon payment, you will receive a signed .PDF file stating that permission has been granted to use the DELES in the abovementioned study. You will also receive the Actual, Preferred, and Instructor forms of the DELES as a Word document.

**Commercial and/or Institutional Use**

Permission to use the DELES for commercial enterprises, institutional entities, and for institutional-affiliated research must be negotiated with Scott L. Walker. A fee for use may be required and rights must be assigned before commercial or institutional use permission will be granted. Typically, university and college faculty wishing to use the DELES for a one-time research project will be granted permission to use the DELES upon payment of the administrative fee. Commercial and institutional uses will be charged a negotiated fee.

Please contact Scott L. Walker at [walkstx@gmail.com](mailto:walkstx@gmail.com) with details of your permission request if you fall into this category.

**Sample Permission Letter**

[Your Name here](#) has been granted permission to use the Distance Education Learning Environments Survey (DELES) for the purpose of \_\_\_\_\_ with the following usage rights being granted.

- One time U.S. rights for e-mail distribution of the Preferred, Actual, and Instructor forms of the DELES
- One time worldwide rights for e-mail distribution of the Preferred, Actual, and Instructor forms of the DELES
- One time U.S. rights for Web posting of the Preferred, Actual, and Instructor forms of the DELES to be removed from the Web after date
- One time worldwide rights for Web posting of the Preferred, Actual, and Instructor forms of the DELES to be removed from the Web after date

\_\_\_\_\_  
Scott L. Walker, ScEdD

\_\_\_\_\_  
Date


**Scott L. Walker, ScEdD**  
**397 S. Willow Ave.**  
**New Braunfels, TX 78130**  
**USA**  
walkstx@gmail.com

**DELES Permission Letter**

Jamie Whiting has been granted permission to use the Distance Education Learning Environments Survey (DELES) for the purpose of the proposed doctoral study: *Virtual Students: Relationships between Student Demographics, Virtual Learning Experience, and Academic Performance* through East Tennessee State University with the following usage rights being granted.

- One time U.S. rights for e-mail distribution of the Preferred, Actual, and Instructor forms of the DELES.
- One time U.S. rights for Web posting of the Preferred, Actual, and Instructor forms of the DELES to be removed from the Web no later than January 31, 2013.

The DELES and its versions and derivatives are copyright protected. When the DELES is published or presented in non-commercial use, you must mention Scott L. Walker as the copyright holder of the instrument in this format: © 2004-2012 Scott L. Walker Used with permission



Scott L. Walker, ScEdD

May 1, 2012  
Date

## APPENDIX C

### Approval Letter from ETSU Institutional Review Board



East Tennessee State University  
Office for the Protection of Human Research Subjects • Box 70565 • Johnson City, Tennessee 37614-1707  
Phone: (423) 439-6053 Fax: (423) 439-6060

#### IRB APPROVAL – Initial Expedited Review

April 9, 2013

Jamie Whiting

**Re:** K-12 Virtual Students: Relationships between Student Demographics, Virtual Learning Experience, and Academic Performance

**IRB#:** c0213.19sw

**ORSPA #:**

The following items were reviewed and approved by an expedited process:

- Form 103; Narrative (dated 2/4/13); Supplemental Submission Form for Studies with Children Participants; Parent Permission\* email script (no version date, stamped approved 4/9/13); Student Assent\* email script (no version date, stamped approved 4/9/13); Survey; Potential Conflict of Interest form; Permission from Sullivan County Schools Director; Assurance Statement; CV

The item(s) with an asterisk(\*) above noted changes requested by the expedited reviewers.

On **April 9, 2013**, a final approval was granted for a period not to exceed 12 months and will expire on **April 8, 2014**. The expedited approval of the study *and* requested changes will be reported to the convened board on the next agenda.

The Parental Permission has been granted a Waiver or Alteration of Informed Consent by Chris Ayres, Chair, ETSU IRB under category 45 CFR 46.116(d)(1-4). Those determinations are as follows: (1) research involves no more than minimal risk to the participants because it only involves an online survey; (2) the waiver or alteration will not adversely affect the rights and welfare of the subjects because parental consent is required; (3) the research could not practicably be carried out without the waiver or alteration because of the large volume of prospective participants and (4) providing participants additional pertinent information after participation is not appropriate because the survey is to assess program effectiveness and information is not regarding the singular participant.

Based on the review of the Children's Advocate, the IRB determined that no greater than minimal risk



Accredited Since December 2005

to children is presented because the research survey takes place in the same manner as the delivery of other instructional course material. The requirement for parental permission is waived. The research protocol is designed for conditions and a participant population for which parental or guardian permission is not a reasonable requirement to protect the participants because no identifiable information will be matched to the survey. An appropriate mechanism for protecting the children who will participate as participants in the research is substituted because parents have the choice to "opt out" their child and an alternative activity will be provided. The waiver is consistent with Federal, State, or local law and the research is not subject to FDA regulations. Assent is required for each child who is capable of providing assent based on age, maturity, and psychological state because participants are children who have completed a virtual learning course in the Sullivan County School System. Documentation of assent is not required.

The following **enclosed stamped, approved Informed Consent Documents** have been stamped with the approval and expiration date and these documents must be copied and provided to each participant prior to participant enrollment:

- Passive Parental Informed Consent Document (no ver. date, stamped approved 4/9/13)
- Student Assent (no ver. date, stamped approved 4/9/13)

Federal regulations require that the original copy of the participant's consent be maintained in the principal investigator's files and that a copy is given to the subject at the time of consent.

**Projects involving Mountain States Health Alliance must also be approved by MSHA following IRB approval prior to initiating the study.**

Unanticipated Problems Involving Risks to Subjects or Others must be reported to the IRB (and VA R&D if applicable) within 10 working days.

Proposed changes in approved research cannot be initiated without IRB review and approval. The only exception to this rule is that a change can be made prior to IRB approval when necessary to eliminate apparent immediate hazards to the research subjects [21 CFR 56.108 (a)(4)]. In such a case, the IRB must be promptly informed of the change following its implementation (within 10 working days) on Form 109 ([www.etsu.edu/irb](http://www.etsu.edu/irb)). The IRB will review the change to determine that it is consistent with ensuring the subject's continued welfare.

Sincerely,  
Chris Ayres, Chair  
ETSU Campus IRB



APPENDIX D

Permission Letter from Director of Schools

**East Tennessee State University**  
IRB – Office for the Protection of Human Research Subjects

**Educational Research**

I, Dr. Jubal Yennie, grant permission to Jamie H. Whiting to  
(Institution Representative-Print Name) (Primary Investigator-Print Name)

conduct research for the study titled K-12 Virtual Students: Relationships between Student Demographics, Virtual Learning Experience, and Academic Performance at the following institutions:

<u>Sullivan Central High School</u>	<u>Sullivan North High School</u>
<u>Sullivan South High School</u>	<u>Sullivan East High School</u>
<u>HMS, CHMS, MHS</u>	<u></u>

As Director of Schools, I attest that our educational institution has policies  
(Institution Representative Title)

developed in conjunction with parents regarding the following:

- The right of a parent of a student to inspect, upon the request of the parent, a survey created by a third party before the survey is administered or distributed by a school to a student.
- Any applicable procedures for granting a request by a parent for reasonable access to such survey within a reasonable period of time after the request is received.
- Arrangements to protect student privacy that are provided by the agency in the event of the administration or distribution of a survey to a student containing one or more of the following items (including the right of a parent of a student to inspect, upon the request of the parent, any survey containing one or more of such items):
  - Political affiliations or beliefs of the student or the student's parent.
  - Mental or psychological problems of the student or the student's family.
  - Sex behavior or attitudes.
  - Illegal, anti-social, self-incriminating, or demeaning behavior.
  - Critical appraisals of other individuals with whom respondents have close family relationships.
  - Legally recognized privileged or analogous relationships, such as those of lawyers, physicians, and ministers.
- Religious practices, affiliations, or beliefs of the student or the student's parent.
- Income (other than that required by law to determine eligibility for participation in a program or for receiving financial assistance under such program).
- The right of a parent of a student to inspect, upon the request of the parent, any instructional material used as part of the educational curriculum for the student.
- Any applicable procedures for granting a request by a parent for reasonable access to instructional material received.
- The administration of physical examinations or screenings that the school or agency may administer to a student.
- The collection, disclosure, or use of personal information collected from students for the purpose of marketing or for selling that information (or otherwise providing that information to others for that purpose), including arrangements to protect student privacy that are provided by the agency in the event of such collection, disclosure, or use.
- The right of a parent of a student to inspect, upon the request of the parent, any instrument used in the collection of personal information before the instrument is administered or distributed to a student.
- Any applicable procedures for granting a request by a parent for reasonable access to such instrument within a reasonable period of time after the request is received.

P.K. Jamie H. Whiting  
(Signature) (Date)

Institutional Rep. Jubal Yennie  
(Signature) (Date)

## APPENDIX E

### Passive Parent Permission:

#### Parent Email Requesting Student Participation in Study

Parents,

You are receiving this email because your child has taken a virtual course in Sullivan County Schools within the last two years. We would like to invite your child to participate in a survey regarding that virtual course. This survey is part of a research study. Please read the information about the study below. If you would not like to have your child participate in this study, please reply to this email with "EXCLUDE" in the subject and your child will not receive an email invitation to participate. Please find a copy of the survey attached to this email.

Thank you,  
Jamie Whiting

Title of Study: K-12 Virtual Students: Relationships between Student Demographics, Virtual Learning Experience, and Academic Performance.

Principal Investigator:  
Jamie Whiting  
Educational Leadership and Policy Analysis  
East Tennessee State University  
PO Box 306, Blountville, TN 37617  
423-354-1006  
[jamie.whiting@sullivank12.net](mailto:jamie.whiting@sullivank12.net)

Background:  
Due to the continuing increase in demand and options for virtual learning in K-12 education, it is important to understand the predictors for academic achievement in virtual courses. The purpose of this study is to examine the relationships between student backgrounds, virtual learning experiences, and academic performance in the K-12 virtual environment. The student background characteristics that will be investigated include gender, grade level, and GPA. The virtual learning experience variables include number of virtual courses taken, the learning management system used for course delivery, and seven scales from the Distance Education Learning Environments Survey.

Study Procedure:  
Students participating in this research study will complete an electronic survey. It is estimated that the survey will take approximately 5-10 minutes to complete. Surveys will be sent to email addresses provided by students upon registering for virtual courses. The survey will be open for 2 weeks.

Risks:  
There are no known risks to participating in this study.

Benefits:

APPROVED  
By the ETSU IRB

DOCUMENT VERSION EXPIRES

APR 09 2013

APR 08 2014

By   
Chair/IRB Coordinator

ETSU IRB

There will be no direct benefit for participation in this study. However, students will have the opportunity to provide information about their experience with virtual courses that may be used to improve virtual courses for K-12 students.

**Alternative Procedures:**

If you do not want your child to participate in the study, please reply to this email and your child will not receive an email invitation to participate. Students may also choose not to complete the survey. Students may stop the survey at any time.

**Confidentiality:**

No identifying information will be collected on the survey. All responses will be anonymous.

**Person to Contact:**

Should you have any questions about the research or any related matters, please contact the researcher at [jamie.whitinger@sullivank12.net](mailto:jamie.whitinger@sullivank12.net).

**Institutional Review Board:**

You may call the Chairman of the Institutional Review Board at 423/439-6054 for any questions you may have about your rights as a research subject. If you have any questions or concerns about the research and want to talk to someone independent of the research team or you can't reach the study staff, you may call an IRB Coordinator at 423/439-6055 or 423/439/6002.

**Voluntary Participation:**

Your child's participation in this study is voluntary. It is up to you to decide whether or not to your child will take part in this study. If you do decide for your child to take part in this study, your consent will be implied by completing the survey. If you decide for your child to take part in this study, you are still free to withdraw at any time and without giving a reason. Your child is free to not answer any question or questions if you choose.

**Costs to Subject:**

There are not costs to you or your child for participation in this study.

**Compensation:**

There is no monetary compensation to you or your child for your participation in this study.

**Consent:**

By allowing my child to click the link to participate in the survey, I confirm that I have read and understood the information and have had the opportunity to ask questions. I understand that my child's participation is voluntary and that he/she is free to withdraw at any time, without giving a reason and without cost. I voluntarily agree to allow my child to take part in this study.

**APPROVED**  
By the ETSU IRB

**DOCUMENT VERSION EXPIRES**

**APR 09 2013**

**APR 08 2014**

By   
Chair/IRB Coordinator

ETSU IRB

## APPENDIX F

### Child Assent: Student Email Requesting Participation in the Study

Dear Student,

You are receiving this email because you have taken a virtual course in Sullivan County Schools within the last two years. We would like to invite you to participate in a survey regarding that virtual course. This survey is part of a research study. Please read the information about the study below. Your parent was sent information about this study by email. If you would not like to participate in this study, then you may choose not to follow the link below. This survey will take approximately 5-10 minutes to complete. Your answers will be anonymous.

[Complete the Survey By Clicking Here](#)

Thank you,  
Jamie Whiting

Title of Study: K-12 Virtual Students: Relationships between Student Demographics, Virtual Learning Experience, and Academic Performance.

Principal Investigator:  
Jamie Whiting  
Doctoral Student  
Educational Leadership and Policy Analysis  
East Tennessee State University  
PO Box 306, Blountville, TN 37617  
423-354-1006  
[jamie.whiting@sullivank12.net](mailto:jamie.whiting@sullivank12.net)

**Background:**

Due to the continuing increase in demand and options for virtual learning in K-12 education, it is important to understand the predictors for academic achievement in virtual courses. The purpose of this study is to examine the relationships between student backgrounds, virtual learning experiences, and academic performance in the K-12 virtual environment. The student background characteristics that will be investigated include gender, grade level, and GPA. The virtual learning experience variables include number of virtual courses taken, the learning management system used for course delivery, and seven scales from the Distance Education Learning Environments Survey.

**Study Procedure:**

Students participating in this research study will complete an electronic survey. It is estimated that the survey will take approximately 5-10 minutes to complete. Surveys will be sent to email addresses provided by students upon registering for virtual courses. The survey will be open for 2 weeks.

**Risks:**

There are no known risks to participating in this study.

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**APR 09 2013**      **APR 08 2014**  
By  **Chair/IRB Coordinator**      **ETSU IRB**

**Benefits:**

There will be no direct benefit for participation in this study. However, students will have the opportunity to provide information about their experience with virtual courses that may be used to improve virtual courses for K-12 students.

**Alternative Procedures:**

If you do not want to participate in the study, then you may choose to delete this email. You may also stop the survey at any time once you have started.

**Confidentiality:**

No identifying information will be collected on the survey. All responses will be anonymous.

**Person to Contact:**

Should you have any questions about the research or any related matters, please contact the researcher at [jamie.whitinger@sullivank12.net](mailto:jamie.whitinger@sullivank12.net).

**Institutional Review Board:**

You may call the Chairman of the Institutional Review Board at 423/439-6054 for any questions you may have about your rights as a research subject. If you have any questions or concerns about the research and want to talk to someone independent of the research team or you can't reach the study staff, you may call an IRB Coordinator at 423/439-6055 or 423/439/6002.

**Voluntary Participation:**

Your participation in this study is voluntary. It is up to you to decide whether or not you will take part in this study. If you do decide to take part in this study, your consent will be implied by completing the survey. If you decide to take part in this study, you are still free to withdraw at any time and without giving a reason. You are free to not answer any question or questions if you choose.

**Costs to Subject:**

There are not costs to you for participation in this study.

**Compensation:**

There is no monetary compensation to you for your participation in this study.

**Consent:**

By clicking the link to participate in the survey, I confirm that I have read and understood the information and have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and without cost. I voluntarily agree to take part in this study.

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**ETSU IRB**

## VITA

### JAMIE HILTON WHITINGER

#### Personal Data:

Date of Birth: March 29, 1977  
Place of Birth: Kingsport, TN  
Marital Status: Married

#### Education:

East Tennessee State University, Johnson City, Tennessee;  
Mass Communications, B.S.; 1999  
East Tennessee State University, Johnson City, Tennessee;  
Elementary Education K-8, M.A.T.; 2006  
Lincoln Memorial University, Harrogate, Tennessee;  
Educational Administration, Ed.S.; 2009  
East Tennessee State University, Johnson City, Tennessee;  
Educational Leadership, Ed.D.; 2013

#### Professional Experience:

Vocational Assessment Assistant, Sullivan County  
Department of Education; 1999-2000  
Web Developer and Staff Development Trainer; Sullivan  
County Department of Education, 2000-2007  
Teacher, Indian Springs Elementary School; 2007-2008  
Teacher, Miller Perry Elementary School; 2008-2009  
Instructional Technology Coach K-12, Sullivan County  
Department of Education; 2009-2012  
Assistant Principal, Miller Perry and Rock Springs  
Elementary Schools; 2012 – present  
Virtual Learning & Communications Coordinator, Sullivan  
County Department of Education; 2012-present