# THE EFFECT OF SCHOOL SIZE ON THE UTILIZATION OF EDUCATIONAL TECHNOLOGIES

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# The Effect of School Size on the Utilization of Educational Technologies

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## ABSTRACT

Daniel Patton. THE EFFECT OF SCHOOL SIZE ON THE UTILIZATION OF EDUCATIONAL TECHNOLOGIES. (Under the direction of Dr. Glenn Holzman) School of Education, December, 2008.

The purpose of this study was to investigate the effect of school size, as defined by student enrollment and by total school budget, on the utilization of educational technologies. The focus group for this investigation was Christian schools that were further delineated by three criteria: (a) membership, (b) scope of program, and (c) geographic location. Membership was schools that were members of the Association of Christian Schools International (ACSI). Scope of program was schools with comprehensive programs. Geographic location was schools in two ACSI regions. The survey instrument covered 23 categorical questions, several of which contained sub-questions. Survey data including the categorical questions and sub-questions provided a total of 36 data fields. Five data fields provided demographic information, and 31 data fields provided utilization of educational technologies information. Data from a total of 154 schools were considered in the final analysis. The study did not support the null hypotheses for this research since the analysis of the data found a significant correlation between school size (total enrollment and total school budget) and a school's utilization of educational technologies within a number of the data fields.

# ACKNOWLEDGMENTS

Is a doctoral degree a challenge, an adventure, an accomplishment, or a journey of learning? To this student it is all these and more; it is an opportunity to see God expand knowledge and reliance on Him throughout each step of the process. With a humble spirit of pride, the finish line is now in sight, but certainly it would not be so without the support of several individuals. The researcher is grateful to those who have invested in my professional growth.

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Lastly, a special thanks to the dissertation committee. Dr. Glenn Holzman, committee chair, was a Godsend after waiting for several months to have a new chairperson assigned. In addition to Dr. Holzman, a special thanks to Dr. Tony Horning, lifelong friend and Academic Dean at Montreat College, and to Dr. Scott Watson, Education Department Chair at Liberty University. In the end, it is clear that the hand of God moved to bring the dissertation committee together. A team of individuals whom God allowed to come together for such a time as this—to support, encourage, and prompt the researcher as his journey for a doctoral degree took place.

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# CHAPTER 1: INTRODUCTION

By stopping and listening to the many voices of education, the listener quickly realizes that education is a very complex system with many topics that engender passion. Two such passionate topics frequently debated include school size and educational technologies. The objective of this study was to examine the effect of school size (total enrollment and total school budget) on the utilization of educational technologies.

The evaluation of utilization of educational technologies was largely by assessment of various "standard" technology budget categories in Christian schools. Further evaluation of the utilization of educational technologies was completed by assessment of how Christian schools execute the following: (a) staff for technology utilization, (b) provide technology classes, (c) utilize technology for enhancement of school programs and mission, and (d) integrate technology across the instructional practices.

This research used school size as the controlled variable to compare to educational technology data because school size provided a slightly different vantage point in contrast to the majority of research data available to date. This vantage point focused on nonpublic schools in general and specifically on Christian schools in the southeastern United States.

To begin the investigation of school size on the utilization of technology in the educational setting, one must first understand that the journey into the world of technology in education has been a relatively brief one. This journey essentially began in the late 1970s for most public schools and became a significant presence in the 1980s for

most Christian schools in America. At the turn of the 21st century, technology has become commonplace in education and in society, if not globally; today it has become to be an integral component of education. In many cases, technology has become a cornerstone on which educational systems have built programs, a reversal of the past model, which saw technology as an add-on enrichment to instruction.

Today's American students have grown up with digital technologies. These students have become not merely technologically savvy but have become steeped in the use of an array of digital technologies such as computers, the Internet, instant messaging, cell phones, and e-mail to the point that they use these technologies seamlessly throughout their daily activities. "Time spent using digital media by children age 13-17 has now surpassed the time they spend watching television" (Net Family News, 2005, p. 1).

While the context is not totally relevant to Christian education, a recent statement by the National Center for Education Statistics (NCES, 2004) provided a summary statement of where education is in general today in relationship to technologies:

> "The technology that has so dramatically changed the world outside our schools is now changing the learning and teaching environment within them. This change is driven by an increasingly competitive global economy and the students themselves, who are born and comfortable in the age of the Internet." (p. 6)

## Research Questions

The research focus of this investigation was to determine whether a statistically significant correlation exists: 1) between school size and utilization of educational technologies and 2) between total school budget and utilization of educational

technologies. The researcher understands that the topic of utilization of educational technologies broadly encompasses investment in educational technologies and the use of computer technology to support and enhance the educational learning process. Specifically, there was a need to research the following two questions:

1. Are there any effects of utilization of educational technologies within Christian schools of various school size categories?
2. Are there any effects of utilization of educational technologies within Christian schools of various total school budget categories?

## The Hypotheses

To determine statistical probability for the quantitative study, null hypotheses that correspond with the research questions were established. The following null hypotheses were used for this study:

HO1: There will be no statistical difference in utilization of educational technologies among Christian schools of various school size classifications.

HO2: There will be no statistical difference in utilization of educational technologies among Christian schools of various total school budget classifications.

## Basic Assumptions

The following assumptions were made within the context of this study:

1. Categorization of “school size” was well documented for public schools within the United States but did not transfer well to the Christian-school context in most correlated areas; it was not an “apples-to-apples” comparison. Therefore, the categories delineated for school size were largely developed from analysis of total

2. school enrollment data available from the Association of Christian Schools International (ACSI).
3. Categorization of the "utilization of educational technologies" was developed as a generalization of technology categories as it related to educational settings and was not developed from a business (for profit) concept. In addition, utilization of educational technologies were considered to be those technology opportunities that were reasonably available to most Christian schools in our country, within the definition of limited budgets.

## Definitions of Terms

1. *School size* was defined as the total enrollment of any single Christian school. A single school was the sum total of all enrolled students in all programs within one Christian school or Christian school system. The six categories of school size included in the research were Christian schools with total enrollments of 0-250; 251-500; 501-750; 751-1,000; 1,001-1,500; and 1,501-2,000 students.
2. "*Comprehensive program*" or "combined program" classification equated to schools with both elementary and secondary grades. While the reader could use somewhat interchangeably the terms "combined" and "comprehensive" in this dissertation study, the intent was to understand that schools within the context of this study had grade levels that started at the preschool or kindergarten level and were sustained through at least what was viewed as secondary grades (i.e., at least sixth grade).
3. *Total school budget* was defined as the financial resources allocated for the operation of a single Christian school for the last fiscal year that data was available. The range of total school budgets in the data set was $25 K to $12 M, and the mean for all

schools in the data set was $72,328.

4. *Utilization of educational technologies* referred to: 1) the spending of a school's financial resources (validated by school budget allocations) or what was included in the financial categories of a school's "technology budget" and to 2) the use of technology to enhance the educational learning process. The Consortium for School Networking (as cited in Redhead, 2001, p. 12) stated that technology utilization and investment should be total cost of ownership (TCO). "TCO includes all of the costs associated with using and maintaining networked computers, respective of whether a school district (or school) owns or leases them" (Redhead, pp. 12-13).

The researcher subscribed to this summary definition for the utilization of educational technologies; however, more specificity was needed. Therefore, a model developed by the Gartner Group was used to define utilization of educational technologies. The Gartner Group is a United States based consulting organization that provides technology services to schools and industry such as research, measurement, and decision support. Redhead (2001) referenced the work of the Gartner Group in his article "Investigating the Total Cost of Technology in Schools: Tools and Strategies for Managing Technology Investments" and included the following core categories, which were included in this research:

a) Hardware: computer equipment and peripheral devices used by students and staff.
b) Resources: software, applications, Internet connections, consumable supplies used by students and staff.
c) infrastructure: components provided in the school building to make it possible to add computer workstations to the network, consisting of the school's local area

d) network, wide area network, and the Internet.

e) Technology support: service provided by school staff, vendors, or third-party contractors to keep the hardware, software, and infrastructure functioning effectively and efficiently.

f) Professional development: activities used to assist staff in learning to use technology effectively and efficiently.

g) Management and planning: budget planning included for technology utilization within the school or school system.

For specific purposes of this dissertation, all six areas as defined by Redhead were included in the final definition for utilization of educational technologies as well as the development, implementation, and utilization of a school technology plan; offering technology courses based on prescribed curricula; and the utilization of educational technologies to support and enhance the school's programs.

## Participants in the Study

The participants in the research study were Christian schools located in two regions of the United States. These regions (Florida and Southeast) were defined by ACSI and encompassed the following eight states: Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia.

## Professional Significance of the Study

This study added quantifiable data to a very limited amount of previous research and was focused on answering the questions "Does school size significantly impact a school's ability to utilize educational technologies?" and "Does total school budget significant impact a school's ability to utilize educational technologies?"

This research also provided a foundational baseline for future research opportunities in the study of educational technologies and their impact on Christian education and education in general, including research related to student achievement impacted by educational technologies.

# CHAPTER 2: REVIEW OF THE LITERATURE

Before launching into a review of the literature related to school size (total enrollment and total school budget) and the utilization of educational technologies, it was important to put Christian education into context because it was the focus of research in this dissertation.

## Historical Background of Independent Christian Day Schools

Protestant-sponsored weekday schooling has not been new to American education. Throughout the Colonial and early national periods, Protestant churches such as Lutheran, Friends, Moravian, Baptist, German Reformed, and Anglican established day schools for their children and charity schools for children of the poor (Cuban, 2001). Although most writers have purported that education in America dates back to the 17th century, Burns and Kohbrenner (1937) have noted that Catholic mission schools were present in the colonies as early as 1594. Bramblet (1985) has placed the first Christian school at 1607 and has placed a beginning of the modern-day tax-supported government schools at about 1850, the zenith of Horace Mann's influence on public schools. He has posited that it was not until about the turn of the century that public schools came into full influence.

During the 19th century, traditional Presbyterians numbered among several denominations that experimented with alternatives to common schools. By the late 1800s, most Protestant denominations supported public schooling (Kaestle, 1983; Kraushaar, 1972; Sherrill, 1932). During this time, the common school had Bible reading without comment, prayers, hymns, and Protestant teachers; Sunday school was expected to stress

the particular tenets of the various denominations (Kennedy, 1966; Lynn, 1964; Lynn & Wright, 1980, p. 503). The domination of the public (secular) schools during the 20th century, has made it difficult to comprehend that education in America had its genesis in the Christian school. By 1900, approximately 92% of elementary and secondary students attended public institutions. Private schools, the vast majority of which were Roman Catholic, enrolled about 8% (Wattenberg, 1976). Stein (2000) has provided a timeline (Figure 1) representing the period of almost 250 years that Christian schools dominated the education scene. Not only did Christian schools predate the public schools, but also the public school had its origin in the Christian schools.

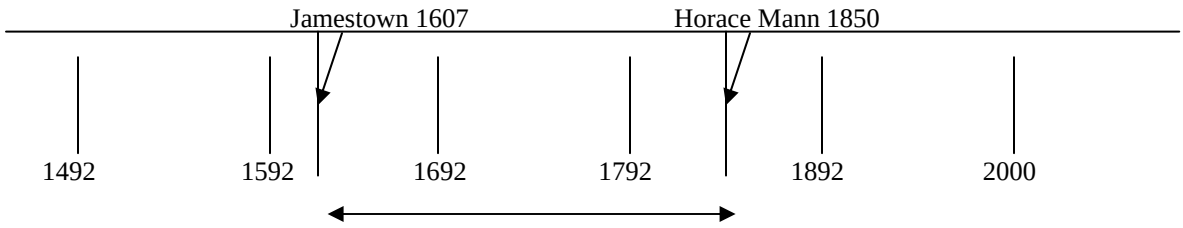


**Figure 1: Christian Schools**

*Figure 1*. Christian-school timeline.

From *A Comparative Study of Public School and Christian School Classroom Environments* [unpublished doctoral dissertation, Capella University] (p. 35), by S. G. Stein, 2000.

The early 20th century witnessed the gradual decline of Protestant influence on American culture and on public schools and the growing influence of secularism (Noll, 1992). In his 1899 book *The School and Society*, noted humanist John Dewey (as cited in Noll) elaborated a philosophy of education in which religion had no place. Owing in large part to his influence, the public school system had become a secular school system.

Dewey's philosophy continued to drive the secularization of the public school system into the 20th century until the judicial system made its impact.

In addition to the cultural and political crises of the 1960s and 1970s, the effects of Darwinism, as well as the 1962 and 1963 Supreme Court rulings regarding prayer and devotional Bible reading in tax-supported schools, compelled conservative Protestants to regain control of their children's education (Carper & Layman, 1997). In the 1960s, because of the continued disenchantment with the ongoing secularization of public education, a resurgent evangelical faith and, in some cases, fears related to desegregation sparked the phenomenal increase in the number of Christian day schools (Carper & Hunt, 1984). Bond (1977) has argued that, prior to the Supreme Court decision to remove prayer from the public school, Protestant Christians, were by and large, indifferent to the public schools. Most have scholars now estimated that from the 1960s to the early 1990s between 8,000 and 12,000 independent Christian day schools were founded (Carper, 1983; Cooper & Dondero, 1991).

Wood (1984) has made the point that "religion and education have overlapping interests, common territories" (p. 12). When viewing the present state of public education from a historical perspective, Wood stated, "Secularity and separation are relatively recent, disturbing novel notions. . . . for most of recorded history, the prevailing concern has been more for how education and religion relate than how they separate" (p. 12).

With Christian education on the rise at the end of the 20th century, the institutions that both organized and supported Christian education became more established in the fabric of education. These institutions included the National Christian School Education, the Ohio Association of Christian Schools, and the Western Association of Christian

Schools. These three organizations merged in 1978 to form the Association of Christian Schools International (ACSI). Records from these independent organizations (pre-1978) and then from the new ACSI organization (post-1978) reflected the growth pattern of Christian schools in America. In 1967 there were 102 member schools in the three organizations (K–12) with an enrollment of 14,569. By 1973 there were 308 member schools with enrollment of 39,360. In 1983 there were 1,900 ACSI member schools with an enrollment of 270,000. By 1993 there were 2,801 member schools with an enrollment of 463,868 (Carper & Layman, 2002). Today ACSI (2008b) cites membership of more than 5,000 schools with an enrollment of over 1 million students in more than 100 countries.

NCES (2008b) has stated that U.S. private schools currently account for about 24% of all elementary and secondary schools, 11% of all students, and 12% of all full-time teachers (p. 1). Seventy-six percent of private schools have had a religious affiliation, while the remaining 24% are nonsectarian (NCES, 2008b). While the growth pattern of the 1960s–1990s has certainly leveled in recent years, the growth of Christian education in America has been one that has clearly tracked its humble beginnings and has demonstrated God's hand of working in and through Christian education throughout many changes in American society.

## School Size

School size has often been a mystical term in education. In some urban settings a small school might have been considered a megaschool in a rural setting. To delineate further, the meaning of a large school may have had a very different meaning for a public-school administrator than it did to a Christian-school administrator. In fact, few

Christian schools in America have had enrollments over 1,000 students, whereas a large percentage of public schools have had enrollments far exceeding 1,000 students.

Based on 2005 data (NCES, 2008b), there were approximately 120,000 schools in the United States, of which 24%, or 28,996, were private elementary and secondary schools (p. 1). In addition, 2005 data indicated approximately 54 million students in public and private education in America, of which 5,057,520 students were enrolled in private schools, including those in Christian private schools (NCES, 2008b). These data have provided an approximation of average school size in the public and private school sectors. U.S. public school enrollment of 49 million students in 2005 divided by approximately 91,000 public schools in 2005 equaled approximately 538 students for the average public school size. U.S. private school enrollment in 2005 of 5,057,520 students divided by 28,996 private schools equaled approximately 174 students for the average school size (NCES, 2008a; NCES, 2008b). While these data were not intended to be extensive, one can posit that school size and the potential meaning of school size may not be very comparable between the public and private school educators.

The topic of school size has largely been driven by either the wind of economic efficiency or the wind of educational outcomes. Although significant research on school size within public education has been substantial, there still remains major disagreement about optimal school size. Likewise, within Christian education there exists little research relating to optimal school size and its effect on education.

A common assumption in the business world has been that larger organizations operate more efficiently than smaller organizations (economies of scale); increasing size decreases per-unit costs (Jewell, 1989). When applied to schools, this reasoning has

implied that larger schools should be more cost-effective than smaller schools (Mullins, 1973; Sybouts & Bartling, 1988). A methodological problem that has appeared occasionally in school-size research has been advocacy style (Johnston & Pennypacker, 1993). That is, the research has been conducted either for or against school consolidation instead of designing the research to evaluate school size without a predetermined desire to confirm a specific point of view. In the public sector of education, advocates have argued that the ideal high school should have between 1,000 and 2,000 students because schools with fewer than 1,000 students are unable to purchase in quantity and have high per-pupil administrative costs (Fox, 1981).

In addition, support for the economies of scale has not been fully endorsed by either educators or statisticians in the public sector. Furthermore, little research has been published as it relates to Christian schools. Monk (1987) found that after school enrollment has reached 400 students, no benefit has related to economies of scale. Fox (1981) found that cost curves have actually taken the shape of a U; increasing school size beyond an optimal level has increased rather than decreased per-pupil cost. Several questions quickly surface:

1. Will the same pattern of economies of scale prove consistent in Christian education with the current trend of larger Christian schools and even the potential of mega-Christian schools in the future?
2. Do technology costs follow the normal curve of school-size economies of scale, demonstrating a correlation of costs between Christian and public schools?
3. Can we transfer the past and present research from public education into the realm of Christian education?

4. Is there an optimal size for Christian schools to more effectively utilize educational technologies?

In most cases, the public school research was not directly applicable to Christian schools as it related to school size and could not be reasonably applied. For example, there were no schools in this research study that have enrollments of over 1,000 high school students; only a few (14 out of 154) had total school enrollment of over 1,000 students. Christian school research data were very limited in many areas and especially in relationship to school size and technology initiatives.

For an understanding of private school size, including Christian schools, the following section has outlined school-size data currently available. The Private School Universe Survey (PSS) was conducted by NCES to collect basic information on American private elementary and secondary schools. First collected in the 1989-1990 school year, the PSS was collected every two years. According to NCES 2005-2006 data, there were approximately 28,996 private schools in the United States with a total enrollment of approximately 5,057,520 students (NCES, 2008b). These same data provided a breakdown of school-size data that was similar to that summarized by ACSI and relevant to the school-size categories utilized within this research study.

According to these NCES (2008a) data, one can quickly discern that there was a significant number 32.8% of private schools (including Christian schools) that had enrollments of less than 50 students; a large number 61.3% of private schools (including Christian schools) that had enrollments of fewer than 150 students; and 82.7% of surveyed schools reported enrollments of fewer than 300 students. The following data pertained to all private schools in all geographic regions of the United States.

Table 1

*U.S. Private School Size: NCES 2008 Data (All Regions of the United States)*

| School Size (Number of Students) | Number of Schools | Percentage of Schools |
|---|---|---|
| < 50 | 9,520 | 32.8 |
| 50-149 | 8,277 | 28.5 |
| 150-299 | 6,202 | 21.4 |
| 300-499 | 2,843 | 9.8 |
| 500-749s | 1,342 | 4.6 |
| 750 or more | 812 | 2.8 |

*Note*. From *Characteristics of Private Schools in the United States: Results from the 2005–06 Private School Survey* (Table 1), by National Center for Education Statistics, 2008 (http://nces.ed.gov/pubs2008/2008315.pdf).

In addition, NCES (2008a, Table 1) provided a breakdown of the data by geographic region, including the South region of the United States. While the NCES South region contained all states in this study (the eight states included in Florida and Southeast ACSI regions), it also contained nine additional states defined as South by the U.S. Census Bureau. Data for the South region showed many similarities to the national NCES data with schools less than 50 students comprising 32.8% of all schools at the national survey level and 36.0 % of all schools in the South region. The data also aligned with the ACSI data regarding large schools (as defined by ACSI) which also comprised less than 5% of the total number of schools. Schools in each of the six school size categories were within a couple of percentage points when national data was compared to South region data. Table 2 next page shows the school size analysis for private schools in the South region of the United States:

Table 2

*U.S. Private School Size: NCES 2008 Data (South Region of the United States Only)*

| School Size (Number of Students) | Number of Schools | Percentage of Schools |
|---|---|---|
| < 50 | 3,318 | 36.0 |
| 50-149 | 2,517 | 27.3 |
| 150-299 | 1,737 | 18.8 |
| 300-499 | 855 | 9.3 |
| 500-749 | 472 | 5.1 |
| 750 or more | 325 | 3.5 |

*Note*. From *Characteristics of Private Schools in the United States: Results from the 2005–06 Private School Survey* (Table 1), by National Center for Education Statistics, 2008 (http://nces.ed.gov/pubs2008/2008315.pdf).

The NCES data has indicated both within the South region and within the total United States that a high percentage of private schools have total school enrollment of fewer than 300 students.

On average, data comparisons of private and public schools indicated that private schools have smaller enrollments, smaller average class sizes, and lower student:teacher ratios than most public schools (Council for American Private Education, 2008, p. 2). School size was typically related to the population density of the local area and its age distribution for children; for private schools, local demand for a school's instructional philosophy also contributed to size of enrollment. In the 2005-2006 school year, the average private school had 174 students, based on data derived from a total of 5,057,020 students in 28,996 private schools (NCES, 2008a, Table 1). The last year for which comparative data were available from NCES for both private and public schools was

2004-2005. These data recorded a total of just over 48 million students in 95,726 public schools, or an average of just over 505 students per school, compared to NCES data for 28,384 private schools of just over 5 million students with an average of 180 students per school.

Recent ACSI (2008a) data for school year 2007-2008 from schools (1,763 out of 3,671) responding to the annual survey reflected enrollments as summarized in Table 3.

Table 3

*ACSI 2007 School Size Data*

| Number of students | Percentage of responding schools |
|---|---|
| < 100 | 33.6 |
| 100-199 | 26.7 |
| 200-399 | 23.1 |
| 400-699 | 10.4 |
| 700-999 | 3.4 |
| 1,000 or more | 2.8 |

*Note*. From *Annual School Survey 2007–08 Report*, by Association of Christian Schools International, 2008 (http://www.dev-test.com/ACSI/2007-08).

ACSI categories of school size differed from those tabulated by NCES; however, the data again appeared to indicate a high percentage of schools with enrollments under 200 students.

In contrast to NCES and ACSI findings, data compiled by the National Association of Independent Schools for the 2007-2008 school year received from 1,083 survey responses from day schools indicated a total enrollment of 546,723 students, or an

average of 505 students per school with a median enrollment of 406 students per school ([NAIS], 2008a). This average was substantially higher than the average derived from ACSI (2008a) annual survey 2007-2008 data that report an average of 247 students per school. Further inquiry would be necessary to determine if these data were fully comparative, or if schools that belong to NAIS have had substantially higher average school enrollments than those reported by ACSI and NCES.

In summary, an evaluation of ACSI and NCES data has appeared to show a significant difference between the average size of a typical public school in America and the average size of a typical Christian school in America. The average size of Christian schools in America has been substantially smaller than public schools, and it has been important to consider this factor within the context of this present study.

## Utilization of Educational Technologies

In the review of the literature as it relates to the utilization of educational technologies, many influences have created pressure on Christian schools to invest in and use educational technologies. These influences may have included school size (under investigation in this study), total school budget (also under investigation in this study), geographic location of the school, age of the school, rural versus urban location, independent versus church school, existing board structure in the school, and many others. In addition, global pressures have had the potential to create positive or negative pressure on Christian schools to invest in and utilize educational technologies. They have included pressure from corporate America, international or global businesses, college and universities, and many others.

Sergiovanni (2006) has described culture as the “normative glue that holds a

particular school together. With shared visions, values, and beliefs at its heart, culture serves as a compass setting, steering people in a common direction" (p. 145). Culture, both internal and external to the school, has had the potential to pressure schools to make appropriate and sometimes inappropriate education decisions. In terms of investment in education, technology has been one area that some argue has been promoted to the extreme because of "external culture" versus sound educational research.

Vision has been an important element of technology integration because it forecasts the direction that teachers and administrators will take as they plan for the future (Johnson, 2006, p. 3). A vision for investment in, utilization of, and integration of technology into educational settings has been the baseline for positive impact from technological investment.

Baylor and Ritchie (2003) found that strong technology leadership positively impacted student learning and reinforced technology use through incentives, recognition, and a focus on professional development. They found that certain characteristics were present in principals who support technology integration. They included the following: (a) value of new ideas, (b) vision for technology use in the classroom, and (c) use of technology in the classroom as a teacher evaluation standard. Educational leaders have inspired a shared vision for comprehensive integration of technology and have fostered an environment and culture conducive to the realization of that vision (International Society for Technology in Education, 2007a). Leadership has become a third area of global/macro influence, as well as school/micro influence on educational technologies. When the culture has become aligned with the vision of the school, and when capable leadership is present, technology makes a difference in many educational settings.

Osborne, Costello, Data, and Shattuck (2004) found that leadership was critical to the early acceptance of technological changes or tolerance to change by faculty and staff. Technology change has had its own history within Christian education. In 2000, ACSI provided leadership by establishing a technology plan to incorporate computer-based technologies in all of ACSI's 5,000 plus schools and throughout the approved academic curriculum. This created a "culture shock" with ACSI schools in general and with faculty within those ACSI schools that were proactive in taking this new direction (Thornhill, 2007, p. 3).

In order for technology to take root in education, utilization of educational technologies has to take place. Technology has become everywhere: in our homes, in our businesses, in our cars, and, yes, in our schools. As stated earlier, "The technology that has so dramatically changed the world outside our schools is now changing the learning and teaching environment within them. This change has been driven by an increasingly competitive global economy and the students themselves, who are born and comfortable in the age of the Internet" (NCES, 2005).

In March of 2007, *Education Week* published its annual assessment of technology entitled "Technology Counts 2007." This article marked the 10th anniversary of the first report on the state of technology in the United States. In the first (1998) edition of "Technology Counts," the editors wrote:

> Billions of dollars are being spent each year in an effort to prepare schools and students for tomorrow's technological demands and challenges. . . . And the fast-changing landscape of educational technology only complicates the task for

> policymakers and administrators who seek to make "smart" decisions about how to proceed (as quoted in "Technology Counts 2007," p. 8).

The editors of the March 2007 *Education Week* stated, "A decade later, the task of making sense of that fast-changing landscape remains just as complicated" ("Technology Counts 2007," p. 8).

Technology has become pervasive in education. Virtually all public schools and the vast majority of private schools now have access to computers and the Internet. Expenditures to equip schools with computers and related technology have steadily increased at the national, state, and school levels. The U.S. Census Bureau (2005) has reported that in 2003 the educational services sector spent $1.6 billion on non-capitalized information and communications technology (ICT) expenditures (p. ix). In 2005 the educational services sector spent $1.6 billion for non-capitalized expenditures and $2.0 billion for capitalized expenditures (U.S. Census Bureau, 2007, p. ix). The financial investment has resulted in both an improved student:computer ratio and increased connectivity to the Internet. Nationwide the ratio of students to computers has fallen from an average of 12.1:1 in 1998 to 3.8:1 in 2005. With respect to this trend line, the 2005 ratio of 3.8:1 also represented a decrease from 2003, when the ratio of students to instructional computers was 4.4:1 (NCES, 2006, p. 1).

The "Technology Counts 2008" annual assessment has provided a line graph based on NCES 2006 statistics entitled "Access Is Now Virtually Universal" (p. 39). The graph indicated that 100% of public schools and 94% of public school classrooms have had Internet access. These findings were in sharp contrast to those in the mid-1990s as reported by Bauseil (2008) in *Education Week's* "Tracking U.S. Trends." Bauseil

reported that in 1994 just over a third (35%) of U.S. public schools had access to the Internet and that the integration of Internet technology into classrooms had followed a similar trajectory: only 3% had Internet classroom access in 1994.

Another trend in the utilization of educational technologies has become distance learning. More than one third of American schools have students enrolled in distance education programs, expanding the range of courses available to them. Wells & Lewis (2006) have stated that 32% of public schools in America provided access for students to online distance learning for courses that are otherwise unavailable at the schools (p. 10). They have further stated that secondary schools were more likely to provide distance learning by 57% to elementary grades equal to 24% and rural areas providing a higher percentage of online classes than cities by 43% compared to 25% (p. 10). “Cyber/online charter schools are being established all across the country. Some states are even sponsoring virtual schools that offer state-centralized courses via Internet or Web-based methods” (Moore, 2005). Over the past two decades, educational leaders have seen technology become a major force in the operation of this nation’s schools, both public and private, and in their instructional and curricular decisions, and now in their decisions to provide online learning opportunities.

What is the state of utilization of educational technologies in Christian schools in America? The answer is significant investment in educational technologies for most Christian schools, as well as public schools in America. During just 3 years of comparable data from the U.S. Census Bureau, the data has revealed massive investment in educational technologies as follows: 2004, a total of $3.6 billion; 2005, a total of $3.7 billion; and 2006, a total of $3.5 billion; in total for these years, almost $11 billion spent

on technology in education (U.S. Census Bureau, 2006, p. ix; 2007, p. ix; 2008, p. 1).

Although written a decade ago, Bain's 1998 article "Caught in the Net" compared technology in education to the other perfect storm. Bain stated:

> There is no more apt example than the current maelstrom of technological innovation engulfing schools. Whether running before the winds of change, questioning the seaworthiness of our school for the impending tempest of computer networks and curricular reforms, or riding out the consequences of decisions already made, we are all facing a storm, potentially treacherous, ever changing, and fast moving. To be drawn into the techno-hype vortex without a vision and an educational compass almost guarantees the creation of the perfect storm in a school.

Clearly, technology investment has been substantial within American education, both public and private, in the last decade and before, and in schools of almost any size. Data from an NCES paper entitled "Computer and Internet Use by Students in 2003" has indicated that "about 91 percent (53 million persons) of children age 3 and over and in nursery school through grade 12 use computers, and about 59 percent (35 million persons) use the Internet" (DeBell & Chapman, 2006, p. iii). Research strongly supports that student use of computers (i.e., part of technology investment) has become a major component of education.

Redhead (2001), in his article "Investigating the Total Cost of Technology in Schools," found that the total cost of ownership related to technology remains an illusive target. Redhead posed the following questions:

1. Do schools really know what they have and are spending on technology?

2. Has technology consumed too much of the school budget?
3. Has technology been worth the cost?
4. How much has been enough to spend on technology support and professional development?

Part of the problem of understanding the investment that schools were making in educational technologies was determining the actual cost of technology investment. TCO is one tool that enables schools to determine both direct and indirect costs of technologies utilized in their setting.

As stated in chapter 1, TCO has included hardware, resources, infrastructure, technology support, professional development, and management and planning. Within these six areas were some areas of direct cost that were easier for schools, public and Christian schools alike, to establish firm financial data. There was within the total cost of educational technologies a substantial level of indirect or "hidden" costs. Indirect cost included labor time that was invested in technology support but not billed to IT, file and data management time invested by those outside of IT staff, and productivity downtime when the computer or network was down, to name a few areas of indirect IT cost. Gartner Measurement (2003, p. 7) has determined that indirect costs can contribute as much as 60% to overall TCO.

Bower (2005) stated, "In industry, the rule of thumb for technology investment is a third for hardware, a third for software, and a third for training and support. A substantial 80-85% of education technology funding has been spent on hardware and wiring over the years, leaving only 15-20% for software, training, and the vital support of hardware and applications. The result has been school labs full of machines that cannot

run software on their networks, and children learning Microsoft Paint as an educational activity. The largest problem has been the overemphasis on hardware."

To further emphasize the concern with overinvestment in hardware, Barton has stated (as cited in Johnson, 2006), "Computers without adequate software for classroom instruction are 'dumb machines' which don't have the capacity to impact student learning" (p. 53).

Again, these statements have raised the following questions in the minds of educators:

1. Should the standards in industry (one third hardware, one third software, one third training and support) transfer into education?
2. Is education so far behind corporate America that the only way to bridge the gap is by heavy investment in technology hardware?

Within the context of this research, there were eight "technology budget" data fields completed by the sample set of 154 schools. These fields were developed to determine the level of school "utilization of educational technologies." The expense categories included the following: technology director, technology curriculum, hardware, software, technology training, outsourced tech support, connectivity, and other technology expenditures. In addition to these questions designed to gather quantifiable data, there were additional research questions that were created to ascertain further a school's utilization of educational technologies. These additional "utilization of educational technologies" questions were included to further validate correlation strength between school size (total enrollment and total school budget) and utilization of educational technologies and were as follows:

1. Check the statement that most closely applies to your school, regarding school-wide use of technology. Answer options were 1) all, 2) most, 3) few, and 4) no instructional classrooms have computers with network and Internet access.
2. Check all statements that apply to your school. Answer options were 1) faculty news is shared by e-mail, 2) faculty Web sites are hosted on your school Web site, 3) faculty Web sites are connected to outside Web sites through your school Web site, 4) faculty use an on-line student grade book, and 5) parents have access to student attendance and grades through an on-line access.
3. Does your school have a network-wide filtration appliance or software to limit access to questionable Web material? 1) Yes or 2) no.
4. How many years is a computer in use in your school before it is considered obsolete? Answer options were 1) 5 years or more, 2) 3-4 years, and 3) less than 3 years.
5. Estimate the percentage of teachers in your school at each skill level in the use of technology in instruction. Answers totaled 100% and were 1) % Beginner, 2) % Intermediate, and 3) % Advanced.
6. Does your school employ an "on-staff" technology director (employee) who has a minimum of 50% of his or her time devoted to educational technology support?
7. How many full-time equivalent computer/technology teachers are employed in your school, not including the technology director if you have one?
8. Does your school have a set "computer or technology" curriculum?
9. How many computer or technology course offerings does your school offer in each of the following program levels? Answer options were a) preschool,

b) elementary school, c) middle school, and d) high school.

10. Does your school have a technology plan?
11. What is the total number of computers your school has available for student and instructional use?
12. Does your school offer any “on-line” classes? If so, at what grade levels?

The utilization of educational technologies has gone beyond merely looking at budget numbers because in many cases the budget numbers do not tell the entire story about a school’s true investment and utilization of educational technologies. In addition, the current level of investment in technology has been deemed inadequate according to recent research (Florida Department of Education, 2006, p. 3). *Florida STAR Survey Results: Fall 2005 Overview* revealed that “only 8% of schools surveyed reported technology funding for hardware and software that was adequate to maintain their current level and make all purchases necessary for desired growth” (Florida Department of Education, p. 3). STAR (System for Technology Accountability and Rigor) survey analysis also indicated that only 25% of the schools surveyed reported enough investment dollars to purchase all software necessary or to maintain their current level of software. In effect, the 2,658 schools in the STAR sample set did not believe that hardware and software investment was adequate (Florida Department of Education, p. 3). An additional statement of interest from this survey, while not a survey of Christian Schools, was that “the most common additional source for technology funding was PTA/PTO (or other school organizations), followed by donations” (Florida Department of Education, p. 4). It was an interesting statement in view of the fact that Christian school investment in educational technologies was often a direct result of fundraising activities.

Recent nationwide ACSI (2008a) data (1,763 out of 3,671 ACSI member schools responding to the survey) summarized that 19% of schools have an average of 4 or fewer students per computer, 22% have 5-6 students per computer, 18% have 7-8 students per computer, 11% have 9-10 students per computer, 8% have 11-12 students per computer, and 21% have more than 12 students per computer.

NAIS data (2008a, Table 3) for independent schools reflected a nationwide average of 4.5 students per computer for the 1,083 responding schools. With information arranged by state, this same NAIS source provided detail for five of the eight states included in the research survey and provides data indicating an average number of students per computer for the 2007-2008 school year for the following states: Florida 3.9, Georgia 3.2, North Carolina 3.0, Tennessee 13.0, and Virginia 4.2 students per computer (NAIS, 2008b).

These findings appear to indicate that private schools and Christian schools have approached the computer-to-student ratio stated as a target for public schools just a few years ago. The research of Statham and Torell (as cited in Ringstaff & Kelley, 2002) suggested that a 1:5 computer-to-student ratio would assure students “near universal access” (Ringstaff & Kelley, p. 18).

NAIS (2008b) also has reported an average of $234 for technology expenses per student, or a total of almost $128 million of technology expenditures per year for the 1,083 responding schools (Table 3). This same NAIS source of independent school data (those schools in the geographic region of this study) reported an average technology expense per student for the 2007-2008 school year for the following states: Florida $166, Georgia $170, North Carolina $157, Tennessee $195, and Virginia $251 (NAIS, 2008b).

In addition, NAIS data has provided summary data for independent schools that were Southern Association of Independent Schools members (164 schools responded); their summary average reflected 5.5 students per computer and an average of $186 for technology expenses per student (NAIS, 2008b). Unfortunately, ACSI annual survey data for this past year or preceding years did not contain this type of summary data for technology.

"Twenty-five years ago, having a computer in your classroom -- or for that matter, your school -- was a mark of distinction" ("Technology Counts 2007," 2007, p. 8). The question was not whether computers belonged in classrooms but how they can be put to most effective use and how schools could ensure that all of their students were receiving opportunities for the utilization of educational technologies. Despite schools' evident commitment to technology, some research have indicated that teachers continue to use computers to maintain their current teaching methods rather than to promote innovative practices (Cuban, 2001). Survey data from a 2001 *Education Week*/Market Data Retrieval/Harris Interactive poll of students, for example, found that only 29% of students said teachers use a computer to help them understand a problem in a different way ("Technology in Education," 2004).

In the 11th edition of *Education Week's* "Technology Counts" reported, the focus was "Push to Improve Science, Technology, Engineering, and Mathematics" (Editorial Projects in Education Research Center, 2008, p. 2). Included in this report was a detailed, state-by-state technology rating for all states in the United States. To provide a generalization from these data as they relate to investment in educational technologies, Table 4 has displayed the grade given for the states within this study for the following

categories of technology: overall technology, access to technology, use of technology, and capacity to use technology. Although it was noted that many of these data were drawn from public schools within each state, the findings strongly support the need for the present study. A summary table of the grades for the eight states has been provided. There were a number of shared rankings between states; for example, both Georgia and North Carolina had a ranking of 1 for use of technology.

Table 4

*State-level Grades and Rankings: All States Within Region of Study*

| | AL | FL | GA | MS | NC | SC | TN | VA |
|---|---|---|---|---|---|---|---|---|
| Overall technology | C (39)* | B (7) | A- (3) | C- (44) | B- (10) | B- (16) | C (36) | B+ (4) |
| Access to technology | D (39) | B- (16) | C (26) | F (47) | C+ (19) | B- (16) | C- (33) | A- (7) |
| Use of technology | B- (17) | A- (5) | A (1) | B- (17) | A (1) | B- (17) | B- (17) | A- (5) |
| Capacity to use technology | C (25) | B (4) | A (1) | C (25) | D (38) | B- (13) | C (25) | B (4) |

*Note*. Data compiled from "Technology Counts 2008: STEM: The Push to Improve Science, Technology, Engineering, and Mathematics," by Editorial Projects in Education Research Center, 2008.
*Numbers in brackets represent each state's ranking out of the 50 states and the District of Columbia.

A cursory look at the data as they relate to "use of technology" has indicated that four of the eight states of reference had an *A* rating, and four had a *B* rating for "use of technology." In addition, the lowest-ranked rating in "use of technology" among these states was a tie for 17 out of 50 states and the District of Columbia. Although it could be the topic for another research project, the point of reference here was the fact that there could be a correlation between a state's "use of technology" rating and how much

emphasis Christian schools in those same states place on the “use of technology.” Suggestions for further research on this topic have been included in the chapter “Findings and Recommendations.”

A final area of interest related to investment in educational technologies that was expanded in the “Findings” chapter of this dissertation was that of the replacement cycle of computers. Significant research was available regarding hardware or computer replacement cycles for both industry and for public schools but was not readily available for Christian schools. The STAR survey reported that “few schools replace student computers every three years or less; however, 45% of the schools do not have a student computer replacement policy” (Florida Department of Education, 2006, p. 6). The report stated the following findings of replacement policy for student computers: 11% less than or equal to 3 years, 37% equal to 4 or 5 years, 9% greater than or equal to 6 years, and 42% have no policy for replacement (Florida Department of Education, p. 6).

It was difficult to compare the data from either ACSI or NAIS to public school data; it was even more difficult to compare the hardware investment in education to corporate investment in hardware. However, it was evident that substantial investment in hardware, as well as in other educational technologies, has occurred in Christian education and in private education in recent years.

For the purpose of this study, the researcher has established a baseline definition from research by Seels and Richey (as cited in Johnson, 2006) and by Welliver (as cited in Coulter, 2004). Seels and Richey (as cited in Johnson) established categories within instructional technology and entitled them “domains of instructional technology.” The domains included design, development, utilization, management, and evaluation. The

third domain, utilization, was of interest in this study (See Figure 2).

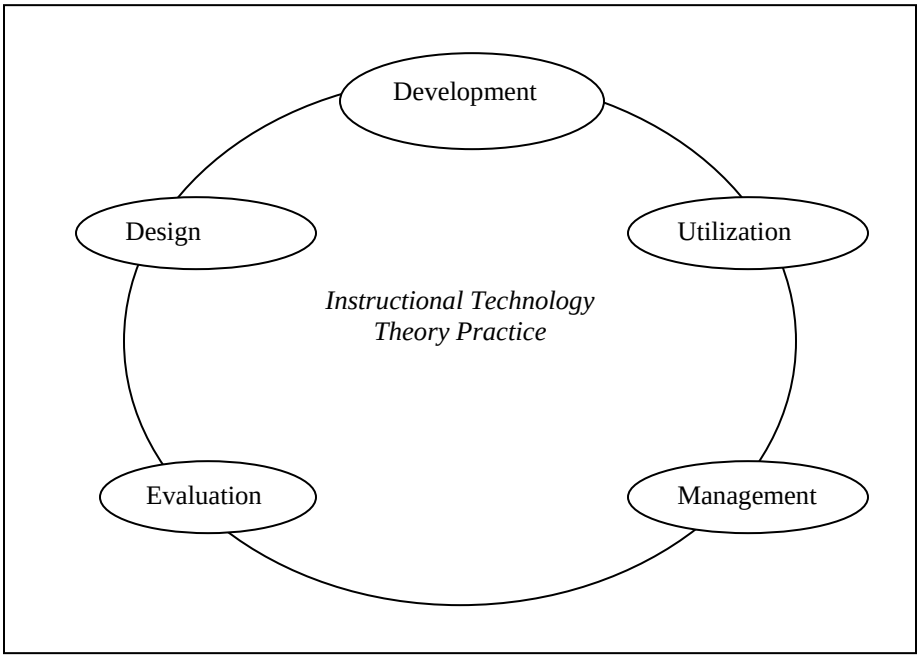


*Figure 2*. The domains of instructional technology.

Adapted from *Utilization of Instructional Technology: Towards a Conceptual Model for Teacher Education* [unpublished doctoral dissertation, North Carolina State University] (p. 44), by B. M. Coulter, 2004.

Coulter (2004) further developed the model by Seels and Richey as it relates to educational settings. The following model (See Figure 3 next page) has depicted the interaction of knowledge/innovation, infrastructure, factors of influence, instructional experience, and barriers to use as they relate to a school's overall "utilization of instructional technology." Utilization of instructional technology only has effect when the following conditions exist: technology knowledge, school infrastructure, staff experience, factors influencing technology are engaged, and barriers inhibiting educational technologies are kept in check. When all these conditions are in place, then effective utilization of instructional technologies is possible.

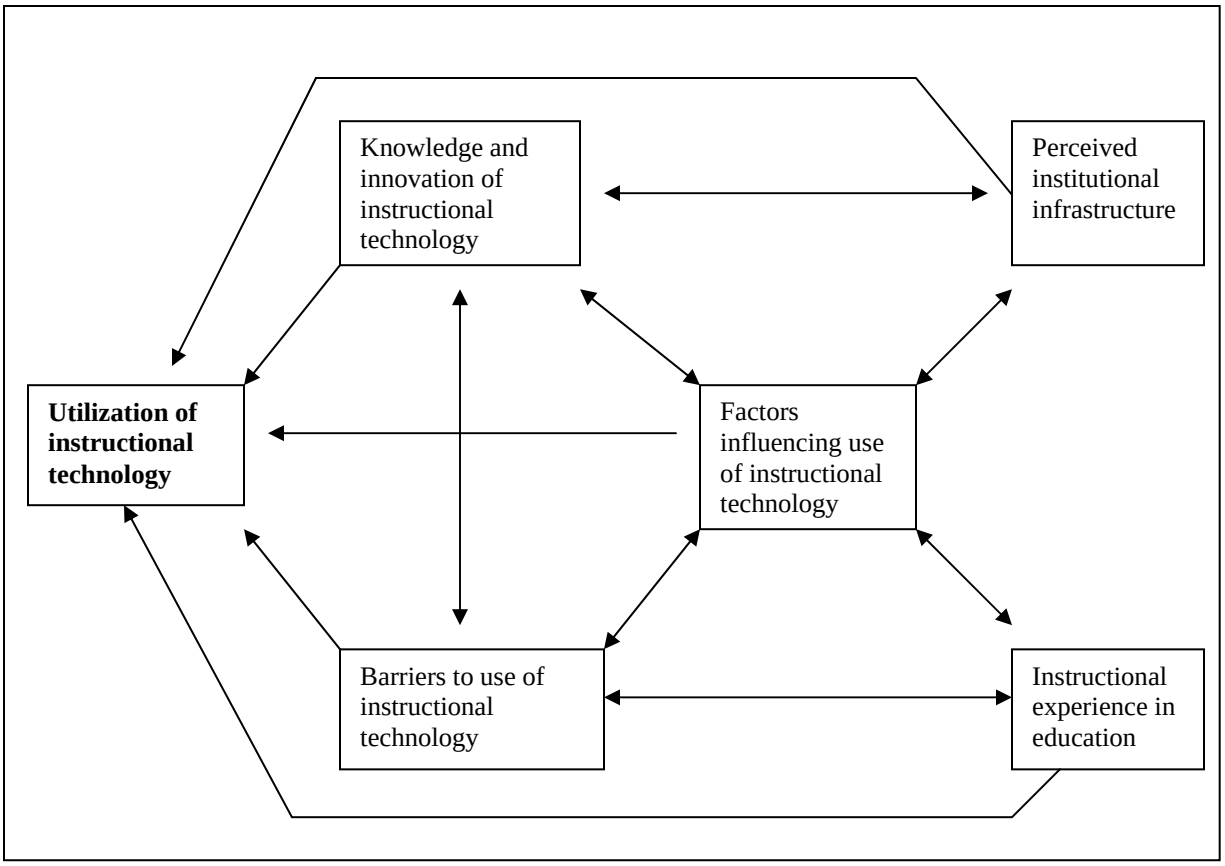


*Figure 3*. Utilization of instructional technology model

From *Utilization of Instructional Technology: Towards a Conceptual Model for Teacher Education* [unpublished doctoral dissertation, North Carolina State University] (p. 4), by B. M. Coulter, 2004.

In reference to the work of Seels and Richey, Coulter (2004) stated, "The utilization domain focuses on the employment of specific instructional technologies through innovation, implementation and institutionalization to encourage and support its applicable use in educational settings" (p. 23). In addition to the work by Seels and Richey (as cited in Johnson, 2006), the researcher evaluated Paul Welliver's instructional transformation model, created in 1989 (as cited in Coulter). This model represented a five-stage continuous model of technology integration. The stages of the model were Level 1, familiarization; Level 2, utilization; Level 3, integration; Level 4, reorientation;

and Level 5, evolution. Level 2, utilization, was defined by Welliver (as cited in Coulter) as follows:

> Teacher tries the technology, but can change lesson if the technology fails. Examples of teacher activities in this stage include maintaining a computerized grade book, using word processing for notes sent to parents, and creating class worksheets. Students of teachers in the utilization stage may use subject-focused computer games to reinforce learning. The key to this stage is the expendability of technology (Johnson, 2006, p. 8).

In the context of this study, can we determine the effect of school size (total enrollment and total school budget) on Christian schools' ability to utilize educational technologies? The researcher defined "utilization of technology" within the context of a "school" as the school's use of educational technologies in the classroom demonstrated by the following technology categories: (a) standards for technology (present or not present), (b) staff for technology (IT director or comparable position present in the school), (c) provision of a scope of technology classes (technology courses offered at various program levels of the school), and (d) integration of technology across the instructional practices (verified that educational technologies were not only available but utilized across the instructional program).

Utilization of educational technologies was often driven by schools that have established "technology standards." Technology standards may have included student, teacher, administrative, school-specific versus school district, state-level standards, and other school technology standards. Research suggests that technology standards were developed along a continuum. Being more generalized at the national level, standards

became increasingly specific at the professional organization level and were very specific and directive at the state and local levels (Baines & Belvin, 2001). The 11th edition of "Technology Counts" stated:

> Of the states with standards (technology), twenty-six spell out their technology expectations in stand-alone documents only, 16 states embed them in the standards of other academic-content areas only. Six states do both. Forty-four states have standards for teachers that include technology. Fewer states, only thirty-five, have the standards for administrators. Only 19 states have policies that tie initial licensure to technology coursework or competence demonstrated through a test ("Technology Counts 2007," 2007, pp. 46-47).

Many states mandate technology standards for teachers, but only 11 states require teacher candidates to pass a test (Fox, 2005). Many instructional technology assessment instruments were standards-based instruments drawing in part on the International Society for Technology in Education endorsed by the National Educational Technology Standards for Students, Teachers, and Administrators; state technology competencies created by many individual states over the past 10 years; and on mandates associated with recent federal legislation (Moersch, 2002).

Setting of instructional technology standards gained notable attention by state and national teacher education agencies, accrediting institutions, and professional teaching organizations, with the majority of instructional technology standards concentrated in the one area of pre-service. Professional subject-area technology standards range from general statements supporting the use of technology in a given discipline area to specific competencies, strategies, and methodologies that were suggested as appropriate and

effective applications of technology for students and teachers education (Baines & Belvin, 2001). Despite the impact these standards have had on influencing pre-service and in-service teachers in the use of technology for teaching and learning, the same standards have come under scrutiny and have been perceived as shortcomings in directing teacher preparation programs closer to technology integration (Moursund & Bielefeldt, 1999). These shortcomings resulted in part from repetitive standards, outdated or obsolete standards, and standards that were either so general that they lack applicability or so specific that they apply only to specific disciplines or particular computer hardware/software platforms (Moursund & Bielefeldt; Office of Technology Assessment, 1995).

Setting of technology standards has occurred on many different levels by many agencies, professional organizations, and governing educational institutions. These standards have varied according to the focus of the organization creating the standards, the population to which the standards apply, and the intent of the standards in influencing technology use in educational settings (Baines & Belvin, 2001). This research has assumed that if a Christian school had a set of technology standards (self-established or from any reputable potential source) the school was therefore a step ahead in utilization of technology.

In addition to technology standards, the survey instrument collected research on whether the school had a technology plan. “School districts with technology plans that include a blueprint for change as well as the supporting philosophy and details on how the plan would improve learning were the most successful at technology integration” (Wenglinsky, 2002, p. 49). Both technology standards and technology plans were guiding

documents and were assumed to be technology drivers within the context of this research.

Another critical area of "utilization of technology" was technology staff support. The survey instrument for this research asked the question "Does your Christian school provide teacher support to use technology? If so, at what level?" For most Christian schools, technology support may or may not have had budget impact. For many years Christian schools enlisted technology support from parent volunteers or from a "technology committee" who provided technology support. This level of support still exists in many Christian schools. In other Christian schools, having technology support was having a "lead technology teacher or perhaps an administrator" who, in addition to teaching or administrating, provided tech support to other teachers and professional staff during the school day. Although this list of possible ways to staff technology support was not exhaustive, the last suggested way that Christian schools were providing technology support was by hiring a part-time or full-time IT director or technology specialist. Ronnkvist, Dexter, and Anderson (as cited in Thornhill, 2007, p. 16) state, "The effective use of computer based technology in the classroom is dependent upon the availability of teacher technical support." Thornhill (2007) stated, "Educational administrators would need to provide technical support resources to the teachers if any tangible success with using computer based technology in the classroom would be realized" (p. 17). Upon this premise, the research of this study set forth to determine if school size impacts Christian schools' ability to utilize educational technologies through staffing a technology support position or positions.

"Technology Counts 2008" (2008) provided summarized data answering the question "Who helps classroom teachers with technology?" (See Table 5 next page):

Table 5

*Who Helps Classroom Teachers With Technology?*

| Position | Percentage |
|---|---|
| Full-time teacher | 26 |
| District-level coordinator | 21 |
| Another person | 15 |
| School-level coordinator who has no other responsibilities | 13 |
| Library media specialist | 12 |
| Principal or another school administrator | 6 |
| Other (no one, part-time teacher, contractor, volunteer) | 7 |

*Note*. From "Technology Counts 2008," March 27, 2008, *Education Week*, p.41

Beyond "Technology Counts 2008," the annual ACSI (2008a) survey asked the question "Does your school have a Technology Director?" in order to determine how schools were supporting or helping teachers to utilize technology (p. 14). A total of 1,552 schools responded to this survey question, with 52% responding "yes" while 48% responded "no." This survey question again reflected a high number of schools with lower enrollment in the no technology director category. More specifically, 609 of the 739 "no" responding schools had enrollments of fewer than 200 students; 378 of these 609 schools had enrollments of fewer than 100 students. These ACSI data were compared to the research data of this study in the "Findings" chapter because a similar survey question "Does your school have an on-staff technology director (employee) who supports educational technologies?" was asked of the 154 ACSI responding schools.

It was assumed that schools that provide a scope of technology courses were

schools that were utilizing technology. Although it was understood that this may not be the case in some schools in general and for some Christian schools specifically, it was necessary to begin evaluation with certain assumptions. Was there a correlation between the size of the Christian school and the number and scope of technology courses a school offers? This study gathered data on course offerings from 154 Christian schools within the context of school size.

The International Society for Technology in Education (2007b) provided an overview of curriculum and content area standards for students entitled "NETS for Students." The source has categorized computer curricula into six divisions as they related to the following content areas that students were taught:

1. Basic (computer) operations and concepts
2. Social, ethical, and human issues
3. Technology productivity tools
4. Technology communication tools
5. Technology research tools
6. Technology problem-solving and decision-making tools

To use technology effectively, teachers must understand how its use fits into the larger curricular and instructional framework. However, according to Statham & Torell (as cited in Ringstaff & Kelley, 2002, p. 7), a survey in 1995 of elementary teachers revealed that schools used technology primarily to improve basic skills rather than integrating it into the curriculum. This same study (as cited in Statham & Torell as cited in Ringstaff & Kelley, p. 22) also reported that only 19% of English classes, 6-7% of mathematics classes, and 3% of social studies classes in high school had integrated

technologies into learning.

The last area of research related to utilization of educational technologies was how it integrated technology across the instructional practices: “The mere addition of computer hardware into the classroom does not insure successful integration of these computers nor do participants gain confidence using computers without proper training, whether from peers or technical support personnel” (Hall, 2001, pp. 40-42). Integration was a key to successful utilization of educational technologies. “Studies consistently report that in order for teachers to integrate technology into the classroom, adequate professional development must be provided” (Johnson, 2006, p. 1; see also Bauer, 2002; Colley, 2002).

In the context of this study, integration was included in the research related to utilization of educational technologies since it was quite possible to invest in educational technologies and not utilize educational technologies; however, when educational technologies were integrated one could postulate that utilization was quite probable. With millions of dollars invested into educational technologies and with the current focus of integration of technology into instructional practices, educators must continue to monitor utilization of educational technologies against student performance. In the end student learning is what educators essentially seek to impact through the educational process that includes the utilization of educational technologies. In Welliver’s 1989 instructional transformation model (as cited in Coulter, 2004), integration was the third stage of the model after the familiarization and utilization stages. The model further denoted that once instructional technologies are integrated into instructional practice that the process then became one of reorientation and evolution. (See Figure 4 next page)

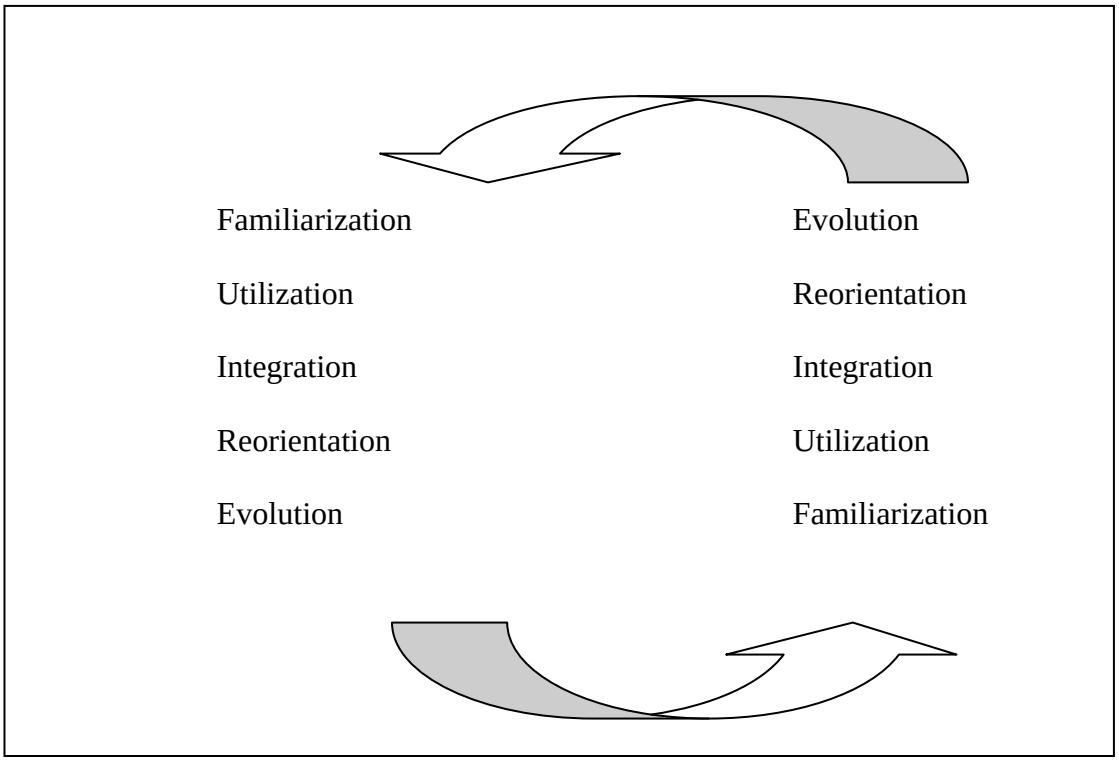


*Figure 4*. Instructional transformation model.

From *Utilization of Instructional Technology: Towards a Conceptual Model for Teacher Education* [unpublished doctoral dissertation, North Carolina State University] (p. 6), by B. M. Coulter, 2004.

Designed specifically for technology integration, Welliver's model (as cited in Coulter, 2004) focused on the changes in teaching practices during the technology integration process. The focus of this research was macro in scope: a school entity versus a classroom or a teacher setting. According to Johnson (2006), integration in Welliver's model was defined as "Technology is necessary. The lesson cannot be taught without technology" (p. 7). Johnson further stated:

> The integration level (level 3) occurs when technology and digitized documents are used to create lessons for students that are required as a part of a class curriculum. When the technology is disrupted by broken hardware, lack of access, or other reasons, the educational process cannot continue. At this level, the

> computer is as necessary to educational activities as chalk was to the classrooms in the 1960's. (p. 10).

"Effective use of technology integration can occur if faculty and students have access to technology, materials, professional development, encouragement, technical assistance, and instructional technology assistance" (Coulter, 2004, p. 65). Utilization of technology has become dependent on many factors. It was the assertion of this study that utilization of technology would become a reality in the Christian school setting when schools did the following:

1. Implemented technology standards and technology plans
2. Prioritized staffing for technology support
3. Provided a scope of technology courses
4. Integrated technology effectively across disciplines

McLeod (2008) stated, "Thus the goal of technology integration is to use the best tools for each job seamlessly so that the technology itself becomes transparent and supports teaching and learning" (p. 4). Ringstaff and Kelly (2002) stated:

> Classrooms are not experimental laboratories where scientists can compare the effectiveness of technology to traditional instructional methods while holding all other variables constant. Moreover, few reliable, valid, and cost-effective assessments exist that measure students' higher-order thinking skills, problem-solving ability, or capacity to locate, evaluate, and use information—skills that many researchers and teachers believe can be enhanced through technology use. Technology has also been shown to increase student motivation and engagement, prepare students for jobs, and enhance students' ability to work collaboratively,

> but we have few, if any tolls and methods to measure impact in these domains. Thus, it is not surprising that the impact of technology on education continues to be debated by educators and researchers alike (pp. 23-24).

As this review of the literature comes to a conclusion, what were the preliminary findings? First, school size (total enrollment categories) in the context of Christian and public school education was an area in need of ongoing research to provide continued understanding. Second, utilization of educational technologies has been a difficult research target to isolate, even in the setting of smaller schools often found in Christian education.

The review of the literature has bridged a brief overview of the historical background of independent Christian schools to a baseline of research as it relates to school size and to a review of the literature as it relates to utilization of educational technologies. Throughout this journey of the literature, relating Christian education and education in general to educational technologies was a massive undertaking for the purposes of making informed educational decisions and for using technology to further the Kingdom work through Christian education.

# CHAPTER 3: METHODS

## The Research Design

The research on educational research methods has suggested three common approaches to research studies in general (Williams, 2007) that include quantitative; qualitative; or mixed methodologies, which combines the former two. Based on the evaluation of school size (total enrollment and total school budget) and technology utilization data in their current state within the ACSI schools in the sample set, the decision was made to classify the quantitative research using the descriptive approach.

Overall the study was designed to determine if correlations exist between school size (total enrollment) and utilization of educational technologies, and if correlations exist between school size (total school budget) and utilization of educational technologies. The general design of this quantitative study was a descriptive study with a survey instrument used as the method of data collection.

## The Research Questions

The research focus of this investigation was to determine whether a statistically significant correlation exists 1) between school size (total enrollment) and the utilization of educational technologies in Christian schools and 2) between school size (total school budget) and the utilization of educational technologies in Christian schools. Although the topic of the utilization of educational technologies is an extremely broad topic and could have been broken down into a specific area or a few specific areas of utilization of educational technologies, this researcher determined that there was a need to research the following two questions:

1. Are there any effects of utilization of educational technologies within Christian schools of various school size categories?
2. Are there any effects of utilization of educational technologies within Christian schools of various total school budget categories?

## The Hypotheses

To determine statistical probability for the quantitative study, null hypotheses that correspond with the research questions were established. The following null hypotheses were used for this study:

HO1: There will be no statistical difference in utilization of educational technologies among Christian schools of various school size classifications.

HO2: There will be no statistical difference in utilization of educational technologies among Christian schools of various total school budget classifications.

## Instrumentation

There were varied methods available to collect data, including surveys, interviews, utilization of available research from reputable sources, and many other collection methods. Based on an investigation of the options for data collection and categorization of quantifiable data currently available to most Christian-school administrators in the sample set of survey schools, the use of quantitative data collected by a researcher-developed survey complemented the research design.

## Other Sources of Data

In addition, quantitative data used in the descriptive results for both school size and technology budget categories were derived and/or confirmed from several sources. The following sources were used extensively in the study:

1. ACSI (2008a) *Annual School Survey 2007-08 Report*: available online to member schools affiliated with ACSI. This survey was a summary document that gives key characteristics of member schools responding to a questionnaire sent to them by Development Testing Services.
2. ACSI (2008b) *Member Directory 2008*: available to all member schools in both hard copy and online member profile.
3. National Center for Educational Statistics (NCES)
4. National Association of Independent Schools (NAIS)
5. Researcher-developed survey data: data gathered from ACSI surveys and from an online survey sent to school leaders and technology leaders via e-mail (hyperlink). ACSI member schools in the states defined.
6. *Guide Star: Connecting People with Non-profit Information*: source for nonprofit IRS Form 990.

## The Context for the Study

The study collected school-size and technology-related data from a subset group of ACSI member schools. The subset of all ACSI member schools was established because of time limitations in handling data (if all ACSI schools had been surveyed) and because of the researcher's familiarity with ACSI schools in Florida, North Carolina, and the Southeast in general. This sample population provided an appropriate number of schools (534 in total) to validate data and provided a size distribution that would allow later research to be developed for ACSI schools on a nationwide scale. The survey data were collected December 1, 2007, through January 15, 2008. The data provided by the schools were based on their 2007-2008 enrollments, their 2007-08 school budget data,

and on their technology expenses as defined in their school year 2007-2008.

## The Participants in the Study

The sample population (N=534) of this study was 534 ACSI member schools that were located in either the Florida region or Southeast region as defined by ACSI (2008b) and that had comprehensive school programs. Schools with limited grade-level offerings were eliminated (several responded to the survey despite the survey instructions) from the sample set (approximately 7) because of their potential to skew the data as they related to technology investment and initiatives. The final data analysis included quantitative data collected from 154 (29% of the sample population) of the responding ACSI member schools with comprehensive programs in the Florida and Southeast regions.

The eight states in which the schools reside and the number of current ACSI member Christian schools in each were as follows: Alabama, 61; Florida, 393; Georgia, 118; Mississippi, 18; North Carolina, 111; South Carolina, 46; Tennessee, 94; and Virginia, 151 (ACSI, 2008b). These data reported total membership of 992 schools in the survey regions. Of these schools, 54% (534 of the 992) were determined to have had comprehensive programs as reported by the schools and documented in the ACSI member directory and had opportunity to participate in the survey.

In addition, “school size” data self-reported in the online survey were verified against the enrollment number documented on the ACSI (2008b) member profile for each of the 154 schools.

## Methods and Instruments Used to Collect Data

An in-depth review of the literature revealed the categories of utilization of educational technologies that created a generic outline for the survey. As stated in chapter

1, the data-collection instrument was developed from the categories of technology utilization found in the total cost of ownership (TCO) model and the Gartner Group model as referenced by Redhead's 2001 article "Investigating the Total Cost of Technology in Schools."

The primary method of collecting utilization of educational technologies data was an online survey created on SurveyMonkey.com. An account with the Web site provider SurveyMonkey.com was created, and the "draft" survey instrument originally created in Microsoft Word (Version 2003) was input. This "official draft" survey instrument was then sent to the dissertation chairman as well as to both ACSI regional directors for comment. A redraft of the survey instrument included the comments from these individuals. The revised survey was sent to a select number of school administrators (five in total) in the Florida and Southeast regions. No changes were made in the content of the survey questions after the pilot group of administrators completed the survey; however, several minor technical changes were necessary in the online survey format. Once these changes were made, the researcher requested that the ACSI regional directors send an e-mail asking for participation of all ACSI member schools in the Florida and Southeast regions. A copy of this e-mail has been included in the Appendix A.

A copy of the online survey instrument has been included in Appendix B. The survey was divided into seven sections: (a) school name and contact information, (b) school demographic information, (c) technology: school-wide information, (d) technology: personnel-related, (e) technology: curriculum-related, (f) technology: budget-related, and (g) research validity.

Research data in sections 1 and 7 of the on-line survey were not tested for

statistical significance and were reported solely in terms of descriptive statistics. Research in section 2 was used only in reference to “school size” and validation of each school being “comprehensive” in scope. Research data in sections 3, 4, 5, and 6 were used for statistical analysis of “utilization of educational technologies.”

A secondary method to collect data was verification of critical data related to school size. Data provided by the online research survey were also verified by data as recorded on the ACSI (2008b) member directory. Contact made with ACSI regional offices (Florida, David Ray; Southeast, Bill Wilson) resulted in approval to use data from their annual (2007-2008) school survey (ACSI, 2008a) for this doctoral dissertation. These data included the following: school name, school contact information, school enrollment, and other categorical data for both the Florida and Southeast regions.

The ACSI (2008b) member directory was used to determine the number of schools in each state within the research regions that had comprehensive programs. These data were important in the findings chapter as they related to validity of the survey data gathered by the researcher. Table 6 (next page) has the summarized “comprehensive” program data. The summary data of schools in the region of survey interest include 992 ACSI member schools, of which 534 were determined to have comprehensive programs, and, of which, 154 of the 534 eligible schools participated in the researcher developed survey or approximately 29% of the schools within the sample set. As the data in Table 6 (next page) confirmed, the Florida Region of ACSI had the largest number of schools (393 out of 992) for any state in the region of study, and the Florida Region of ACSI also had the largest number of schools with comprehensive programs (147 out of 534) for any state in the region of study.

Table 6

*ACSI Member Schools: Schools With Comprehensive Programs Within the Region of Study*

| State | ACSI member schools | | |
|---|---|---|---|
| | Total number | Number with comprehensive programs | Percentage that are comprehensive |
| Florida | 393 | 147 | 37 |
| Alabama | 61 | 38 | 62 |
| Georgia | 118 | 90 | 76 |
| Mississippi | 18 | 14 | 78 |
| North Carolina | 111 | 78 | 70 |
| South Carolina | 46 | 28 | 61 |
| Tennessee | 94 | 48 | 51 |
| Virginia | 151 | 91 | 60 |
| Entire region of study | 992 | 534 | 54 |

*Note*. From *Member Directory 2008*, by Association of Christian Schools International, 2008, Colorado Springs, CO: Author.

After the determination was made pertaining to schools with comprehensive programs, each school was analyzed to place in a category as it relates to their school size as of the 2007-2008 school year. Table 7 (next page) has summarized “school size” data for ACSI member schools that had comprehensive programs in the research regions (ACSI, 2008b).

Table 7

*ACSI Member Schools: School Size Within the Region of Study*

| State | Number of schools by size range | | | | | | Total # of schools |
|---|---|---|---|---|---|---|---|
| | 0-250 | 251-500 | 501-750 | 750-1,000 | 1,001-1,500 | 1,501-2,000 | |
| Florida | 88 | 28 | 20 | 6 | 4 | 1 | 147 |
| Alabama | 22 | 12 | 0 | 2 | 0 | 2 | 38 |
| Georgia | 50 | 23 | 9 | 4 | 4 | 0 | 90 |
| Mississippi | 9 | 4 | 0 | 0 | 1 | 0 | 14 |
| North Carolina | 51 | 17 | 6 | 7 | 4 | 0 | 85 |
| South Carolina | 14 | 9 | 3 | 1 | 1 | 0 | 28 |
| Tennessee | 26 | 9 | 3 | 7 | 2 | 0 | 47 |
| Virginia | 70 | 16 | 5 | 1 | 0 | 1 | 93 |
| Totals | 330 | 118 | 46 | 28 | 16 | 4 | 542 |
| Percentage of total | 61 | 22 | 8 | 5 | 3 | 1 | 100 |

*Note*. From *Member Directory 2008*, by Association of Christian Schools International, 2008, Colorado Springs, CO: Author.

A secondary method used to verify "school total budget" accessed a majority of the responding school's financial data as reported to the federal government on the school's annual Form 990 report. Of the 154 schools in the final data, 99 (60.3%) had data confirmed by this procedure. Comparisons of data indicated that self-reported total budget amounts closely aligned with the data found in the Form 990 data. In other words, the data available online either matched or closely approximated reported budget

amounts. For the few schools for which the numbers did not match, this researcher e-mailed the school administrator of each school to confirm that the total budget number was correct in the self-reported SurveyMonkey survey before beginning SPSS analysis.

## Data Analysis

The decision process for analysis of data followed the logic established in the textbook *Fundamental Statistics for the Behavioral Sciences* by Howell (2008). The data were quantitative, or what has been sometimes referred to as "measurement data" (Howell, p. 9). For example, a question in the survey was "What is your school's total budget for this school year 2007-08?" The resulting values from 154 survey schools provided quantitative data.

Although the data were determined to be quantitative, the question still remained "How should the data be analyzed?" The researcher next evaluated categorization of the data as it pertained to "differences versus relationships" (Howell, 2008, p. 10). Although these two categories can and often do overlap, this researcher was primarily interested in the relationship aspect of "school size" (total enrollment and total school budget) to the "utilization of educational technologies."

There were several options available to assist in the research analysis at this stage: regression analysis, Pearson product-moment correlation, and/or Spearman rank correlation coefficient. To define the most relevant method to use, the researcher considered the question "How many predictors were in the hypotheses and research data?" (Howell, 2008, inside back cover).

Because the variable (predictor) of interest in this dissertation, school size (both total enrollment and total school budget) was able to be ranked for effective statistical

analysis, the best method of analysis was determined to be Spearman rank correlation coefficient ($r_s$). Spearman $r_s$ is a variant of Pearson $r$ and uses ranked data.

The researcher enlisted the expertise of Dr. Tom Granoff, professor at Loyola Marymount University and Pepperdine University. Dr. Granoff has a Ph.D. in clinical psychology, and his assessment of the data has been indispensable to the purposes of this study. The flow of data from survey to analysis was as follows:

1. Survey created in Microsoft word (Version 2003).
2. Survey input into SurveyMonkey.
3. Survey data downloaded from SurveyMonkey into an Excel (Version 2003) spreadsheet.
4. Survey data confirmed from ACSI (2008b) member directory or online profile data.
5. Survey data confirmed by follow-up e-mail with several schools about questionable information.
6. Survey data (Excel) imported into SPSS (Version 15.0).
7. Survey data e-mailed to Dr. Granoff.
8. Data evaluated by statistician in SPSS (Spearman rank correlation coefficient analysis).
9. The preliminary findings and those of Dr. Granoff discussed for clarification of research problems and technology categories of “investment in” and “utilization of.”
10. Final analysis completed by Dr. Granoff and the researcher.

11. Statistical data established as relevant to the study to include (a) number of schools in each school-size category; (b) median size of schools in each category; and (c) mean, standard deviation, minimum, and maximum for the following data subsets: technology director (salary/benefits), technology curriculum, hardware, software, training budget, outsourced tech support, connectivity, other technology-related expenses, total technology budget, total school budget, and number of students (population).

SPSS (Version 15.0) states: Correlations. For tables in which both rows and columns contain ordered values, Correlations yield Spearman's correlation coefficient, rho (numeric data only). Spearman's rho is a measure of association between rank orders. When both table variables (factors) are quantitative, Correlations yield the Pearson correlation coefficient, r, is a measure of linear association between the variables. Values of the correlation coefficient lie between -1 and 1. The sign of the coefficient values indicates the direction of the relationship, and its absolute value indicates the strength, with larger absolute values indicating stronger relationships.

Cohen (1988) has written extensively on the subject of statistical correlations. In his book *Statistical Power Analysis for the Behavioral Sciences*, he has suggested that a correlation of 0.5 is large, 0.3 is moderate, and 0.1 is small. With only a slight modification of the verbiage, the researcher used statistical levels that were consistent with benchmarks for statistical analysis and were prescribed by Cohen. They were as follows: a weak correlation (.10-.19), a moderate correlation (.30-.49), and a strong correlation (.50-1.00).

## Validity

Validity or the degree to which this research study accurately assessed the three variables (school size, investment in educational technologies, and utilization of educational technologies) within this study was critical to the overall analysis of the data. Both face validity and content validity were confirmed by several peer groups before the survey was distributed to ACSI member schools. Peer group one consisted of employees or those affiliated with Gaston Christian School, and included the following: 1) administrators, 2) IT Director, and 3) the Chairman of the Technology Task Force at Gaston Christian School. Peer group two included five Christian School administrators whom the researcher knew and who were leading Christian Schools with progressive technology programs. Peer group three included 1) the Southeast Regional Director for ACSI and 2) the Florida Regional Director for ACSI. Peer group four included several professors at Liberty University.

The panel of experts received the survey in November of 2007 with a letter detailing the research problem and the proposed distribution of the survey. The panel was asked to verify if the survey content and structure appeared to be correct and if the questions asked aligned with the research problem (in effect, the content validity).

In addition to peer review, The Review of the Literature chapter has documented that the survey content was in fact well designed regarding: 1) school size and 2) utilization of educational technologies.

Survey validity was further confirmed when school size data was verified against ACSI data (independently collected by ACSI); no substantial difference was found. When the school budget data was confirmed for many schools against data reported on

the school's federal filing of their 990 reports, no substantial difference was found.

After receiving comments and restructuring the language in several sections of the survey, the survey was input into the on-line survey provider, SurveyMonkey, and it became an active survey for participants mid-December 2007.

## Reliability

Reliability or the extent to which the researcher-developed survey produced the same results with repeated trials was more difficult to analyze statistically for this research study. With respect to reliability, it was asserted that no statistical measure was appropriate because all of the data including 1) school size (both total enrollment and total school budget) and 2) utilization of educational technologies data were specific to each school. The validity of the survey instrument was of great importance, but reliability was not an issue of importance because of the type of data collected. To substantiate this distinction further, the researcher counseled with Dr. Granoff, statistician on the project, who confirmed that using a reliability measure such as Cronbach's Alpha or Kuder-Richardson Formula was not of importance because the survey questions covered a wide spectrum of dissimilar financial data. Dr. Granoff further stated that he regularly uses Cronbach's Alpha for attitudinal surveys, but not surveys designed to gather specific financial data with a broad range of data points.

With that determination stated regarding reliability, the researcher did take measures to assure limited reliability through test-retest of data; two specific, but core data categories were confirmed by a modified test and retest method. Both school size and total school budget data were confirmed, including 1) school size self-reported on the survey against school size data recorded independently by ACSI in their annual survey,

and 2) total school budget self-reported on the survey against total school budget reported independently by the schools on their federal filing of their 990.

In addition, the researcher-developed survey demonstrated internal consistency which added to survey reliability. This assertion can be made because there was no interpretation of data by an interviewer or researcher, since each school that participated in the survey did so through an on-line secure website. All schools responded to identical questions. All responding schools had to complete all required questions in the survey since the survey protocol did not allow schools to skip questions or leave data fields blank. It was understood that self-reported data, while adding merit to reliability of data, also had limitations as stated later in Chapter 5.

## Summary Statement

Methods used in research studies have been as varied as the topics of such studies. There were many ways the researcher could have navigated the waters of methodology as it has related to the study of school size in relation to investment in educational technologies, and to the study of school size in relation to utilization of educational technologies. It should be noted that great care was taken to gather data appropriate to correlation analysis and extensive time was invested to check self-reported data (online survey) with data the schools reported to other sources (ACSI and Form 990 returns). Confidentiality was paramount in the handling of the survey data, to ensure integrity of the study and to handle it in a manner worthy of the calling as Christian educators.

# CHAPTER 4: FINDINGS

## Introduction

The purpose of this research was to examine the effect of school size on the utilization of educational technologies within the Christian school setting. The study collected and evaluated data to investigate potential correlation between the size of Christian schools in the Southeast region of the United States and their utilization of educational technologies. Survey responses from 154 schools were used for this study.

The common states where the Christian schools were located were Florida (39.0%), Georgia (16.9%), and Virginia (14.9%). Over half (57.8%) were independent, with another 37.0% being church-sponsored. The most common school configuration was kindergarten through grade 12 (57.8%). School sizes ranged from 0-250 students to 1,500-2,000 students, with a median size being 375 students. Fifty-nine percent used technology in all instructional classrooms. All but four (97.4%) had a school Web site, and 63.0% reported that it was “often” a source of communication. In a multiple-response question, the most common technology applications were faculty news shared via e-mail (87.0%), online student grade books (64.9%), and parents having access to student attendance and grades (54.5%). Eighty-four percent had a network-wide filtration system. In all but 6.5% of the schools, computers needed to be at least 3 years old before being considered obsolete. About half (48.7%) employed an on-staff technology director for support. Seventy percent had a written computer or technology curriculum, and 71.4% had a technology plan. Only 16% offered any online classes. A summary table (See Table 8 next page) of the states in which the Christian schools in the sample were located

is provided. The state with the largest representation in the sample was Florida with 60 of the 154 schools in the sample set.

Table 8

*Survey Data: Frequency Counts for States*

| State | *n* | % |
|---|---|---|
| Alabama | 8 | 5.1 |
| Florida | 60 | 39.0 |
| Georgia | 26 | 16.9 |
| Mississippi | 6 | 3.9 |
| North Carolina | 12 | 7.8 |
| South Carolina | 6 | 3.9 |
| Tennessee | 13 | 8.4 |
| Virginia | 23 | 14.9 |

*Note*. $N = 154$.

Table 9 summarized the number and percentage of schools in the sample set that were "comprehensive" school programs. The minimum standard to be included in the research was preschool or kindergarten through at least grade 6. The majority of schools in the sample set 57.8% were schools with preschool or kindergarten through grade 12. The other category included schools that were in process of adding additional grades beyond grade 6 and therefore it was determined that they fit the minimal category of at least PS/K through grade 12 (See Table 9 next page).

Table 9

*Survey Data: Frequency Counts for School Programs*

| School program | *n* | % |
|---|---|---|
| PS/K through grade 12 | 89 | 57.8 |
| PS/K through grade 8 | 30 | 19.5 |
| PS/K through grade 6 | 9 | 5.8 |
| Other | 26 | 16.9 |

*Note*. *N* = 154.

Table 10 (See next page) summarized the school size make-up within the 154 schools of the sample set. Consistent with ACSI and NCES (both national and South region) data, the data in the research showed the highest percentage of schools in the smallest school size category. For ACSI data the smallest school size category was less than 100, for NCES data the smallest school size category was less than 50, and for this research the smallest school size category was 250 or less. The smallest school size for this research of 250 or less was chosen because only schools with comprehensive programs were included in the research. In addition, consistent with ACSI and NCES data, the data in the research showed a progressively smaller percentage of schools in each school size classification from smallest to largest school size. While it is acknowledged that the school size categories are not totally apples-to-apples they are comparable and of importance as evaluation of school size to utilization of educational technologies were considered. Table 10 (next page) is included to provide an overview of school size from the research data.

Table 10

*Survey Data: Frequency Counts for School Size*

| School size | *n* | % |
|---|---|---|
| 0-250 | 67 | 43.5 |
| 251-500 | 33 | 21.4 |
| 501-750 | 25 | 16.2 |
| 751-1,000 | 15 | 9.7 |
| 1,001-1,500 | 12 | 7.8 |
| 1,501-2,000 | 2 | 1.3 |

*Note*. *N* = 154.

Table 11 data summarized one of the data points that added to research regarding schools in the data set that utilize educational technologies across their instructional classrooms.

Table 11

*Survey Data: Frequency Counts for School-wide Use of Technology*

| Number of instructional classrooms using technology | *n* | % |
|---|---|---|
| All | 91 | 59.1 |
| Most | 24 | 15.6 |
| Few | 25 | 16.2 |
| None | 14 | 9.1 |

*Note*. *N* = 154.

Tables 12 and 13 summarized data that added to the research establishing schools' utilization of educational technologies. The majority of the schools in the sample set documented that they used their school's website often as a communication source and used email as the means to communicate to faculty.

Table 12

*Survey Data: Frequency Counts for Use of School Web Site*

| School's Web site | *n* | % |
|---|---|---|
| Primary communication source | 34 | 22.1 |
| Often a communication source | 97 | 63.0 |
| Seldom a communication source | 19 | 12.3 |
| No school Web site | 4 | 2.6 |

*Note*. $N = 154$.

Table 13

*Survey Data: Frequency Counts for Technology Applications*

| Technology applications* | *n* | % |
|---|---|---|
| Faculty news is shared by e-mail. | 134 | 87.0 |
| Faculty Web sites are hosted on your school Web site. | 45 | 29.2 |
| Faculty Web sites are connected to outside Web sites through your school Web site. | 39 | 25.3 |
| Faculty use online student grade book. | 100 | 64.9 |
| Parents have access to student attendance and grades through an online access. | 84 | 54.5 |

*Note*. $N = 154$.

Data compiled in Table 14 added to the research of schools' utilization of educational technologies. With the exception of on-line classes, the majority of schools in each area of classification invested into educational technologies for the areas included in the research.

Table 14
*Survey Data: Frequency Counts for Investment in Technology*

| Question asked of school | | *n* | % |
|---|---|---|---|
| Do you have a network-wide filtration appliance or software? | | | |
| | Yes | 130 | 84.4 |
| | No | 24 | 15.6 |
| After how many years do you consider a computer obsolete? | | | |
| | 5 or more years | 78 | 50.6 |
| | 3-4 years | 66 | 42.9 |
| | < 3 years | 10 | 6.5 |
| Do you employ an "on-staff" technology director for support? | | | |
| | Yes | 75 | 48.7 |
| | No | 79 | 51.3 |
| Do you have a written or prescribed "computer or technology" curriculum? | | | |
| | Yes | 107 | 69.5 |
| | No | 47 | 30.5 |
| Do you have a technology plan? | | | |
| | Yes | 110 | 71.4 |
| | No | 44 | 28.6 |
| Do you offer any "online" classes? | | | |
| | Yes | 24 | 15.6 |
| | No | 130 | 84.4 |

*Note*. $N = 154$.

Table 15 displays the descriptive statistics for selected variables. These statistics included the percentages of the faculty with various technology skill levels, numbers of technology courses, and the number of available computers at the school.

Table 15

*Survey Data: Descriptive Statistics for Selected Variables*

| Variable | *M* | *SD* | Low | High |
|---|---|---|---|---|
| Percentage beginner skill | 25.87 | 21.19 | 0 | 100 |
| Percentage intermediate skill | 50.77 | 20.81 | 0 | 95 |
| Percentage advanced skill | 22.44 | 15.82 | 0 | 80 |
| Full-time equivalent computer/technology teachers | 1.05 | 1.08 | 0 | 5 |
| Preschool technology courses | 0.38 | 0.68 | 0 | 4 |
| Elementary school technology courses | 3.97 | 4.71 | 0 | 40 |
| Middle school technology courses | 1.87 | 2.67 | 0 | 30 |
| High school technology courses | 2.12 | 3.76 | 0 | 40 |
| What is the total number of computers your school has available for student and instructional use? | 61.27 | 73.86 | 0 | 500 |

*Note*. $N = 154$.

Table 16 (next page) displays the descriptive statistics for technology-related budget variables. These statistics included the total technology budget for the school ($M$ = \$67,867), the total school budget ($M$ = \$2,764,430), and the technology percentage of the total budget ($M$ = 6.29%). Dividing the total technology budget by the total school budget the researcher derived an average of 6.29% of the total school budget for the schools in the sample set were invested in educational technologies (See Table 16).

Table 16

*Survey Data: Descriptive Statistics for Technology-related Budget Variables*

| Budget variable | *n** | *M* | *SD* | Low | High |
|---|---|---|---|---|---|
| Technology director | 111 | 26,222 | 26,994 | 0 | 105,504 |
| Technology curriculum | 110 | 5,768 | 13,352 | 0 | 75,000 |
| Hardware | 123 | 20,535 | 35,686 | 0 | 250,000 |
| Software | 117 | 8,538 | 18,511 | 0 | 150,000 |
| Training | 98 | 1,909 | 4,591 | 0 | 40,000 |
| Outsourced tech support | 100 | 4,544 | 8,164 | 0 | 40,000 |
| Connectivity | 99 | 5,081 | 8,785 | 0 | 74,000 |
| Other technology | 53 | 7,634 | 15,984 | 0 | 80,000 |
| Total technology | 127 | 67,867 | 86,609 | 0 | 477,000 |
| Total school | 128 | 2,764,430 | 2,850,489 | 0 | 12,000,000 |
| Technology percentage of total budget | 124 | 6.29 | 19.37 | | |

*Note*. $N = 154$.
*Responses based on self-report and/or verification from external sources.

Cohen (1988) suggested some guidelines for interpreting the strength of linear correlations. He suggested that a "weak correlation" typically had an absolute value of $r = .10$ (about 1% of the variance explained), a "moderate correlation" typically had an absolute value of $r = .30$ (about 9% of the variance explained), and a "strong correlation" typically had an absolute value of $r = .50$ (about 25% of the variance explained). For the sake of parsimony, this "Findings" chapter has primarily highlighted those correlations that were "strong." In addition, given the large sample ($N = 154$) and the fact that a small correlation of $r = .15$was statistically significant at the $p = .05$ level, the "strong

correlation" interpretation criterion was used to minimize the potential of numerous Type 1 errors stemming from interpreting and drawing conclusions based on potentially spurious correlations.

## Research Hypothesis 1: School Size to Investment in Educational Technologies

Research Hypothesis 1 stated, "There will be no statistical difference in utilization of educational technologies among Christian schools of various school size classifications." To address this hypothesis, Spearman rank-ordered correlations were utilized to compare 31utilization of educational technologies measures to school size (total enrollment). For school size, 27 of the 31 correlations were significant at the $p < .05$ level, and 23 were strong correlations based on the Cohen (1988) criteria. Specifically, the twenty-three measures that were strongly related to school size included: 1) School-wide use of technology ($r = .47$, $p < .001$), 2) Faculty use an online student grade book ($r = .35$, $p < .001$), 3) Parents have access to student attendance and grades through an online access ($r = .43$, $p < .001$), 4) Network-wide filtration appliance ($r = .40$, $p < .001$), 5) Employ an "on-staff" technology director for support ($r = .45$, $p < .001$), 6) Full-time equivalent computer/technology teachers ($r = .69$, $p < .001$), 7) Does your school have a technology plan ($r = .34$, $p < .001$), 8) What is the total number of computers available for the students ($r = .80$, $p < .001$), 9) school's Web site ($r = .34$, $p < .001$), 10) faculty Web sites are hosted on your school Web site ($r = .33$, $p < .001$), 11) Have a written or prescribed "computer or technology curriculum ($r = .42$, $p < .001$), 12) Elementary technology courses ($r = .29$, $p < .001$), 13) Middle school technology courses ($r = .44$, $p < .001$), 14) High school technology courses ($r = .53$, $p < .001$) and all nine of

the technology budget variables. The four correlations that did not indicate significant level of correlation included: 1) "Does your school offer any 'online' classes?" ($r$ = .06), 2) Percentage beginner-skill faculty ($r$ = .03), 3) Percentage intermediate-skill faculty ($r$ = .03), and 4) Preschool technology courses ($r$ = .11) (See Table 17).

Table 17

*Survey Data: Spearman Rank-ordered Correlations for School Size to Utilization of Educational Technologies*

| Correlation Variable | School size |
|---|---|
| School-wide use of technology | .47[d] |
| Faculty use an online student grade book | .35[d] |
| Parents have access to student attendance and grades through an online access | .43[d] |
| Network-wide filtration appliance | .40[d] |
| Short computer life cycle | .18[a] |
| Employ an "on-staff" technology director for support | .45[d] |
| Full-time equivalent computer/technology teachers | .69[d] |
| Does your school have a technology plan? | .34[d] |
| What is the total number of computers your school has available for student and instructional use? | .80[d] |
| Does your school offer any "online" classes? | .06 |
| School's Web site | .34[d] |
| Faculty news is shared by e-mail | .21[b] |
| Faculty Web sites are hosted on your school Web site | .33[d] |

Table 17 continued

| Correlation Variable | School size |
|---|---|
| Faculty Web sites are connected to outside Web sites through your school Web site | .21[b] |
| Percentage beginner-skill faculty | .03 |
| Percentage intermediate-skill faculty | .03 |
| Percentage advanced-skill faculty | .24[c] |
| Have a written or prescribed "computer or technology" curriculum | .42[d] |
| Preschool technology courses | .11 |
| Elementary school technology courses | .29[d] |
| Middle school technology courses | .44[d] |
| High school technology courses | .53[d] |
| Technology director budget | .67[d] |
| Technology curriculum budget | .58[d] |
| Hardware budget | .69[d] |
| Software budget | .67[d] |
| Training budget | .54[d] |
| Outsourced tech support budget | .35[d] |
| Connectivity budget | .61[d] |
| Other technology budget | .69[d] |
| Total technology budget | .77[d] |

*Note*. $N = 154$. "Yes" answers were calculated as correlations of 1.00 and "No" answers as correlations of zero. [a]$p < .05$; [b]$p < .01$; [c]$p < .005$; [d]$p < .001$.

## Research Hypothesis 2: Total School Budget to Utilization of Educational Technologies

Research Hypothesis 2 stated, "There will be no statistical difference in utilization of educational technologies among Christian schools of various school budget classifications." For the 31 correlations for total school budget with utilization of educational technologies, 28 were significant at the $p < .05$ level, and 24 were "strong correlations" based on the Cohen (1988) criteria. Specifically, total school budget was positively correlated with the following: 1) School-wide use of technology ($r = .56$, $p < .001$), 2) Faculty use an online student grade book ($r = .45$, $p < .001$), 3) Parents have access to student attendance and grades through an online access ($r = .49$, $p < .001$), 4) Network-wide filtration appliance ($r = .47$, $p < .001$), 5) Short computer life cycle ($r = .28$, $p < .001$), 6) Employ an "on-staff" technology director for support ($r = .53$, $p < .001$), 7) Full-time equivalent computer/technology teachers ($r = .73$, $p < .001$), 8) Does your school have a technology plan ($r = .44$, $p < .001$), 9) What is the total number of computers available for the students ($r = .86$, $p < .001$), 10) School's Web site ($r = .36$, $p < .001$), 11) Faculty Web sites are hosted on your school Web site ($r = .28$, $p < .001$), 12) Have a written or prescribed "computer or technology curriculum ($r = .56$, $p < .001$), 13) Elementary technology courses ($r = .34$, $p < .001$), 14) Middle school technology courses ($r = .46$, $p < .001$), 15) High school technology courses ($r = .55$, $p < .001$), and all nine of the technology budget variables. The three correlations that did not indicate significant level of correlation included: 1) "Does your school offer any 'online' classes?" ($r = .14$), 2) Percentage beginner-skill faculty ($r = .05$), and 3) Percentage intermediate-skill faculty ($r = .09$) (See Table 18).

Table 18

*Survey Data: Spearman Rank-ordered Correlations for Total School Budget to Utilization of Educational Technologies*

| Correlation Variable | Total school budget |
|---|---|
| School-wide use of technology | .56[d] |
| Faculty use an online student grade book | .45[d] |
| Parents have access to student attendance and grades through an online access | .49[d] |
| Network-wide filtration appliance | .47[d] |
| Short computer life cycle | .28[d] |
| Employ an “on-staff” technology director for support | .53[d] |
| Full-time equivalent computer/technology teachers | .73[d] |
| Does your school have a technology plan? | .44[d] |
| What is the total number of computers your school has available for student and instructional use? | .86[d] |
| Does your school offer any “online” classes? | .14 |
| School’s Web site | .36[d] |
| Faculty news is shared by e-mail | .20[a] |
| Faculty Web sites are hosted on your school Web site | .28[d] |
| Faculty Web sites are connected to outside Web sites through your school Web site | .25[c] |
| Percentage beginner-skill faculty | .05 |
| Percentage intermediate-skill faculty | .09 |

Table 18 continued

| Correlation Variable | Total school budget |
|---|---|
| Percentage advanced-skill faculty | .22[b] |
| Have a written or prescribed "computer or technology" curriculum | .56[d] |
| Preschool technology courses | .22[b] |
| Elementary school technology courses | .34[d] |
| Middle school technology courses | .46[d] |
| High school technology courses | .55[d] |
| Technology director budget | .78[d] |
| Technology curriculum budget | .59[d] |
| Hardware budget | .76[d] |
| Software budget | .78[d] |
| Training budget | .57[d] |
| Outsourced tech support budget | .34[d] |
| Connectivity budget | .71[d] |
| Other technology budget | .78[d] |
| Total technology budget | .87[d] |

*Note*. $N = 154$. "Yes" answers were calculated as correlations of 1.00 and "No" answers as correlations of zero. [a]$p < .05$; [b]$p < .01$; [c]$p < .005$; [d]$p < .001$.

# CHAPTER 5: SUMMARY, CONCLUSIONS, LIMITATIONS, DISCUSSION, AND RECOMMENDATIONS

This study examined the correlation between the independent variables "school size" (total enrollment and total school budget) and the dependent variable "utilization of educational technologies." As an aid to the reader, this final chapter has restated the research problems, the hypotheses, and summarizes the methodology; it has also provided a summary section, as well as conclusions, limitations, discussion, recommendations for practice, and recommendations for further research.

The two research questions under investigation were as follows:

1. Are there any effects of utilization of educational technologies within Christian schools of various school size categories?
2. Are there any effects of utilization of educational technologies within Christian schools of various total school budget categories?

From the basic research questions, the researcher developed the following two hypotheses for this study:

HO1: There will be no statistical difference in utilization of educational technologies among Christian schools of various school size classifications.

HO2: There will be no statistical difference in utilization of educational technologies among Christian schools of various total school budget classifications.

The methodology for this research was aligned with Creswell's findings. "Quantitative research involves the collection of data so that information can be quantified and subjected to statistical treatment in order to support or refute 'alternate

knowledge claims'" (Creswell, 2003, p. 153). The researcher concluded specifically that data related to the independent variables "school size" (total enrollment and total school budget) and the dependent variable (utilization of educational technologies) could best be analyzed through the collection of quantitative data. Therefore, a quantitative research design was chosen.

Given the decision to use the quantitative research design, an investigation ensued to determine available data to include in this study. The conclusion of that investigation revealed that little or no available data existed for the three variables of study. The researcher then developed a survey instrument to collect data from Christian schools; the instrument was entitled *ACSI Member School Survey, Florida and Southeast Regions, Winter 2007/08* (Appendix B). A total of 534 schools with comprehensive programs received the invitation to complete the online survey. A total of 154 (29%) completed the survey accurately and were included in the statistical software SPSS using Spearman rank-ordered analysis.

## Summary of Descriptive Data

It has been long understood that school size has been a condition that affects many opportunities within schools' program offerings. Given the great interest in educational technologies, this study was designed to increase the understanding of how school size in the Christian school community has affected the utilization of educational technologies. Since little data was available for Christian schools as it relates specifically to the potential correlation of the independent and dependent variables in this study, the research began from a basically blank slate. As the investigation developed, two

categories of school size were established. School size was evaluated as number of students (enrollment) and as a condition of total school budget.

Christian schools within each school-size category (from smallest to largest) reflected a significantly higher utilization of educational technologies at each higher level. The larger the Christian school (by size category), the more they utilized technology hardware, software, training, connectivity, curriculum, technology staffing, and total technology budgets. In addition, larger Christian schools utilized technology more often by hiring an "on-staff" technology director, as well as providing their faculty more opportunities for on-line student grade books and providing their parents greater access to student attendance and grades through an on-line web site.

Clearly, Christian school size was an independent variable that significantly affected Christian schools' utilization of educational technologies. Survey responses indicated that larger Christian schools reflected a shorter computer life cycle of 3-4 years versus a significant number of smaller Christian schools with computer life cycles of 5 years or more. Larger Christian schools not only had larger per-student investment in technology than smaller Christian schools, but they also had a significantly higher percentage of schools that had established technology plans.

Christian schools within each total school budget category (from smallest to largest) reflected a significantly higher utilization of educational technologies at each higher level. The larger the Christian school (by budget category), the greater the use of technology hardware, software, training, connectivity, curriculum, technology staffing, and total technology budgets.

Clearly, in the sample set of Christian schools, total school budget was an independent variable that significantly affected utilization of educational technologies. Hardware, software, number of computers for student and instructional use, and technology director budget were all measures that indicated extremely strong correlations to total school budgets, with the majority of the remaining variables reflecting significant correlations.

## Summary of Findings

### *Research Question One*

Research Question One asked, "Are there any effects of utilization of educational technologies within Christian schools of various school size categories?" For the 31 correlations for school size with utilization of educational technologies, 27 were significant at the $p < .05$ level, and 23 were "strong correlations" based on the Cohen (1988) criteria.

### *Research Question Two*

Research Question Two asked, "Are there any effects of utilization of educational technologies within Christian schools of various total school budget categories?" For the 31 correlations for total school budget with utilization of educational technologies, 28 were significant at the $p < .05$ level, and 24 were "strong correlations" based on the Cohen (1988) criteria.

Based on statistical analysis of the research data, the analytical review rejected both null hypotheses:

1. HO1: There will be no statistical difference in utilization of educational technologies among Christian schools of various school size classifications.

2. HO2: There will be no statistical difference in utilization of educational technologies among Christian schools of various total school budget classifications.

## Conclusions

The typical Christian school in the Southeast U.S. has made increased utilization of educational technologies as school size has increased for each of the following school-size categories: 1) 0-250 to 251-500, 2) 251-500 to 501-750, 3) 501-750 to 751-1,000, 4) 751-1,000 to 1,000-1,500, and 5) 1,000-1,500 to 2,000.

The typical Christian school in the Southeast U.S. has made increased utilization of educational technologies as total school budget has increased. The budget categories within the research survey of total school budget categories included: 1) 0 to $400,000, 2) $401,000 to $1,000,000, 3) $1,000,001 to $1,500,000, 4) $1,500,001 to $3,000,000, 5) $3,000,001 to $5,000,000, 6) $5,000,001 to $12,000,000.

On the basis of this study alone, it was difficult to ascertain the magnitude with which varying school size (both total enrollment and total school budget) impacts specific areas of utilization of educational technologies. For example, do Christian schools with enrollments of 0-250 students have only 25% the technology budget compared to schools in the enrollment classification of 750-1,000 students (4 times larger)? Questions of this type and the research applied to them could help establish optimal Christian school size as it relates to one dependent variable, investment in technologies. In addition, on the basis of this study alone, it was difficult to determine the magnitude with which varying school size impacts specific areas of utilization of educational technologies. For example, were Christian schools with enrollments of 750-1,000 able to offer just as many

technology courses as schools with enrollments of over 1,500? Again, this type of specificity relating to school-size research was not the intent of this study.

This research was not meant to be macro, nor was it meant to be micro with emphasis one or two technology criteria. The research was investigative and simply designed to establish whether or not correlations existed when utilization of educational technologies was examined against two independent variables of Christian school size.

The purpose of this study was not designed to be terminal research or to build upon prior research. Prior research investigating the variables cited in this study was evasive or non-existent. As a result, this research was a starting point for future research. School size and technology will remain topics of interest for many years, and future investigations will build upon this research.

Further research should be directed towards the discovery of possible optimal levels of school size related to a number of variables. These variables should include curriculum offerings, program offerings, technology investment and utilization, and perhaps other criteria. Since substantial data and research were available relating to curriculum and program offerings, this study was meant to establish a bridge to further understanding.

## Implications

The goal of this research project was not to make definitive recommendations for Christian school leaders, but to provide a beginning definition of how Christian schools within various school size classifications were utilizing technology. Clearly, there were multiple factors that impacted school administrators' decision-making aside from school size; other factors included whether the school was 1) a church-affiliated or independent

Christian school, 2) an accredited or non-accredited school, 3) the school's aptitude for technology, 4) the geographic location of the school, 5) the stakeholders' expectations for technology, etc. However, most school decisions, including Christian School decisions, ultimately funneled down to a budget question, and a considerable level of each budget question has a connection to school size (enrollment = income = opportunities within the school's operating budget). In many cases for Christian schools, technology expenses were also contingent on both school budget and the school's fundraising efforts.

When the researcher made the decision to focus on school size, it was a decision to focus on the impact of school size impact on technology investment and the school-size impact on technology utilization since the researcher anticipated that school size was just the tip of the technology iceberg.

Implication # 1: Per student utilization of educational technologies was impacted by school size. (See Table 19 next page) Schools within the school size categories 0-250 and 251-500 were very close in their per student average technology expenditures ($105.46/student to $104.01/student). The data also showed that schools in the 750-1,000 category had more per student technology investment than schools at the lower school size category levels ($222.23/student). Schools in the 1,250-1,500 school size category did not appear to continue the upward trend of higher per student technology expenditures ($196.17/student). This could have been due to an economy of scale or perhaps other factors that future research could confirm. There was no proposed understanding from the 1,500-2,000 data since there were only two schools in that evaluation. The major implication of this finding was simply, if utilization of educational technologies is a priority, then schools with enrollment of fewer than 500 students and

with comprehensive programs will have far fewer educational technology opportunities than schools with enrollment over 500 students.

Table 19

Summary: School Size to Per Student Average Technology Expenditures

| Midpoint of school size category | Mean total technology expenditures | Per student average technology expenditures (mean total technology budget/midpoint) |
|---|---|---|
| 125 (category 0-250, n = 67) | $13,182 | $105.46 |
| 375 (category 251-500, n=33) | $39,001 | $104.01 |
| 625 (category 501-750, n = 25) | $91,418 | $146.27 |
| 875 (category 751-1,000, n = 15) | $194,451 | $222.23 |
| 1,250 (category 1,001-1,500, n=12) | $236,358 | $195.17 |
| 1,750 (category 1,501-2,000, n = 2) | $320,000 | $139.41 |

Future research specific to each of the school-size categories could confirm or refute the inferences made in implication # 1. In addition, while the sample set was appropriate for validation of the research findings, a much larger sample set would be valuable in future research as it relates to schools in the school size category with a mid-point of 1,750 (Category 1,501-2,000 students).

Implication # 2: Utilization of educational technologies increased progressively until reaching the 100% point of saturation as demonstrated in the “Does your school

have a written computer curriculum?" responses. In schools within the midpoint size 125 there was an increase of 27% of schools with the midpoint size 375 (49% up to 76% of schools having a written computer curriculum); in schools with the midpoint size 375 there was an increase of 8% of schools with the midpoint size 625 (76% to 84% of schools having a written computer curriculum); in schools with the midpoint size of 625 there was an increase of 16% of schools with the midpoint of 875 (84% to 100% of schools having a written computer curriculum). At that point, 100% of all schools had a written set computer curriculum within the higher school-size categories. The major implication of this finding was simply, if utilization of educational technologies is a priority, then schools with enrollment of fewer than 750 students (midpoint 875 schools) and with comprehensive programs; these schools will have fewer educational technology opportunities than schools with enrollment of 750 or above students. It would also be interesting to investigate if this finding is only a matter of school size, school budget, accreditation alignment of schools, newer schools versus schools that have operated for many years, and many other potential factors that could be contributing to implication # 2 (See Table 20).

Table 20

Summary: School Size to Written Computer Curriculum

| Midpoint of school size category | Number schools with a written computer curriculum in each category | Percent of schools with a written computer curriculum in each category |
|---|---|---|
| 125 (category 0-250, n=67) | 33 out of 67 | 49% |
| 375 (category 251-500, n=33) | 25 out of 33 | 76% |

Table 20 continued

| Midpoint of school size category | Number schools with a written computer curriculum in each category | Percent of schools with a written computer curriculum in each category |
|---|---|---|
| 875<br>(category 751-1,000, n = 15) | 15 out of 15 | 100% |
| 1,250<br><br>(category 751-1,000, n=15) | 12 out of 12 | 100% |
| 1,750<br><br>(category 1,501 – 2,000, n=2) | 2 out of 2 | 100% |

## Comparative Studies and Limitations

Within the context of Christian School research, no comparative research studies were discovered that analyzed school-size (total enrollment or total school budget) and the utilization of educational technologies. Fragments of information were derived from many studies, including:

- Classroom Computer Integration and Technical Support in Christian K-12 Schools (Thornhill, 2007)
- Change in Classroom Practices of Technology Use by K-12 Teachers (Johnson, 2006)
- Utilization of instructional technology: Towards a conceptual model for teacher education. (Coulter, 2004)

Ronnkvist, Dexter, and Anderson (as cited in Thornhill, 2007, p. 16) stated, "The effective use of computer based technology in the classroom is dependent upon the availability of teacher technical support." Thornhill (2007) stated, "Educational administrators would need to provide technical support resources to the teachers if any

tangible success with using computer based technology in the classroom would be realized" (p. 17). The findings of this research aligned with the findings of Thornhill in that having a technology director on staff was a significant contributor in schools utilization of educational technologies. In effect, schools with a technology director (more than 50% of responsibilities) on staff were also schools whose data reflected: 1) shorter computer life cycle, 2) written or prescribed "computer or technology" curriculum, 3) technology plans, and 4) a higher percentage of teachers who had advanced technology skills.

The findings of this research aligned with Johnson's (2006) findings in the dissertation entitled "Change in Classroom Practices of Technology Use by K-12 Teachers." Johnson stated: "Studies consistently report that in order for teachers to integrate technology into the classroom, adequate professional development must be provided" (Johnson, 2006, p. 1). This research found a strong correlation between the utilization of educational technologies and teachers who had either 1) intermediate technology skills or 2) advanced technology skills. While there is much more to professional development than training opportunities for technology skills, it is predicted that further study of schools with a high percentage of teachers with advanced technology skills would also be schools with 1) an on-staff technology director and 2) schools that have significant investment in professional development specific to utilization of educational technologies.

The findings of this research aligned well with the findings of Coulter. "Effective use of technology integration can occur if faculty and students have access to technology, materials, professional development, encouragement, technical assistance, and

instructional technology assistance" (Coulter, 2004, p. 65). This research indicates a strong correlation between technology budget and a number of utilization of technology data including 1) higher percentage of advanced-skill faculty, 2) shorter computer life cycle, 3) higher percentage of network-wide filtration appliance, and 4) use of online student grade books.

Furthermore, this research also aligned with Coulter's (2004) study entitled "Utilization of instructional technology: Towards a conceptual model for teacher education." While Coulter's study is not specific to Christian schools, it is still very applicable. In reference to the work of Seels and Richey, Coulter (2004) stated, "The utilization domain focuses on the employment of specific instructional technologies through innovation, implementation and institutionalization to encourage and support its applicable use in educational settings" (p. 23). Specifically, this research found that Christian schools that 1) provide technology plans, 2) have a prescribed "computer or technology" curriculum, 3) have an on-staff technology director, and 4) have significant technology budget investment are in fact schools that a) have a higher percentage of advanced-skill faculty; b) have a higher percentage of elementary, middle, and high school technology courses; and c) use technology more often as the primary tool of communication.

Each of these studies had components that added to the overall value of information in this research study; however, this research supported the claim of those in Christian Education that little research was available that was specific to the Christian school setting.

Therefore, the first limitation stated in this research study addressed the limitation

of available research specific to the study of Christian Schools related to: 1) total school enrollment, 2) total school budget, and 3) utilization of educational technologies.

Beyond the limitation of available comparative studies, there were several limitations that were important to reference. One concern was the reliability of self-reported data. All schools responding to the survey were assumed to have accurately reported their school's data. Extensive efforts were used to confirm the accuracy of responses; the researcher did access total budget numbers (total income and total expenses) for each school that had a Form 990 report posted on GuideStar (Philanthropic Research, 2008). Much of the confirming data was also self-reported, however, via the school's Form 990. Of the 154 schools in the final data, 99 had data that did confirm that their self-reported total budget number closely aligned with what the administrators reported for the following year. To summarize this point, the data available online for most of the schools' 990 federal return matched or closely matched the self-reported budget data as confirmed by GuideStar (Philanthropic Research). There were a few schools whose total budget data did not match. In each case, the researcher either e-mailed the school administrator to confirm that the total budget number was correct, or he eliminated the data deemed invalid before the SPSS analysis was applied.

A third limitation of the research data related to the individuals who completed the on-line survey. The accuracy of the data accessed by these individuals may have been questionable; faulty guessing or estimation of school data by these individuals may have been a factor. This limitation could have affected the data if inaccurate data were supplied for lack of simply not knowing or not having access to accurate data for their school.

A fourth limitation of the research concerned the number of schools that responded to the survey compared to the number of schools contacted to participate in the study (154 of 534 schools). The motivation to complete the on-line survey deserves review. Perhaps participants were motivated to complete the survey to experience an on-line survey. Perhaps they were motivated to complete the survey as a favor to the researcher, not because they knew him personally, but because they knew how difficult it was for doctoral students to collect research data. Perhaps they were motivated because they believed their school was excelling with technology and wanted their school's data included in the research. Further research could validate whether data from the 154 schools in this original research study constituted a representative cross section of Christian schools in the regions of study.

A final limitation concerned the definitions of the variables themselves. While the significance of the correlation findings in this research supported the hypotheses, this researcher has acknowledged that the definitions for all variables [school size: (total school enrollment and total school budget) and utilization of educational technologies] could be open for discussion and interpretation in future studies.

While school size was not a difficult term to define, it was a difficult term for researchers to agree upon in relation to the numerical range of school-size categories. NCES school-size data included in this research had categories of < 50, 50-149, 150-299, 300-499, 500-749, 750 or more for U.S. Private Schools. ACSI school-size data included in this research has categories of < 100, 100-199, 200-399, 400-699, 700-999, and 1,000 or more. The research for this study used categories that provided a numerical range of school size more equally distributed and more easily interpreted against technology

survey data. Researcher specified categories of school size included: < 250; 251-500; 501-750; 751-1,000; 1,001-1,500; and 1,501-2,000. One may argue that using data from these and other sources was not apples-to-apples; however, the data were easily interpreted against the researcher-developed categories.

Despite the potential for debate about minor additions or deletions to the distinctives of "utilization of educational technologies," the researcher maintains that the primary categories or components of this variable were included in this study. Therefore, future research may suggest variance in the significance of the correlations, but it can be contended that additional data would still support the hypotheses.

## Delimitations of the Study

There were several delimitations that were important in understanding both the methodologies used and the findings attained. They were as follows:

1. This study surveyed only Christian schools that were ACSI member schools in the Florida and Southeast regions of the United States.
2. The researcher requested and received permission from the regional directors of both regions before the survey was initiated. The request for schools (i.e., school administrators) to participate in the research study came to both regional directors, who, in turn, expedited e-mails requesting participation to all schools within their specific region. The researcher accounted for missing and what appeared to be inconsistent data from several schools by removing the data from these schools in the final Statistical Package for the Social Sciences (SPSS) assessment. Data from 154 schools remained in the final analysis.
3. The researcher made every attempt to ensure confidentiality of data collected,

especially given the sensitive nature of school budget data. All data represented in this dissertation were compiled to protect identification of any individual school.

## Recommendations for Christian Schools

Technology continues to be a significant investment for educators and for Christian-school educators. This research should cause other Christian-school leaders to consider the need for additional research relating to school size and the utilization of technology. Specifically, Christian-school leaders should investigate the following questions:

1. Is there an optimal school size for Christian schools as it relates to the utilization of educational technologies? A partial but invaluable solution to this question would be a partnership between researchers and ACSI and/or other Christian-school organizations to define the data needed, followed by collaboration to collect that data in the coming years.
2. Do Christian-school educators invest too much in technology compared to other Christian schools of like size? Again, collection of data by a para-Christian school organization would provide significant value to future research. In addition, establishing a Christian-school leader consortium to address specifically the topic of “utilization of educational technologies” could prove to be a major advancement for Christian schools.
3. Do Christian schools invest comparable technology funds as other private or public schools of like size? To address this concern, the researcher recommends that Christian-school leaders participate in several quality para-school organizations, like ACSI, NAIS, ISTE, and other regional organizations that

provide research data valuable to Christian-school leaders and their decision-making processes in technology.

4. Do some Christian schools utilize technology more efficiently despite their school-size limitations? Further research is needed to confirm that Christian schools function in such a manner; if so, defining the variables that allow smaller schools to see technological advancement comparable to schools of much larger size would be necessary. Do these schools provide technology advancement through stellar fundraising efforts? Do these schools provide technology advancement through reduction of other expenses such as salaries, benefits, program expenses, etc? Do these schools provide technology advancement through tuition and/or special technology charges to their parents? Once again, the key to these discoveries would be to develop explicit questions to ask and then create a methodology to gather the needed research.

These questions that are surfacing from the present study and the recommendations to address them represent just a few of the opportunities for Christian-school leaders.

## Recommendations for Continued Research

Research has become the bridge between making decisions and making informed, intelligent decisions. A void exists in Christian-school research. One may conclude, therefore, that Christian educators could make more informed and more intelligent decisions if more research were available.

Why has research been lacking? Research costs money, and organizations that provide support to Christian education require evidence confirming the importance of the

needed research before they will establish the means and process to collect, analyze, and summarize quality Christian-school research. Recommendation 1: Christian-school leaders should seek the help of para-organizations like ACSI to provide pertinent research.

Research has been limited, and much of the research that has been available has been specific to a very limited span of topics. Recommendation 2: Christian-school leaders must become educated about their utilization of educational technologies. This expanded knowledge baseline could help educators know what questions they need to ask within the approved technology expenditures within their own schools.

Recommendation 3: The sample set of this research should be expanded to a nationwide sampling of Christian schools within the membership of ACSI. This broader scope of research could further confirm the findings of the data within this research on a national level versus a regional level.

Recommendation 4: The research of other budget and program offerings should include correlations to school size. In other words, to investigate if the findings of this study transfer to other budget areas outside technology categories would be advisable. If such correlations exist, the research results could determine potential areas of concern related to school size for Christian schools.

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APPENDIX A

**November 2007**

**Dear ACSI Member School,**

Thank you for taking the time to read this letter and for your consideration of completing a brief on-line survey about the school that you serve.

My name is Daniel Patton and I currently serve as Head of School at Gaston Christian School in Gastonia, NC. I have served as Head of School in three ACSI schools for the past sixteen years, and I am currently completing my Doctoral Dissertation through Liberty University's School of Education. You can obtain more information about GCS and myself by accessing our website at www.gastonchristian.org. My dissertation topic will research the correlation between school size and technology initiatives for ACSI Schools in eight southern states.

I have been in contact with Mr. Bill Wilson, ACSI Southeast Director, and I have his approval to make contact with you to gather the needed data.

I need your help in completing an on-line survey. (Less than 20 minutes total time). The survey can be accessed at this link: http://www.surveymonkey.com/s.aspx?sm=4j5upHQWUkJrWEkynfcVZw_3d_3d -- your password to access the survey is ACSI. You will be asked to enter a brief demographic section about your school (name, address, your name) and then complete 20 school specific questions.

I believe this research is very important, and I thank you in advance. Your completion of the survey by Monday, December 31, 2007 is greatly appreciated.

I will send every school that completes this survey a summation of the results during the spring of 2008. You can email me any questions at dpatton@gastonchristian.org .

**Thank you!**

**Sincerely,**

**Daniel N. Patton**
**GCS, Head of School**
**Liberty University, Doctor of Education Candidate**

APPENDIX B

# ACSI Member School Survey

### Florida and Southeast U.S. Regions
### Winter 2007/08

Thank you for taking the time to complete this survey. Your responses will be kept confidential and will only be released in summary form with those of all respondents. Your investment in my doctoral dissertation is greatly appreciated. Sincerely, Daniel Patton.

## School Name/Address and Contact Information

1. What is your school's name and address?
   _____
   _____
   _____

2. What is the name and email address of the person completing this survey?
   _____
   _____

## School Demographic Information

3. Is your school church sponsored or an independent school?
   _____ Church sponsored
   ____ Independent
   ____ Other (please specify)

4. School programs (please choose one)
   _____ PS or K through Grade 12
   _____ PS or K through Grade 8
   _____ PS or K through Grade 5 or 6
   _____ Other - please describe

5. School size (include all programs except daycare)
   _____ less than or equal to 250 total students
   _____ more than 250 but less than or equal to 500 students
   _____ more than 500, but less than or equal to 750 students
   _____ more than 750, but less than or equal to 1,000 students
   _____ more than 1,000 students

## Technology – School-wide Information

6. Check the statement that most closely applies to your school – regarding school-wide use of technology.
   - o All instructional classrooms have computers with network and internet access.
   - o Most instructional classrooms have computers with network and internet access.
   - o Few instructional classrooms have computers with network and internet access.
   - o No instructional classrooms have computers with network and internet access.

7. Check the statement that most closely describes your school's website.
   - o It is the first and primary source of communication to school stakeholders.

- o It is often used as a source of communication to school stakeholders.
- o It is seldom used as a source of communication to school stakeholders.
- o We do not have a school website at this time.

8. Check all statements that apply to your school.
   - o Faculty news is shared by e-mail
   - o Faculty websites are hosted on your school website
   - o Faculty websites are connected to outside websites through your school website
   - o Faculty use an on-line student grade book
   - o Parents have access to student attendance and grades through an on-line access

9. Does your school have a network-wide filtration appliance or software to limit access to questionable web material?
   - o Yes
   - o No

10. How many years is a computer in use in your school before it is considered obsolete?
    - o 5 years or more
    - o 3-4 years
    - o Less than 3 years

## Technology – Personnel Related

11. Estimate the percentage of teachers in your school at each skill level in the use of technology in instruction. (Responses should total 100%)
    _____ % Beginner
    _____ % Intermediate
    _____ % Advanced

12. Does your school employ an "on-staff" technology director (employee) – who has a minimum of 50% of their time devoted to educational technology support?
    - o Yes
    - o No
    - o Other (please specify)

13. How many full-time equivalent computer/technology teachers are employed in your school – not including the technology director if you have one?
    _____

## Technology – Curriculum Related

14. Does your school have a set "computer or technology" curriculum?
    - o Yes
    - o No

15. How many computer or technology course offerings does your school offer in each of the following program levels? (In other words, if your school has a set curriculum for each grade level of K-5, then your answer would be 6 for Elementary School)
    _____ Preschool (Pre-3 and Pre 4)
    _____ Elementary School (K through $5^{th}$)
    _____ Middle School ($6^{th}$ through $8^{th}$)
    _____ High School ($9^{th}$ through $12^{th}$)

16. Does your school have a technology plan?

- o Yes
- o No

17. What is the total number of computers your school has available for student and instructional use? (Do not include daycare, administrative, or office computers).
    _____

18. Does your school offer any "on-line" classes?
    - o Yes
    - o No

19. If yes to question # 18, what grade levels do you currently offer on-line classes for?
    _____
    _____

20. If no to question # 18, what level of program do you intend to offer in the next 5 years.
    _____ Elementary "On-line" School (K through 5th)
    _____ Middle "On-line" School (6th through 8th)
    _____ High "On-line" School (9th through 12th)
    _____ None are in the planning at this time

## Technology – Budget Related

21. What is your school's technology budget for this school year 2007-08?

| | |
|---|---|
| Technology director (salary/benefits) | _____ |
| Technology curriculum (textbooks, teacher editions, etc) | _____ |
| Hardware | _____ |
| Software | _____ |
| Training (technology related professional development) | _____ |
| Outsourced tech support | _____ |
| Connectivity (T-1, DSL, other) | _____ |
| Other | _____ |
| **Total Amount (Sum of all of the above)** | _____ |

22. What is your school's total budget for this school year 2007-08? _____

## Research Validity and Thank You

23. Do you believe this research will prove the following research hypothesis:

**School size is a condition that affects a school's investment in technology**

- o Yes
- o No

Thank you for your time and for completing this survey. You will receive a summary of the data once the analysis is complete. This data can be helpful not only in my dissertation work, but also in your Christian School endeavors. Any questions related to this survey can be forwarded to my attention at dpatton@gastonchristian.org.
Sincerely -- Dan Patton