A QUANTITATIVE EXAMINATION OF THE EDUCATIONAL TECHNOLOGY CHARACTERISTICS OF OHIO SCHOOLS AND THEIR BLUE RIBBON STATUS

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A Dissertation Presented in Partial Fulfillment
Of the Requirements for the Degree
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ABSTRACT

The purpose of this study was to analyze data from Ohio schools and the frequency of use of educational technology, a teacher's comfort level using technology, and a teacher's beliefs about the effect of educational technology on teaching and learning based upon the school's Blue Ribbon award status. The study used an ex-post facto, quantitative comparative research design. The variables examined originated from an archival data set: the Ohio Biennial Educational Technology Assessment: 2011 (*BETA 10-11*). The research questions examined the differences between Blue Ribbon and Non-Blue Ribbon schools based on educational technology use, a teachers' comfort level with technology, and belief about the effect of educational technology on teaching and learning. The theoretical basis for the study is educational technology innovations and recognized high achievement in public schools. The Blue Ribbon School Program honors public and private elementary, middle, and high schools that are either preforming high academically or have improved student achievement to high levels, especially among disadvantaged students. The BETA (10-11) teacher survey on educational technology consisted of 117,575 teachers from K-12 public schools in Ohio. In the 2010-2011 school year, the state of Ohio had 11 public schools awarded the Blue Ribbon status. There was no significant difference between Blue Ribbon schools and Non-Blue Ribbon schools based upon the three educational technology characteristics.

Descriptors: Educational technology use, teacher comfort level with technology, teacher belief about educational technology, Blue Ribbon schools, Ohio Biennial Educational Technology Assessment: 2011

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CHAPTER ONE: INTRODUCTION

Background

There is a general agreement among educators and business leaders that a growing gap exists between the skills needed for the 21st Century and the current state of the American educational system (Moylan, 2008). However, it has been a matter of disagreement that the implementation of technology into the education system has done little to improve the quality of the teaching and learning (Brown, 2006). To many, technology can play an essential role in transforming education. In fact, there have been great efforts to get teachers to integrate technology into the teaching and learning process (Adam, 2007). The United States continues to invest billions in educational technology as a means to improve student achievement in the United States K-12 public schools (Wallis, 2006). Very little research has been conducted in exploring the correlation between educational technology and recognized high-achieving schools that make up the 98,916 K-12 public schools in the United States (NCES, 2009). It was John Dewey that proposed the significant relationship between student achievement and process life skills (Dewey, 1916). According to Dewey, it is the teacher's responsibility to mix the ingredients of studies and relevant life skills to make a significant contribution to the value of a student's life. Dewey's idea is relevant today as teachers struggle with educational technology and 21st Century Skills as a means to improve student achievement and meet adequate yearly progress (AYP).

Statement of the Problem

Research demonstrates that access to technology in schools has greatly improved (Stewart, 2010). In addition, educational technology can play a pivotal role in changing both student learning and teaching practice (Riley, 2007). Schacter (2011) found several research studies that have linked classroom technology use with improved academic achievement. "Educational technology is considered to be a major innovation not a minor one for the advancement of students" (Fullan, 1992, p. 57). Although technology has the potential to transform education, barriers still remain that limit technology integration into everyday instruction (Keengwe, 2008). If educational technology is an important innovation, then it is important to identify possible variables that could influence student achievement. Morgan (1963) stated the importance of studying other classifications in the same study to observe if the effects are not linear for one specific variable. For the purpose of this study, influential educational technology variables are identified by the following categories: a) Educational technology frequency of use by teachers and students; b) Comfort level with technology by the teacher; c) A teacher's beliefs about the effect of educational technology on teaching and learning.

Educational technology does not fit well in the traditional structure of teaching (Prensky, 2005). The one-size fits all model of instruction does not align itself with the skills needed for the 21st century (Kelly, 2009). The premise for the 21st Century skill movement is that the world has changed so fundamentally in the last few decades that the role of learning and structure of education must evolve to meet the demand of the global economy (Trilling, 2009). The frequency of educational technology, a teacher's comfort level with technology, and beliefs about the effect of educational technology on teaching and learning should be characterized by a strong consistent integration of 21st Century skills across content areas to better prepare students for the future. Examining the extent that educational technology variables play in Ohio schools could provide a snapshot of educational technology as a force of innovation for student achievement. The most current survey, *Biennial Educational*

Technology Assessment: 2011 (BETA 10-11), from the state agency eTech Ohio, provides a collection of current data surrounding teachers' educational technology use in the state Ohio. The BETA (10-11) presents district and school self-reported data regarding technology accessibility and usage in Ohio's K-12 public schools. The BETA (10-11) data is archived, accessible, and available for manipulation to study. eTech Ohio strongly encourages analysis of BETA (10-11) data for the educational community (eTech Ohio, 2010). The BETA (10-11) data was studied from identified schools from Ohio that received the National Blue Ribbon Award of Excellence in comparison to those schools that did not receive the award.

The Blue Ribbon School Program honors public and private elementary, middle, and high schools that are either high performing or have improved student achievement to high levels, especially among disadvantaged students. The program is part of a larger Department of Education effort to identify and disseminate knowledge about best school leadership and teaching practices. Each year since 1982, the U.S. Department of Education has sought out schools where students attain and maintain high academic goals (Department of Education, 2011). What is missing from the literature is a specific discussion about high-achieving Blue Ribbon schools and the influence of specific educational technology characteristics on student achievement. It is not known to what extent differences exist between Ohio schools based upon their Blue Ribbon award status and the three variables: a.) Educational technology frequency of use; b.) Teacher's comfort level with technology; c.) A teacher's beliefs about the effect of educational technology on teaching and learning.

Purpose of the Study

More people than ever before are reaping the benefits of the information age (Brown, 2010). From the inner cities to remote rural areas, communities have benefited from the integration of technology into the American school system (Page, 2006). The purpose of this study was to analyze data from Ohio schools and the frequency of use of educational technology, a teacher's comfort level using technology, and a teacher's beliefs about the effect of educational technology on teaching and learning based upon the school's Blue Ribbon award status.

Research Questions

Three research questions were developed based on the current literature on educational technology and student achievement. The questions were designed to be answered by testing the related null-hypotheses and analyzing the results of the 2011 Ohio BETA survey.

Research Question 1: *To what extent does educational technology use differ between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

Research Question 2: *To what extent does the educational technology teacher comfort level differ between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

Research Question 3: *To what extent does a teacher's beliefs about educational technology differ between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

Null Hypotheses

From the research questions, the following null hypotheses were inferred:

$H_0$1: *There is no difference in educational technology use between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

$H_0$2: *There is no difference in teacher comfort level between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

$H_0$3: *There is no difference in a teacher's beliefs about educational technology between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

Nature of the Study

This study was an ex post facto, quantitative, comparative research design. Data analysis took place using the most recent data from the eTech Ohio Biennial Educational Technology Assessment: 2010 (BETA 10-11). BETA (10-11) provided a collection of current data surrounding educational technology in all of Ohio public schools based upon responses from Ohio K-12 public school teachers. The teacher survey included information on the frequency of use of specific technology from teachers and students, Web 2.0 technology, internet access in the classroom, availability and use of technology devices, software, a teacher's beliefs about technology, a teacher's comfort level with technology, and technology-related professional development activities (Panzio, 2010). To gain better insight into the educational technology use of teachers from high achieving Ohio schools compared to the normal population of Ohio schools, the study examined the independent variables represented by the schools that received the Blue Ribbon award and those that did not. The dependent variables that were examined were 1.) The school's frequency of use of educational technology; 2.) A teacher's comfort level with educational technology; 3.) A teacher's belief about educational technology effectiveness on teaching and learning.

The sample for the BETA (10-11) teacher survey on educational technology consisted of 117,575 teachers from K-12 public schools in Ohio. The BETA (10-11) survey is one of two related surveys conducted under a nested design involving Ohio school districts and individual buildings within the school district. The survey frame included full-time and part-time teachers teaching at least one regularly scheduled class in grades K through 12.

Excluded from the sampling frame were administrators, counselors, advisors, and social workers. (eTechOhio, 2011). A teacher's years of service, elementary, middle or secondary levels, district, and specific school buildings within that district stratified the public school sampling frame.

Data collection for the study was conducted in two stages. The first stage was to identify specific schools in Ohio that received the National Blue Ribbon of Excellence Award for the 2010-2011 school year. Each year the United States Department of Education accepts applications for the Blue Ribbon Award program from the CSSO of each state. Blue Ribbon Schools must meet either of two criteria:

> *High performing schools*: Regardless of the school's demographics or percentage of students from disadvantaged backgrounds, the school is high performing. These are schools that are ranked among a state's highest performing schools as measured by state assessments in both reading (English language arts) and mathematics or that score at the highest performance level on tests referenced by national norms in at least the most recent year tested. For public schools, "high performing" is defined by the CSSO of each state, but at a minimum means (a) that the achievement of the school's students in the most recent year tested places the school among the highest performing schools in the state on state assessments of reading (or English language arts) and mathematics, and (b) disaggregated results for student subgroups, including students from disadvantaged backgrounds, must be similar to the results for all students tested. In addition, one-third of the schools nominated by each state must be schools with at least 40 percent of their students from disadvantaged backgrounds.

Public schools must also make Adequate Yearly Progress (AYP) two years prior to nomination and also in the year of their nomination.

Improving schools: These are schools with at least 40 percent of their students from disadvantaged backgrounds that have reduced the achievement gap by improving student performance to high levels in reading (English language arts) and mathematics on state assessments or tests referenced by national norms in at least the most recent year tested. For public schools, improving student performance to high levels is defined by the CSSO of each state but, at a minimum, means: (a) the school has demonstrated a positive trend in test results from the earliest to the most recent year tested, (b) in the most recent year tested, the achievement of the school's students places the school in the top 40 percent of schools in the state on state assessments of reading (or English language arts) and mathematics, and (c) disaggregated results for student subgroups, including students from disadvantaged backgrounds must show improvement similar to that of all students (U.S. Department of Education, 2010).

Ohio Schools, regardless of their demographics, must perform in the top 10 percent of schools in the state as measured by the Ohio Graduate Test (OGT) and the Ohio Achievement Test (OAT) in both reading and mathematics to be considered for nomination to the Blue Ribbon program. In addition to all students performing at the 90th percentile or higher during the 2008-2009 school year, students in each racial/ethnic and the economically disadvantaged subgroup must have performed at the 60th percentile or higher. Schools, regardless of their demographics, must perform in the top 10 percent of schools in the state of Ohio as measured by the OGT and OAT in both reading and mathematics (Panzio, 2011).

After review of the nominees, the U.S. Department of Education publishes a list of the award winners for each state. The state of Ohio had 11 public schools out of 18 awarded the Blue Ribbon status for 2010-2011 school year (Panizo, 2011). The Blue Ribbon public schools in Ohio were announced on the Ohio Department of Education website. The researcher kept the names of the schools anonymous to protect their identities.

This study utilized an ex post facto, quantitative comparative research design. In quantitative research, the researcher collects and analyzes numerical data to understand and explain phenomena (Ary, 2006). The purpose of using a quantitative research design for this study was related to what Maddox (2008) recommends as a research design to test a theory by stating a narrow hypothesis and the collection of data to support or refute the hypotheses. The study was considered a comparative study because it aimed to make comparisons of existing similarities or differences of status in groups or individuals (Ary, 2006). The data that was utilized in this study was collected by Ohio eTech and was not subjected to any manipulation. The researcher was limited to the questions that are on the BETA (10-11) survey. This classified the study as an ex post facto analysis because it was based upon archival data. In addition, the participants in the study are divided into two dichotomous groups based upon the school's receiving the Blue Ribbon Award. The researcher sought only to examine the statistical significance between the independent variables. Even though the researcher did not manipulate the variables, an attempt was made to determine the strength of relationship between the independent and dependent variables.

The data collected for this study was derived from teacher responses to the BETA (10-11) survey. The data was extracted from the survey using the following procedures: First, the raw data set was retrieved from the Ohio eTech website. Second, the independent variables were identified using the published list of Blue Ribbon Award school recipients for the state of Ohio found on the Ohio Department of Education website. A randomized procedure was performed to determine an acceptable sample size of Non-BR schools. Third, questions from the teacher survey were categorized into frequency of educational technology use, a teacher's comfort level with educational technology, and a teacher's belief about the effect of educational technology on teaching and learning. This identified the three dependent variables. Lastly, the variables were imported into the statistical program, Statistical Package for the Social Sciences (SPSS)-Windows version 19.0. SPSS data were sorted using the independent variables identifiers from the schools' Blue Ribbon award status. The independent variables were 1.) Ohio schools that received the Blue Ribbon award for the 2010-2011 school year, and; 2.) A randomized sample of Ohio schools that did not receive the Blue Ribbon award. Questions from the Teacher BETA (10-11) survey were identified into the three categories of combined teacher and student frequency of educational technology use, a teacher's comfort level with educational technology, and a teacher's belief about the effect of educational technology on teaching and learning.

Quantitative data was analyzed in this study to determine whether the three categories of educational technology variables are of any significance to an Ohio school's achievement and status of a Blue Ribbon school. Descriptive and inferential statistics were used to measure and understand the archival data from the teacher's BETA (10-11) survey. Descriptive statistics were generated to identify the frequency, mean, and standard deviation of the dependent variables from the Blue Ribbon schools and Non Blue Ribbon schools. The inferential statistical tests that were used were the Analysis of Variance model (ANOVA). The ANOVA model first determined if the dependent variables display a normal distribution as measured by frequency of educational technology use, a teacher's comfort level with educational technology, and a teacher's belief about the effect of educational technology on teaching and learning. The research plan was if the data showed normality, then the output from the ANOVA was used to test for statistical significance. If the output was not normal, then a Kruskal-Wallis (KW) non-parametric analysis of variance (ANOVA) was used to test the hypothesis in the study. Corder & Foreman (2009) recommends the (KW) non-parametric test because it can be run when the data contains categorically measured variables. The (KW) non-parametric variable tests that have an overall significance of < .05 identified pairwise comparisons of the dependent variables. These pairwise groupings revealed if there is any statistically significant difference between the Blue Ribbon and Non-Blue Ribbon schools. The data showed normality so the one-way ANOVA was used to test for significance.

Limitations of the Study

This research study was limited to Ohio K-12 public schools. The survey instrument was not chosen or created by the researcher. It is an institutional survey written to provide information for eTech Ohio, not specifically for this dissertation. This study was a secondary analysis of archival data from the Ohio eTech survey, Biennial Educational Technology Assessment (BETA 10-11). Therefore, the researcher had no control over the original samples from which data was collected. The sample was non-randomized, thus creating a possible problem with generalizing the results into the population. Since data was already collected, it is not subject to manipulation by the researcher. The researcher was limited to the questions already collected on the BETA (10-11) survey. This study only considered teacher data that was collected from Ohio schools that received the national Blue Ribbon Award of Excellence, and those Ohio schools that did not receive the award. Questions from the BETA 10-11 survey were sorted into categories of: 1.) Student/Teacher Frequency of Educational Technology Use; 2.) A Teacher's Comfort Level with Educational Technology; 3.) A Teacher's beliefs about the effectiveness of Educational Technology on teaching and learning.

Delimitations

There are a number of interesting research questions that could have been formed from the BETA 10-11 survey that will not be pursued, such as, "How does professional development influence educational technology use?" or "Is there a relationship between teaching experience and educational technology use?" These questions were not pursued in this study because the focus of the inquiry was on the relationship between the educational technology variables of a teacher's frequency of use, comfort level, and beliefs about educational technology and school's that received the Blue Ribbon Award of Excellence.

Significance

It was the goal of this proposed study to make a contribution to the body knowledge on educational technology among the K-12 Ohio public schools. This study is significant to practitioners, because it examined three key components of educational technology-frequency of use, a teacher's comfort level with the use of technology, and a teacher's beliefs about the effectiveness of educational technology on teaching and learning and the relationship to high achieving schools. The intentions of this study were to either add to or refute the current research base that suggests a high level of teacher educational technology can positively impact student achievement. If a significant relationship existed between Ohio Blue Ribbon schools and educational technology, then this study would have provided the foundation for further study of the possible connection between student achievement and educational technology among Ohio educators. However, the study revealed no educational technology significance between these Blue Ribbon and non-Blue Ribbon schools. The conclusion from this study provided evidence for further exploration into what is classified as positive student achievement and the role educational technology should play in student achievement. Schools continue to push forward emphasizing educational technology as a means to improve the skills of all students (Brown, 2006). The Partnership for 21st Century Skills (2007), a collaborative organization of business and educational leaders, defined what students need to do to compete in the 21st century. In the foundational white paper, the Partnership for 21st Century Skills stated that in order to successfully face rigorous higher education coursework, career challenges, and a globally competitive workforce, U.S. schools must align classroom environments with real world environments by infusing 21st Century skills. Educational technology is perceived as a critical component to a successful educational program. This study attempted to go beyond the technology use data to examine the extent of the differences of educational technology characteristics between recognized high achieving Ohio schools and the normal population.

Summary

Chapter one introduced the problem that was investigated and the design elements for this study. Chapter two contains a review of related research concerning educational technology as a force of innovation to improve student achievement. Chapter three will explain the research methodology and design used in this study; it describes the population and sample, the data collection procedures, methods of data analysis, reliability, and validity. Chapter four presents the results and the interpretation of findings and a summary of the results. Chapter five discusses the study’s results and offers conclusions, implications and recommendations for future research.

CHAPTER TWO. REVIEW OF THE LITERATURE

Introduction

In the current state of K-12 public education, the conditions for successful technology integration finally appear to be in place including access to technology, trained teachers, technology infrastructure, and favorable national and state policies. According to the National Center for Education Statistics (2009) recent survey of 1,589 public school districts in the 50 states and the District of Columbia: there is a 100% internet connection rate, the percentage of districts that offered access to online district resources to all elementary or all secondary teachers was 92 percent, the percentage that offered access to electronic administrative tools to all teachers was 87 percent for elementary and 95 percent for secondary, and the percentage that offered server space for posting web pages or class materials to all teachers was 82 percent for elementary and 83 percent for secondary. Despite the high-level of access to technology, the level of educational technology use is still surprisingly low (Collins, 2009).

The problem that was explored in this study focused on the differences of educational technology characteristics and Ohio schools based upon their Blue Ribbon award status. Discovering to what extent educational technology variables differ among Ohio schools based upon recognized student achievement provided significant data on the amount of emphasis that should be placed on educational technology as a means of innovative school improvement and increased student achievement. The literature review will begin by discussing the relationship of educational technology to innovation and student achievement. A current literature review of this studies' variables- frequency of technology use, teacher's attitudes and beliefs about technology, and comfort level with educational technology will be examined. It will be followed by a look at theoretical influences that support educational technology. In addition, the literature review will discuss factors that support and constrain educational technology use and access by both teachers and students.

Educational Technology a Force of Innovation

Computers are not at the core of the American public school. They are used mainly for special courses, tech prep, business applications, or for basic computer literacy (Collins, 2009). Contrast this with the modern office or factory where computer technology is central to almost all aspects of the work environment. Proponents of educational technology argue that trying to prepare students for the 21st century with 19th century technology is like teaching people to fly a rocket ship by having them ride bicycles (Collins, 2009). Technologies have developed over time to make complicated work more manageable to the common person. Tools such as the wheel and the plow were used to grow crops.

The Industrial Revolution brought about a new set of power tools like machines and engines that were used to augment human labor. The current Knowledge Revolution is driven by a new set of tools that empower people's minds rather than their bodies (Brown, 2007). John Seely Brown (2007) argues, that tools drive science. Not theory, not experiment; it's the tools. The computer's ability to process information and data has established it as a central focus of innovation. It becomes evident that tools drive innovation. "Looking back over the 20th century, American ingenuity has been truly incredible. From Ford's Model T in 1908 and on to the washing machine (1911), refrigerator (1924), microwave oven (1953), modem (1958), hand-held calculator (1967) and the personal computer (1981), American innovations have transformed our nation, again and again, creating whole new industries and occupations" (STEM Caucus, 2003, p.1). New innovations will continue to be critical, both in maintaining a solid industrial base and increasing our standard of living. Innovation leads to new products and processes that sustain our industrial base; innovation depends on a solid knowledge foundation in math, science, technology, and engineering; without this knowledge base, innovation, as well as our industrial base, will erode (STEM Caucus, 2003). The design of the American education system is based upon a 19th century Industrial revolution model. This model served its purpose but education should adapt to the job market of the future (Blinder, 2006, p.115).

To define innovation and technology in terms of educational reform, one must understand the interdependence of these two concepts. First, Webster (2009) defines innovation as the introduction of a new idea, method, or device. Educational innovation is best defined by the same characteristics that reflect new instructional strategies or tools for learning that improve instruction (Hill, 2007). Technology was best defined by Webster (2009) as the practical application of knowledge especially in a particular area. Notice the absence of technology in terms of computer hardware. When the concepts of technology and innovation are applied to education, it would be characterized by the practical application of knowledge delivered by 21st century educational methods of instruction. A widely accepted definition of educational technology is provided by the Association for Educational Communications and Technology Definitions and Terminology Committee: Educational technology is the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning (Seels,1994, p.1).

The idea of innovative educational technology is not new. The first mathematics teacher to bring an abacus into his classroom was using technology to aid learning. Projectors, tape recorders, and televisions have been in schools for decades. The final decade of the twentieth century saw increases both in computing power and the number of people able to access computers and the Internet. It is said that society is moving from the industrial age to the information age, in which radically different rules apply in every aspect of society, education being no exception. Finnis (2004) stated that Society's transition to the information age is likely to impact learning and education in two ways. First, rapidly improving technology will enable higher quality learning to be made available to an ever-growing audience through increasingly sophisticated modes of presentation. Secondly, the very nature of the information age may require a different kind of preparation than was the case in the industrial age. Both of these impacting factors define how innovative educational technology is defined (p.55).

Educational Technology and Student Achievement

Several studies have examined the correlation between technology use and its existence with student achievement and attitudes (Starbek, Erjavec, & Peklaj, 2010; Wenglinsky, 2006; Wilson & Trainin, 2007). Current research points to the supporting factors of student and teacher improvement in technology literacies as a variable of positive gains in achievement. Judson (2010) investigated whether an identifiable link existed between gains in technology literacy and achievement in the areas of reading, mathematics, and language arts. Students making the most strides in technology literacy made improvements in areas of language arts. The study revealed students predominately used word processing as the main tool of technology. If students prominently used computers in schools for mathematical functions such as manipulating data, modeling equations, creating charts and graphs, then possibly this data would have shown similar gains in mathematics for the high technology literacy gain groups. If language arts skill building is occurring more prevalently among students who are making technology literacy gains, the expectation is that thinking or learning about language is being shaped by the context of technology.

> For students with a higher level of technology literacy, the role of the computer is moving away from being a supplier of a curriculum or even from being a blank slate, but in the meditational role the student is engaging the technology as a better tool to reconcile understanding (Jones, 2010, p. 282).

This reinforces earlier research (Cuban, 2001) that educational technology could facilitate entry to academic achievement. The researchers termed these pupils as the open door students. These researchers described open door students as having gained a sense of self-confidence and a drive to do well in school and that this stems from their increased technology proficiency (Peck, 2002). The challenge for researchers and educators is to facilitate strong technology literacy gains more universally and to help students possess the keys to other content areas.

Variables related to Educational Technology

This study focused on three key variables related to educational technology- educational technology frequency of use, a teacher's comfort level use of technology, and a teacher's belief about educational technology. The purpose of the study was to examine to what extent a difference exists between Ohio based upon the Blue Ribbon award status and these three variables. Since 1994, the National Center for Educational Statistics (NCES) has conducted a series of surveys on public school teachers' use and access of educational technology. The most current report from the NCES (2009) found that accessibility is at all time high but still does not match frequency of use (Gray, 2009).

Table 1

Selected findings from Teacher's Use of Educational Technology in the U.S. Public Schools 2009:

- Teachers reported that they or their students used computers in the classroom during instructional time often (40 percent) or sometimes (29 percent). Teachers reported that they or their students used computers in other locations in the school during instructional time often (29 percent) or sometimes (43 percent).
- Teachers reported having the following technology devices either available as needed or in the classroom every day: LCD (liquid crystal display) or DLP (digital light processing) projectors (36 and 48 percent, respectively), interactive whiteboards (28 and 23 percent, respectively), and digital cameras (64 and 14 percent, respectively) (table 3). Of the teachers with the device available, the percentage that used it sometimes or often for instruction was 72 percent for LCD or DLP projectors, 57 percent for interactive whiteboards, and 49 percent for digital cameras.
- Teachers indicated that a system on their school or district network was available for entering or viewing the following: grades (94 percent), attendance records (93 percent), and results of student assessments (90 percent) (table 4). Of the teachers with one of these systems available, the percentage using it sometimes or often was 92 percent (grades), 90 percent (attendance records), and 75 percent (student assessments).
- Teachers sometimes or often used the following for instructional or administrative purposes: word processing software (96 percent), spreadsheets and graphing programs (61 percent), software for managing student records (80 percent), software

> for making presentations (63 percent), and the Internet (94 percent) (Gray, 2009, p.13)

A teacher's comfort level is usually measured by personal computer use and the ability to integrate educational technology into the curriculum or content. Rakes (2006) examined the relationship between a teacher's current instructional practices and personal comfort level with technology. The findings revealed that teachers with a higher measurement of personal comfort level with technology use demonstrated a higher integration of technology in instructional practices.

A teachers' belief about the effectiveness of educational technology on teaching and learning appears to greatly influence the frequency of use. Grunwald and Associates (2010) surveyed more than 1,000 K-12 educators on their beliefs about educational technology. The study addressed five myths about technology use in education particularly by teachers and educators' perceptions about the effects of technology use on student learning, behaviors, and skills. According to the report's authors,

> Frequent technology users place considerably more emphasis on developing students' 21st century skills specifically, skills in accountability, collaboration, communication, creativity, critical thinking, ethics, global awareness, innovation, leadership, problem solving, productivity and self-direction. Frequent users also have more positive perceptions about technology's effects on student learning of these skills and on student behaviors associated with these skills. (Grunwald and Associates, 2010, p.29).

Many studies find that access to computers and technology does not result in a higher frequency of the use of technology. "It is suggested that beliefs are far more influential than knowledge in determining how individuals organize and define tasks and problems and are stronger predictors of behavior" (Pajares, 1992,p. 311). A teacher's belief concerning their personal ability to effectively use technology and their beliefs regarding the potential effect on student achievement is quite possibly the most significant factor in determining what actually happens with the use of educational technology.

The variables presented in this literature review reveal three important factors that may influence the achievement of Ohio schools that received the Blue Ribbon Award of Excellence.

Theoretical Framework

The developing idea of educational technological innovation has theoretical roots in the work of Dewey, Christensen, and Constructivist thought. Tanner (1997) examined closely the practices of Dewey's Laboratory school, and how the reforms can be applied to a 21st century education. Dewey's teachers focused curriculum on subject matter that related to real life. Dewey tried to tie curriculum to reality and not treat it like an isolated world only for school. When Dewey's students worked with tools in the garden, it was not about the tools but the process of farming. It would be safe to infer that Dewey would view technology in the 21st century the same way. Learning would not focus on the tool of technology, the computer, but on how it is used in everyday life. The same concept of real world application is a major foundation of the 21st century skills movement (Wehling, 2007).

Secondly, the purpose of Dewey's laboratory school was to make discoveries about education. Computer technology has opened new ways of teaching and learning. Take for example the growth of the charter school movement. Currently, one in five students attend a non-traditional public charter school in the United States. 56% of students from large cities attend a charter school. Charter schools are growing at a rate of 11% each year (National

Alliance for Public Charter Schools, 2010). Emphasis on social connections and students living and working cooperatively was at the forefront. Dewey's school was organized as an informal community in which each student was responsible for their own work as well as helping others with problems (Tanner, 1997). Dewey was passionate about school representing a real life community. Daggert (2010) reinforces Dewey's theory by emphasizing rigor, relevance, and relationship in a technological driven world. The tools of technology have created social connections, access to information, and the ability to learn anytime. This was Dewey's vision for education.

The idea of educational technology and computer-assisted instruction has its roots in Constructivism (Dalgarno, 1996). The Constructivist Learning Theory has its foundations in the work of Jean Piaget. Piaget (1972) advocated that knowledge is a construction and not a reality, the understanding of which is continuously revised and reconstructed as new experiences are acquired. Therefore, the construction of new knowledge can only take place when that new knowledge is actively assimilated and incorporated into existing knowledge (Piaget, 1972). The constructivist approach to learning engages learners to explore and personalize the materials during the learning process. Learning becomes more project-based to allow learners to experience the world by doing things, rather than passively receiving information, to build things, to think critically, and to develop problem-solving skills (Page, 2006). Four epistemological assumptions are at the core of constructivist learning: (a) Knowledge is physically constructed by learners who are involved in active learning; (b) Knowledge is symbolically constructed by learners who are making their own representations of action; (c) Knowledge is socially constructed by learners who convey their meaning making to others; (d) Knowledge is theoretically constructed by learners who try to explain things they don't completely understand (Gagnon & Colley, 2001, p. 1). Current educational literature supports that a constructivist approach to educational technology is recommended in order to meet the needs of 21st century learners (Sims, 2006). Educational technology tools, such as wikis, provide students with the constructivist tool to construct their own knowledge around content knowledge instead of being directed and forced to learn from their teacher (Churach & Fisher, 2001). The roots of the Constructivist Learning theory has influenced the technological innovative model of teaching and learning for the 21st Century.

The movement towards more of a technological innovative model of teaching and learning requires an understanding of how innovation works in business and society. Christensen (2008) developed the Disruptive Innovation theory. The theory explains why organizations struggle with certain kinds of innovation and how organizations can predict successful innovations.

> There are two types of innovation. First, sustaining innovations are sometimes dramatic breakthroughs whereas others are routine; but the competitive purpose of the innovations is to sustain the performance in the established market. Airplanes that fly farther, computers that process faster, cell phones batteries that last longer, and televisions with clearer images are all sustaining innovations (Christensen, 2008, p.46).

From time to time, the business world experiences a shake up when a different type of innovation emerges in an industry- a disruptive innovation. A disruptive innovation is not a breakthrough improvement for sustainment. Instead, it disrupts the market by providing a service or product to a new area of competition (Christensen, 2008). The personal computer is an example of a disruptive innovation.

> During the 1970's and 1980's the Digital Equipment Corporation (DEC) was the leading minicomputer company. The average cost of the minicomputer was well over $200,000 and required an engineer to operate it. Apple began to pioneer a personal computer targeted to children. Children had been non-consumers of computers before this. DEC was not bothered by the personal computer. In fact, their focus was on sustaining their current market. After a decade, Apple and other computer companies took the personal computer to another level. No longer did the market need large mainframe computers when a cheaper personal computer could do the same thing. DEC collapsed due to a disruptive innovation. This is repeated time and time again with disruptive innovations like the Kodak camera, Ford Model T, Xerox copier, Southwest Airlines affordable flight, and the iPod (Christensen, 2008, p. 50).

To apply the disruption theory to public education, Christensen wrote a book called *Disrupting Class, How Disruptive Innovation Will Change the Way the World Learns*. The disruptive innovation theory provides many ideas and strategies that contribute to the success of a technological innovative program of education. Christensen (2008) argues that schools have "crammed" the new technologies into their existing structure, rather than allowing the disruptive technology to take root in a new model and allow that to grow and change how they operate. Through many case studies and scientific findings, Christensen (2008) provides five concrete disruptive innovations for educators: 1.) Customized learning will help many more students succeed in school; 2.) Student-centric classrooms will increase the demand for new technology; 3.) Computers must be disruptively deployed to every student;

4.) Disruptive innovation can circumvent roadblocks that have prevented other attempts at school reform; 5.) America can compete in the global classroom and global market.

21st Century skills instructional approaches. There is much educational talk of the importance of 21st century skills being developed in the classroom (Rotherham, 2009). A movement began in 2002 that brought business and educational partners to the table to define 21st Century Skills. This became known as the Partnership for 21st Century Skills. This organization included founding members like the U.S. Department of Education and corporations like Microsoft and Cisco. "The mission statement of the Partnership for 21st Century Skills is to serve as a catalyst to position 21st century skills at the center of US K-12 education by building collaborative partnerships among education, business, community and government leaders" (Partnership for 21st Century Skills, 2007, p.12). The Partnership advocates that every child in America needs 21st century knowledge and skills to succeed as effective citizens, workers, and leaders in the 21st century. The Partnership (2007) states that there is a profound gap between the knowledge and skills most students learn in school, and the knowledge and skills they need in typical 21st century communities and workplaces. To successfully face rigorous higher education coursework, career challenges, and a globally competitive workforce, U.S. schools must align classroom environments with real world environments by infusing 21st century skills. The 21st Century specific student outcomes include:

1. Mastery of core subjects (English, reading or language arts, world languages, art, mathematics, economics, science, geography, history, government and civics) connected by interdisciplinary themes such as global awareness and financial literacy.

2. Learning and innovation skills such as problem solving, critical thinking, and collaboration.
3. Information, media and technology skills.
4. Life and career skills such as self-direction, adaptability, responsibility, social skills, and leadership (Partnership for 21^{st} Century Skills, 2007, p.13).

The drive behind the 21^{st} Century Skills initiatives is the failing performance of U.S. students compared to other countries. Most Americans feel that they received a good education and that their children will as well (Morrison, 2004). Unfortunately, not many are aware our country has been falling behind, particularly in the areas of math and science, when compared with our international competitors. Independent of other countries, our students are on average getting worse in these subjects and not pursuing them in college (STEM Caucus, 2003). "According to the National Center for Education Statistics, about one-third of the fourth-graders and one-fifth of eighth-graders cannot perform basic mathematical computations, and U.S. high school seniors recently tested below the international average for 21 countries in mathematics and science" (STEM Caucus, 2003, p.1). As a result, fewer American students than ever are graduating from college with math and science degrees. When compared with our international competitors, we are not performing well.

In 1995, U.S. fourth graders ranked 12^{th} against other nations when it came to mathematics competency. By the 8^{th} grade, their ranking dropped to 19^{th}, below not only Asian students in countries such as Korea, Japan and Taiwan, but also below students in many Eastern European nations such as Bulgaria, the Czech Republic and Slovenia. A similar deterioration has occurred in science. In 1995, U.S. fourth graders ranked 6th in science competency. By the 8th grade their ranking dropped to 18th, below many of the same countries cited above. More recent rankings of U.S. students relative to their counterparts around the globe have been no more encouraging with respect to America's future ability to compete. Countries outperforming the U.S. in science and math, on average, spend 10 percent less of their respective GDPs on primary and secondary education than the United States does. Obviously, there are other important educational elements that go beyond funding, such as the fact that nearly 70 percent of U.S. middle school students are taught math by teachers with neither a major nor certification in this critical subject. Internationally, the average is 29 percent.

The story is not much better at the higher educational levels. The interest of young Americans' in science and technology has eroded over time.

> In 1960, one out of every six (17 percent) U.S. bachelor or graduate degrees was awarded in engineering, mathematics or the physical sciences but by 2001, that number had engineering, mathematics or the physical sciences but by 2001, that number had dropped to less than one in 10 (just 8 percent) of all degrees awarded in the U.S. This constitutes more than a 50 percent decline from 1960. In terms of actual numbers of graduates in these critical areas, the U.S. produced just 148,000 in 2001-the smallest numbers in two decades (STEM Caucus, 2003, p. 3).

At this rate, our educational system will fail to meet our economy's workforce demands by the end of this decade. American students' disinterest in math and science continues at the graduate-level, too, where less than 10 percent of degrees are conferred in engineering, mathematics and computer science. This places our country 20th internationally in terms of the share of graduate degrees in these critical areas.

> Furthermore, more than 40% of U.S. doctoral students in engineering, mathematics and computer science are foreign nationals. In several fields it is more than half. Despite these numbers, a majority of parents think their kids are getting plenty of math and science education. The push for more rigorous (STEM) Science, Technology, Engineering, and Math education has a direct link to the 21 Century skills and outcomes (STEM Caucus, 2003, p. 3).

Ghysels (2009) suggested that to better prepare our students for the 21st Century, teachers must move beyond the role of facilitators and become collaborators in learning, seeking new knowledge alongside students and moving our schools from teaching systems to learning organizations.

***21st Century learning environments*.** A 21st century learning environment will have a relevant and applied curriculum. A curriculum that emphasizes 21st century skills is sometimes criticized because it lacks an emphasis on content (Motteram, 2009). Many people link John Dewey to the idea of exclusion of core content when educating children. However, it is a misinterpretation of Dewey's work to assume the idea of eliminating core subjects. Dewey's interest was in creating engaging, relevant, and applied schoolwork for children (Ehrlich, 1998). The challenge then is to design learning opportunities for students that integrate core content in a relevant and applied real world application. Project-based learning has been identified as one of the methodologies to bridge the gap between core content and a relevant applied curriculum. Moylan (2008) reviewed several project-based practices and endeavors. It was concluded that success in learning was gained according to student outcomes. “Project-Based Learning is defined as a systematic teaching method that engages students in learning essential knowledge and life-enhancing skills through an extended, student-influenced inquiry process structured around complex, authentic questions and carefully designed products and tasks” (Mergendaller, 2006, p.4). Project based learning brings the core content into a relevant and applied curriculum of study.

A 21^{st} century learning environment will include the process of informative assessment throughout the curriculum. Informative assessment guides and facilitates learning. Teachers can use informative assessment to make instructional changes. Likewise, students can maintain their work as demonstrations of their learning and use reflective practices for continuous and deep learning. Through informative assessment, students and teachers can use evidence of current progress to adjust, adapt, or supplement the learning experience (Gallagher, 2009). To understand informative assessment, consider the student as gamer.

> They are motivated to play because they get feedback every few seconds. That feedback entices and enables them to “stay in the game,” provided they have learned from prior experiences, monitors the current situation, pays attention to the constant feedback, and reacts quickly enough. “Failure” simply provides them with a quick break before they get back into the game—with renewed effort, new data, and new resolve to achieve new plateaus (Apple, 2008, p. 24).

William (2008) studied research findings from over 4,000 studies. He indicated that it is informative and not summative assessment that has the most significant impact on student achievement. For the assessment to be meaningful and timely, the student must be clear not only about the learning goals but also on the criteria by which the learning will be measured.

A culture of innovation and creativity is a trademark of a 21st century learning environment. The business sector recognizes the competitive nature of the world of work and the role of innovation (Christensen, 2008). As mentioned previously, this means education needs to focus on creativity and innovation as a vital 21st Century Skill. Those who have successfully created cultures of innovation and creativity suggest that one key is to abandon efficiency as a primary working method and instead embrace participation, collaboration, networking, and experimentation. This does not mean that focus, process, and discipline are not important; just that innovation and creativity require freedom, disagreement, and perhaps even a little chaos—especially at the beginning (Drucker, 2002). Cavus (2009) completed an experimental case study on the use of cell phone technology in the classroom. The innovation of mobile technology has little history in a traditional classroom setting. The study revealed higher level of engagement by the students based upon survey results. The frequency of student responses to questions and creative use of this technology were two indicators of a positive learning experience.

Another important foundation of a 21st century learning environment is the building of a social and emotional connection to the students. A widely accepted view of educational leadership usually has a social connection component. Learning is always supported by a social or emotional connection. The literature on social and emotional engagement stems back to Vygotsky's view that the process of learning is at once individual and sociocultural, and includes research from the cognitive, educational psychology, and social sciences (Kozulin, 2003). Schools are often referred to in the context of communities and culture. Each student should have one adult in the learning setting that they can talk to and be motivated by. Recent research suggests that social and emotional competencies do make a positive difference in student learning. The Collaborative for Social and Emotional Learning (CASEL) stated results from a study that summarizes the impact of social and emotional competence across 207 research studies. "The report revealed, on average, students in programs that addressed social and emotional competencies outperformed control groups academically by 11 percentiles" (Viadero, 2009, p. 10).

Lastly, a 21st century learning environment will have 24-hour access to technology. One of the main barriers to educational technology is the gap that exists between a student's use of technology and technology used for teaching and learning (Kozma, 2003). Technology should be woven throughout the curriculum in such a way that a student's learning can take place in or out of school. Technology is the foundation that supports all these other principles. Social networks can create the social and emotional connection. It can lead to daily use of 21st century skills like problem solving, creativity, innovation, and collaboration. In addition, if academic achievement is the goal, then access to technology can be the gate to higher performance. The literature reveals attitudes about learning and engagement is higher in a technology rich environment. A study on the impact of an Internet virtual Physics laboratory on the achievement in Physics, science process skills, and computer attitudes of 10th-Grade students revealed positive gains. The four classes contained 75 students who were equally divided into an experimental group and a control group. The pre-test results indicated that the student's entry-level physics academic achievement, science process skills, and computer attitudes were equal for both groups. On the post-test, the experimental group achieved significantly higher mean scores in physics academic achievement and science process skills (Yang, 2007, p. 259). Access to technology is a cornerstone to a 21st century learning environment.

21st Century skills and student achievement. In the current educational climate that focuses on state testing and yearly progress, one must wonder why should we focus on 21st century skills? Are 21st-century skills and student achievement linked? Slavin (2008) conducted a review of the research on the achievement outcomes of four approaches to improve middle and high school student reading. "The study identified 33 randomized or matched control-group studies that met the criteria. Instructional-process programs that involved cooperative learning and those that combined large and small group instruction with technology activities yielded positive effects" (Slavin, 2008, p. 24).

Will the development of 21st century skills prepare students for postsecondary technology competences? In a recent study, university level engineering and technology professors were surveyed about the basic attributes and competencies that they foresee a secondary student needing in order to be successful in their college-level engineering or technology program. The competencies were grouped into like attributes and competences. The participants then evaluated each competency based upon a Likert scale. The findings of the study revealed that high school learning environments must require in their students competency in written communications, verbal communications, reading, honesty, strong work ethics, and a willingness to learn. Educational Technology can be structured in such way that it requires students to 1) work in teams; 2) organize their thoughts; 3) communicate with team members; 4) solve a problem; 5) present their findings orally; 6) evaluate their success through a written document. This type of learning activity should also cause students to work outside of their comfort zone, thereby stretching 21st century skill development. These types of problem-based learning activities should also be formulated across disciplines and must be an essential and integrated expectation from day one through graduation and beyond (Harris, 2008, p.22). The competencies revealed in this study support the components of a 21st century learning environment.

Some would argue that education reform should not focus on technology innovation and 21st century skills. Bauerlein (2007) argued that by putting emphasis only on these media-rich processes harms concentration and makes it difficult for learners, when they need to, to focus on difficult and complex topics. This brings up the question of an online virtual learning classroom versus a traditional classroom. In a comparative research study conducted by the University of South Dakota, it was indicated that students fared evenly in "pre and post quantitative measures of learning outcomes". However, the actual level of learning described by students varied between online courses and face-to-face learning (Reisetter, 2007, p.71). Many argue that today's student requires a different approach to learning and knowledge. Are we experiencing a shift in the way learning takes place and knowledge is acquired? The brains of learners termed the Net Generation are wired differently; this new generation expects a constant stream of new media to stay alert and focused. They scan the news media online rather than reading articles in traditional newspapers (Tapscott, 2008).

> An extension of this view might argue that we no longer need to remember facts, as they are now literally stored at our finger tips on the mobile devices that we all carry, our relationship to knowledge changes and the way that learning takes place alters to suit the needs of this developing situation (Carson, 2005, p.35).

It is also argued that educational institutions at all levels are rapidly becoming outdated and irrelevant, and that there is an urgent need to change what is taught and how

(Prensky, 2005). Research suggests that students' everyday technology practices may not be directly applicable to academic tasks, and so education has an important role in fostering information literacy that will support learning. Lorenzo (2006) stated that a student's lack of critical thinking when using Internet-based information sources imply that students are not as net savvy as we might have assumed. Questions are raised if students are engaged by technology and can make meaning of it beyond a surface level. The results of large-scale surveys of teens suggest that high levels of online activity include help with homework and for social communication. The results also suggest that the frequency and nature of teen Internet use differs between age groups and socio-economic background (Lee, 2005). Bennett (2008) suggests the research evidence to date indicates that a proportion of young people is highly adept with technology and relies on it for a range of information gathering and communication activities. "However, there is a disconnect between in school and out of school learning with technology" (Bennett, 2008, p. 781). This view is supported by research that indicates that technology plays a different role in a student's home and school life (Lohnes & Kinzer, 2007). Sutherland-Smith (2002) observed high school students interacting with text from an Internet search. Students were easily frustrated when the search did not yield an immediate answer to their inquiry. This is only one of many cases that indicate technology alone is not the key component of a 21st century learning environment. The Partnership for 21st Century Skills advocates that there are several components that makes up a 21st century education.

Technology access and availability. The challenge of shaping a 21st century education is accompanied by the digital divide between those with and without 24/7 access to technology. The issue of the digital divide in education was first addressed in the early

1990's. The infusion of technology was much more evident in better-resourced school districts. These schools were much more likely to have Internet access and computer technology available to staff and students (U.S. Department of Education, National Center for Education Statistics, 2002). The E-Rate program in the United States (officially the *Schools and Libraries Program of the Universal Service Fund*), established in 1996 and implemented in 1997, addressed the digital divide between low and high poverty public schools by allocating money from telecom taxes to poor schools without technology resources. Internet access increased from 14% in 1996 to 95% in 2007 (Pozo-Olano, 2007). Gray (2010) estimates Internet access to be at 100% for all public school classrooms in 2009.

The digital divide in schools goes just beyond basic access to computers and the Internet. Technology related skills and training is considered part of the digital divide of 21st century educational skills. Despite the growth in access to technology in schools, there remains a large gap in abilities related to socio-economic status to function effectively online. Dijk (2005) maintains the upper socio-economic class has access to technology at home, whereas the lower socio-economic class is limited to technology access only at school. The availability of technology outside of the classroom will continue to be a divide among student groups. The development of students as digital citizens requires both skills and access. Mossberger (2008) defined digital citizens as those who have the ability to read, write, comprehend, and navigate textual information online and who have access to affordable broadband. Because of the Internet's significance of economic advancement and participation in democracy, technology and Internet skills will be the ideal of citizenship for the 21st century (Mossberger, 2008, p.140). After the Industrial Revolution, Horace Mann argued that education could bring everyone up to a common, high level of success through the teaching of American citizenship and values. He wanted to make it possible for anyone from any socio-economic class to achieve the American dream. The creation of the common school provided any student to take advantage of social mobility (Collins, 2009). Access to educational technology and skill acquisition is a vital component of 21st century digital citizenship.

Supporting Factors of Educational Technology

Availability and access to educational technology seems to get most of the attention in educational research. There have been a number of studies that focus on teachers' use of technology (Al-Zaidiyeen, 2010; Clausen, 2007; Anderson, 2007; Hua, 2008). The focus should be on how students can employ educational technology in learning situations and the development of 21^{st} century skills (Simkins, Vodicka, & Gonzales, 2009). The challenge is to build educational technology into the core practice of school (Collins, & Halverson, 2009). As discussed previously, frameworks like the 21^{st} Century skills movement incite strategic planning for the future of education (Friedman, 2005). However, the research seems to indicate that educational technology integration is sparsely achieved in K-12 education (Friedman, 2005; Franklin & Molebash, 2007; Hew & Brush, 2007; Lawless & Pellegrino, 2007). Other researchers point to pockets of innovative technology programs, like the Apple Classroom of Tomorrow (ACOT) that yield positive academic support for the use of technology in the classroom (Conley, 2004). The most influential supporting factor of educational technology is that we are living in a time where transformational technologies are changing culture, society, teaching, and learning. Jacobs (2010) states that educators have a duty to examine the effect of technology trends and respond to the question, "What does it mean to educated in the 21^{st} century?" Jacob (2010) further defines the supporting role of innovative educational technology for the 21st century learner by making the case that there is a large technological experience gap of learners of today then of previous generations. The current generation of students has lived in a technological era where Google and text messaging have always existed. The new technological structure challenges the framework of knowledge that was developed by the educational systems of generations long ago and which is still accepted as the best form of education (Jacobs, 2010, p.81).

Constraining Factors of Educational Technology

If there is any common thread throughout literature on educational technology, it is related to the barriers of technology integration on classroom instruction. Brinkerhof (2006) pointed out that barriers are grouped into four main categories: resources, institutional and administrative support, training and experience, and attitudinal or personality factors. Over time, research has indicated that external factors associated with resources like connectivity and administrative support have become almost obsolete. School Internet connectivity and the access to computers are at an all-time high. According to the United States Department of Education's National Center for Educational Statistics, Ninety-seven percent of teachers had one or more computers located in the classroom every day, while 54 percent could bring computers into the classroom. Internet access was available for 93 percent of the computers located in the classroom every day and for 96 percent of the computers that could be brought into the classroom. "The ratio of students to computers in the classroom every day was 5.3 to 1" (Gray, 2010, p.3). The idea of internal barriers like attitude and teaching personality has led researchers to explore why true technology integration is not achieved on a consistent basis (Zhao, 2007).

Gulbahar, (2007) found a difference in student observations of technology integration in the classroom compared to their teachers. Teachers reported successful integration of technology while the students reported that technology was not being utilized sufficiently in their classes. Research seems to suggest that a teacher's pedagogical view of teaching and learning contribute to a positive view of technology integration. Anderson and Maninger (2007) concluded that teachers with a constructivist view of teaching made better use of educational technology. In similar studies, other research suggests that there is a relationship between a teacher's student centered-approach and technology integration in the classroom (Judson, 2006; & Totter et al., 2006). The external barriers like connectivity seem to have little influence on why educational technological integration is not being utilized in the classroom. The rationale for using educational technology has been problematic due to the lack of pedagogical research (Christiansen, 2008). The challenge to identify the internal barriers and pedagogical practices of educational technology integration is a gap in the research that needs to be addressed.

Implications for Further Research

Though a number of studies investigated access and frequency of use related to educational technology, a search of the literature revealed very little emphasis on key variables related to recognized academic achievement on the school level. The Blue Ribbon Award of Excellence establishes the benchmarks of high-achieving schools. The variables of high-achieving schools- educational technology frequency of use, a teacher's beliefs about educational technology, and a teacher's comfort level with educational technology could or could not be important factors of success of these high-achieving Ohio schools. This study investigated high achieving Ohio schools and examined if there was any educational technology significance compared to their counter parts. Review and research of educational technology variables of Blue Ribbon schools and contributing factors of success is important to identify positive practices needed to make gains in the arena of student achievement.

Summary

The principles discussed and reviewed in this literature review revealed the importance of the role of innovation and technology in a 21st Century education. As the above review indicates, a study of achievement in a 21st century learning environment requires an examination of several components based upon a theoretical foundation. The research points to pockets of successful educational technology for instruction but not on a comprehensive level. By tracing the role of innovation and 21st Century skills, discussing the influence of educational technology on achievement, and providing an overview of the variables that possibly cause schools to receive the Blue Ribbon Award of Excellence, this chapter has accomplished the goals of providing a current literature review regarding the topic.

CHAPTER THREE: METHODOLOGY

The purpose of this study was to examine the educational technology characteristics of Ohio schools based upon their national Blue Ribbon Award status. The researcher used a comparative design to examine if there was a difference between frequency of educational technology use, a teacher's comfort level with technology, and a teacher's beliefs about the effect of educational technology on teaching and learning associated with Ohio schools based upon their Blue Ribbon Award status. The Blue Ribbon Award of Excellence recognizes high achieving and improving schools across each state. A Blue Ribbon school is recognized as not only completing a high level of performance indicators established by the United States Department of Education but will have also been in the top 10% of schools in the state based upon the state standardized test. A Blue Ribbon school is recognized as model institution of continuous improvement where positive achievement practices can be found.

Current literature has proposed many theories regarding practices that schools can implement that will improve academic achievement (Cudeiro, 2005). However, a gap exists in the current literature on educational technology as a force of innovation in high achieving Blue Ribbon schools. This study analyzed archival data from the Ohio Biennial Educational Technology Assessment 2011 survey (BETA 10-11) to determine to what extent differences exist between educational technology characteristics and Ohio schools based upon their Blue Ribbon award status. The participants were Ohio K-12 public educators. The independent variables are based upon the Blue Ribbon Award schools from Ohio and randomized non-Blue Ribbon schools for the 2010-2011 school year. The independent variables were divided into two groups of those schools that were awarded the Blue Ribbon award, and those schools that were not. The identified dependent variables of Blue Ribbon (BR) and Non-

Blue Ribbon (Non-BR) schools were the school's frequency of educational technology use, a teacher's comfort level with educational technology, and a teacher's beliefs about the effect of educational technology on teaching and learning. All three dependent variables were identified and tested from the 2011 Ohio BETA survey. This chapter presents a detailed overview of the purpose for this study and describes the research design and methods that are used to conduct the study. This chapter also includes information about the research questions, hypotheses, population and sample, instrumentation, procedures, and data analysis used in the study.

Research Questions & Hypotheses

Three research questions were developed based on the current literature on educational technology and student achievement. The questions were designed to be answered by testing the related null-hypotheses and analyzing the results of the 2011 Ohio BETA survey.

Research Question 1: *To what extent does educational technology use differ between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

Research Question 2: *To what extent does the educational technology teacher comfort level differ between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

Research Question 3: *To what extent does a teacher's beliefs about educational technology differ between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

Three null-hypotheses were developed to specifically address the research questions stated above. To answer Research Question 1, a null-hypothesis was generated that would test the following educational technology variables from the Ohio BETA (10-11) Survey: a combined teacher's frequency of educational technology use and a student's frequency of educational technology use. To answer Research Question 2, a null-hypothesis was generated that would test the following educational technology variables from the Ohio BETA (10-11) Survey: a teacher's comfort level with the use of educational technology. To answer Research Question 3, a null-hypothesis was generated that would test the following educational technology variables from the Ohio BETA (10-11) Survey: a teacher's belief about educational technology. Each null-hypothesis was related to a data element from the 2011 Ohio BETA Survey.

$H_0$1: *There is no difference in educational technology use between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

$H_0$2: *There is no difference in teacher comfort level between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

$H_0$3: *There is no difference in a teacher's beliefs about educational technology between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

Instrumentation

The specific data for analysis in this study was acquired from archival data from the eTech Ohio *Biennial Educational Technology Assessment 2010-2011 (BETA 10-11).* The BETA (10-11) is a K-12 public school census comprised of two surveys that collect school district self-reported data regarding technology accessibility and usage in Ohio's public schools. The surveys were administered to the entire population of K-12 educators in Ohio. The BETA (10-11) serves as a statewide resource for policymakers as consideration is made for the progress and future needs of educational technology initiatives within the State of Ohio (eTech, 2011). The surveys are administered every other year. In the early years, the surveys were substantially rewritten each year. More recently, the survey redesign process has been structured to maintain historic comparability while keeping up with emerging issues. Each round of the BETA data gathering is comprised of surveys that focus on different levels of the K-12 enterprise: Teachers, buildings, and districts (eTech, 2011) Ohio eTech established the BETA assessment in 2000. BETA is designed to collect issue-oriented data within a relatively short time frame. The BETA (10-11) was released to all public school districts on March 26, 2011. The completion date was May 27, 2011. The BETA survey collects data from the district, school, and teacher level. To ensure minimal burden on respondents, the surveys are generally limited to Likert scale model questions, with a response burden of about 30 minutes per respondent. Reported data is compiled and made public on the eTech Ohio website.

The BETA (10-11) survey for teacher's use of technology will be used in this study (see Appendix A). This survey was developed to reflect how educational technology is kept within the Ohio public school systems. The teacher-level survey includes information on the use of computers and access in the classroom; availability and use of technology tools and applications, a teachers' comfort level with technology for instruction; students' use of educational technology; teachers' beliefs about technology for instruction; and a teachers' skill level with Web 2.0 technologies. The teacher survey covers the following specific demographics: Current teaching grade level, years of teaching experience, and subject or content area. (eTechOhio, 2011). Items were selected from the questionnaire that identified the specific educational technology characteristics of frequency of use, a teacher's comfort level, and a teacher's belief about educational technology. Table two summarizes the questions and variable identifiers.

Table 2

Ohio Biennial Education Technology Assessment: 2011

Question	Variable Identifier
Question 4:Frequency of students using Technology Tools to build mastery of academic content	Frequency of Use 4.1-4.14
Question 16: Frequency of student's accessing and managing digital content	Frequency of Use 16.1-16.2
Question 9: Frequency of teacher educational technology use	Frequency of Use 9.1-9.10
Question 13: Comfort level of using technology for instruction	Teacher Comfort Level 13.1-13.14
Question 15: A Teacher's belief about technology for Instruction	Teacher Belief 15.1-15.4
Question 17: Level of Advocacy for digital learning through audio and video media	Teacher Belief 17.1
Question 20: Skill level of the teacher's understanding and use of Web 2.0 tools	Teacher Comfort Level 20.1

The survey instructed teachers to use the following definitions when answering the survey.

Administering assessments. Student use of computers to take quizzes or tests.

Blog. A type of website or component of a website that allows an online user to generate and maintain entries of commentary.

Communicating with parents. Means of communicating with parents using technology tools. Examples include email, text, or website postings.

Concept map. A diagram that shows relationships among concepts by representing concepts as geometric objects, such as boxes or circles, and connecting these objects with labeled arrows in a descending and branching hierarchical structure. This allows the relationship between concepts to be articulated in linking terms.

Desktop publisher. Software that enables users to use different typefaces, specify various margins, justifications, layout illustrations, and graphs with text. Common uses include creating newsletters, announcements, fliers, and cards. Sample Applications include Adobe PageMaker or Microsoft Publisher.

Digital video for classroom instruction. Accessing digital video through a website, CD-ROM, Video On-Demand, or Video Streaming Services for classroom instruction.

Instructional content development and activities. Use of technology to teach lessons focused on specific learning benchmarks.

Web 2.0 tools. Technology tools that provide for increasingly sophisticated use of the World Wide Web including the ability to collaborate and share information online.

Digital reference. Research that utilizes computer and Internet technology. Common uses include search engines (such as Google or Yahoo!), INFOhio, and Teacher's Domain.

Document camera. An electronic digital presenter that transmits an image of an object in real-time before a large group. Document cameras are able to magnify and project images of actual, three-dimensional objects, as well as transparencies.

Drill and practice tools. Applications that help build and reinforce facts and skills. Sample applications include "US Geography for Kids" or "Soccer Math".

ePortfolio. A digital portfolio that houses a collection of online projects assembled and managed by a user on the web.

e-Reader. A handheld device primarily designed for reading electronic books such as an iPad or Kindle.

Examining student performance trends plan instruction. The Data Analysis for Student Learning (DASL) student information management module is an example of a tool that allows for this type of interaction.

H.323 compliant. A standard that specifies the components, protocols and procedures that provide multimedia communication services. This standard includes real-time audio, video, and data communications over packet-based networks (including the Internet).

H.320 compliant. An ITU (International Telecommunication Union) standard for videoconferencing over digital circuits. Using the H.261 compression method, it allows H.320-compliant videoconferencing room and desktop systems to communicate with each other over ISDN, fractional T1 and Switched 56 services.

Handheld. A mobile computing device that can be held in the palm of its user. Typically the device has a display screen with miniature keyboard or touch input. Such devices have the ability to receive and update information via a wireless connection. In some cases, the handheld device provides an alternative-computing assistant to the conventional computer. Examples include Smartphones, PDAs, e-Readers, or Clickers.

Interactive surface technology. A large interactive display that connects to a computer and/or projector system, projects a computer's desktop onto the surface that is touch sensitive enabled so that users may control the computer using a pen, finger, or other device. Examples include pads, mimeos, and whiteboards. *Interactive Tablet* A portable device with a touch or digital pen-to-screen interface system that uses radio frequency, 802.11, or Bluetooth technology. In a classroom the tablet interfaces with an instructor workstation with the ability to record, save, and recall presentations.

Interactive videoconferencing. A tool used in distance education settings when participants at one location can see and hear those at other locations on television screens. Participants may use a variety of media including videotapes, audiotapes, email, telephone, fax, Internet, computer software, print, computer graphics, slides and overheads.

Interactive virtual worlds. An online community genre that is delivered and engages users within a computer-based simulated environment. Users can interact with one another and use and create objects to inhabit the virtual environments.

*Internet tools that reinforce content-specific instruc*tion. There are a number of tools on the Internet that reinforce content-specific instruction such as simulations, drill/practice tools. Simulation software enables us to imitate a real phenomenon on the computer. Drill and practice tools provide students an opportunity to build and reinforce facts and skills.

*Instructional online gam*ing. Games or simulations that engage and challenge learners through increased interactivity between the learner and the instructional content.

Managing student information. Includes documenting students' grades, attendance, and discipline notes electronically.

Managing student information. Includes documenting students' grades, attendance, and discipline notes electronically.

Multimedia authoring. Computing applications that combine text, graphics, video, animation, and sound to create an integrated product.

1:1 Computing. A combination of laptops, mobile laptop carts, and desktop computers in classrooms that allow one-to-one computing for students during targeted assignments or for building research and computing skills.

Peripheral equipment. Any device that works in conjunction with a computer but is not part of the computer itself. Examples include mouse, keyboards, printers, document cameras, projectors, probes, and interactive whiteboards. *Podcasting* A digital process wherein audio and video programming can be created with a computer, microphone, camera, and software.

Posting class-related information using online tools. Use of teacher websites, learning management systems, teacher blogs or wikis, or an educational social media site, such as Moodle, Blackboard, or Google Apps, to post and/or share classroom-related information.

Presentation software. An application that enables the user to create electronic slideshows. Examples include Microsoft Power Point, OpenOffice, KidPix, HyperStudio, and Apple Keynote.

Projector. A device that projects an active or inactive image onto a screen or surface.

SMS (Short message service). The text communication service component of a phone.

Simulation software. An application that allows users to imitate a real phenomenon with a set of computational operations and program models, reducing any real-to-life phenomena to mathematical data for computer generated simulation. Often used to test, correct, or validate a design or theory of relationships. Examples include SimCity, Real Lives, cell growth simulations, and stock market simulations.

Spreadsheet. An application that allows users to create and manipulate numbers to conduct data analysis for math, science, and other projects. Examples include Microsoft Excel and Appleworks.

Student response systems (SRS). An educational technology tool that allows students to record their responses to multiple-choice questions via hand-held transmitters and wireless receivers.

Technology to support standards-based instruction. Use of technology software and hardware to support the delivery of standards-based instruction.

Tablet. A wireless, portable personal computer with a touch screen interface that is typically smaller than a notebook computer but larger than a handheld device. Tablets may be a convertible device where the screen rotates 180 degrees and uses a stylus digital pen, a slate device that integrates a screen based keyboard, or a hybrid tablet which operates as a notebook but with a display that can be removed and operates as a slate. Examples include the iPad, Kindle, and Nook.

Technical design. Design that incorporates engineering rules, specifications, dimensions, and proper scaling of real-life components. Computer-Assisted Design (CAD) software is often the computing solution that provides the most flexibility to accomplish these features of design that primitively is done by hand.

Tutorials for self-paced learning. A tool that helps students to learn new concepts step-by-step, or improves their skills at their own speed. Examples include "BrainPOP," "Ask Dr. Math," and the National Library of Virtual Manipulatives.

Telcom. Telecommunications network operator or provider.

Video Distance Learning. A technology-enabled teaching and learning system specifically designed to be carried out remotely by using video electronic communication. Examples include virtual field trips and collaborative projects with students in other locations via video.

Video on-demand system. A system that allows users to select and watch/listen to video or audio content on demand by streaming content through a television and set-top box, a computer, or other device. Content may also be downloaded to a device such as a computer, digital video recorder, or portable media player to be viewed at any time.

Web page authoring. This gives the ability to develop web content in a desktop publishing format through local or online applications. Web authoring is also used to describe the process of creating a website from writing the HTML (Hypertext Markup Language) code to the textual content of the pages or manipulating text and pictorial objects in a GUI (Graphical User Interface) program.

Wiki. A collaborative web page that allows users to add or edit content that has already been published.

Word processor. An application that allows users to create a document and store it electronically on a computer or a disk. Examples include Microsoft Word, AppleWorks, and Corel WordPerfect (eTech Ohio, 2010)

Participants

The sample for the BETA (10-11) teacher survey on educational technology consisted of 117,575 teachers from the public schools in Ohio. This survey was one of two related surveys conducted under a nested design involving Ohio school districts and individual buildings within the district. The survey frame included full-time and part-time teachers teaching at least one regularly scheduled class in grades K through 12. Excluded from the sampling frame were administrators, counselors, advisors, and social workers (eTechOhio, 2011).

Data Collection and Response Rate

Data collection for the study was conducted in two stages. The first stage was to identify specific schools in Ohio that received the National Blue Ribbon of Excellence Award for the 2010-2011 school year. Each year the U.S. Department of Education accepts applications for the Blue Ribbon Award program from schools that meet the criteria. After review of the nominees that meet the criteria, the U.S. Department of Education publishes a list of the award winners. The state of Ohio had 18 schools awarded the Blue Ribbon Award for the 2010-2011 school year (Panizo, 2011). Eleven of the 18 schools are classified as a K-12 public school. The list of Blue Ribbon public schools from Ohio were announced on the Ohio Department of Education website.

Table 3

Ohio Blue Ribbon Schools

Elementary Schools: Six total
Intermediate Schools: One total
High Schools: Four total

(Panzio, 2011)

The BETA (10-11) survey data was divided into two groups of Ohio schools. Since this is not an experimental study but comparative, the two groups were defined by their Blue Ribbon Award status. The comparison groups are 1.) Ohio K-12 schools that received the Blue Ribbon Award and 2.) Randomized sample of Ohio K-12 schools that did not receive the Blue Ribbon Award. Comparison group one has 11 schools and comparison group two has 2,844 schools. Throughout this dissertation, the groups may be abbreviated Blue Ribbon (BR) schools and non-BR schools. Comparative group one was the eleven schools that received the Blue Ribbon award for the 2010-2011 school year and participated in the BETA (10-11) survey during the same year. The population of comparative group two was a randomized sample of all Ohio K-12 public schools that responded to the BETA (10-11) survey. The randomized sample of comparative group two were drawn from the 2,844 Ohio public schools that participated in the BETA 10-11 survey that did not receive the Blue Ribbon award for the 2010-2011 school year. It was determined that a randomized sample size of 495 was required from the effect size. The randomized procedure used a random number generator that sorted the random numbers from smallest to largest, then picked the first 495 from the comparative two group. If a school in the list of 495 did not meet the criteria (is a charter/private school or does not have BETA survey data), a secondary randomized list was available to draw from.

Directions for the BETA (10-11) survey were made available online to Ohio school districts on March 16, 2011. The directions introduced the survey and requested that all K-12 educators from the district complete the BETA (10-11) survey. For confidentiality reasons, the online instrument did not include the name of the participant. The collection deadline was May 24, 2011. Completion statistics were made available August 10, 2011.

Of the 117,575 teachers in Ohio, teacher sampling were received from 65,768 K-12 educators or 56 percent of the eligible educators.

Validity and Reliability

Validity and reliability are important factors in quantitative research. Validity is the capability of the testing instrument to measure what it was designed to measure. Reliability is the measure of how stable, dependable, trustworthy, and consistent a test is in measuring the same thing each time (Worthen, 1993). Hopkins (1998) states that reliability is closely defined by the error; greater reliability is associated with less error. Measures of internal reliability such as Cronbach's alpha were not calculated in this study because the types of responses solicited were not primarily related to opinions. The BETA (10-11) survey has face validity and content validity. "Face validity refers to the survey being appropriate and significant to the respondents" (Anastasi, 1988, p.444). Ohio Etech and Ohio Department of Education statistical experts evaluate the questions yearly. "Content-related validity is the degree to which an instrument logically appears to measure an intended variable; it is determined by expert judgment" (Anastasi, 1988, p.114).

The experts who evaluate this survey are the hundreds of Ohio educational leaders and stakeholders who use the results of the survey to guide educational technology decision making on the state and local level. The BETA (10-11) survey was designed to account for sampling error and to minimize non-sampling error, estimates produced from the data collected are subject to both types of error. Sampling error occurs because the data was collected from a sample rather than a complete census of the population, and non-sampling errors are errors that occur during the collection and processing of the data. Non-sampling error is the term used to describe variations in the estimates that may be caused by population coverage limitations and data collection, processing, and reporting procedures. The sources of non-sampling errors are typically problems like unit and item nonresponse, differences in respondents' interpretations of the meaning of questions, response differences related to the particular time the survey was conducted, and mistakes made during data preparation. It is difficult to identify and estimate either the amount of non-sampling error or the bias caused by this error (Dodge, 2006). To minimize the potential for non-sampling error, Ohio Etech and statistical experts at the Office of Educational Technology extensively review the questionnaire and instructions each year for consistency of interpretation of questions and definitions (Q. Roberts, personal communication, July 24, 2011).

Research Design

This study utilized a quantitative, comparative research design. In quantitative research, the researcher collects and analyzes numerical data to understand and explain phenomena (Ary, 2006). The purpose of using a quantitative research design for this study is related to what Maddox (2008) recommends as a research design to test a theory by stating a narrow hypothesis and the collection of data to support or refute the hypotheses. The study was considered comparative because it aimed to determine existing differences or similarities of status between groups or individuals (Ary, 2006). Correlational analyses were used to examine the relationship between the dependent variables for each individual group of BR and Non-BR schools. Even though the researcher did not manipulate variables, an attempt was made to determine the strength of relationship between the independent and dependent variables. Correlation summarizes the strength of relationship between two variables, but it is important to remember that correlation is not causation (Ary, 2006, p.154). The Pearson correlation cannot determine a cause-and-effect relationship. It can only establish the strength of the association between variables. This study did not have complete control over the variables; therefore, the relationships are more suggestive than confirmed. Since the data is archived, control cannot be established. The data utilized in this study was collected by Ohio Etech and was not subjected to any manipulation. The researcher was limited to the questions that are on the BETA (10-11) survey. This classified the study as an ex post facto analysis because it is based upon archival data. In addition, the participants in this study are in groups based upon the school's Blue Ribbon award status. Even though the researcher did not manipulate variables, an attempt was made to determine the strength of relationship between the independent and dependent variables.

Data Extraction

The data collected for this study was derived from teacher responses to the BETA (10-11) survey. The data was extracted from the survey using the following procedures: First, the raw data set was retrieved from the Ohio Etech website. Second, independent variables were identified using the United States Department of Education Blue Ribbon Award recipients for the State of Ohio. In addition, a randomized sampling procedure was conducted on Non-BR schools.   Third, questions from the teacher survey were categorized into teacher's frequency of educational technology use, a teacher's comfort level with educational technology, and a teacher's belief about the effect of educational technology on teaching and learning. This identified the three dependent variables. Lastly, the variables were imported into the statistical program, Statistical Package for the Social Sciences (SPSS)-Windows version 19.0. SPSS data was sorted using independent variable identifiers from the school's Blue Ribbon award status. The main identifiers were 1.) Teachers from Ohio schools that received the Blue Ribbon award for the 2010-2011 school year 2.) Randomized sample of teachers from Ohio schools that did not receive the Blue Ribbon award. Questions from the Teacher BETA (10-11) survey were identified into the three categories of frequency of educational technology use, a teacher's comfort level with educational technology and a teacher's belief about the effect of educational technology on teaching and learning.

Variables

To gain better insight into the educational, technology characteristics of Ohio schools that received the BR award compared to the sample population of Non-BR Ohio schools, the study examined the independent variables represented by the schools that received the Blue Ribbon award and those that did not. The dependent variables that were examined were the school's frequency of use of educational technology, a teacher's comfort level with educational technology, and a teacher's belief about the effect of educational technology on teaching and learning.

Dependent Variables

For the purpose of this study, the dependent variables were divided into three categories of frequency of educational technology use, a teacher's comfort level with educational technology, and a teacher's belief about educational technology effect on teaching and learning. Questions from the Teacher BETA (10-11) survey were identified into one of the three categories (See Table 2). Questions focused on the frequency of educational technology use of teachers and their students. Frequency of educational technology use was indicated on a scale of 1-5 where 1 is do not have access and 5 is daily. Teacher education technology use questions and student education technology use questions were summed up to derive a combined education technology use score for the school. Questions regarding a teacher's comfort level used a Likert scale of very low to very high of technology tools and Web 2.0 tools for teaching and learning. A teacher's beliefs about the effect of educational technology on teaching and learning were measured by a Likert scale of strongly disagree to strongly agree on the items of 1.) I believe technology functions as an effective tool for helping students master the state academic content standards; 2.) I believe the use of technology makes the process of learning more interesting for students; 3.) I believe technology improves the effectiveness of my teaching (makes my job more interesting). Also, a teacher's beliefs about the effect of educational technology on teaching and learning were measured by the response to the question on a teacher's advocacy for digital learning with media. Teachers responded to a Likert scale of very weak to very strong.

Independent Variables

The two independent variables of Blue Ribbon schools (BR) and Non Blue Ribbon (Non-BR) were identified by the published list of schools from Ohio on the Department of Education website that received the Blue Ribbon award. This variable was in coordination with the teacher BETA (10-11) survey completion statistics from all Ohio school districts. The Non-BR schools were a randomized sample of the population of schools that did not receive the Blue Ribbon award.

Statistical Analysis

Quantitative data was analyzed in this study to determine whether the three categories of educational technology variables are of any significance to an Ohio school's achievement and status of a Blue Ribbon school. Descriptive and inferential statistics were used to measure and understand the archival data from the teacher's BETA (10-11) survey. Descriptive statistics were generated to identify the frequency, percentages, mean, and standard deviation of the dependent variables of Blue Ribbon schools and Non Blue Ribbon schools. To estimate the effect size, a calculation of the mean and standard deviation for the BR schools were subtracted from the average of the overall state were performed. The randomized sample was generated by employing a number generator and then matching it up to the recommended effect size from the above procedure.

The inferential statistical test used was the one-way Analysis of Variance model (ANOVA). The ANOVA model first determined if the independent variables display a normal distribution as measured by frequency of educational technology use, a teacher's comfort level with educational technology, and a teacher's belief about the effect of educational technology on teaching and learning. If the data showed normality, then the output from the ANOVA was used to test for statistical significance. If the output was not normal then a Kruskal-Wallis (KW) non-parametric analysis of variance (ANOVA) was used to test the hypothesis in the study. Corder & Foreman (2009) recommends the (KW) non-parametric test because it can be run when the data contains categorically measured variables. The (KW) non-parametric variable tests that have an overall significance of $p < .05$ identified pairwise comparisons of the dependent variables. These pairwise groupings would reveal if there were any statistically significant differences between the Blue Ribbon and non-Blue Ribbon schools.

Chapter Summary

Chapter three presented the research questions, null hypotheses, proposed design, and methodology that were used in this study. This chapter also provided a description of the population and sample, measured variables, instrumentation, data collection, and proposed statistical procedures that were used to analyze the data from the BETA (10-11) survey.

CHAPTER FOUR: DATA ANALYSIS & RESULTS

Introduction

The purpose of this study was to examine the educational technology characteristics of Ohio schools based upon their national Blue Ribbon award status. The findings from the descriptive and inferential statistical analyses that were conducted are presented in this chapter. The educational technology characteristics that were evaluated were the variables of frequency of educational technology use, a teacher's comfort level with technology, and a teacher's beliefs about the effect of educational technology on teaching and learning. This chapter presented the statistical analyses of data obtained from 65,768 Ohio K-12 educators.

In the original data there are 11 BR schools and 496 Non-BR schools that had usable data. Initially, a weighted average for each question by each school was calculated. If there was no response within a question within a school, this weighted average was coded as 0.000 in the data. The three calculated variables (frequency of use, teacher comfort, and teacher belief) were determined for each school. Each calculated variable included a sum of the weighted averages for questions from the survey (See Table 2.). Histograms of the three calculated variables for both the BR and Non-BR groupings were produced to check for the assumption of normality. All three calculated variables were approximately normal represented by a bell-shaped curve (See Appendix B.).

The chapter is divided into three sections. The first section presents descriptive statistical analyses of the respondent's answers. The second section presents inferential statistical analyses and results from testing of the null hypotheses. Finally, a summary of the results from the correlational analyses within the school group is presented in the third section.

This study was guided by three research questions and corresponding null hypotheses:

Research Question 1: *To what extent does educational technology use differ between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

$H_0$1: *There is no difference in educational technology use between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

Research Question 2: *To what extent does the educational technology teacher comfort level differ between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

$H_0$2: *There is no difference in teacher comfort level between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

Research Question 3: *To what extent does a teacher's beliefs about educational technology differ between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

$H_0$3: *There is no difference in a teacher's beliefs about educational technology between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

Descriptive Statistics

Descriptive statistical analyses were conducted to present general quantitative descriptions of the sample. The descriptive statistics provided information on the mean, standard deviation, median, minimum and maximum of the three variables for both the BR and Non-BR schools in Ohio.

Frequency of Educational Technology Use

A school's frequency of technology use was derived from questions that focused on the frequency of educational technology use of teachers and their students (See Table 2.). Frequency of educational technology use was indicated on a scale of 1-5 where 1 indicates the teacher does not have access and 5 indicates that the teacher has daily access. Teacher education technology use questions and student education technology use questions were summed up to derive a combined education technology use score for the school. The overall random Non-BR school sample totaled four hundred ninety-six (n = 496). The total of BR Ohio schools totaled eleven (n= 11). If there was a no response within a question of frequency of technology use, the weighted average was coded as 0.000 in the data. For frequency of technology use, there were 10 Non-BR schools and one BR that had responses that were unusable. This left a valid sample size of 410 Non-BR usable responses (n = 410; 83% usable response rate) and 10 BR usable responses (n= 10, 91% usable response rate) used for analysis of frequency of technology use.

Table 4

Frequency of Technology Use Usable Sample

Ohio Schools	N
BR Schools	10
Non-BR Schools	490

Descriptive statistical analyses from 500 teacher respondents indicated the frequency of technology use between BR and Non-BR schools varied little (See Table 5).

Table 5

Frequency of Technology Use

BR vs. Non-BR Schools	N	Mean	Std. Deviation	Median	Minimum	Maximum
BR	10	65.9634	6.15646	64.8821	56.83	74.80
Non-BR	490	66.1286	6.15594	66.1072	46.50	99.50
Total	500	66.1253	6.14982	66.0478	46.50	99.50

A Teacher's Comfort Level Using Technology for Instruction

A teacher's comfort level with technology was derived from two questions that focused on the ease of use and familiarity with specific educational technology (See Table 2). Questions regarding a teacher's comfort level used a Likert scale of very low to very high of technology tools and Web 2.0 tools for teaching and learning. The overall random Non-BR school sample totaled four hundred ninety-six (n = 496). The total of BR Ohio schools totaled eleven (n= 11). If there was a no response within a question of frequency of technology use, the weighted average was coded as 0.000 in the data. For teacher comfort level, there were no Non-BR schools or BR that had responses that were unusable. This left a valid sample size of 496 Non-BR usable responses (n = 496; 100% usable response rate) and 11 BR usable responses (n= 11, 100% usable response rate) used for analysis of a teacher's comfort level with technology.

Table 6

Teacher Comfort Level with Technology Usable Sample

Ohio Schools	Number
BR Schools	11
Non-BR Schools	496

Descriptive statistical analyses from the 507 teacher respondents indicated that a teachers' comfort level with technology varied little between BR and Non-BR educators (See Table 7).

Table 7

Teacher's Comfort Level with Technology for Instruction

BR vs. Non-BR Schools	N	Mean	Std. Deviation	Median	Minimum	Maximum
BR	11	45.4468	3.81882	46.0875	40.65	53.00
Non-BR	496	44.0508	4.60239	43.9261	31.00	68.50
Total	507	44.0811	4.58816	43.9355	31.00	68.50

A Teacher's Belief About the Effect of Educational Technology

A teacher's beliefs about the effect of educational technology on teaching and learning were measured by a Likert scale of strongly disagree to strongly agree on the items of 1.) I believe technology functions as an effective tool for helping students master the state academic content standards; 2.) I believe the use of technology makes the process of learning more interesting for students; 3.) I believe technology improves the effectiveness of my teaching (makes my job more interesting). Also, a teacher's beliefs about the effect of educational technology on teaching and learning were measured by the response to the question on a teacher's advocacy for digital learning with media. Teachers responded to a Likert scale of very weak to very strong (See Table 2). The overall random Non-BR school sample totaled four hundred ninety-six (n = 496). The total of BR Ohio schools totaled eleven (n= 11). If there was a no response within a question of frequency of technology use, the weighted average was coded as 0.000 in the data. For teacher comfort level, there were no Non-BR schools or BR that had responses that were unusable. This left a valid sample size of 496 Non-BR usable responses (n = 496; 100% usable response rate) and 11 BR usable responses (n= 11, 100% usable response rate) used for analysis of a teacher's belief about the effect of educational technology.

Table 8

Teacher's Belief about the Effect of Educational Technology Usable Sample

Ohio Schools	Number
BR Schools	11
Non-BR Schools	496

Descriptive statistical analyses from the 507 teacher respondents indicated that a teacher's belief about the effect of educational technology varied little between BR and Non-BR educators (See Table 9).

Table 9

A Teacher's Belief about the Effect of Educational Technology

BR vs. Non-BR Schools	N	Mean	Std. Deviation	Median	Minimum	Maximum
BR	11	20.1059	1.92890	19.8000	17.71	25.00
Non-BR	496	19.9274	1.32150	20.0000	7.00	25.00
Total	507	19.9313	1.33514	20.0000	7.00	25.00

Inferential Statistical Analyses and Results

This section presents the findings of the inferential statistical analyses to answer the three research questions and to test the three null hypotheses in the study. The dependent variables in the study were normally distributed for each sample as shown by normal distribution of data plotted on histograms (see Appendix B.). The one-way analysis of variance (ANOVA) can be utilized to compare two or more groups for differences and to test a null hypothesis. The procedure was used to determine differences between BR and Non-BR schools for the frequency of technology use, teacher comfort level with technology, and a teacher's belief about the effect of educational technology. An alpha level of 0.05 was used as the criterion for statistical significance.

Research question 1: Educational technology use. The first research question asks, "To what extent does educational technology use differ between Blue Ribbon and Non-Blue Ribbon schools in Ohio?" The related null hypothesis stated that there is no difference in educational technology use between Blue Ribbon and Non-Blue Ribbon schools in Ohio. Table 10 presents the findings for the one-way analysis of variance test of the frequency of educational technology use of Ohio BR and Non-BR schools. The One-Way ANOVA test determined if there were differences between the means calculated for the BR and Non-BR schools.

Table 10

Dependent Variable: Frequency of Educational Technology Use

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.268[a]	1	.268	.007	.933
Intercept	170993.356	1	170993.356	4512.212	.000
BRvNon-BR	.268	1	.268	.007	.933
Error	18872.048	498	37.896		
Total	2205151.581	500			
Corrected Total	18872.316	499			

Table 10 shows that there was no statistically significant difference in the frequency of educational technology use between Ohio BR and Non-BR schools, F (1, 1) = .007, p = .933. The researcher failed to reject null hypothesis one.

Research question 2: Teacher comfort level. The second research questions asks, "To what extent does the educational technology teacher comfort level differ between Blue Ribbon and Non-Blue Ribbon schools in Ohio?" The related null hypothesis stated that there is no difference in teacher comfort level between Blue Ribbon and Non-Blue Ribbon schools in Ohio. Table 11 presents the findings for the one-way analysis of variance test of teacher comfort level with educational technology between Ohio BR and Non-BR schools. The One

Way ANOVA test determined if there were differences between the means calculated for the BR and Non-BR schools.

Table 11

Dependent Variable: Comfort Level of Teachers using Technology for Instruction

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	20.972[a]	1	20.972	.996	.319
Intercept	86196.440	1	86196.440	4094.583	.000
BRvNon-BR	20.972	1	20.972	.996	.319
Error	10630.925	505	21.051		
Total	995825.392	507			
Corrected Total	10651.897	506			

Table 11 shows that there was no statistically significant difference in the teacher comfort level with educational technology between Ohio BR and Non-BR schools, $F\ (1, 1) = .996$, $p = .319$. The researcher failed to reject null hypothesis two.

Research question 3: Teacher's beliefs. The third research questions ask, "To what extent does a teacher's beliefs about educational technology differ between Blue Ribbon and Non-Blue Ribbon schools in Ohio?" The related null hypothesis stated that there is no difference in a teacher's beliefs about educational technology between Blue Ribbon and Non-Blue Ribbon schools in Ohio. Table 12 presents the findings for the one-way analysis of variance test of teacher's beliefs about educational technology between Ohio BR and Non-BR schools. The One-Way ANOVA test determined if there were differences between the means calculated for the BR and Non-BR schools.

Table 12

Dependent Variable: Teachers Beliefs about Technology for Instruction

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.343[a]	1	.343	.192	.661
Intercept	17246.840	1	17246.840	9659.632	.000
BRvNon-BR	.343	1	.343	.192	.661
Error	901.655	505	1.785		
Total	202310.221	507			
Corrected Total	901.998	506			

Table 12 shows that there was no statistically significant difference in a teacher beliefs about technology for instruction between Ohio BR and Non-BR schools, F (1, 1) = .192, p = .661. The researcher failed to reject null hypothesis three.

Correlation Analysis

Correlational analyses were used to examine the relationship between the dependent variables for each individual group of BR and Non-BR schools. Correlation summarizes the strength of relationship between two variables, but it is important to remember that correlation is not causation (Ary, 2006, p.154). The Pearson correlation cannot determine a cause-and-effect relationship. It can only establish the strength of the association between variables. The statistical analyses presented in Table 13 and 14 show the Pearson correlation for the dependent variables of frequency of educational technology use, a teacher’s comfort level with educational technology, and a teacher’s beliefs about educational technology for instruction for both BR and Non-BR schools.

Correlations were computed among the three variables of frequency of use, comfort level, and beliefs on educational technology for Blue Ribbon schools. Comfort level and beliefs about the effectiveness of educational technology were computed on data from the eleven Blue Ribbon schools. Frequency of use correlation was computed on the data from 10 Blue Ribbon schools. The results suggest that eight out of nine correlations were statistically significant and were greater or equal to $r(10) = +.788$, $p < .01$, two-tailed. The correlations of frequency of use and a teacher's beliefs about the effectiveness of educational technology were significant on the 0.05 level, $r(9) = +.689$, $p < .05$ (See Table 13).

Table 13

Correlations within the BR Group

		Dependent Variables		
		Frequency of Use	Comfort Level of Teachers using Technology for Instruction	Belief of Teachers in Technology for Instruction
Frequency of Use	Pearson Correlation	1	.834**	.689*
	Sig. (2-tailed)		.003	.028
	N	10	10	10
Comfort Level of Teachers using Technology for Instruction	Pearson Correlation	.834**	1	.788**
	Sig. (2-tailed)	.003		.004
	N	10	11	11
Belief of Teachers in Technology for Instruction	Pearson Correlation	.689*	.788**	1
	Sig. (2-tailed)	.028	.004	
	N	10	11	11

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Correlations were computed among the three variables of frequency of use, comfort level, and beliefs on educational technology for Non-Blue Ribbon schools. Comfort level and beliefs about the effectiveness of educational technology were computed on data from the 496 Non-Blue Ribbon schools. Frequency of use correlation was computed on the data from the 490 Non-Blue Ribbon schools. The results suggest that all correlations were statistically significant for comfort level and beliefs about technology and were greater or equal to r(495) = +.495, p < .01, two-tailed. The correlations of frequency of use between comfort level and teacher's beliefs about the effectiveness of educational technology were greater or equal to, r(489) = +.553, p < .01 (See Table 14).

Table 14

Correlations within the Non-BR Group

		Dependent Variables		
		Frequency of Use	Comfort Level of Teachers using Technology for Instruction	Belief of Teachers in Technology for Instruction
Frequency of Use	Pearson Correlation	1	.657**	.553**
	Sig. (2-tailed)		.000	.000
	N	490	490	490
Comfort Level of Teachers using Technology for Instruction	Pearson Correlation	.657**	1	.495**
	Sig. (2-tailed)	.000		.000
	N	490	496	496
Belief of Teachers in Technology for Instruction	Pearson Correlation	.553**	.495**	1
	Sig. (2-tailed)	.000	.000	
	N	490	496	496

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

Positive coefficients tell us there is a direct relationship. A relationship can be strong and yet not significant. Conversely, a relationship can be weak but significant. When one variable increases, the other increases (Ary, 206, p. 154). In general, the results suggest that within each group of BR and Non-BR schools there is a positive correlation among the tested variables of frequency of use, a teacher's comfort level, and beliefs about the effectiveness of educational technology. However, it appears to be a higher positive correlation in the Ohio BR schools between the three calculated variables than within the Non-BR schools. Table 14 summarizes the results.

Table 15

Correlation Group Comparison

Dependent Variables	Frequency of Use/Comfort Level	Comfort Level /Beliefs	Frequency of Use/Beliefs
BR Schools	.834**	.788**	.689*
Non BR Schools	.657**	.495**	.553**

** $p < 0.01$ level.
* $p < 0.05$ level.

Summary of Results

The purpose of this study was to analyze data from Ohio schools and the frequency of use of educational technology, a teacher's comfort level using technology, and a teacher's beliefs about the effect of educational technology on teaching and learning based upon the school's Blue Ribbon award status. This chapter presented test findings from the three null hypotheses tested at an alpha level of p > 0.05. The one-way ANOVA was conducted to evaluate whether the independent variable of Blue Ribbon status indicated any significant difference on the three dependent variables of frequency of educational technology use, a teacher's comfort level with technology, and a teacher's beliefs about technology for instruction. Findings of the analyses indicated no difference between Ohio Blue Ribbon and Non- Blue Ribbon schools. All three Null hypotheses were not rejected. The findings of the analyses also indicated that Blue Ribbon schools demonstrate a higher correlation among the variables of the number of frequency of educational technology use, a teacher's comfort level with technology, and a teacher's beliefs about technology for instruction than Non Blue Ribbon schools. The interpretation of the findings, implications from the findings, conclusions, and recommendations for further study will be presented in chapter five.

CHAPTER FIVE: Summary and Analysis of Findings

Introduction

The study's underlying purpose was to determine to what extent selected educational technology factors differ among recognized high achieving schools and the general population of Ohio K-12 public schools and those teachers from those schools.

Due to the potential benefit of educational technology for teaching and learning and federal and state initiatives for teachers to utilize technologies to enhance their instruction, obtaining information regarding the differences between Blue Ribbon and Non-Blue Ribbon schools was necessary. In order to assess the potential differences among Blue Ribbon and non-Blue Ribbon Ohio schools selected factors were explored for their potential benefit to decision makers for the advancement of educational technology as a force of improved achievement for Ohio students.

The review of literature on the connection of educational technology to student achievement revealed varied opinions regarding the relationship between a teacher's use, comfort level, and beliefs about educational technology. It appears there are numerous research studies on new technologies and their effects on teaching and learning. Currently, there are many educational technology studies that are funded by companies and institutions that have created and promoted the use of technology. This is raising questions about the research in general. For example, it is difficult to identify specific empirical data to support the case for mobile learning in schools. The studies that do look at the effects of mobile technologies on learning are often based on small samples of students involved in short-term pilots, not the kind of large-scale, ongoing samples of students that educators and policymakers would like to see (Education Week, 2011).

Discussion of Findings

The review of literature and a careful examination of the Ohio Biennial Educational Technology Assessment: 2011 (BETA 10-11), survey led to three research questions:

Research Question 1: *To what extent does educational technology use differ between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

Research Question 2: *To what extent does the educational technology teacher comfort level differ between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

Research Question 3: *To what extent does a teacher's beliefs about educational technology differ between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

Using a quantitative, comparative statistical model, three null hypotheses were tested:

$H_0$1: *There is no difference in educational technology use between Blue Ribbon and Non-Blue Ribbon schools in Ohio*

$H_0$2: *There is no difference in teacher comfort level between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

$H_0$3: *There is no difference in a teacher's beliefs about educational technology between Blue Ribbon and Non-Blue Ribbon schools in Ohio?*

In all three cases, the null hypotheses were not rejected. The findings from this study supported all the null hypotheses, which stated that there is no significant difference between select educational technology variables and what is found in Blue Ribbon and Non-Blue Ribbon schools in Ohio. This outcome could result from several factors ranging from the respondents access to technology, pedagogical philosophy (Clausen, 2007) or their attitudes about technology use in the classroom (Christensen, 2008). The conclusion is that all three null hypotheses are plausible. However, the researcher cannot conclude that the null hypotheses are true. Further research is needed to determine if there are any differences in the educational technology characteristics of high achieving Ohio Blue Ribbon schools and the Non-Blue Ribbon schools.

Frequency of Educational Technology Use

Because there are studies that suggest technology use is correlated with greater levels of achievement (Aeby, 2003; Cuthell, 2006), the researcher expected teachers in Ohio Blue Ribbon public schools to use educational technology in their classroom instruction more frequently. When reporting frequency of student and teacher classroom use, the participants were instructed to respond with never, at least once per year, at least once per month, or at least once per week. When comparing the mean of Blue Ribbon Schools (65.9634) and Non-Blue Ribbon (66.1286) it appears to be of no significance (.993) to the frequency of use. Any use of technology for classroom instruction below this level, for example, using computers only once or twice a month constitutes extreme underutilization of educational technology in Ohio public schools.

The current trend of a low frequency of use is not just an issue in Ohio. NCES (2010) found teachers reported that they or their students used computers in the classroom during instructional time often (40 percent) or sometimes (29 percent). Teachers reported that they or their students used computers in other locations in the school during instructional time often (29 percent) or sometimes (43 percent). At one time the thought was that it was an issue of accessibility that caused a low frequency of technology use in the classroom. However the most current statistics reveal that ninety-seven percent of teachers had one or more computers located in the classroom every day, while 54 percent could bring computers into the classroom. Internet access was available for 93 percent of the computers located in the classroom every day and for 96 percent of the computers that could be brought into the classroom. The ratio of students to computers in the classroom every day was 5.3 to 1 (Gray, Thomas, and Lewis, 2010, p.3). The results of this study support the low frequency of use found in the recent NCES data. Without a consistent higher amount of educational technology use by the participants, obtaining a measurement of the differences among high achieving schools and their counterparts can not be measured adequately. Further research on the increase use of educational technology could propel both types of schools to improve or possibly not. At the current rate, teachers cannot effectively use technology as a consistent proven means of student achievement integrated into the school curriculum.

Teacher Comfort Level with Educational Technology

Respondents to the BETA (10-11) survey were asked to rate their comfort level with educational technology on a scale from very low, low, moderate, high, and very high. What is interesting to note is the items listed in the survey were not all technology applications. Questions regarding comfort level included feedback on concept mapping, technical design, interactive presentations, and online learning were taken into consideration. In addition, respondents were asked their skill level with Web 2.0 for teaching and learning. When comparing the mean of Blue Ribbon Schools (45.4668) and Non-Blue Ribbon (44.0508) it appears to be of no significance (.319) to a teacher's comfort level with educational technology. As reported in earlier studies (Norris, 2003); (Albejadi, 2000) lack of time is stated as a major barrier to teacher's use of educational technology in the classroom. It is worth noting that lack of time is a multifaceted factor that affects the integration of educational technology. Lack of time for most teachers includes time set aside for professional development. Teachers are busy during the day teaching, and completing non-teaching functions such as grading papers, preparing lesson plans, and communicating with parents. Time for professional growth usually takes the back seat to all other professional tasks.

Gray (2010) reported the percentage of teachers that reported spending hours in professional development activities for educational technology during a 12 month period was 13 percent for none, 53 percent for 1 to 8 hours, 18 percent for 9 to16 hours, 9 percent for 17 to 32 hours, and 7 percent for 33 or more hours (p. 4). Such apparent lack of time, coupled with a low degree of training, culminates into a low comfort level for educators to use educational technology for classroom learning on a regular basis.

A Teacher's Beliefs about Educational Technology

Respondents to the BETA (10-11) survey were asked to rate their beliefs about educational technology as a force of innovation for education on a scale from strongly agree, agree, neutral, disagree, and strongly disagree. Teachers responded to the following questions:

> *Technology Beliefs:* How would you describe your beliefs regarding educational technology? I believe technology functions as an effective tool for helping students master the state academic content standards.
>
> *Technology Beliefs:* How would you describe your beliefs regarding educational technology? I believe the use of technology makes the process of learning more interesting for students.
>
> *Technology Beliefs:* How would you describe your beliefs regarding educational technology? I believe the use of technology saves me time on routine tasks
>
> *Technology Beliefs*: How would you describe your beliefs regarding educational

technology? I believe technology improves the effectiveness of my teaching (makes my job more interesting) (eTech Ohio, 2010).

Martin & Shulman (2006) found that a teacher's pedagogical beliefs inhibit educational technology or innovation on a consistent basis in the classroom. Therefore, to overcome such barriers a required pedagogical shift is required of a technology-resisting teacher. As more teachers use technology, and those who resist see the usefulness of educational technology as a learning tool, they experience an adjustment in attitudes towards educational technology for teaching and learning. In this study, the majority of respondents to the BETA (10-11) questions on beliefs were found to be in agreement that educational technology functions as an effective tool for helping students master the state academic content standards. However, when comparing the mean of Blue Ribbon Schools (20.1059) and Non-Blue Ribbon (19.9274) it appears to be of no significance (.661) to a teacher's beliefs about educational technology. Therefore, the researcher concluded that although a majority of respondents agree that it is an effective tool it is used very little as a strategy for student achievement. Conversely, Judson's (2006) research suggested that there is a connection between technology integration and the teachers who viewed technology as a valuable instructional aid. Teachers who regarded educational technology as valuable were more inclined to use a variety of technological resources in their classrooms.

Correlation of Variables within the Group

In order to further investigate into the differences between BR and Non-BR schools, a Pearson Correlation test was performed to look for the positive relationship among the dependent variables in each group. The researcher inferred that the higher frequency of use would have a positive influence on the comfort level and beliefs about educational technology from the respondents. This conclusion is supported by several studies that point to the progression from a frequent user of technology to a high comfort level and change of beliefs (McKenzie, 2004; Zhao & Frank, 2003). Recent studies indicate that on average, teachers use computers several times a week for preparation but very few times for instructional purposes (Groff, 2008). Further research is needed on why teachers use technology to increase their own proficiency and productivity, yet do not strive to find effective applications of educational technology as an instructional tool.

It is interesting to note that BR schools have a slightly higher rate of correlation between frequency of technology use, teacher comfort level with educational technology, and a teacher's beliefs about educational technology (See table 13.). The correlation found in this study does not imply that there is causation in this study. It is only suggested that the differences could be the result of factors not apparent in the data. For example, the large sample of Non-BR schools could have contributed to a possible lower correlation. Ary (2006) states that correlations can be influenced by outliers, unequal variances, non-normality, and nonlinearity in the data. The strongest relationship among the variables of the BR schools was with the frequency of use and a teacher's comfort level with educational technology (See table 13.). The researcher is inferring that the larger correlation is evidenced by the smaller sample of BR schools that share this common characteristic. Corder & Foreman (2009) noted that a relationship can be strong and yet not significant. Equally, a relationship can be weak but significant. For small samples, it is easy to generate a strong correlation by chance, and one must take into consideration the significance to keep from jumping to conclusions. For large samples, it is easy to achieve significance, and one must pay attention to the strength of the correlation to establish if the relationship can explain the findings. This presents a need for additional study that would investigate the primary dynamics of internal and external factors that affect teachers' educational technology use related to comfort level and beliefs. This study supports the idea that teacher beliefs influence professional practice, and therefore, become pivotal factors in the application of new educational technologies (Haney & Lumpe, 1995).

Theoretical Implications

This study provided strength to the theory espoused by Oppenheimer (2003) and Cuban (1986) that the record of educational technology in schools reveal that while technologies can provide a positive educational experience in certain instances, successes pale in comparison to the failures and promises of improved student achievement overall. Oppenheimer (2003) contends not knowing the past history of failed educational technology, we seem condemned to repeat it over and over again. Both of these authors contend that there is a repetitive cycle of technology in education that goes through hype, investment, poor integration, and lack of educational outcomes. The cycle keeps revolving only because each new technology reinitiates the cycle (Oppenheimer, 2003).

In 1922, Thomas Edison maintained that movies would revolutionize our educational system. In the 1960s, the Kennedy and Johnson administrations invested millions in classroom TV (Cuban, 1986). An understanding of the historical cycle of educational technology to solve the challenges of student achievement will keep the current innovations in perspective. Conversely, many would argue the computer specifically should not be compared to these earlier attempts at educational technology as a method to improve student achievement. Research on underperforming schools seems to indicate technology's ability to reduce the digital divide of education serves to only intensify existing forms of inequality.

Mark Warschauer (2004) states of underperforming US schools:

The placing of computers and Internet connections in low-income schools, in and of itself, does little to address the serious educational challenges faced by these schools. To the extent that an emphasis on provision of equipment draws attention away from other important resources and interventions, such an emphasis can in fact be counterproductive. (p. 586)

This researcher finds that effective teachers are the primary agents of positive student achievement (Goe, 2007; Hunter & Rebell, 2004). Without good teachers, education fails; with good teachers, education succeeds. Educational technology is largely immaterial to this equation. The question remains that if there is shift in pedagogical beliefs by the teachers about educational technology would student achievement increase? This study indicated that Blue Ribbon schools excel with the same amount of educational technology use, teacher's comfort level with technology, and beliefs about the effectiveness of educational technology as their Non-Blue Ribbon counterparts. In this researcher's professional opinion based on the data from this study of over 500 Ohio K-12 public schools and the current literature, the reason there has not been an impact of educational technology is that students have actually, for all intents and purposes, not used the technology with frequency of use to measure it as a force for student achievement. The reason for this lack of consistency lies at the feet of the teachers. Access to educational technology is at an all-time high in the American educational system (Gray, 2010). Frankly, there cannot be a consistent impact of educational technology on student achievement until educators experience a pedagogical shift where students can have the opportunity to access and use the technology.

Limitations of the Study

The study was a quantitative comparison using an ex post facto comparative and correlational design to analyze resulting educational technology survey data from Ohio schools based upon their Blue Ribbon status. The specific data for analysis in this study was acquired from archival data from the eTech Ohio *Biennial Educational Technology Assessment 2010-2011,* BETA (10-11). The BETA (10-11) was released to all public school districts on March 26, 2011. The completion date was May 27, 2011. The data was supplied by Ohio K-12 public educators with voluntary responses to the survey. This study was limited to analysis of tendencies and possible relationships of trends from survey data collected from within the state of Ohio. However, similar states may provide similar results. Based on the ex post facto and comparative designs of this study, causality cannot be assumed where correlation exist between in the BR and Non-BR school groups. In this study, the data was analyzed based upon the result of life experiences, pedagogical beliefs, and interpretation of the survey questions by the teachers that responded.

Another limitation is that there are always inherent risks to a correlational comparison. Gay & Airasian (2006) noted some complications for researchers to consider in interpreting correlational coefficients such as using the proper correlation method to calculate the correlation, the possibility of low reliabilities, knowing if the variables are valid, and knowing if the range of scores is restricted or extended.

Recommendations

Practitioner recommendations. This quantitative research study revealed that there is no significant difference in the educational technology use, comfort level with technology, and beliefs about the effect of educational technology between Ohio educators based upon the Blue Ribbon status of their school. According to the United States Department of Education's National Center for Educational Statistics, Ninety-seven percent of teachers had one or more computers located in the classroom every day, while 54 percent could bring computers into the classroom. Internet access was available for 93 percent of the computers located in the classroom every day and for 96 percent of the computers that could be brought into the classroom. The ratio of students to computers in the classroom every day was 5.3 to 1 (Gray, 2010, p.3). The idea of internal barriers like attitude and teaching personality has led researchers to explore why true technology integration is not achieved on a consistent basis (Zhao, 2007). The literature review suggested that a teacher's pedagogical view of teaching and learning contribute to a positive view of technology integration. Anderson and Maninger (2007) concluded that teachers with a constructivist view of teaching made better use of educational technology. The investment to return of educational technology in the classroom is very low.

Based on the literature review and the results of this research, this researcher recommends that practitioners and educational professionals be held to higher standards of professional growth. The needs of the 21st century demand a shift in how students are prepared to succeed not only academically but also as productive contributors to society. Therefore, practitioners need to accept that part of their responsibilities, as an educator, is ongoing professional development of 21st century skills for teaching and learning. Many other professional fields and industries have made the transition to innovate as a means of economic survival and resurgence of the American way. This researcher's opinion is that if individual educators would make priority their personal research and development as a professional educator, then the necessary student progress would be influenced by the reflective practices of these quality educators.

Policy recommendations. Based on the literature review and results of this research study, the researcher has several policy recommendations for Ohio public school districts and policymakers. The purpose of this study was to analyze data from Ohio schools and the frequency of use of educational technology, a teacher's comfort level using technology, and a teacher's beliefs about the effect of educational technology on teaching and learning based upon the school's Blue Ribbon award status. Schools obtaining the Blue Ribbon status have demonstrated a high degree of performance on a state mandated assessment. However, this researcher questions the form of state tested achievement as the only measure of success in public schools in Ohio. Throughout the state of Ohio, there are schools innovating the model of teaching and learning. STEM programs that focus on inquiry skills across the curriculum with an emphasis on science, technology, engineering, and math expose students to real world problem-solving and application.

The emergence of K-12 online and charter schools have challenged the idea of a factory model type of curriculum where students move at the same pace with the only common characteristic of age. It appears that a standardized measurement might not be the best assessment for a changing world and society. A rethinking of the skills that students need to be equipped with is much overdue. The models and proposals from the 21st century skills movement and other researched models of innovation have been proposed. The logical next step is that the policymakers need to support and require the necessary innovational change for K-12 education. In addition, recognizing positive schools that are focused on the needs of individual learners outside of mandatory state assessments would highlight the importance of diversity among measured achievement.

Recommendations for further research. It has been said that a good learning experience should leave you with more questions than answers. One recommendation would be to replicate the study to include a qualitative component for a more in-depth and deeper description of instructional activities, learning environment, and students' engagement with technology integration in Blue Ribbon schools.

A tracking of pre-service educators and their preparation for the field would be an additional study. This could take the form of a longitudinal study that would focus on pre-service teacher programs that are focusing on 21st century skills and methodologies. The researcher would follow these educators into the system and study if their training was applicable to their teaching environment. The Research would be guided by three questions: Was the initial training of these pre-service teachers adequate to prepare them to use educational technology for teaching and learning? Over a six year data-collection period, did the teacher's beliefs about educational technology as a force of innovation change? Did the technology training provided to these entry-level teachers influence their comfort level and beliefs about educational technology?

Another area for further research is teacher perception of educational technology as a force of innovation. The purpose of this study would be a qualitative design on Ohio educators and the number of years in the profession as a possible comparison variable related to educational technology perception. The research would be guided by three questions: Why do a majority of educators indicate that educational technology is a force for innovation but the data demonstrates a low frequency of use for educational technology? Was the initial implementation of technology into their classroom and their initial training and support enough to raise the comfort level of use? Were other variables involved that influence a teacher's beliefs about the effectiveness of educational technology on instruction?

Three years from now, Ohio will be instituting a new online K-12 standardized state achievement test based upon the Common Core standards. This represents a major shift in test taking in Ohio. Instead of filling out multiple-choice bubbles or writing extended responses on answer sheets, students will be answering questions online and even getting some questions in video form. It is recommended that a study be conducted on how educational technology will be used in the preparation of Ohio K-12 students for the new student performance test.

Future studies that focus on these recommendations may provide a model for educational technology use as a force of innovation for all Ohio teacher and students. Additional studies that focus on these recommendations may provide data that will be useful in determining future trends in educational technology.

Conclusion

The purpose of this study was to analyze data from Ohio schools and the frequency of use of educational technology, a teacher's comfort level using technology, and a teacher's beliefs about the effect of educational technology on teaching and learning based upon the school's Blue Ribbon award status. Findings in this study suggested that there are no significant difference between high achieving Blue Ribbon schools in Ohio and Non-Blue Ribbon schools based upon their educational technology use, comfort level, and beliefs. While Blue Ribbon schools displayed a higher correlation as a group between the dependent variables, it did not impact the overall observed difference in significance between both types of schools.

The researcher believes that the examination of the role of educational technology and the relationship to recognized high-achieving K-12 Ohio public schools will help in the development of further studies focused on the correlation of educational technology characteristics and student achievement. In addition, the findings of this study can provide information for continued dialogue on this topic and also strengthen the research literature on the current state of technology integration in K-12 public school classrooms.

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Appendix A

Background Information

In what school building do you start your teaching week?

Enter the first few characters of the name to select.

	Public School Building
School Building	

1. What grades are you teaching this year?

Check all that apply.

- ☐ Preschool - Kindergarten
- ☐ Kindergarten - Grade 1
- ☐ Grades 2 - 3
- ☐ Grades 4 - 5
- ☐ Grades 6 - 8
- ☐ Grades 9 - 12

2. Including the current year, how many years of teaching experience do you have?

- ○ 1 year or less
- ○ 2 - 5 years
- ○ 6 - 12 years
- ○ 13 - 20 years
- ○ 21+ years

3. What subject(s) are you teaching this year?

Check all that apply.

- ☐ Self-contained Elementary
- ☐ Subject-specific Elementary
- ☐ Self-contained Middle/High School
- ☐ Middle/High School Reading/Language Arts
- ☐ Middle/High School Mathematics
- ☐ Middle/High School Science
- ☐ Middle/High School Social Studies, Government, History, etc.
- ☐ **Please check here if you are primarily a special needs teacher**
- ☐ Other, such as Art, Business, Foreign Language (please specify)

Student Technology Use

4. How often do you have your students use the following technology tools to build mastery of the academic content?

	Students do not have access	Never	At least once per year	At least once per month	At least once per week	Daily
Word processing	◯	◯	◯	◯	◯	◯
Spreadsheets	◯	◯	◯	◯	◯	◯
Presentations	◯	◯	◯	◯	◯	◯
Desktop publishing	◯	◯	◯	◯	◯	◯
Drill and practice on basic skills	◯	◯	◯	◯	◯	◯
Content-specific simulation software for students to interactively make decisions and see consequences	◯	◯	◯	◯	◯	◯
Tutorials for self-paced learning	◯	◯	◯	◯	◯	◯
Use of the Internet for the instructional activities listed above?	◯	◯	◯	◯	◯	◯
Use of the Internet as a digital reference for research?	◯	◯	◯	◯	◯	◯
Web page authoring	◯	◯	◯	◯	◯	◯
Video distance learning (telepresence/virtual conferencing)	◯	◯	◯	◯	◯	◯
Concept mapping	◯	◯	◯	◯	◯	◯
Technical design	◯	◯	◯	◯	◯	◯
Multimedia authoring	◯	◯	◯	◯	◯	◯

5. How many computers are available for student use in your classroom?

6. What other technology tools, if any, do you have <u>your students</u> use?

7. In what ways has technology improved the effectiveness of your classroom?

8. What is the primary obstacle you face when utilizing technology in the classroom?

Teacher Technology Use

9. How often do you use technology to...

	I do not have access	Never	At least once per year	At least once per month	At least once per week	Daily
Manage student information?	◯	◯	◯	◯	◯	◯
Examine student performance trends in order to plan instruction?	◯	◯	◯	◯	◯	◯
Administer assessments?	◯	◯	◯	◯	◯	◯
Create lesson plans?	◯	◯	◯	◯	◯	◯
Develop instructional content and activities?	◯	◯	◯	◯	◯	◯
Support standards-based instruction?	◯	◯	◯	◯	◯	◯
Communicate with parents?	◯	◯	◯	◯	◯	◯
Post class-related information using online tools? (i.e., Moodle, Blackboard, Google Apps)	◯	◯	◯	◯	◯	◯
Support instruction with video distance learning?	◯	◯	◯	◯	◯	◯
Access digital video for classroom instruction?	◯	◯	◯	◯	◯	◯

10. Which of the following technologies would you like to have integrated within your classroom?

	Rating	If you already have this technology, do you use it for teaching?
1:1 Computing: Handhelds (e.g., iTouch, Clickers/Student Response System or SRS, Smartphone)		
1:1 Computing: Laptops/Netbooks		
1:1 Computing: Tablets (e.g., e-Reader - iPad, Kindle, Nook)		
ePortfolio tools		
Interactive Surface Technologies (e.g., pad, mimeos, writeboards)		
Learning Management System		
Online courses		
Instructional online gaming		
Interactive virtual worlds		

11. Does your school provide any of the following for your use?

	Do you use this technology?	Would you like access to this technology at your school?
Laptop/netbook		
Desktop		
Media player/device		
Smartphone		
Web 2.0 tools for planning (secure blogs, wikis, social media)		
e-mail account		

12. Is a computer with Internet access available to you during your off-school time? (e.g., your own computer or a computer provided by the school)

◯ Yes

◯ No

13a. Please indicate if you need professional development in any of these areas.

- [ ] Word processing
- [ ] Spreadsheets
- [ ] Presentations
- [ ] Desktop publishing
- [ ] Drill and practice on basic skills
- [ ] Simulation software for students to interactively make decisions and see consequences
- [ ] Tutorials for self-paced learning
- [ ] Internet tools that reinforce content-specific instruction
- [ ] Use of the Internet as a digital reference for research
- [ ] Web page authoring
- [ ] Video distance learning
- [ ] Concept mapping
- [ ] Technical design
- [ ] Multimedia authoring
- [ ] None needed
- [ ] Other (please specify)

Technology Leadership

14. How would you rate your principal in terms of his or her role supporting educational technology?

	Very weak	Moderately weak	Adequate	Moderately strong	Very strong
Being a leader for educational technology	○	○	○	○	○
Encouraging me to use technology in my classroom	○	○	○	○	○
Providing sufficient professional development opportunities to build my capacity to use technology in the classroom	○	○	○	○	○

Technology Beliefs

15. How would you describe your beliefs regarding educational technology?

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I believe technology functions as an effective tool for helping students master the state academic content standards.	○	○	○	○	○
I believe the use of technology makes the process of learning more interesting for students.	○	○	○	○	○
I believe the use of technology saves me time on routine tasks.	○	○	○	○	○
I believe technology improves the effectiveness of my teaching (makes my job more interesting).	○	○	○	○	○

Digital Learning and Web 2.0

16. How often do you or your students access and manage digital media content?

	Never	At least once per year	At least once per month	At least once per week	Daily
How often do you access digital media content online?	◯	◯	◯	◯	◯
How often do your students manage digital media content in the classroom?	◯	◯	◯	◯	◯

17. Rate your level of advocacy for digital learning through the access of audio and video media.

- ◯ Very weak
- ◯ Moderately weak
- ◯ Adequate
- ◯ Moderately strong
- ◯ Very strong

18. Do you have access to district-provided Web 2.0 tools for your classroom? (e.g., blogs, tagging, social bookmarking, podcasting, RSS feeds, or wikis)

- ◯ Yes
- ◯ No

19. What technologies do you use to post lessons and activities for your classroom?

	Yes	No, won't use it	No, but would use the technology if provided
Learning Management System	◯	◯	◯
Short Message Service or SMS (i.e., text messages)	◯	◯	◯
Teacher web page	◯	◯	◯
Blog	◯	◯	◯
Wiki	◯	◯	◯
Podcasting	◯	◯	◯

20. What skill level best expresses your understanding and use of Web 2.0 tools (e.g., blogs, tagging, social bookmarking, podcasting, RSS feeds, wikis)?

- ◯ Very low
- ◯ Low
- ◯ Moderate
- ◯ High
- ◯ Very high

Technology Support

21. When your classroom technology does not work, who provides technical support?

Check all that apply

- ☐ Technology coordinator or technician
- ☐ Student
- ☐ Another teacher
- ☐ Myself
- ☐ Parent
- ☐ Community member
- ☐ Contracted IT
- ☐ Does not apply to me

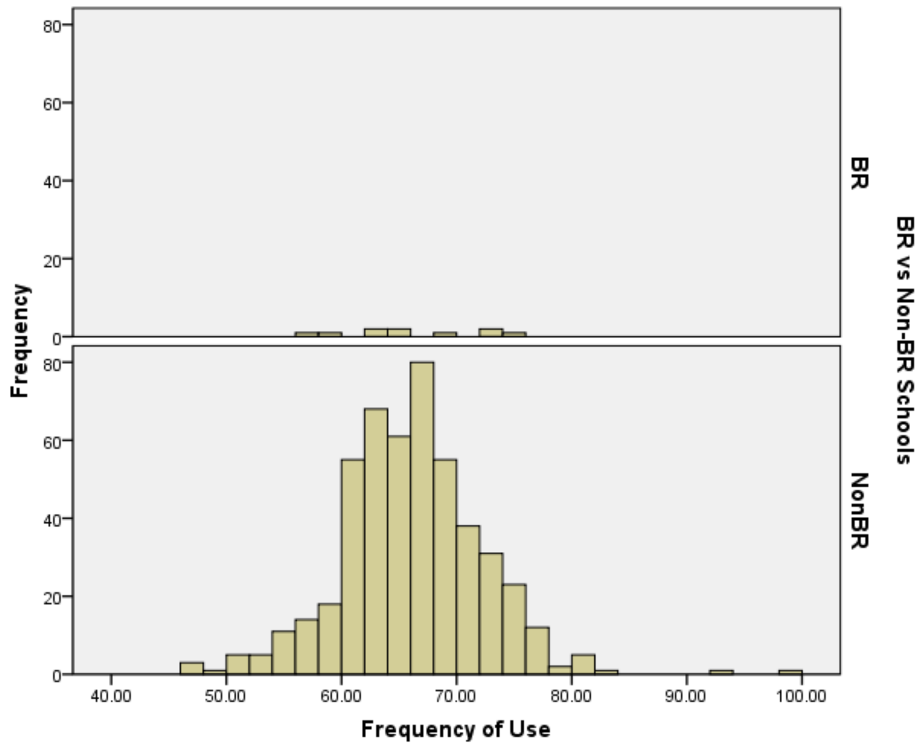
21a. If you rely on someone other than yourself for technology support, how long does it usually take to resolve a problem?

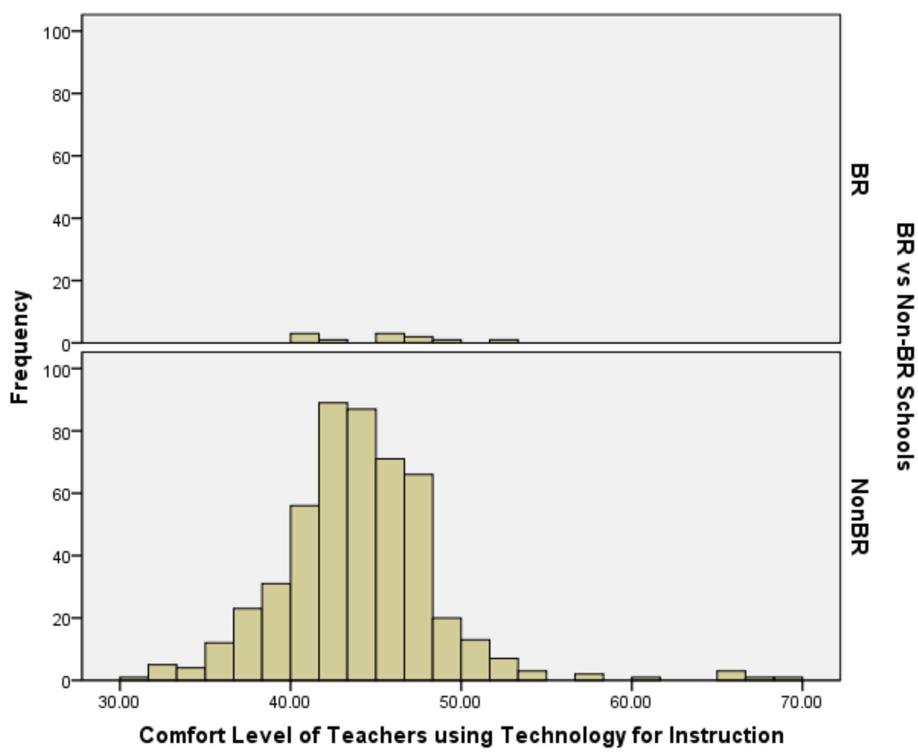
- ◯ Same day
- ◯ Next day
- ◯ 2-3 working days
- ◯ 4-5 working days
- ◯ More than 5 working days
- ◯ Does not apply to me

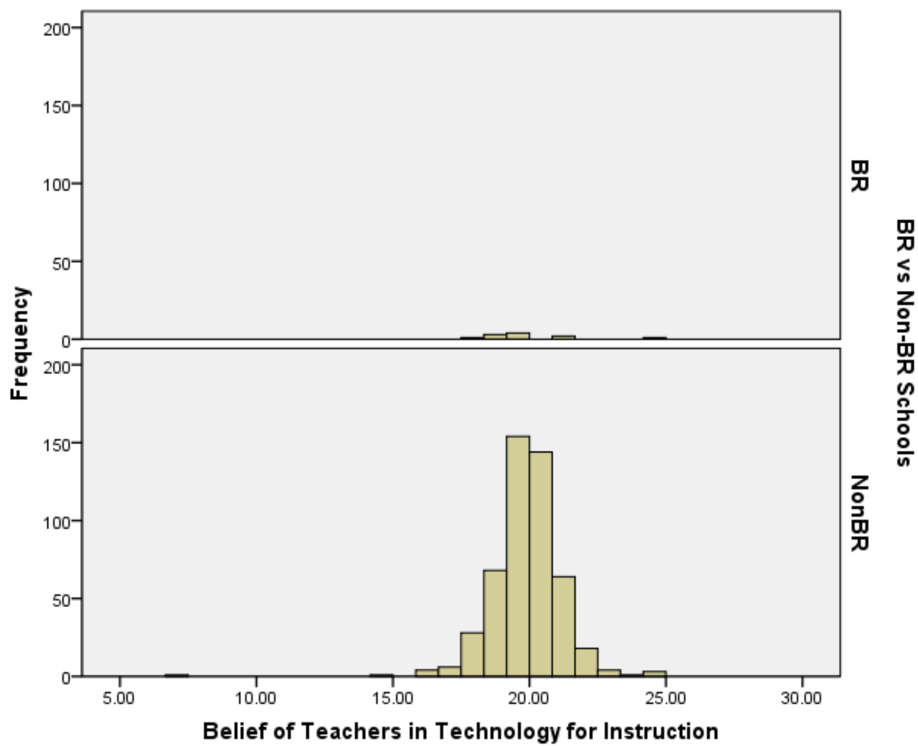
22. What is the primary way you request technology support within the building?

- ◯ Help desk ticket
- ◯ e-mail
- ◯ Phone
- ◯ Face-to-face contact
- ◯ Unsure

Appendix B


Frequency
BR
NonBR
BR vs Non-BR Schools
Frequency of Use


Frequency
BR
NonBR
BR vs Non-BR Schools
Comfort Level of Teachers using Technology for Instruction


Frequency
BR
NonBR
BR vs Non-BR Schools
Belief of Teachers in Technology for Instruction
0
50
100
150
200
5.00
10.00
15.00
20.00
25.00
30.00