

VIRTUAL LEARNING: IS IT CONDUCIVE TO STUDENT ACHIEVEMENT?

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Virtual Learning: Is It Conducive To Student Achievement?

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## Abstract

Janie Mae Sheeley Johnson Torain. VIRTUAL LEARNING: IS IT CONDUCTIVE TO STUDENT ACHIEVEMENT? (Under the direction of Dr. Clarence Holland) School of Education, July 2009.

The use of technology to compel student learning has become an increasingly central component of teaching, learning, and school improvement efforts. What exactly does virtual learning entail? How does it integrate with curriculum and instruction? Does it present organizational challenges to educational institutions? This study examined unit test scores, end-of-course grades, instructors' opinions of teaching online, students' satisfaction with online course, and instructor interaction, as measures of the effectiveness of online and face-to-face curriculum delivery on student achievement. A series of *t* tests conducted to compare the mean scores of the face-to-face and the online formats provided data to determine no significant difference in five unit tests and the final course grades of the two formats. An interview of instructors provided an insight to teachers of online courses and their advice to students about the self-motivation and commitment needed to fulfill online course requirements. The students' survey conveyed that 89% of the respondents took the online course from home, registered with no trouble, think that they will take another online course in the future, agreed or strongly agreed that the course was intellectually challenging, and agreed or strongly agreed to being well advised about the self-motivation and commitment needed to fulfill course requirements. This study of virtual learning opened up dialogue among educators to discuss issues such as alternatives to traditional teaching and learning to reach the diversity of learners. It provided foundational evidence for decisions of expenditures for technology, professional development, and facilities.

## Dedication

I give praises to God for blessing me with a compassionate, Spirit-filled spouse, Nathaniel. His wisdom, understanding, and encouragement have no limits. Thanks for allowing those weekends getaways to renew my strength. Love and kisses to Takiya Johnson, a wonderful daughter, whose encouragement and strength were endless.

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## CHAPTER 1: INTRODUCTION OF THE STUDY

### Introduction

Distance learning, e-learning, virtual learning, the information super highway, no matter the choice of terminology, information technology has advanced elemental changes in how teaching and learning take place. Although historically, the idea of using technology to deliver content was unacceptable by many educators and textbook publishers, schools in America, over the last two decades, have embraced distance learning tools to enhance students' educational opportunities. New choices and opportunities for students, parents, educators, and administrators have opened as technologies provide any time and any place modes of educating the masses (Fletcher, 2004).

Before the advent of other mediums, the US Postal Service was the main means to deliver distance learning materials. After the students enrolled in courses, the instructors mailed reading materials, assignments, and tests. Students completed the assignments and returned the materials in the same mode—through the postal service. In the high school arena, satellite, microwave, cable, and broadcast television first gave students access to courses not otherwise available in their local schools. Therefore, rural high schools or schools with minimal financial funding were able to offer advanced placement (AP) courses, honor courses, foreign languages, and courses demanding highly qualified teachers.

More recently, multimedia and Internet-based technologies have provided powerful options for distance teaching and learning. Many home schools, charter schools,

and Christian academies have been utilizing distance learning as a means to supplement and provide the expertise needed in educating students. With practically all public, private, home schools, colleges, universities, and even Christian academies now linked to the Internet, states, districts, and those educating the masses are increasingly opting to utilize online courses to expand their programs of study (National Education Association, 2006). Since the opportunity to pursue an entire degree program online has become reality, there are major concerns that need addressing. The lack of teacher and student proficiency with technology is one major concern (Wegner, S. B., Holloway, K. C., & Garton, E. M., 1999). Secondly, there is a resistance to change on the part of faculty (Parrot, 1995). Third, there may be student passivity (Filipczak, 1995). Fourth, there must be an awareness of hardware limitations (Kerka, 1996). Finally, there is learner isolation (Kubala, 1998). These issues were a small number of the apprehensions to distance teaching and learning opportunities addressed in most of the literature. While they represent legitimate areas of concern, for the most part, these problems relate to training and technology issues that have attainable remedies. Less obvious in the literature is increased student achievement because of distance teaching and learning.

As the use of standardized testing to measure school accountability has expanded, so has the list of arguments for excusing the low achievement of whole categories of students. While special education law provides for testing with accommodations, in practice it has pushed educators to focus more on procedural compliance. The achievement of language-minority students has often been overlooked or incorrectly measured as school districts lacked the skill or will to administer appropriate assessments (Wenning, Herdman, Smith, McMahon, & Washington, (2007).

This study of distance learning will examine the difference between traditional classroom and online distance learning for a community college computer information systems course. The areas of analysis will be the students' interim grades, final grades, and preference of instruction.

### Background of the Study

Prior to the 1970s, a report titled Equality of Educational Opportunity concluded that schools had no significant difference in student achievement (Coleman, Campbell, Hobson, McPartland, Mood, Weinfield, & York, 1966). This study, known as the Coleman Report, included 4,000 schools. Six hundred thousand students participated in this study. The researchers collected and analyzed data from 60,000 teachers as well. Coleman and his colleagues concluded that only 10 percent of the variance in student achievement came from the quality of schooling a student received. The researchers went on to ascribe the majority of the differences in student achievement to three main factors:

- a student's natural ability or aptitude
- a student's socioeconomic status
- a student's home environment.

Advancements in technology have helped remove some geographical and economical roadblocks to higher educational achievement. One of the feats for educators has been to ensure that information technology increased the quantity of educational opportunities. An even greater challenge has been to maintain or enhance the quality of those educational opportunities. As educational institutions experienced and analyzed online teaching and learning, research revealed that there is a demand for new forms of delivery. Because today's students are accustomed to using wikis, blogs, and the Internet,

these 21st-century learners require a more interactive learning environment. Most curriculum standards for the delivery of instruction did not contemplate these new tools of communication. Meticulously created to instruct students in the traditional face-to-face classrooms, simply incorporating 20<sup>th</sup>-century standards of learning and methods into an online environment proved ineffective. According to the NEA, “Shoehorning content created for conventional classrooms for delivery online will diminish the overall quality of education” (National Education Association, 2006).

### Study Objective

This study examined the impact of two course formats (face-to-face and Internet-based) on student outcomes as measured by a comparison of test scores and the end-of-course final grade. Several instructors of both formats shared their thoughts and strategies on how to deliver content. A review of students’ comments, evaluation of the course, and evaluation of the instructor helped divulge their satisfaction with their preference of format, content delivery, and instructor strategies.

In many instances, there is little or no consideration of the impact on student learning outcomes given when instituting the change to an Internet-based curriculum content delivery system. This study compared students’ test scores from an Internet-delivered course to a group of students whose instructional opportunities were from the traditional, in-class model. With the use of independent sample t-tests, results indicated that there was no significant difference between the comprehensive test scores of students of the online course as compared to students’ test scores in the face-to-face environment.

According to the Higher Education Program and Policy Council (2001), both online and face-to-face courses must meet the highest standards of quality design and

instruction. In 2001, the online environment was a relatively new one for teaching and learning at the secondary level. Consequently, it was important to recognize and explicitly describe key features considered when adopting this form of instruction. The quality of online course offerings should consider the following areas:

1. Curriculum -- Online curricular offerings should be challenging, relevant, and aligned with appropriate national, state, and/or district standards for student learning.
2. Instructional Design -- Online courses should be informed by and reflect the most current research on learning theory and designed to take advantage of the special circumstances, requirements, and opportunities of the online learning environment and support the development of 21st-century learning skills.
3. Teacher Quality -- Teachers should be skilled in the subject matter, learning theories, technologies, and teaching pedagogies appropriate for the content area and the online environment.
4. Student Roles -- Students should be actively engaged in the learning process and interact on a regular basis with the teacher and online classmates in the course.
5. Assessment -- Assessment should be authentic, formative, and regular, providing opportunities for students to reflect on their own learning and work quality during the course. End-of-course assessments should give students the opportunity to demonstrate appropriate skills and understanding that reflect mastery of the course content.

6. Management and Support Systems -- The course should be managed to ensure effective student and school participation. Support systems should provide resources to teachers, students, and parents comparable to those provided by face-to-face courses, as well as special support necessitated by the unique circumstances of the online environment.

7. Technological Infrastructure -- Finally, the technical infrastructure supporting the online course should provide the necessary tools for instruction and interactivity. The technology behind the course should work reliably, simply, and economically. Technical assistance should be available whenever needed by students or teachers (National Education Association, 2006).

Higher education courses and programs have a longer record of establishment and a different set of purposes, administrative practices, and audiences than secondary education. Documents such as the National Education Association's *Quality on the Line* (Phipps & Merisotis, 2000) and the American Federation of Teachers' *Distance Education: Guidelines for Good Practice* (Higher Education Program & Policy Council, 2001) identified characteristics of effective online courses at the college level.

Online courses must address the unique social, educational, and emotional needs of students. In addition, when students complete a significant portion of coursework online, computer literacy, access to a computer, and the cost of Internet access are other limitations and concerns to consider. This research was limited only to comparing comprehensive test scores to establish criteria to compare student achievement in the course and not examining online programs that serve as the bulk of a student's education.

## Research Questions

This study examined the test results of students in a course taught online and compared the scores to the same course taught in a face-to-face setting. It provided information to help institutional-level planners - administrators, technology and media specialists, and technology planning team members - make purchasing, resource allocation, and other decisions relating to technology. However, this study may be used as a factor to guide decisions about professional development for educators, including decisions about content, timing, and types of opportunities provided. This study addresses the following:

1. What was the impact of distance learning on students' final grades?

Using the independent sample t-tests, results indicated that there was no significant difference in the final course grades of the face-to-face and the online students.

Null Hypothesis-There will be no significant difference from students that experience the curriculum content online and students that experience the curriculum content face-to-face.

2. What was the impact of distance learning on teaching practices?

Instructors who taught the same course online and face-to-face completed an opinion survey. Since the aim of the instructors' survey was to gather and examine expert input on the pros and cons of online teaching, it was not statistically calculated.

Null Hypothesis-There will be no significant difference in teaching practices of the online instructor and the face-to-face instructor.

3. What was the students' satisfaction with instructions?

A survey disseminated to students by the community college allowed the researcher to gather helpful insights to students' preferences of learning environments.

Null Hypothesis-There will be no significant difference of students' preferred instructor interaction, online or face-to-face.

#### Statement of the Problem

There has been much public debate, even among educators, over the intrinsic worth of Internet-based distance learning. Proponents declare that online teaching and learning can resolve all the problems confronting traditional education. Opponents insist that courses taught through the virtual format are incapable of living up to the learning standards of the traditional face-to-face classroom. Administrators, to assure the most efficient use of their education budget, must make decisions whether to provide the additional funding needed to support new and ever-changing technology, software licensing, and professional development for teachers. In light of the discussions for and against learning online, this study examines distance learning's affect on student achievement (Phipps, Merisotis, & Harvey, 2000).

In every subject, educators have an enormous amount of content to deliver that students must assimilate and learn. Because of the No Child Left Behind (NCLB) Act passed in 2001, curriculum content must be presented in a manner that will show gains in achievement in all students. Along with this surmountable responsibility, teachers increasingly realize that no single textbook can convey all the concepts and differing viewpoints on any unit of study. Therefore, many content area teachers are turning to electronic resources that complement textbooks (Richardson & Morgan, 2006).

According to Allen & Seaman (2003), web-based computer technologies have changed teaching and learning. Internet technologies have opened the door to more powerful, easier to use, and economically feasible media for educational purposes. These authors also purported that the majority of public higher education institutions indicated that online courses attracted a growing number of students. In addition, when comparing these online courses to traditional face-to-face courses, students achieved the same or even higher learning outcomes.

Phipps & Merisotis (2000) supposed that increasing faculty involvement and acceptance of online education were due in part to the increase in access to computers, high-speed Internet, and software packages, such as course management software, that were designed to make teaching and learning online more user-friendly. In addition to the pique of online learning by students and educators, the changing demographics of both students and highly qualified educators support the need of a flexible educational delivery system (National Center for Education Statistics, 2000-2001). Finally, the traditional college-bound students are Internet and computer literate. These students are more receptive to courses taught in the virtual environment and expect a high level of technology use in their coursework (Synergy Plus, Inc., 2002).

In the last seven years, there has been an explosive growth in distance teaching and learning accompanied by their increasing impact on instructional methodologies and strategies across education and training. Growth in distance teaching and learning has encompassed elementary through secondary education, postsecondary education, all branches of the military, the commercial world of vendors of education, and providers of training products and services (Synergy Plus, Inc., 2002). The NCES estimated in 2000-

2001 there were just over three million enrolled in distance education courses at two- and four-year schools. By 2010, Waits & Lewis (2003) expect enrollment in distance education courses to surpass 17 million students.

Although technology-supported distance learning has expanded steadily since the early 1970s, the following factors have contributed to the explosion in the mid-1990s and the continued expansion:

- The advent of the World Wide Web;
- The introduction of commercial Web browsers;
- The availability of inexpensive PCs;
- A growing demand for flexible learning;
- Changing demographics.

The World Wide Web (WWW) has enhanced collaboration among people. With the development of tools for browsing and navigating throughout the Internet, accompanied by the large-scale telecommunication network, the WWW is more pervasive in everyday activities (Bisdikian, Brady, Doganata, Foulger, Marconcini, Mourad, Operowsky, Pacifici, & Tantawi, 1998). Web browsers have made the Internet a more user-friendly environment. Novice users have the ability to integrate text, graphic, and sound into a single tool (Willis, 1994).

Willis (1994) reported that the dramatic improvements in the processing power of personal computers, rapid development of computer networks, and decreasing prices have made the computer a dynamic force in distance education. Computers are an interactive-multimedia tool that can facilitate self-paced learning. Innovations are constantly emerging while related costs decrease. Open source software has provided

another advantage to the distance learner, the use of technology without bearing the cost of implementing it (West, 2007).

Since the first state-sponsored virtual (online) secondary school was created nearly 10 years ago in Florida, the Southern Regional Education Board (SREB, 2005) states have found state virtual schools to be a viable means of ensuring equity-of-access for students and an effective way to provide quality teaching and courses at reasonable costs. Through state-sponsored virtual schools, SREB states also have avoided many of the issues associated with independent virtual schools. Research by Clark (2001) revealed issues such as funding for startup, staffing, and technology. He further cited issues with outdated infrastructure. Locating appropriate courseware, software development tools, and finding qualified staff were among other barriers noted in his study. SREB reports a growing understanding among states that providing Web-based courses to middle school and high school students produces desirable grades and student test scores. As an alternative to traditional classroom teaching, online courses proved beneficial to reach students who needed:

- Additional or advanced academic courses their schools did not or could not provide.
- To retake courses for graduation.
- Alternatives to courses currently offered in their school.
- Increased access to courses because of physical disabilities.

#### Importance of the Study

The South Eastern Regional Vision for Education (SERVE), (2004) best described the desired outcomes of an educational activity when they said:

The ultimate desired outcome of an education activity is student achievement. This presumption can pose significant challenges when evaluating a project that is one part of an ongoing, integrated effort.

Teacher professional development is perhaps the most common example of this reasoning. Any professional development effort moves forward on the logical proposition that:

- (a) Teachers do not already possess the specific knowledge, concepts, skills, processes, or dispositions being provided;
- (b) They will acquire the specified knowledge and skills by participating in professional learning activities;
- (c) They will then apply what has been learned in their classrooms;
- (d) Their teaching practices will subsequently change;
- (e) Student activities will then be different than they were previously;
- (f) Improved student engagement, motivation, and; and ultimately,
- (g) Measurable improved student learning

If the evaluated project applied a strategy of providing professional development for teachers, student achievement was several levels logically removed from those activities. While changes in student behavior were evident in one year, anticipated positive impact on achievement was not obvious (p. 2).

Online learning offers some advantages for students, but it also poses special problems. More information than ever has been made available to students through the

distance learning environment. Along with the information came many barriers (Schmetzke, 2001). According to Rowland (2000), institutions have invested in computer hardware, software, facilities, and instructors, increasing student access to online courses. On the same note, increased access has not automatically assured increased understanding or learning. Identifying effective characteristics such as learner interest, expectations, and attitudes are essential in order to obtain positive results from web-based education. Understanding learner attitudes towards web-based teaching would assist learners in an effective organization and adoption of web-based learning environments (Erdogan, 2008). Other problem areas that increase the importance of this study are the facts that curriculum content presented online may prohibit student achievement. Web pages divided into segments or frames can confuse software programs that translate text to voice. Web pages with a long list of hyperlinks crowded together can confuse a student with visual, cognitive, or motor disabilities. This study brought awareness to the format and appearance of curriculum presented online.

#### Rationale

In spite of a mistaken perception by many that online learning is not text-based, the opposite is true. Some instructors have converted lectures into online handouts. Online discussions and group activities are almost entirely text-based. Class discussions have taken the form of Blackboard discussion groups and real-time chats that entail exchange of on-screen text messages. Some instructors have exposed students to an entire semester's worth of text material within one week as a component of online learning.

Much of the interactivity of some online courses has occurred without the assistance of the teacher or instructional assistant. Students have learned in the solitude of

their own computers. The heavy dependency on self-motivation and reading ability requires new strategies to help fill the gap between the online content and the students' ability to retain the information. Exposure to curriculum content online may not necessarily mean learning took place. This study compared the outcomes to determine which course delivery format offered greater achievement.

### Methodology

This study utilized a hybrid of methods (historical, qualitative, quantitative, ex-post facto). To give an account of what had occurred, the researcher employed historical research methodology to examine the online and face-to-face computer information system courses taught in the fall semester of 2007. Information sources for students' scores were archived Blackboard courses and Excel files. Blackboard course management software was used to support Internet-based instruction and as a grade book. Students' assignments, tests, and final grades were downloaded to Excel files.

Interviews with some of the instructors that taught online and face-to-face and the students that enrolled in the courses provided qualitative research data. The instructors gave their expert opinions through the interview questions. The students completed a Likert scale evaluation of teacher performance and satisfaction with the course. Chapter 3 discusses the interview and survey validation. As much as possible, the researcher attempted to review the data based on current research requirements for historical research and phenomenological research investigations.

Descriptive statistics were used to analyze and summarize the numerical and nominal data. The students' scores and final grades were input into the Statistical Package for the Social Sciences (SPSS) software to perform factor analysis by identifying

underlying variables or factors that explained correlations within a set of observed variables. Chapter Four provides a more detailed discussion of the appropriate statistical methods for comparison of the online and face-to face sections.

#### Definition of Terms

*Academic standards* -- The skills and knowledge base expected of students for a particular subject area at a particular grade level.

*Achievement* -- Something accomplished successfully, especially by means of exertion, skill, practice, or perseverance. The Ofsted (2002-2008) handbook spoke of achievement by saying:

The distinction between standards and achievement was crucial. Achievement was judged by reference to the progress made by individuals and groups of students, taking into account their prior attainment and potential. Standards were judged by reference to the level of performance of groups of students against national averages (p. 76).

*Anticipated Achievement Normal Curve Equivalent* -- Estimates the average score for students of similar academic aptitude. This allows comparison of an individual student's level of achievement with that expected of similar students.

*Criterion Referenced Test (CRT)* -- A test linked to predefined content standards and designed to measure student achievement of those standards.

*Curriculum* -- The planned interaction of pupils with instructional content, materials, resources, and processes for evaluating the attainment of educational objectives

*Descriptive research* -- Research that asks questions about the nature, incidence, or distribution of variables; it involves describing but not manipulating variables using techniques for organizing, summarizing, and describing observations (Ary, Jacobs, Razavieh & Sorensen, 2006).

*Distance learning (Education)* -- A training course delivered to remote sites via audio, video (live or prerecorded), or computer technologies, including both synchronous and asynchronous instruction. However, distance education courses may include a small amount of on-campus course or lab work, on-campus exams, or occasional on-campus meetings. Distance learning is a dynamic concept, and the name itself was subject to revision.

According to the American Federation of Teachers (2001), *distance learning* referred to students taking courses where most of the interaction and communication between the student and instructor occurred electronically. This interaction includes e-mail, online chatting, video, telephone, and other communications that do not require the student and the instructor to be in the same location at the same time. The number of students enrolled in such learning environments grew exponentially in the last decade (Waits & Lewis, 2003). Other terms for *distance learning* follow:

- In higher education the generic term of *distance learning* has been supplanted by *distributed learning* (Dede, 1996), reflecting the nature of the new Internet technologies and the fact that distance was not necessarily the primary, or only, obstacle addressed. As early as 1991, Hezel & Dirr noted that time conflict was a primary consideration for enrollment in distance learning courses and brought into question the adequacy of the term *distance learning*.

- In the commercial world, *distance learning* was often referred to as *e-learning* or identified as *learning-on-demand*, or *just-in-time training*.
- In secondary schools and community colleges, the terms *virtual college*, *virtual learning*, *virtual school*, *online instruction*, and *multimedia-based learning* defined the evolving Web-based segments of the distance learning continuum.
- The U.S. Department of Defense (DOD) in its Learning Anytime Anywhere Partnerships (LAAP) program used the term *learning anywhere and anytime*.
- *Advanced Distributed Learning* (ADL) is a new term and acronym in use today coined and made famous by the Department of Defense as part of its department-wide education and training transformation initiative.

*E-learning* -- A general term that relates to all training that was delivered with the assistance of a computer. Delivery of e-learning can be via CD, the Internet, or shared files on a network.

*Early College* -- An intervention strategy for students who may not be well served by traditional high schools. Early Colleges are small schools where students can earn a high school diploma with the potential to earn an Associate's Degree or two years of college credit towards a Bachelor's Degree in five years or less.

*Ex-post facto research* -- Also called *causal-comparative research*, a type of research that attempts to determine the causes for, or the consequences of, differences that already exist in groups of individuals.

*Historical research* -- Giving an account of what has happened in the past through a process of systematically investigating past events.

*Hybrid classes* -- A significant amount of the course learning activity has been moved online, making it possible to reduce the amount of time spent in the classroom. Traditional face-to-face instruction is reduced but not eliminated. The hybrid course model is also referred to as *blended*.

*Learning Management System (LMS)* -- A learning management system is a product such as Angel, Blackboard, Desire2Learn, eCollege, or WebCT that facilitates the delivery of curriculum content online.

*Meta-analysis* -- The systematic combination of quantitative data from a number of studies that investigates the relationship between the same variables, a weighted average of effect sizes (Ary, Jacobs, Razavieh & Sorensen, 2006).

*Moodle* -- A course management system (CMS), that is a free, open source software package designed to help educators create online learning communities. It can be downloaded and used on any computer (including web hosts). The scale of the program ranges from a single-teacher site to a university with 200,000 students.

*National Vocational Qualifications (NVQ)* -- Nationally recognized qualifications that are based on standards that have been developed across industries that clearly define the skills and knowledge needed in the work place. The standards are agreed upon by a cross-section of people working within each industry, and they relate directly to the work skills and knowledge one needs to demonstrate to prove competency in an area of work. NVQs define skills, knowledge, and attitudes that can be directly applied and assessed within the workplace.

*No Child Left Behind (NCLB)* -- A testing, reporting, and accountability model. In a major expansion of the federal role in education, the NCLB Act requires annual testing,

specifies a method for judging school effectiveness, sets a timeline for progress, and establishes specific consequences in the case of failure.

The No Child Left Behind Act of 2001 (NCLB) is a federal law that mandated a number of programs aimed at improving U.S. education in elementary, middle, and high schools by increasing accountability standards. The approach behind NCLB was based on theories of standards-based, or outcome-based, education, which stated that high expectations goal-setting would result in greater educational achievement for most students (White, 2007).

*Online content* – A combination of data, form, and context presented on the Internet, on web pages or through course management systems. Examples are documents, spreadsheets, e-mails, images, forms, videos, pod casts, instant messages, wikis, and blogs.

*Qualitative research* -- A generic term for a variety of research approaches, such as case study, ethnographic, and action research, that study phenomena in their natural settings, without predetermined hypotheses.

*Quality* -- A product becomes a quality product when it is of value to the customer. According to Bradbery (1991), one thing that seems to be universal in most approaches to defining the word *quality* is customer satisfaction. In the end, students in distance education systems are in the best position to assess the quality of any particular online program. Therefore, for this study, quality is determined by student satisfaction. Students' judgments of quality are personal and subjective, based on their individual needs, demands, desires, and experiences. Therefore, there may be different levels of expertise when determining the quality of a particular study program. However, their

judgments are decisive for the future of any study program, because the student/customer is the one who makes the investment in terms of money, time and effort.

A traditional conclusion seems to be that quality means different things to different interest groups. Any distance education system incorporates many different elements and processes. The actual degree of importance given to these varying components depends upon which interest group is going to interpret quality.

*Quantitative research* -- Investigations using operational definitions to generate numeric data to answer predetermined hypotheses or questions. According to Ary, Jacobs, Razavieh, and Sorensen, (2006), quantitative research strives for testable and confirmable theories that explain phenomena by showing how they were derived from theoretical assumptions subjected to tests using a predetermined procedure such as an experimental, ex-post-facto, or a correlation design.

*Quasi-experimental research* -- Research in which the investigator can control the treatment and the measurement of the dependent variable but cannot control assignment of the subjects to treatment (Ary, Jacobs, Razavieh & Sorensen, 2006).

*South Eastern Regional Vision for Education (SERVE)* – A university-based education organization with the mission to promote and support the continuous improvement of educational opportunities for all learners in the Southeast. It is located at the University of North Carolina at Greensboro, under the leadership of Dr. Ludwig David van Broekhuizen. The organization's commitment to continuous improvement is manifested in an applied research-to-practice model that drives all of its work. Building on research, professional wisdom, and craft knowledge, SERVE staff members develop tools, processes, and interventions designed to assist practitioners and policymakers with

their work. SERVE's ultimate goal is to raise the level of student achievement in the region. Evaluation of the impact of these activities combined with input from stakeholders expands SERVE's knowledge base and informs future research (The SERVE Center, Inc. 2004).

SERVE develops, publishes, and distributes a variety of research-based studies, training materials, policy briefs, brochures, and videotapes. These informative products and publications are guides to available resources, current issues in education policy, and exemplary educational programs. In addition to its publications, SERVE also provides services, such as trainings, professional development, technical assistance, and evaluations.

*Teleclasses* – Classes delivered in a videoconferencing environment with two-way interactive audio and video. The instructor sees and talks to students at a remote location.

*Telecourse* – A delivery format supplemented by printed materials with an available instructor all through the course. Students view the majority of the course content from videocassettes or DVDs for successful completion of the course. Students usually take exams on campus.

*TeleWeb courses* -- An interactive instructional scheme similar to the Telecourse format that integrates the viewing of lessons through videotapes, DVDs, or CDs along with online activities and resources. Students use the Internet to participate in class discussions and instructional activities.

*Total Quality Management (TQM)* – A management system that has provided administrators with applicable models, systems, tools, and techniques in the field of

distance education that assist in the monitoring of complex distance-education systems. TQM has created a new focus on accountability. The definition of quality is no longer based on what the management regards as appropriate, but rather on the customers' and the students' perceived needs, expectations, and preferences.

*Virtual Learning Environment (VLE)* – A software system designed to help teachers by facilitating the management of educational courses for their students, especially by helping teachers and learners with course administration. The system can often track the learners' progress while monitored by both teachers and learners. While frequently thought of as primarily tools for distance education, VLEs supplement instruction in the face-to-face classroom.

### Chapter 1 Summary

Many academic institutes are implementing advanced technologies as a part of existing teaching frameworks (Mioduser & Nachmias, 2002). According to Harasim (2000 p. 41-61), the invention of computer-mediated communication (CMC) systems and the World Wide Web led to the development of two main models of online learning: one based on cooperative learning and interaction, while the other based on publication of information on the Internet. Undeniably, the development of huge amounts of web-based learning materials (Bork, 2001) and web-based contents have become a major component in many academic courses (Nachmias, 2002). Presentation of educational contents on the Internet is highly valuable for students who enjoy visual presentation of information and supplements to materials taught in lectures according to Cummings, Bonk, and Jacobs (2002). Conversely, according to these authors, the arrangement of course content online did not necessarily result in students' using it to augment their learning or understanding.

Nachmias' (2002) study was concerned about the large quantity of resources, the financial investments, the time, and the effort required to develop online learning materials. Consequently, Soong, Chan, and Chua (2001) stated that there must be an examination as to whether these resources have benefit.

This study sort to provide valuable information concerning various educational needs by examining and comparing the outcomes from the application of distance education. Considering the diversity in learning styles and changes in student demographics, there is a demand for alternatives to the traditional methods of delivering instruction. Educational administrators, teachers, and the public must trust online distance teaching as a valid and proven instructional method. Furthermore, administrators and teachers need to know what to expect when planning, operating, and teaching in an online environment. This study investigated these needs.

#### Organization of Remaining Chapters

Chapter 2 will review the research literature relating to face-to-face and distance learning's affect on student achievement. Chapter 3 will discuss the research design and the selection of the subjects in addition to providing detailed descriptions of ExamView®, Blackboard, and other instruments used in the research procedure, data processing, and analysis. Chapter Four will present the results of the data collection and analysis of the data. In Chapter 5, there will be a discussion of the limitations of the study. Chapter 5 will also summarize the research, draw conclusions, and provide suggestions and recommendations for further research.

## CHAPTER 2: REVIEW OF THE LITERATURE

### Introduction

Identification of instructional strategies that have a high probability of enhancing student achievement in all subjects and at all grade levels has been the primary goal of many studies. The review of literature for this study includes a brief assessment of the search process. Secondly, there was an examination of the theories used to frame the research. Finally, this research will observe how this knowledge connects the viability of online versus traditional presentation of curriculum and its affect on student achievement.

Historically, many educators, especially in the K-12 arena, have been slow to accept the use of the Internet and other technology mediums to deliver curriculum. In recent years, however, there has been a sudden increase in the growth of online courses, the use of course management systems, and the use of the Internet as instructional tools in postsecondary and K-12 areas of education (Fletcher, 2004). Studies have shown that there are an enormous amount of resources produced for academic web sites and various course management systems. Few experimental studies show evidence regarding the use of these contents by students increasing academic proficiency or achievement. This study will examine the delivery of curriculum content utilizing online tutorials and activities in the online environment as compared to face-to-face delivery and their effects on student achievement. Numerous factors interact in a complex manner, affecting each other and, in turn, influencing student achievement. Some factors this study examines include:

- A historical resistance to changes in education;

- Secondary and postsecondary standards;
- Methods;
- Local, state and federal mandates;
- Curriculum quality;
- Teacher qualifications; and
- The demographics and characteristics of the students.

The desire to research a subject as cutting edge as virtual learning and its effect on student achievement was the consequence of the No Child Left Behind Act, professional learning communities, plummeting end-of-course scores, and other education initiatives. A plethora of scholarly articles on e-learning, distance learning, and learning provided both the theoretical and empirical basis for the literature review

#### Search Process

The online learning phenomenon is vast and varies enormously with an assortment of theories and frameworks. It has dramatically changed the direction and delivery of distance education in the past decade. To investigate the numerous aspects of online learning in order to focus on the specific component of online versus traditional delivery of content, the researcher conducted the primary literature searches using Liberty University's Journal Data Base and Dissertation Abstracts. Searches also included books, secondary cited articles, and websites. Several searches conducted using the Education Resources Information Center (ERIC) resulted in many topics related to online versus traditional learning and student achievement.

## Theoretical Literature

### Framework for Online Instructions

Learning theories and long-existing principles of education accommodate innovative and speedy means of delivering information, often utilizing technology. Unfortunately, this sometimes comes without considering learner needs or learner outcomes. The primary premise for this study was the Theory of Action. This theory stated that student learning and achievement will increase when powerful interactions occur between students and teachers around challenging content. This theory also purports that the critical path for improving student achievement is to improve the quality of teaching (Kurtenbach, Frazier, 2005).

Comparison of outcome studies would be one of the most effective methods for determining the effectiveness of various educational technologies. The growth in the number of distance education courses has raised questions about the effectiveness of online instruction (Wardrope, 2001). Russell Baker (2004) addressed online quality based on the research of Ralph Tyler (1949) and Benjamin Bloom's (1953, 1956) body of research for traditional curriculum development. Tyler's Basic Principles of Curriculum and Instruction (1949) used the application of objective-centered principles to curriculum as: 1) Objectives, 2) Experiences, 3) Organization, and 4) Evaluation. Tyler's (1949) Principles provided a rationale to examine problems of online teaching and learning. Bloom's (1953, 1956) Taxonomy applied specific verb terminology related to learning objectives. These specific terms made it feasible to describe detailed behaviors and to assess successful achievement of learning objectives.

The aim of this study was to examine and compare student achievement in online and face-to-face learning environments at the post-secondary level. This study also considered the perspective of the instructors of the online and face-to-face courses concerning how information and communication technologies have influenced their teaching pedagogies and practices. The rapidly evolving changes challenge the teachers of the 21<sup>st</sup>-century learner.

In higher education, student evaluation of instruction provides data that serve a variety of functions. Some of the purposes of student evaluation of instruction include revision of courses and programs, improvement of instruction, institutional accreditation, and tenure decisions about faculty. Because of online delivered instruction, student evaluation becomes notably more complex, as issues of technology and pedagogy intertwine (Cohen, 2003). Other aspects of classroom instruction affect student achievement. From the reviewed literature, the following areas emerged:

1. The literature on the effects of the use of traditional classroom instruction and the learning management system used to deliver the content at the secondary and postsecondary level had diverse consequences on student achievement.
2. The literature showed evidence of a clear problem with the instructional design used by the teacher; in particular, the learning theories that supported their pedagogical strategies could have a negative or positive effect on student achievement. The strategies include development of instructional materials and activities.

3. The literature on improving the entire process of analysis of learner needs and goals and the development of a delivery system to meet those needs established several positive consequences to student achievement.

From this review, the research questions will determine if the delivery format used has a significant effect on student achievement.

### Empirical Research

#### Stages of Online Learning

Morabito's study (1999) took a historical look at the birth and development of distance education during the 1980s. In 1997, educational organizations announced revolutionary new ways of teaching online, yet, from a historical perspective, these revolutionary new methods were duplicating what had been already developed and implemented online over two decades prior to 1997. According to Morabito (1999), online distance education was a natural outgrowth of distance and correspondence education of the 1980s.

In *Telecommunications and Distance Education*, Alexander Romiszowski (1993) categorized distance education into four generations: 1) the print-based model, 2) open broadcast by radio or television, 3) audio and video teleconferencing systems, and 4) integrated use of new developments in telecommunications and computing. However, these four categories are inseparable. As technology emerges, the previous one accompanies each generation.

The print-based model of correspondence education survived the test of time, utilized intensively to this day. Institutionalized distance education brought about the application of other media. A second generation of distance education through the 60s

and 70s, supported by correspondence instruction and print materials, transformed to heavy reliance on open broadcast by either radio or television.

Teleconferencing systems characterized the third generation of distance education. These started with audio conferencing but progressed to more sophisticated audio graphic conferencing systems that supported the telephone audio conference with visual and text material (Barker & Goodwin, 1992). Another parallel development was video conferencing, which in the beginning, was a somewhat expensive alternative to the audio conference. Due to developments in digital computer-based desktop video, in the late 80s and early 90s, video conferencing became economically accessible to an even larger section of the educational community (Parker & Olgren, 1984; Tremblay, 1992).

Society is now in the fourth phase of development of distance education based on the integrated use of new improvements in telecommunications and computing. The integrated use of remote study materials supported by computer-based multimedia teleconferencing characterizes these advancements (Steinberg, 1992). Integrated multimedia computer technology will provide the platform, which will most resemble real-time, interactive instruction through Virtual Learning Environments (VLEs).

#### Challenges of Choosing a Learning Management System

VLEs are learning-management software systems that synthesize the functionality of computer-mediated communications software (e-mail, bulletin boards, newsgroups, etc.) and online methods of delivering course materials (e.g. the WWW). To date, several different packages have appeared from both leading commercial vendors and university-based projects. Other systems are currently under development. Most of these systems reproduce the classroom environment online and use the technology to provide learners

with new tools to facilitate their learning. They aim to accommodate a wider range of learning styles and goals, to encourage collaborative and resource-based learning, and to allow greater sharing and re-use of resources.

For example, Bratina, Hayes, and Blumsak (2002) confirmed that online curriculum content, put into small pieces or modules, is accessible, interoperable, transportable, and durable throughout different e-learning environments. The reusability and durability of online learning modules has decreased overall development time for course creators by providing a database of graphics/charts that are retrievable by anyone using or creating online courses. In each instance, the teacher provides text or easily modified explanations for each type of audience.

A new VLE, called Moodle, is attracting the attention of the K-12 environment. Moodle is a course management system (CMS) - a free, open source software package designed using sound pedagogical principles, to help educators create effective online learning communities. Moodle enables teachers to develop online curricula and lesson plans, administer assignments and quizzes, and participate in professional development activities from home. It also allows students to engage in lessons off-site if they have Internet access, providing a valuable school-to-home connection that can maximize learning. Moodle can help with basic functions such as classroom management or more complex tasks, such as e-learning, that extend into on-site classroom instruction.

Munoz & Duzer (2005) compared Moodle to Blackboard to determine whether free software satisfactorily met the needs of students, faculty, and instructional technologists for online teaching and learning. Humboldt State University (HSU) was paying approximately \$8,600 annually for a Blackboard license. California State

University (CSU) campuses, San Marcos, Chico, and San Francisco State, collaborated with these HSU researchers to experiment with Moodle to compare conclusions with the learning management software used at their campuses. For their study, they used a course previously taught in the classroom for 20+ years to compare Moodle 1.3.2 to Blackboard™ 6.0.

Munoz & Duzer's (2005) study examined the first fully online Moodle course in the CSU system. This was the first online experience for both the developer and the facilitator of the course. In addition, this fully online course was the first experience for thirty-five students who thought they were enrolling in a face-to-face course. The students experienced the content of the course through these features of Moodle and Blackboard™:

- Electronic assignment submissions;
- Virtual areas for group work;
- Self-assessment quizzes and online testing;
- Embedded Shock Wave Flash files;
- Surveys;
- Discussion forums; and
- Links to external web pages.

Only Moodle offered sequential learning objects, tracked specific student activity, offered single-question voting tools called polls, and provided glossaries that allowed student entries, evaluation, and comments.

Because of the study, the facilitator of the course gave the following Moodle advantages over Blackboard™:

- Easily provides individualized feedback to all assignments.
- Easier to track students' activity in class as to when and how often students accessed the content of the class.
- Easier to determine from where students accessed the course.

The facilitator gave Blackboard™ advantages over Moodle as having a more refined appearance, a better grade book, easily distinguished read and unread discussion threads, and more prominently displayed announcements when starting the course.

The instructional technologist, the developer of the online course, listed many more advantages of Moodle over Blackboard™ with Blackboard™ receiving only four advantages over Moodle. According to the developer, Moodle:

- Is easier to maneuver.
- Has less area monopolized for navigation.
- Is easier to incorporate multimedia elements.
- Have more tools available.
- Has easier student activity tracking.
- Have more accurate quiz scores.
- Has customization to add desired features.
- Have surveys that allow as few as two choices.

The developer stated that Blackboard™ seemed more intuitive for beginners, had built-in survey tools, and a readily available resource area for the grouping of external web sites.

The students' satisfaction results showed an overall 35.7% favored Moodle, 21.4% favored Blackboard™, and 42.9% had no preference. Of the study participants, 57.2% agreed to take another Moodle course, while 46.2% agreed to another

Blackboard™ course. Final exam grades for the course showed a significant correlation of .832 for those students with participation scores of 60 or higher. Final grades for the course showed a significant correlation of .928.

Most of the learning management systems presently available have comparable sets of features and a variety of capabilities. Some systems are better suited for a particular educational context while other systems are superior in design. Appendix D illustrates some of the most accepted VLEs, the organizations that produce them, and the uniform resource locator. A comprehensive examination of VLE systems was neither possible, nor would remain complete for very long because of ongoing development. Britain and Liber (2000) selected a manageable number of field leaders that form a representative sample of the various tools that exist from both commercial and higher education sources to use as example systems. This study will investigate the test scores of participants using the Blackboard™ program as the form of delivery of the online content.

#### Potential Problems with Online Learning

Kearsley, Lynch, and Wizer (1995) indicated that numerous studies have concluded that “online learning activities were well suited for graduate level education” (p. 37). These researchers went on to say just because these online programs are successful at the postsecondary level does not mean that these online programs are appropriate for high school students. This study chronicles what researchers have reported on the strengths, weaknesses, and factors influencing students’ success in the virtual environment. It also raises a number of issues for educators to consider when investigating the implementation of virtual programs.

In summary, computer-based instruction has evolved over the years and has taken a variety of formats. Tools of the 1970s and 1980s consisted of computer-assisted instruction and other instructional paraphernalia. The 1980s and 1990s introduced an array of multimedia technology with the latter portion of the 1990s experiencing teleconferencing. To determine their effectiveness, value, and impact on learning outcomes, researchers conducted comparison studies of these computer-based technologies to other established instructional applications (Bernard, R. M., Abrami, P. C., Lou, Y., Borokhovski, E. Wade, A. & Wozney, L., 2004).

#### Instructional Design and Pedagogical Strategies

The Internet and web-based computer technologies that support online learning have changed the education landscape considerably. Internet technologies now provide easy-to-use, powerful, and economically-sound media for educational purposes. As a result, large numbers of public higher education institutions are offering courses online and expect growth in this type of education in the near future (Allen & Seaman, 2003).

According to Allen and Seaman, (2003), the majority of public higher education institutions indicated that online courses attract a growing number of students when compared to traditional education and achieve the same or even higher learning outcomes. Growth was attributed to the increase in access to computers, broadband Internet, and software packages, such as course management software, that are designed to make Internet-based learning more user-friendly (Phipps & Merisotis, 2000). In addition, the changing demographics of college students support the need of a flexible postsecondary educational delivery system. Students today are older, employed, married, and/or have dependents, which has created a need for flexibility of course delivery, both

in terms of time and place (National Center for Education Statistics [NCES], 2000).

Finally, traditional students (i.e., those entering higher education immediately following high school) were Internet-literate and expected a high level of technology use in their coursework, making them more receptive to Internet-based courses (Synergy Plus, 2002).

Nachmias & Segev (2003) researched the use of computer logs to evaluate the consumption of online content, to investigate the individual differences among students in terms of content usage, and to determine the amount of content presented in a course's web-supported sites. Finally, a discussion of further implications of information related to content usage showed relevance for the evaluation of Information, Communications, and Technology (ICT) implementation in higher education institutes. As part of the Virtual Tel-Aviv University (TAU) project, the study included specifically developed course websites. The main goal of the project was to enrich and deepen academic learning on the campus via implementation of advanced technologies, mainly the Internet.

Nachmias & Segev (2003) examined the amount of content presented on the faculty course websites by discipline and level of study. The research concluded that no differences existed in the number of content items presented in faculty websites, which related to exact sciences in comparison to social sciences and humanities, nor between websites for undergraduate vs. graduate courses. The researcher found a positive correlation between the number of students in a course and the number of content items presented in the website. A further investigation of the contents presented on the website revealed that students viewed a large portion of the content with about half of the courses having all content items viewed by at least one student.

One of the central findings of this study was that 62% of the students viewed the content items, while 38% of the students listed in the courses did not do so even once. The study showed that the rate of students that did not use the items at all was higher among undergraduate than of the graduate students. In addition, students of the exact sciences viewed the material more than the students of the social sciences and humanities courses.

In Blackboard, statistical data showed the number of times students visited a particular content folder and the length of time the student was there. According to findings of Nachmias and Segev (2003), there was a significant variation among students using content items online with regard to the number of items viewed. Their study of online utilization of course content involved the presentation of content, the usage rate of the website's course content, and the individual differences among students concerning content utilization.

One-hundred seventeen course websites with over 5,000 undergraduate, graduate, and PhD students from all faculties took part in the courses. The amount of course material obtainable in the course website averaged 28 (standard deviation 24.9). There was a positive correlation between the number of content items presented in the website and the number of students in the course. Of the 3,301 items of course material accessible online, students viewed 2,926, 89% of all items presented.

One of the central findings of this study showed that the rate of students that did not use the items at all was higher among undergraduates. Of the items available online in the course website, the students viewed and made use of about 38% (SD 30%). Other students, however, viewed a greater percentage of the items presented, with five percent

consuming all content items presented on the course website. In this respect, the references and resources were not useful to the students. This finding regarding the relevance of contents contradicts the descriptions in the study by Sasson & Nachmias (1999), who found great variance in viewing rates of web pages in course websites, with some pages not viewed at all. The content of the websites viewed were linear in nature (Sasson & Nachmias, 1999). The researchers found that this linearity supported a clear and positive relation to the lack of viewing of content within the website. Although a linear structure is suitable for information viewed like a book, students were less likely to view the content. In the study by Nachmias & Segev (2003), there was variety in the arrangement of resources accessible in the course websites. The arrangement of the content caused students to expose themselves to greater amounts of content items during the search for specific information.

Nachmias & Shany (2002) presented a similar finding regarding interpersonal differences among students learning with course websites. Their study found a large variance in students' tendencies to succeed in a virtual course. The researchers found that while the online course suited about 40% of the students, one third of the students never made it inside of the learning circle. Findings of the two studies match the American Federation of Teachers (AFT) Report (2001), which discovered that a certain type of student tends to succeed better in distance learning courses. First, this successful student was one that had a sincere desire to learn independently with consistent self-motivation. Secondly, this student maintained self-discipline and avoided procrastination. Finally, this student communicated effectively with the instructor and finished course requirements in a timely manner.

Sankaran and Bui (2001) looked at 116 university students enrolled in a business course in one of two sections (face-to-face and Web-based lectures). The authors measured performance on a pre-test and a post-test. An analysis of performance based on ethnicity was another aspect of their study. They found no significant differences between the two groups on any of the measures, but did find that students who were more motivated performed better in both formats. They used these findings to argue that instructors who were planning to offer their courses in Web format can do so with minimum redesign. This finding contradicted much of the other research.

#### Challenges of Learner Needs: Characteristics

This portion of the literature review will examine quality measures for online courses offered to public high school (grades 9-12) students. Established longer, higher education courses and programs have a different set of purposes, administrative practices, and audiences. While some of these characteristics also apply to online courses in a high school environment, to be effective there, online courses must address the unique social, educational, and emotional needs of high school students. Additional limitations and concerns may arise when high school students complete a significant portion of coursework online. It is noteworthy, however, to examine online programs that serve as the large component of a high school student's education.

Developments in web-based education have provided students with a wide variety of learning alternatives that have expanded the educational process beyond the traditional classroom (Erdongan, Bayram & Deniz, 2008). Web-based programs can increase the range of course offerings available to all students as well as provide educational access to learners with extenuating circumstances (e.g., homebound, incarcerated, and atypical

students for whom regular classrooms are not effective). In addition, web-based programs provide an alternative method of instruction. The number of students participating in online courses is large and growing dramatically. Rose (2001) estimated that by 2006, a majority of public high school students would take an online course before graduating.

Another area that raises a series of questions is the appropriateness of online education for younger students. Again, while there are many technical and management issues that cross over and apply to online courses for all age levels, too many important differences exist to automatically apply one criteria in that setting. The research base for online courses and educational programs offered to preschool, elementary school, and middle school students was extremely limited. Therefore, the review of literature, understanding the characteristics and needs of learners in earlier grades, recommends great caution in the use of the online environment to deliver instruction to students prior to the secondary level (NEA 2006).

#### Challenges of Learner Needs: Personalized

Educators delivering curriculum online can customize their content to fit the different learning needs of diverse student populations. Oakes (2002) discovered that instructors provided or students chose highly personalized learning experiences. These experiences can interoperate across technologies from different vendors. In effect, each student can have an individual learning plan (ILP) in each course. Instructors create and present learning modules to students based on their different learning preferences and abilities. These individualized plans may materialize through instructor choice, pre-assessments, comparing content to results of standardized tests, or by allowing students to choose content that is appealing to them. For example, textual learners would choose

modules that were text specific. Visual learners would choose content that incorporates graphics and other visual aids. Auditory learners would choose learning objects that incorporate auditory components. Advanced students would have different choices and tools to scaffold their development than those who needed remediation.

Universities currently offer a great number of distance learning courses via the Internet to potential new students. The more courses offered this way, the greater the need to understand how students learn from course web sites. Hence, it was important to outline and study learning patterns of students in course websites (Nachmias & Segev, 2003).

#### Providers of Online Courses

The North Carolina distance learning options include several different providers of online high school courses that are listed in Appendix D. For nearly a decade, the State Regional Education Board (SREB) Educational Technology Cooperative has helped SREB's 16 member states provide high-quality online academic courses to middle grades, high school, and postsecondary students. More recently, the Cooperative has increased its work with the K-12 community. One focus is on what it takes to develop and provide high-quality online courses and teaching. Another focus is on what state agencies need to do to provide the organization and structure to meet state academic goals.

In partnership with the BellSouth Foundation (now the AT&T Foundation), the Southern Regional Education Board launched the SREB-State Virtual Schools Alliance in June 2005 to help member states increase middle and high school students' access to quality academic courses through state-supported virtual schools. Through a multiyear grant, the Alliance helps states share the information and resources essential to the

successful creation of a state virtual school, including developing or acquiring quality online courses, preparing competent online teachers and securing adequate funding.

State-sponsored virtual schools in the SREB states are increasing in number and size as a viable means of providing quality courses to students. Less than 11 years ago, none of the 50 states used the Web to provide courses to middle or high school students. By the late 1990s, only Florida had created and provided Web-based courses for high school students. Beginning in 2000, other SREB states, including Kentucky, Louisiana and West Virginia, began to implement state virtual schools. SREB states now lead the nation in the number of state virtual schools that have been implemented. Nearly all SREB states have a state virtual school, and most of the remaining few states are either planning or beginning the initial implementation of one. More than 90,000 middle and high school students were enrolled in state virtual schools in SREB states during academic year 2005-2006. This was nearly a 100 percent increase from the previous year.

There is a growing understanding that providing Web-based courses to middle and high school students works. Online courses have shown to be important to reach students who need:

- academic courses their school cannot provide;
- to retake courses for graduation;
- alternatives to traditional education;
- options to courses offered in their school; and
- access to courses because of physical disabilities.

### What was SREB's role?

Using the Web to provide high school academic courses is still relatively new, and states are still learning how to provide and manage state virtual schools. Approaches vary in how state virtual schools are organized, funded, and implemented. SREB's Educational Technology Cooperative has worked closely with states for more than seven years, providing up-to-date information and leadership, and assisting states in sharing their experiences and resources. The Cooperative continues to support states as they address policy, instruction, and management issues connected with virtual schools.

The state departments of education that do not have a state virtual school but offer online courses to students through state allocations or federal grants are included in Appendix D. Online courses provided by the state virtual schools in the SREB states are developed, contracted, or purchased. Funded through state and federal grants, educators and the state Department of Public Instruction (DPI) collaborated to develop online courses. The state owns the courses that it develops. Institutions other than the state DPI host and administer contracted courses. States may contract to have college credit courses offered at high school campuses. High school instructors, who meet the hiring requirements of the college, may teach these classes. Vendors and other institutions develop online courses and make them available for purchase by state DPI. The public school students registered through DPI and state allocations for distance learning paid the tuition (SREB, 2005).

### Challenges of Curriculum Quality

Because of the growth in the number of distance education courses, questions and concerns about the effectiveness of online instruction are rising (Wardrope, 2001). The

Council for Higher Education Accreditation (Eaton, 2000) alleged two issues needed addressing: defining an effective framework for distance learning and determining how to evaluate and ensure quality. Russell Baker (2004) addressed these two issues for online quality based on the research of Ralph Tyler (1949) and Benjamin Bloom's (1953, 1956) body of research for traditional curriculum development.

Tyler's Basic Principles of Curriculum and Instruction (1949) used the application of objective-centered principles to curriculum. These principles were:

- 1) Objectives--What educational purposes should the school seek to attain?
- 2) Experiences--What educational experiences can be provided that are likely to attain these purposes?
- 3) Organization--How can these educational experiences be effectively organized?
- 4) Evaluation--How can we determine whether these purposes are being attained?

Tyler's (1949) Principles provided a rationale by which to investigate problems of online teaching and learning. Baker (2004) used these Principles as a part of the framework for his examination of online course development.

Bloom's (1953, 1956) Taxonomy applied particular noun and verb terminology related to learning objectives. These terms made it possible to describe exact behaviors and assess successful achievement of learning objectives. Bloom's (1953, 1956), categories of learning objectives along with some of the verbs are: (Osborn, 2002)

- 1) Knowledge—arrange, define, duplicate, memorize, recognize
- 2) Comprehension—classify, describe, identify, report, restate
- 3) Application—apply, choose, illustrate, solve, write

- 4) Analysis—analyze, categorize, criticize, distinguish, test
- 5) Synthesis—assemble, collect, manage, organize, propose
- 6) Evaluation—argue, assess, choose, value, evaluate

Baker (2004) examined these verbs with specific course learning goals within Bloom's (1953, 1956) categories and clarified desired results for both the student and the teacher working within the online environment.

Churches' (2009) study addressed the changes and developments that have occurred since Bloom published Bloom's Taxonomy in the 1950s, and Lorin Anderson published Bloom's Revised Taxonomy in 2000. He developed what he called Bloom's Digital Taxonomy to account for emerging technology advances to include the new behaviors, procedures, and learning opportunities. Like the original and revised taxonomies, the Digital Taxonomy has cognitive elements as well as methods and tooling. Collaboration is an increasing influence on learning. Digital media often facilitate collaboration in its various forms. Churches' (2009) digital taxonomy used technological tools as a medium to achieve, recall, understand, apply, analyze, evaluate, and create. Appendix K depicts the original taxonomy key terms and nouns alongside the revised taxonomy key terms and verbs. The Bloom's Digital Taxonomy utilizes the verb category sequence of the revised taxonomy within its classification. Appendix K displays the levels in increasing order, from Level 1 Lower Order Thinking Skills (LOTS) to Level 6, Higher Order Thinking Skills (HOTS).

The distinctions between conventional in-class courses and distance learning courses created several factors that distance learning course designers needed to address. First, traditional course design allows personal interaction between the instructor and

student with the opportunity to request feedback, obtain responses, and give directions immediately. Second, face-to-face courses place the student with other learners to draw from each other's experiences and work together in groups. Third, the obligation to be present at class creates a responsibility for the student and provides a source of answerability, perhaps motivating him or her to perform the required tasks (Baker, 2004).

Most universities, including leading academic institutes, are implementing advanced technologies and utilizing the Internet as an instructional tool (Mioduser & Nachmias, 2002). However, in light of this, Nujaidi (2003) reported that many people warn of the possible harmful effects of using technology, more specifically, the Internet to deliver curriculum content in the classroom. Will children lose their ability to relate to other human beings? Will they become dependent on technology to learn? Will they find inappropriate materials? The invention of the printing press, radio, and television probably brought on the same questions. All of these can be used inappropriately, but all of them have given humanity unbounded access to information which can be turned into knowledge. Appropriately used, interactively and with guidance, the Internet and technology have become tools for the development of higher order thinking skills.

Inappropriately used in the classroom, technology can perpetuate old models of teaching and learning. Students can be "plugged into computers" to do drill and practice that are not so different from workbooks. Teachers can use multimedia technology to give more colorful, stimulating lectures. Both of these have their place, but such use does not begin to tap the power of these new tools to deliver curriculum content. The Internet and other online software can be used to deliver content to stimulate and develop writing skills, collaborate with peers in foreign countries, do authentic kinds of research that are

valuable to the adult world, and do complex kinds of problem solving that would otherwise be impossible.

### Requirements For Online

To develop procedures for teaching and learning online, there needed to be a teacher-facilitated process that placed students at the center of active learning (Ferguson, 2001). Virtual learning environments that use course management systems as their chief delivery method usually aspire to be rooted in constructivist theory. Constructivism, described as a philosophical position, views learners as creators of knowledge (d'Entremont, 2004, p. 6). A learning environment should create situations in which learning is relevant and focused on solving real-world problems. The instructors should guide, and learners should be in control. Ferguson (2001) goes on to say that the constructivist learning environments must provide tools that help learners interpret multiple perspectives. The constructivist learning environment ensures that the learner internally controls and mediates learning. This environment also makes provisions for multiple representations of reality and focuses on knowledge construction, not reproduction (Ferguson, 2001. p. 46, 50-51). Ferguson (2001) also articulates that when using the constructivist theory in the online classroom, instructors should make a selection of web-based tools available to students and use a variety of strategies to design the course.

To accommodate for traditional personal interaction between instructor and student, online course design must post:

1. An understandable, comprehensive syllabus/course outline;

2. Interesting, engaging, streaming video with downloadable or CD-Rom video files for students who rely on dial-up connections;
3. Course notes to supplement video lectures and required readings;
4. Links to other websites, course references, materials, and readings on the web for students to download.

To accommodate for traditional students' learning by interacting with other learners and drawing from others' experiences in groups, online course design must provide:

1. Structured chat rooms and audio chat (web-based tools that function similar to teleconferencing). Chat also allows the instructor to provide immediate feedback to learner questions, evaluate learner participation, and take attendance.
2. Email to communicate with other learners and the instructor.
3. Bulletin boards, group discussion boards, and digital drop boxes to allow the learners to collaborate on projects, exchange ideas, and participate in group activities.

The online course design must provide for the traditional attendance requirement and make a conscientious effort for the learner to be present at class. The online format also has the challenge to provide a source of accountability, perhaps escalating enthusiasm, inspiring the student to perform the required responsibilities. To accomplish these tasks, the online design must include:

1. Online testing procedures comparable to paper-based instruments;
2. Interactive activities that reinforce desired student behaviors;

3. Sufficient feedback through virtual office hours;
4. Computer graded exams giving students correct answers to the questions answered incorrectly;
5. Virtual classrooms, an online, interactive class session between students and instructors;
6. Whiteboards that allow the instructor and students to write and draw on an electronic board sharing a virtual classroom session.

Numerous studies evaluate distance learning course effectiveness based on assessment of final grades for students of both the online and the face-to-face course design. This source of evaluation does not resolve the concern for the provision of quality of teaching and learning delivered online (Sonner, 1999). Karr (2002) said, “While technology has provided meaningful tools for tracking, sorting, and disseminating information, it has created unprecedented complexity, as well as a concern for the value and integrity of that information”. Baker’s study (2004) proposed a structure for the improvement and assessment of the quality of instruction and content of online classes based on integrating the stages of cognitive learning in Bloom’s Taxonomy within an alteration of Tyler’s principles. His central question was whether students obtained a quality education through courses using the distance learning formats.

#### Challenges of Online Evaluation

The method Baker (2004) used to develop a framework for design and evaluation of the online curriculum was a mixture of Bloom’s categories and Tyler’s principles: Bloom Criterion and Tyler Objectives, Experiences Organization and Evaluations. An evaluation, designed with specific questions that had yes or no answers, aided in the use

of the framework as a well-designed instrument for examination of curriculum components. In addition, Bloom's Criterion and Tyler's Objectives addressed and described each of the evaluation criteria in the questions. Baker (2004) then established a scale to assess the evaluation points, dividing the value equally among the evaluation point questions for each principle.

Baker's research (2004) sample was constrained to an investigation of a twenty-six week virtual high school course called Biotechnology: The Changing Face of Genetics. The study was limited to samples of the course without complete admittance to all course components. The course used diverse methodologies for the presentation of content with the main delivery method by means of text and graphics. The principal content area called Learning Space contained the main topic discussion document as well as the usual back and next arrow icons that guided students from screen to screen. The ending of the main topic area is where the students entered the Course Room. This area held all of the course activities and communications. In addition, this area permitted communication with students, student groups, and instructors about discussions, course resources, coursework, and other items generally discussed in a traditional classroom.

Baker's (2004) study compared the traditional classroom to the distance learning environment according to Tyler's Principles and Bloom's Taxonomy. He determined that the distance learning methods with an absence of synchronous response and advanced technology tools restricted the students to obtaining the information predominantly from reading. There was little or no evidence of a control mechanism to direct student behavior. Students' numerous opportunities to carry out the skills essential to accomplish the preferred behaviors did not exist.

Online instruction has received increased attention because several researchers have found that this type of instruction results in increased learning. Flexibility was a key satisfaction indicator for online learners. Curiosity, scheduling issues, and a strong desire to attempt online courses were drivers of whether students sought to learn in a traditional face-to-face environment or in an online environment. Attrition rate of the online learner is greater than that of the attrition rate for the traditional student. The reasons for the higher attrition rate varied among learners and included these issues: difficulty with self-direction, poor technology skills, and difficult, time-consuming courses. The study also revealed that five of the six online students were employed and were not able to attend traditional classes (Bocchi, Eastman, & Swift, 2004; Graham & Scarborough, 2001).

Educators may view the findings of Baker's study as an opportunity to reconsider their instructional strategies and to adapt their traditional instructional techniques to ensure the quality of online instruction. The American Distance Education Consortium (2003) developed guiding principles for distance learning, claiming that the principles found in quality traditional instruction were often similar to those found in online learning environments (Ali, 2003; American Association of Higher Education, 2004; Major & Taylor, 2003).

Conversely, other educators argue that high quality interaction, required to effectively deliver online courses, can only be achieved in a form that is "dramatically different from the traditional roles of instructor and student" (Conway, Easton, & Schmidt, 2005). As educational institutions are increasingly held accountable for student

learning (Braathen & Robles, 2000; NCATE, 2003), the effective delivery of instruction represents an important way to respond to such accountability.

Plair (2007) relayed that the virtual schools format for kindergarten through ninth grade was at the developing stage of change. He questions where classroom teachers stand in the virtual-school trend. The position within the virtual school movement of classroom teachers deemed “highly qualified” under the federal No Child Left Behind Act (NCLB) appeared nebulous at best. A combination of face-to-face and virtual schooling required a degree of accountability to support NCLB guidelines.

The accountability provisions of the NCLB Act expanded school choice. The provisions awarded opportunities for those attending public schools that were not meeting their state’s expectations to attend elsewhere. Many districts had not been able to meet the demand for transfers because of the lack of school capacity. Capacity and supply issues were real, particularly in rural districts with limited transportation options and schools in need of improvement. Hassel and Terrell’s (2004) study found that districts that truly sufferer from lack of capacity and supply found that virtual schools were a viable solution for meeting the choice requirements of NCLB.

According to Plair (2007), the lack of teacher visibility in online schools raises issues of accountability, access, and social justice. If teachers were out of the picture, the monitoring of content for bias, fairness, and tolerance maybe at risk. Similarly, opportunities for matching virtual content with face-to-face content were minimal. The virtual decision maker will determine the best course of action for students in this new instructional design for the secondary level.

In its annual report, Evergreen Consulting Associates, an online-education group, suggested keeping experienced teachers out of the virtual-schooling process, reasoning that “classroom veterans rarely have the opportunity to develop these online skills on the job” (Plair, 2007 p. 35). However, classroom veterans are some of the highly qualified teachers that the NCLB Act is mandating to be hired to teach. Hassell and Terrell (2004) reported that one of the benefits of online learning was the increase in the number of highly qualified teachers. Rather than restricting those instructors’ contributions to teaching to one place, online learning allowed students in different locations to share top instructors’ expertise. These researchers reported that teachers who have left the traditional system found working in an online learning situation to be particularly desirable due to scheduling, health issues, or work style.

#### Challenges of Curriculum Content, Pedagogy, and Delivery

Comparative studies provide information related to the type of content areas, learners, pedagogical circumstances, and media used to deliver instruction that was most suitable for distance learning when designed and conducted effectively, including a thorough analysis of the characteristics and effects of the media used to deliver instruction in both distance and traditional learning environments (Smith & Dillon, 1999). Unfortunately, this thorough analysis has not been documented in previous comparative studies, leading to flawed research design, conclusions, and generalizations. For instance, Russell (1999) summarized 355 comparative studies related to the effectiveness of distance versus traditional instruction and concluded that no significant differences were found between the two methods. However, problems were found with his approach, including the fact that those studies were not of equal quality and rigor.

The different sample sizes made it difficult to aggregate the results based upon test statistics (Bernard, et. al., 2004).

Strickland's (2007) study addressed demographic and effective characteristics of the distance learner. Her study looked at the course grade and the final exam scores of Respiratory Care Education curriculum delivered to students in the traditional and hybrid classrooms. Strickland (2007) used the standardized student evaluation of the course to evaluate the satisfaction with the course. She discovered few statistical differences between the effectiveness of a traditional course delivery method and a hybrid one. Strickland noted that although increased classroom size, accessibility of material, and flexibility were benefits to the hybrid classroom, motivation and technological ability are also major factors in the success of a student in the blended environment. She concluded that the blended learning environments were a viable option for course delivery in health care education. Identifying these characteristics can provide the educator with valuable information to assist students in overcoming barriers to success.

According to the National Association of Secondary School Principals [NASSP] (The Principal Line, 2007), the purpose of assessment should be to inform instruction and improve learning. NASSP reported that it is important that assessments produce diagnostic data that can give educators a direction for increasing student success, individually. According to the NASSP, The Principal Line (2007) also stated that the stress given to high-stakes standardized test scores as a means of measuring student achievement should be alleviated. Test scores ignore other crucial contributions that promote or inhibit learning. Other indicators for determining student success were rates of student and teacher attendance, number of discipline referrals, class size, level of

parental involvement, and school climate. Non academic aspects to be factored into the determination of school quality and student progress were the availability of physical and mental health care, nutrition, and other student and family support services (The Principal Line, September, 2007).

Researchers at Purdue University were developing models, academic analytics to create interventions for at-risk students, to predict academic success. The researchers examined indicators of aptitude and effort, by mining historical data such as Standardized Aptitude Test (SAT) scores and Grade Point Averages (GPA) from Student Information Systems (SIS) using WebCT-supported classes in spring 2006. The end goal was to develop intelligent agents that would automatically take actions such as alerting the instructor that a student was in trouble, or notifying the student about help sessions that were available, and to provide trend data to administrators with an interest in retention (Kelly, 2006). The Learning and Skills Council's (LSC) Quality Improvement Strategy (2003-2006) states the following:

For colleges and accredited adult and community learning provision, learner success rates were the qualifications gained by the expected date divided by the qualifications commenced [. . .] There was a strong policy steer that most of the increase in learner success rates in this type of provision was to occur in long qualifications. . . those of 24 or more weeks' duration.”

LSC adds that the measure of learner success for work-based learning providers was a single measure: completion rates. These were the number of learners who achieve a framework or a National Vocational

Qualifications (NVQ) divided by the number of learners who left their program of learning in a given period (p. 23).

Aldridge (2003) investigated learning environment and student outcomes in a grade 11 online nuclear physics course. The study sample consisted of 32 eleventh grade Physics students in two classes. He used a quantitative survey and pre- and post-tests to determine students' perception of the learning environment and knowledge of nuclear physics. There were no significant differences. Other literature reviews have been conducted (Berge & Mrozowski, 2001; Jung & Rha, 2000; Saba, 2000) but have had "the inability to answer questions about magnitudes of affect" (Bernard, et al., 2004, p. 384). However, several research studies have been conducted that have used meta-analysis to address the questions about magnitudes of effects. Other researchers (Phipps & Merisotis, 1999) selected and analyzed approximately 40 empirical studies and concluded that the effectiveness of distance education was questionable. However, their report did not include every study published and, therefore, it was very difficult to use their findings to generalize (Bernard, et al, 2004).

Meta-analysis is a statistical approach used to summarize the results of many studies that have attempted to solve the same problem. It gives the researcher an opportunity to express the average results of the studies. The main characteristic of a meta-analysis is that the results of each study are translated into an effect size, which is the numerical way of expressing the magnitude of a reported relationship. For instance, in an experimental study, the effect size expresses how much better or worse the experimental group performed as compared to the control group. Upon calculation of the

effect size for each study, the results are averaged and an average number for all studies are generated (Gay, Mills, & Airasian, 2006).

Meta-analysis was found to have the following advantages:

- Investigated sources of variability in effect sizes
- Addressed issues related to sizes of effects
- Controlled for internal validity by concentrating on comparative studies and external validity by including a high number of studies
- Provided the flexibility to add or delete new or existing studies to be included in future analyses (Gay, Mills, & Airasian, 2006).

Six meta-analysis studies will be discussed in chronological order. In the first study, Machtmes & Asher (2000) identified 30 experimental or quasi-experimental studies that compared distance education (e.g., live or pre-produced Telecourses) with traditional instruction in terms of classroom achievement. They selected 19 of those studies, dated between 1943 and 1997, to code for effect sizes and study features. The overall weighted effect size for the comparisons conducted was not significant. The homogeneity of the effect size was violated because of changes in the technology available and the level of education of the students over the period under scrutiny. Machtmes & Asher (2000) discovered that the study features that made an impact on student achievement were the type of interaction, type of course, and type of site.

In the second study, Cavanaugh (2001) analyzed 19 experimental or quasi-experimental studies. These studies, conducted between 1980 and 1998, compared distance education (e.g., videoconferencing, etc.) with traditional instruction. Results indicated that the overall weighted effect size for the comparison conducted was

significant in favor of distance education, therefore, the homogeneity of the effect size was not violated. A limitation of this study was that it focused on K-12 learning environments in which distance education had not been widely used.

Allen, Bourhis, Burrell, & Mabry (2002) conducted the third study found in the literature. Twenty-five studies that compared distance education and traditional classroom conditions in terms of measures of student satisfaction were summarized. It must be noted that if effect sizes could not be calculated because of missing data or a comparison group was not used, the study was not included in the analyses. Results showed a slight correlation favoring classroom instruction. Regarding the limitations of this study, only student satisfaction was investigated, which does not provide strong evidence of effectiveness.

Shachar & Neumann (2003) conducted the fourth study of this investigation. They examined 86 studies, dated between 1990 and 2002, and found an effect size for student achievement of .37 that pointed to the conclusion that there was no difference between distance education and traditional classroom instruction. Ungerleider & Burns (2003) were the authors of the fifth study in which they reviewed the literature on online learning. The researchers conducted a meta-analysis of 12 quantitative studies, of which 10 originated in the USA, one from Canada, and one from Greece. In terms of educational settings, 10 of the 12 studies were conducted in universities and two in secondary schools. Only two had random assignment of participants to the groups. Sample sizes ranged from 27 to over 450 participants, with two of the studies not reporting that information.

Ungerleider and Burns (2003) found that most studies displayed a poor research methodology and/or statistical analysis. There was no overall difference between the different modes of instruction in terms of academic achievement (grades, test scores, etc.). The findings did elevate an issue often raised in terms of technology and education: that the standard methods of assessment used for traditional teaching are not appropriate for the kind of learning done in a technology-rich environment.

In the sixth study, Bernard, et al. (2004) conducted a meta-analysis of the empirical studies found in the literature dated between 1985 and 2002 and that compared distance education with traditional classroom instruction. Two hundred thirty-two studies were analyzed in terms of achievement, attitude, and retention outcomes. Results indicated effect sizes of zero on all three measures. The study concluded that several components of distance education out-perform their traditional classroom counterparts and several other components perform more poorly.

The sixth meta-analysis of the comparative distance education was conducted on research literature between 1985 and 2002. Two hundred thirty-two studies containing 599 independent achievement, attitude, and retention outcomes were analyzed. Overall results indicated effect sizes of essentially zero on all three measures and wide variability. In addition, the sixth study generated different results when dividing achievement outcomes into synchronous and asynchronous types of communication. It must be noted that both groups remained heterogeneous. While mean achievement effect sizes for asynchronous communication favored distance education, synchronous communication favored classroom instruction.

Bernard, et al. (2004) purported that because none of the measures was homogeneous, the study may be in error to make claims regarding the effectiveness of distance education versus traditional classroom instruction based upon mean effect sizes and heterogeneity. In addition, it is risky to interpret means as if they are true representations of population values. The wide variability means that a substantial number of distance education applications provided better achievement. The study also showed that the online students viewed online content more positively and had higher retention rates than their classroom counterparts. On the other hand, a substantial number of distance education applications were not as good as classroom instruction on all three measures: achievement, attitude, and retention (Bernard, et al., 2004).

#### Teacher Training and Pedagogical Strategies

A wide range of concerns and issues confronts teachers of online courses. Since teaching does not begin and end simultaneously for all students, time-management skills are extremely essential for both the online teacher and students. One of the major reasons why some students drop their online courses is the lack of time-management skills (SREB, 2006). These considerations cover the gamut of pedagogy, curriculum, assessment, personal style, hardware and software considerations, and availability of resources as well as many others. Teachers should consider these issues as they decide whether they should instruct online, or as they prepare for work in the online environment:

- Am I ready to teach online?
- What do I need to know?
- How can I learn this prior to teaching online?

- Do I have access to computers, Internet connections, and other resources necessary for teaching a course online?
- Will this change what I teach and how I teach?
- What kinds of support structures will be in place to assist me?
- Am I flexible to work with the technology?
- How can the content accommodate individual student needs (particularly students with special needs)?
- Will I be able to enhance my professional skills?
- What time will I have to collaborate with colleagues?

Those responsible for administering the implementation of online programs also need to consider these questions in order to design effective learning environments, provide necessary support to teachers, and establish reasonable workloads for the teachers (NEA, 2006).

In order for e-teaching to take place, there must first be “e-professional development” (Milne-Home, 2001). Several public school systems have developed and implemented online professional development programs focusing on training teachers in the use of various integration techniques for technology. Indianapolis Public Schools implemented a comprehensive technology plan called Community of Learners, Information, Communication and Knowledge (CLICK), which focuses on empowering teachers and administrators to implement technology into the curriculum (Bohnenkamp & McMahon, 2001). The school district, in collaboration with Indiana University-Purdue University Indianapolis School of Education, provided a cutting-edge online environment and software called Oncourse. The software allowed collaboration where users

communicated via course mail, bulletin board discussion, forums, and online chats. Online quizzes or surveys in addition to course information and resource web sites were made available.

After participating in the online experience where curriculum determined the technology, teachers redefined their role, as well as the role of the technology. CLICK professional development used the latest technology to allow teachers to learn at their own pace, with ample support, in a collegial environment where they had access to a wide range of instructional resources. CLICK for administrators allowed the principals to train online in the virtual environment, write their own technology plans and explore innovative ways to use an online environment to support the teachers.

McMunn, Schenck & McColskey (2003) affirmed that educators in schools, districts, and classrooms must 1) learn how to think differently about the nature and purpose of their work and 2) know how to be good consumers of the research and data that supported this thinking. This should include resources and systemic support, strategies, and factors to consider that will ultimately help teachers create classroom assessments, grading practices, and reporting procedures that exemplify student achievement of standards. According to McMunn, Schenck & McCloskey (2003) this model describes quality professional development and support. Training and support to help teachers work to change practices around classroom assessments, grading practices, and reporting procedures reflect a standards-based system (McMunn, Schenck & McColskey, 2003). The contents of the paper discuss the assumptions, inputs, interventions, outcomes, and impacts of the thinking process that are part of the professional development planning and implementation.

McMunn, Schenck & McColskey (2003) outlined a district model of professional development for teachers that included basic components that led to the following:

- Building teacher capacity (e.g., professional development, instructional leadership);
- Setting the conditions in the district for continuous improvement (e.g., defining standards, strategic planning);
- Supporting effective school improvement processes (e.g., informal school reviews, allocation of funds);
- Monitoring progress (e.g., use of data on implementation of practices, recommendations for change).

Access to quality online teaching can result in improved student performance academically and increased course completion rates. Improvements in the technology used to access and effectively provide web-based courses contribute to these improvements in online teaching as well. The SREB (2006), in collaboration with knowledgeable resource persons from K-12 and postsecondary education, provided detailed standards that SREB states used to characterize and execute quality online teaching. Research evidence in which online teaching included the standards listed below provided higher student achievement regardless of the location of students and teachers. The SREB (2006) 11 standards for quality online teaching are listed under three categories below:

#### Academic Preparation

- The teacher meets the professional teaching standards established by a state licensing agency.

- The teacher has academic credentials in the field in which he or she is teaching.

#### Content Knowledge, Skills and Temperament for Instructional Technology

- The teacher has the prerequisite technology skills to teach online.

#### Online Teaching and Learning Methodology, Management, Knowledge, Skills and Delivery

- The teacher plans, designs, and incorporates strategies to encourage active learning interaction, participation, and collaboration in an online environment.
- The teacher provides online leadership in a manner that promotes student success through regular feedback, prompt response, and clear expectations.
- The teacher models, guides, and encourages legal, ethical, safe, and healthy behavior related to technology use.
- The teacher has experienced online learning from the perspective of a student.
- The teacher understands and is responsive to students with special needs in the online classroom.
- The teacher demonstrates competencies in creating and implementing assessments in online learning environments in ways that assure validity and reliability of instruments and procedures.

- The teacher develops and delivers assessments, projects and assignments that meet standards-based learning goals and assess learning progress by measuring student achievement of learning goals.
- The teacher demonstrates competencies in using data and findings from assessments and other data sources to modify instructional methods and content and to guide student learning.
- The teacher demonstrates frequent and effective strategies that enable both teacher and students to complete self-and pre-assessments.

The SREB (2006) purported that the most important factor affecting student knowledge is the educator. Educators who know their subject matter, recognize how to teach, and can fine-tune their teaching to student needs will be successful in raising student achievement. Teacher expectations are also a significant factor in how much and how well students learn.

In the last decade, many states implemented content standards that defined student learning goals for schools and districts. Many of these same states created a testing and accountability program that assessed student achievement on standards. These reform efforts not only raise expectations for student achievement, but also expectations for teachers' performance. The testing and accountability initiatives will not be able to achieve the goal of improved student outcomes for all students without the following:

- significant, coordinated efforts to build district, school, and teacher capacities;
- organizing teaching and learning around content standards;
- building cultures that use classroom assessment to improve learning.

The state systemic reform for districts was to ensure that school faculties understood how to continuously improve instructional programs, align them with standards, and know how to assess student progress towards achievement of those standards.

#### Statement of the Hypothesis

This study examined the impact of two course formats (face-to-face and Internet-based) on student outcomes as measured by course participation, final course grade, and student preference and frequency of interaction with the course instructor. The ultimate desired outcome of an education activity often is defined in terms of increased student achievement. This presumption can pose significant challenges when evaluating a project that is just one part of an ongoing, integrated education effort. This is a problem particularly if the theories driving project design expect that project strategies will result in some outcome, which eventually has a positive effect on student learning.

This study examined students' preference of instructor interaction, unit test scores and the end-of-course grade as measures of the effectiveness of online and face-to-face curriculum delivery on student achievement. Demographic data in this study were gender, age, access to on campus classrooms, learning preferences and instructor interaction. This study's three research questions and hypotheses were:

1. What was the impact of virtual learning on student achievement?

Hypothesis-There will be no significant difference in student achievement of students that experience the curriculum content online and compared to students that experience the curriculum content face-to-face.

2. What was the impact of virtual learning on teaching practices?

Hypothesis-There will be no significant difference in teaching practices of the online instructor and the face-to-face instructor.

3. What were students' preferred instructor interactions?

Hypothesis-There will be no significant difference of students' preferred instructor interaction online, or face-to-face.

### Chapter 2 Summary

The prevalence of online distance education courses requires university and high school faculty to face new challenges and make new decisions in the areas of course management and design, delivery method, student communication media, creation of an engaging learning environment, assessment, and use of new technologies. The increase in online learning has required all educational institutions to change the distribution of information to students; therefore, administrators need to be aware of the changes that must occur in the area of faculty preparation. The faculty and departments need to be accountable for creating learning environments that are real, meaningful to all students, and conducive to student achievement.

According to Levy (2003), faculty members teaching an online class are faced with a number of new situations. These included:

- the administration or management of online courses;
- the course layout and design;
- the best delivery method for the content, such as text, graphics, audio, or video;

- the various communication methods that the students will use such as email, discussion boards, and chats; ways to increase and maintain student involvement; appropriate student assessments for online learning; and a working knowledge of all the technologies being implemented in the online course.

The literature review revealed that most studies place much emphasis on the medium used to deliver instruction. However, effective instructional practices are essential in any type of learning environment. For instance, maintaining constant communication with students while providing sufficient feedback creates a learning environment filled with dynamic interaction. This strategy has been found to be an effective instructional practice in both online and traditional learning environments (ADEC, 2003, Singh & Pan, 2004). Even if exactly the same media were used to deliver instruction in both the traditional classroom and the distance education settings, the media were used for different purposes. For example, in the distance education setting, media were used to connect the instructor with the students. In the traditional classroom, support or supplemental instruction is its main use (Gaytan, 2006).

Most studies reviewed lacked internal validity such as control of inequalities. Pedagogical tools that foster active learning need further development to become more effective in any type of learning environment. Each constituent in the online education process—policymakers, administrators, teachers, parents, and students—must consider a number of important issues when contemplating creating, adopting, administering, or participating in online courses (NEA, 2006). To be equipped:

- States must determine guidelines for the creation and use of online courses for students within their jurisdiction.
- Local school districts must identify their own goals in using online programs and must have tools to assess their appropriateness and effectiveness.
- Teachers must know what constitutes quality online teaching.
- Teachers must know to what standards they will be held accountable.
- Parents must understand how online education functions and how to ascertain what is the best interest of students.
- Students must become informed consumers, aware of how online courses can enhance their educational portfolios, and what is required for success in these courses.

Regarding the limitations of a meta-analysis, control could not be applied to the studies under scrutiny. The best course of action was to assess the strengths and weaknesses of the research methodologies found in those studies (Bernard, et al., 2004). Finally, there is a great necessity for faculty development especially for those teaching online. The major portion of this preparation to teach online should include training related to effective student learning in the distance education environment.

## CHAPTER 3: METHODS

### Introduction

The objective of this study was to examine and compare student achievement in online and face-to-face learning environments at the post secondary level. Learning theory and long-existing principles of education are being made to accommodate new and faster means of information delivery, often utilizing technology. Unfortunately, this sometimes comes without full regard to learner outcomes. This study also considered the perspective of the instructor of the online and face-to-face courses taught regarding how information and communication technologies have influenced instructors' teaching pedagogies and practices. Teachers of the 21st-century learner are challenged daily to keep up with the rapid changes that are evolving at an ever-increasing rate.

In higher education, student evaluation of instruction provides data that serve a variety of functions. Some of the purposes of student evaluation of instruction include revision of courses and programs, improvement of instruction, institutional accreditation, and tenure decisions about faculty. When instruction is delivered online, student evaluation becomes notably more complex, as issues of technology and pedagogy intertwine (Cohen, 2003). In this chapter, profiles of the participants are described, and the results of the surveys are discussed in detail. The answers to the inquiries in this study provided insight to virtual learning and its effect on student achievement.

## Research Design and Methodology

The research design included an investigation of the information students provided on a survey. Demographic data in this study were gender, age, academic need to take the course, and preference of instructor interaction.

A comparison of the course delivery methods in two computer information systems courses taught by the same teacher had a quantitative perspective. One group of students completed the course in a traditional environment, while the other group completed the course online. The interim grades and final course grades were compared and analyzed for each student. This study ascertained the relationship between the online and face-to-face format of the delivery of curriculum and its affect on student achievement at the post-secondary level.

The study evaluated test scores and end-of-course grades to compare the overall achievement of students in the face-to-face and the online class. Additionally, the study sought to determine if demographic characteristics led to significantly different beliefs about online or face-to-face classes. The data helped to determine whether implications related to beliefs, achievement scores, and demographic characteristics exist. The use of correlation coefficients assisted in the determination of any statistically significant relationship between these factors. The research problems and summaries were:

1. Using the independent sample t-tests, results will indicate that there is no significant difference in final course grades of the face-to-face and the online environments. Problem Statement: Is there a significant difference in the final grades of students that experience the curriculum content online compared to students that experience the curriculum content face-to-face?

- a. Null Hypothesis-There is no significant difference in student achievement from students that experience the curriculum content online as compared to students that experience the curriculum content face-to-face.
2. What is the impact of distance learning on teaching practices? An opinion survey distributed to instructors who taught the same course online and face-to-face provided data. The instructors' survey was not statistically calculated since the aim was to gather and examine expert input on the pros and cons of online teaching. Problem Statement: Is there a significant difference in the teaching practices of instructors that teach online and teach face-to-face?
    - b. Null Hypothesis-There will be no significant difference in teaching practices of the online instructor and the face-to-face instructor.
  3. What is the students' satisfaction with instructions? A survey disseminated to students by Piedmont Community College's Student Development Department allowed the researcher to gather helpful insights to students' preferences of learning environments. Problem Statement: Is there a significant difference of students' satisfaction with the instructor's presentation of content, online or face-to-face?
    - c. Null Hypothesis-There will be no significant difference of students' preferred instructor interaction, online or face-to-face.

The researcher used the Statistical Package for the Social Sciences, now the Statistical Product and Service Solutions (SPSS), to conduct t-tests to assess the significance of the difference between the means of the two course formats. There was a subject pool of 66 college students. To assess variance homogeneity, the researcher

utilized the Levene's test. If the significance from this test was less than 0.05, then variances were significantly different. Problem statement one consisted of comparing students' test scores and end-of-course grades. The generated histograms described the distributions of the test scores. For comparison purposes, each test and section has separately created histograms (see Appendix I).

For problem statement two, PCC instructors that taught online and face-to-face voluntarily completed a survey. Green, Armstrong, and Graefe's (2007) study suggested use of the Delphi method for aggregating diverse opinions. The Delphi technique helped to predict outcomes of similarities and differences. The Delphi technique enabled communication, encouraged discussion, and generated new ideas about online teaching. Another advantage was the ease of answering electronically versus the paper and pencil approach of the past to bring together the knowledge and judgment of experts. In addition, the researcher analyzed the 10-item interview developed by Distance Learning (2008) using the hermeneutic and holistic methods. The researcher looked at how all the statements made by the interviewees were interrelated. Any contradictions or consistencies in the interviewees' responses provided data for analysis. Finally, all the comments from the interviewees provided a conglomeration of strategies that surpassed any one single comment. The disadvantage included investigator bias in the formation of questions and the interpretation of responses.

The third problem statement studied students' satisfaction with the course through the information provided by each student on a standardized student evaluation of the course. The student evaluation was a standard survey instrument distributed by PCC. Other faculty members administered the instrument to the students. Sometimes the dean

of that division was the administrator. The instrument was a Likert scale where the students specified their level of agreement with a statement. Students bubbled their choice of agreement on a scan form.

### Research Context

The literature indicated that significant investments in information and communication technologies have been made by federal, provincial, and municipal governments; school boards; colleges and universities; non-governmental agencies; and private sector organizations. The investments included the development of infrastructure to support access to the Internet, organizational intra-nets, general and special purpose portals, as well as software. The professional development and additional training needed for the instructors of online courses is another venture. While there are few reliable estimates of the magnitude of these investments, without doubt, these investments have been costly.

The accountability provisions of the No Child Left Behind Act (NCLB) expanded school choice for students attending public schools. If a school did not meet state expectations, students could enroll elsewhere. As a result, school districts turned to virtual schools as an approach to providing options under NCLB. Early College, Learn and Earn, the College Achievement Program (CAP), and other initiatives sought to change the face of higher education by targeting those students traditionally underrepresented on college campuses.

According to the Accrediting Commission for Community and Junior Colleges (ACCJC, 2002) an effective institution ensures that its resources and processes support student learning. An effective institution will also continue to assess that learning and

pursue institutional excellence and improvement. To gain a comprehensive perspective of the institution, this Commission has provided four standards by which the institution can go through a self-evaluation process. Even though the standards are presented separately, they work together to facilitate a dialogue on the institution's effectiveness and on ways in which it may improve. The four standards are:

- I. Institutional Mission and Effectiveness
- II. Student Learning Programs and Services
- III. Resources
- IV. Leadership and Governance

This study involved Standard II, a focus on student learning outcomes.

Institutions deliberately develop learning outcomes at the course, program, and degree level to demonstrate the effectiveness of its efforts to generate and support student learning. To determine whether learning has occurred and if changes have improved learning and teaching, require that learning outcomes be measured and assessed. One of the features of this assessment is that faculty engage in discussions of teaching strategies to maximize student learning. Standard II also requires that those providing student support services develop student-learning outcomes. Standard II suggest that an institution evaluates the quality of their policies, processes, and procedures for providing students admission and progression through the institution. In addition, an institution's key processes and allocation of resources should focus on student learning outcomes.

Ultimately, Standard II requires that an institution conduct a self-analysis. This self-analysis may lead to improvements regarding teaching and learning. This focus requires that the institution provide evidence of a conscious effort to do the following:

- make learning the institution's core activity
- measure that learning
- assess how well learning is occurring
- make changes to improve student learning
- organize its key processes to support student learning
- allocate its resources to effectively support student learning; and
- improve learning as an important means to institutional improvement.

One of the reasons this study took place was the scrutiny of college and university programs as to how well they prepared students for the challenges that await them as 21st-century workers. The No Child Left Behind Act placed more responsibilities, accountability, and pressure on educators to produce better overall results.

A rural, public, two-year community college, Piedmont Community College (PCC), was selected to help determine if the information in the literature was true. PCC has been in operation since 1970. It was first located inside of businesses, factories, local public schools, and any other facility that had space for a classroom. The campus facility was built and put into operation in 1977. The classroom for the lectures in the face-to-face classes consisted of 15 tables with two students per table with straight back chairs. The computer lab where the face-to-face lab work was completed consisted of 28 desktop computers with stationary, cushioned chairs. The overall facility was well kept and landscaped.

According to PCC's academic regulations (2008-2010) normal attendance at all classes is required for students to achieve educational success. PCC's attendance

committee established the following class attendance policy in order to encourage student success:

- Administration expects regular and punctual attendance to all classes. To receive credit for a course, the student must attend class prior to the Census Point and attend a minimum of 80 percent of classes, labs and shop hours. Failure to attend class is an absence, regardless of the reason. Instructors count absences from the first scheduled meeting of the class, not the first day the student attends. All work missed during absences must be made up to the satisfaction of the instructor. Failure to complete required assignments will negatively affect the student's final grade.
- The instructor, through the eighth week of the semester, may withdraw a student who exceeds the 20 percent limit of absences. If a student exceeds the 20 percent limit after the eighth week, the instructor is authorized to award the student an "I", "WP", "WF", or "F" grade as warranted by the student's performance and circumstances.
- The instructor must authorize any exceptions to this policy (p. 37).

At the time of the research, PCC made distant learning available in a number of delivery formats. Classes were available through the Internet, Teleclasses, Telecourses, TeleWeb, and hybrid. Table 1 depicts PCC's enrollment for CIS 110 in these various formats for the fall semester 2007. The college offered; through distance learning, nine certificate programs, six associate degree programs, and four diploma programs

(Piedmont Community College, 2008). PCC offered 29 programs of study with a full-time faculty of 98.

Table 1 Student Enrollment in Various Delivery Formats Fall 2007

Delivery Format	N
Online	56
Face-to-Face	75
Hybrid	40
Telecourses	11
Teleclasses	14
Total	196

The CIS 110 course is one of many in the Computer Information Technology curriculum. This course of study is designed to prepare graduates for employment with organizations that use computers to process, manage, and communicate information. This customized-flexible curriculum can meet a community's information systems needs. CIS 110 introduces computer concepts, including fundamental functions and operations of the computer. Topics include identification of hardware components, basic computer operations, security issues, and use of software applications. Upon completion, students should be able to demonstrate an understanding of the role and function of computers and use the computer to solve problems. This course has been approved to satisfy the comprehensive articulation agreement general education core requirement in natural science and mathematics. Table 2 shows the total number of online and face-to-face students enrolled at PCC.

Table 2 Percentages of Students Enrolled in CIS Fall 2007

Delivery Format	PCC CIS N	CIS Study N	%
Online	56	22	39.2
Face-to-Face	75	44	58.7
Total	131	66	50.4

Course work was intended to develop a student's ability to communicate complex technical issues related to computer hardware, software, and networks in a manner that computer users can understand. Classes cover computer operations and terminology, operating systems, database, networking, security, and technical support. The courses also cover the features of application software such as word processing, spreadsheets, databases, multimedia, Internet searching, and emailing software.

#### The Research Participants

The course enrollment for the term of research consisted of 66 students. One instructor taught both the face-to-face and the online courses. The instructor has taught the course online for five years and is a veteran teacher of 23 years. There were two face-to-face classes with a total student enrollment of 44 and 1 online class with a total enrollment of 22. Table 3 shows the final sample of students for each delivery format.

Table 3 Research Sample Online and Face-to-Face: Male and Female Students

Gender	Online Section	Face-To-Face
Male	5	13
Female	17	31
Total Number	22	44

Since random assignment or the use of control groups was not feasible in this educational setting, the sample consisted of the entire class of 22 students from the online class and 44 students from the face-to-face class. The dean of the business department distributed a student satisfaction survey (Appendix F) to the CIS students in the fall 2007 classes. The survey sample consisted of the online students enrolled in PCC's Computer Information Systems: Introduction to Computers course for fall 2007. This sample had the same instructor teaching both formats of the course. There were some limitations in this study. First, the sample sizes were quite small. Second, the study was not an experiment and, thus, the assignment of the participants was not random. Chapter 5 contains further discussion of these limitations.

The demographics of the students in all sections were low to middle income, ranging in age from 18 to 60+ years old. All sections consisted of more females than males. The online class section had a male to female ratio of 1:3 while one face-to-face class had a ratio of 1:1 and the other had a male to female ratio of 1:3.

#### Instructor Interview Participants

At the time of the research, PCC had 37 full, part-time, and adjunct instructors that taught in the distance education department. For this study, the survey participants were instructors of CIS courses in the business department. The business department at PCC had three full time and two adjunct online instructors. One instructor of the CIS online and face-to-face course first completed the instructor interview. This pilot interview helped to establish reliability and dependability of a constant explanation of the interview that would be implemented with the other instructors. The researcher then

made the instructor interview available to the distance education department. The researcher selected these participants based solely upon the accessible population.

#### Instruments Used in Data Collection

Data collection for this study included several instruments and recording processes. ExamView®, a testing tool that creates paper and online tests, was used to develop the test for the online and face-to-face classes. Students had five tests per semester. Each test had two components, a set of true/false multiple-choice questions and then a hands-on component for Microsoft Office 2003. The 25 to 50 true/false and multiple-choice questions were randomly generated from the test pool of the ExamView® software supplied with the text. The hands-on components were assigned by the instructor from the textbook based upon lab assignments students had done the previous weeks.

The five tests centered on the following content:

- 2) Email and the Internet
- 3) Word processing (Word)
- 4) Spreadsheets (Excel)
- 5) Presentation software (PowerPoint)
- 6) Database (Access)

The data was analyzed using Microsoft Excel and SPSS software. The test scores and final grades were exported from Blackboard to a Microsoft Excel spreadsheet. Microsoft Excel basic statistical operations assisted the researcher in exploring and drawing conclusions from the data. Excel is a spreadsheet software package with a wide range of applications. The simplicity of both entering and manipulating data made this a

useful package for performing preliminary statistical exploration of data. The instructor recorded and calculated student grades for all sections using Excel. SPSS software was used to perform factor analysis. This was done to identify underlying variables or factors that explained correlations within a set of observed variables. Data was analyzed using the means and *t* tests.

First, students took five tests during the semester. Each test had two components, a set of true/false multiple-choice questions and then a hands-on component for Microsoft Office's Outlook, Word, Excel, PowerPoint, and Access. Test 1 assessed features of email and the Internet. Test 2 assessed word processing skills. Test 3 evaluated spreadsheet skills. Test 4 assessed presentation skills and Test 5 assessed database skills. Software supplied with the text provided randomly generated true/false and multiple-choice questions. In this specific case, the software is ExamView®. The teacher assembled the hands-on component from Exam View® performance item bank based upon lab assignments students had completed the previous three weeks. The final grade for the entire course, calculated and weighted by the instructor, included the individual assignments and the tests.

Finally, PCC distributes a student survey instrument at the conclusion of each term. Faculty members other than the instructor of the course administer the survey to the students. Sometimes the dean of that division is the administrator. The students specify their level of agreement with various statements using a Likert scale recording answers on a scan form. Academic computing received the collected scan forms for analysis and computations of results (See Appendix F). Students voluntarily completed the survey.

Blackboard Statistics Tracking could not be utilized to view detailed statistics on content item usage for all course users. The researcher was not allowed to view the Review Status information or the User Progress page that would have given detailed statistics to determine how many times the particular content item was viewed and exactly when it was accessed. In Blackboard, Statistics Tracking is separate from Course Statistics. Course statistics provide information about content area usage by the students. Statistics Tracking allows instructors to view dates and times the students logged into Blackboard. The researcher did not have access to these features of Blackboard.

#### Instrument Validation and Reliability

ExamView® was used to create, edit, and administer the printed and web tests. ExamView® is assessment software that allows the building of comprehensive tests with Test Generator, administration of tests with Test Player, and evaluation of results with Test Manager. The instructor used ExamView® to:

- Customize and select questions;
- Save questions in question banks for compilation into multiple study guides and tests;
- Administer tests on paper and online; and
- Grade tests, track progress and generate reports.

The instructor exported the tests from ExamView® to Blackboard and set up the tests to be self-scoring. The researcher did not perform content validation of the five tests. ExamView® allowed the set up of dynamic questions that automatically substituted values, units of measure, graphs, text, and answer choices for each question. One created

question generated numerous variations of that question, which assessed the same concept (Nagel, 2008).

For this study, the tests used to assess both sections of students were publisher validated for the general population of students that use the textbook, *Introduction to Computers*. This textbook came with ExamView® formatted questions with publisher-prepared question banks for adopters of the textbook. The ExamView® Test Generator supported 14 question formats, which allowed the instructor to group test questions by their question type, mix the different question types on a test from the question bank, and create tests that more closely resemble course objectives. Internal consistency estimated reliability for the question bank. The instructor grouped two questions in a test that measured the same concept. The instructor exported tests, question banks, and assignments to Blackboard. To encourage honesty, the instructor timed the test with dynamic questions, one question with numerous variations, all of which tested the same concept. Each student had a different variation of the same test.

The developers of the student survey instrument consisted of the deans, division chairs, and the vice president for instruction and student development. The developers of the instrument met with the Southern Association of Colleges and Schools (SACS), the accrediting body for community colleges. After approval from SACS, the developers met with Noel-Levitz, a company that specializes in assisting colleges in managing student data and enrollment. They analyzed, recommended changes, and approved the instrument. Dossett (2009) also purported that following the prescribed process would render the survey instrument 100% valid. Faculty members other than the instructor administered the survey instrument to the students. The dean of that division has also

served as a survey administrator. The instrument was a Likert scale where the students specified their level of agreement with a statement. Students bubbled in their choice of agreement on a scan form. The administrator collected the scan forms and delivered them to academic computing for analysis and computation of results. For the validity of the instrument, Dossett (2009) suggested guarding against faculty members giving their own instructor/course evaluation. Another limitation to the validity of the instrument was making sure every student answered every question.

Reliability for the student instrument estimated the degree to which the student survey instrument measured the same way each time used under the same conditions with the same subjects. Since reliability is estimated and not measured, estimation was not available because the ability to measure the student survey instrument the same way each time it was used under the same condition with the same subjects was impossible. However, PCC administered the student survey instrument. PCC's student survey had periodic updates for the last two decades.

### Procedures

Near the end of each term, the students take a student satisfaction survey. Students participated voluntarily and the instructor informed them that this study would explore the effectiveness and comparison of the online and face-to-face instructional environment on student achievement. Although this was a convenience sample, and not a true random sample, neither the researcher nor the course instructor controlled which course students enrolled in, which should have alleviated violations of random assignment for data analysis. In carrying out the research design, several specific procedures were used. ExamView® test scores' central tendency was used to determine

the difference between the means of the virtual and face-to-face classes. From the scores for all sections, five test scores, Test 1 through Test 5, and the final course grade were selected for analysis.

### Data Analysis

The data was analyzed using several strategies. First, the data was reduced by collecting the number of students in each delivery format. The researcher used the instructor's Excel spreadsheet and keyed the test scores and end-of-course grades into the SPSS as a mixture of nominal, ordinal, interval and ratio data (See Tables in Appendix H). Mean comparison tests were performed to look for significant differences in achievement between the groups. SPSS 16.0 for Windows was used for data analysis.

ExamView® test scores' central tendency was used to determine the difference between the means of the online and face-to-face classes. Grades were recorded in Microsoft Excel and the raw data was put in to SPSS 16.0 for analysis. For a more comprehensive analysis, the study combined the two face-to-face classes. A series of *t* tests compared the mean test scores for the face-to-face sections and the online section. Levene's test for equality of variances projected whether the two groups had approximately equal variance on the dependent variable at the .05 level. This procedure, in this context, tested the equality of the means among the groups. Levene's test works by checking the null hypothesis to verify that the variances of the group are equivalent. The output probability is the likelihood that at least one of the samples in the test has a significantly different variance. If the variance is larger than a preferred percentage (usually 5%), then it is too large to be able to apply parametric tests (see Appendix J).

Results from the student survey were reported using measures of central tendency and variation, frequencies, and percentages. Achievement scores were also reported using frequencies, measures of central tendency, and percentages. Participants of the survey submitted data describing their need to take the course, time constraints, and ease of attending campus through the online format (see Table 7). Nine participants of the online course completed the survey. This was 60% of the remaining 15 online students and 41% of the original 22 online students.

1. The results from the online survey and the demographic data were analyzed in Quia (See Appendix G and H). Demographic data including gender, age, academic need to take the course, and preference of instructor interaction were reported using frequencies and percentages.

### Chapter 3 Summary of Methodology

This research project examined the delivery of curriculum content utilizing online tutorials and activities in the virtual environment. A comparison was made of the test scores and final grades to the scores of students that received the content in the traditional face-to-face format. The goal of the study was to determine which format, online or face-to-face, had the greatest effect on student achievement and level of proficiency.

Demographic and belief data were collected using an online survey. This study obtained achievement scores using web-based criterion referenced tests. Data was analyzed using descriptive summaries and tests for correlations and significant differences among groups.

## CHAPTER 4: RESULTS

### Introduction

As reported in Chapters 1 and 2, this study detailed the challenges of effective distance education programs to increase student achievement in light of numerous obstacles such as limited funding for technology, professional development for instructors, and demographics of students. This study was conducted to examine the test scores and final grades of students utilizing online learning methods as compared to the test scores and final grades of students experiencing traditional classroom methods. There was a review of the relevancy of online learning management systems, student demographics, curriculum quality, technology availability, and instructor training impact on student achievement. The organization of this chapter is a restating of each of the three study questions outlined in Chapter 1 followed by a narrative summary of the research results.

### Research Question One

What was the impact of virtual learning on student achievement? The researcher used descriptive and inferential statistics to determine the impact between the online and traditional sections. The following response provided helpful statistical information in answering this research problem.

### Descriptive Statistics

Generated histograms describe the distributions of the test scores (see Appendix D). For comparison purposes, the researcher created histograms for each section and test separately. All the score distributions were negatively skewed. See Figure 1 for Test 1

Email/Internet in the Appendix I. The distributions of the scores for the face-to-face sections were similar. The distribution of scores for the online section, however, showed more variability. This may be due, in part, to the fact that, for the online section, the original scores were on a 50-point scale. The researcher then rescaled to 100 points by dividing the grade points obtained by 50, the number of points possible. For example, if a student got 42 points on the 50 points scale, their score would be 84 on the 100-point scale ( $42/50$ ). For Figure 2, Test 2 Word, in both face-to-face sections, there were a few potential outliers. Overall, there was more variability in scores compared to Test 1. Figure 3, Test 3 Excel, and Figure 4, Test 4 PowerPoint, revealed the same phenomenon. As before, there were a few potential outliers in the face-to-face sections. There was much variability in scores for these tests. Figure 5, Test 5 Access, had no obvious outliers. Figure 6, Final Grades for the course histogram shows the distributions of the final percentages for the three sections. Note that all students, including those who missed some exams and those who failed to pass the course, are included (See Appendix I).

### Inferential Statistics

The researcher conducted a series of  $t$  tests to compare the mean scores for the face-to-face sections and the online section. This study combined the scores for the two face-to-face sections. Whenever the equality-of-variances assumption was violated, the degrees of freedom were adjusted before computing the observed significance level. For this study, random assignment of students to the classes was not feasible; therefore, caution was taken in the interpretation of the results of these tests.

Test 1 Email/Internet. There were 43 students in the face-to-face section. The mean and the standard deviation respectively were 93.81 and 4.615. There were 20 students in the online section. The mean and the standard deviation were 91.00 and 7.881. Levene's test for equality of variances was significant,  $F(1, 61) = 6.268, p = 0.015$ . The results of the  $t$  test, with adjusted degrees of freedom for heterogeneity of variances, were not significant,  $t(25.254) = 1.483, p = 0.150$ . As depicted in Table 4, the mean scores for the two sections were not significantly different.

Table 4 Means & Standard Deviations of Tests 1-5 for CIS 110 Group Statistics

Test	Instructional Format	N	M	SD
1 Internet/Email	Face-to-Face	43	93.81	4.615
	Online	20	91.00	7.881
2 Word	Face-to-Face	41	86.83	15.081
	Online	20	88.3	9.137
3 Excel	Face-to-Face	38	86.92	12.3965
	Online	17	87.41	8.360
4 PowerPoint	Face-to-Face	39	88.38	13.996
	Online	16	88.25	11.475
5 Access	Face-to-Face	37	84.19	10.357
	Online	15	86.80	11.156

Test 2 Word. There were 41 students in the face-to-face section. The mean and the standard deviation respectively were 86.83 and 15.081. There were 20 students in the online section. The mean and the standard deviation were 88.30 and 9.137. Levene's test

for equality of variances was not significant,  $F(1, 59) = 1.160, p = 0.286$ . The results of the  $t$  test were not significant,  $t(59) = -0.401, p = 0.690$ . The mean scores for the two sections were not significantly different.

Test 3 Excel. There were 38 students in the face-to-face section. The mean and the standard deviation respectively were 86.92 and 12.395. There were 17 students in the online section. The mean and the standard deviation were 87.41 and 8.360. Levene's test for equality of variances was not significant,  $F(1, 53) = 1.029, p = 0.315$ . The results of the  $t$  test were not significant,  $t(53) = -0.148, p = 0.883$ . The mean scores for the two sections were not significantly different.

Test 4 PowerPoint. There were 39 students in the face-to-face section. The mean and the standard deviation respectively were 88.38 and 13.996. There were 16 students in the online section. The mean and the standard deviation were 88.25 and 11.475. Levene's test for equality of variances was not significant,  $F(1, 53) = 0.033, p = 0.856$ . The results of the  $t$  test were not significant,  $t(53) = 0.034, p = 0.973$ . The mean scores for the two sections were not significantly different.

Test 5 Access. There were 37 students in the face-to-face section. The mean and the standard deviation respectively were 84.19 and 10.375. There were 15 students in the online section. The mean and the standard deviation were 86.80 and 11.156. Levene's test for equality of variances was not significant,  $F(1, 50) = 0.002, p = 0.965$ . The results of the  $t$  test were not significant,  $t(50) = -0.806, p = 0.424$ . The mean scores for the two sections were not significantly different.

$t$  Test on Final Grade for the Course Percentage. The  $t$  test on this variable, and its implication, are somewhat different from those conducted on the five exams. In the

previous test analysis, when a student missed an exam, the case was treated as missing. In other words, the analysis included no zeros. Results of the  $t$  test reported in Table 5, all students' grades are included. This is because there was no systematic way to exclude certain students, if they all had valid percentage values.

Table 5 Means & Standard Deviations of Final Grades for CIS 110

	Instructional Format	N	M	SD
Final Grades	Face-to-Face	44	79.49	22.56
	Online	22	69.86	31.19

There were 44 students in the face-to-face section. The mean and the standard deviation respectively were 79.50 and 22.565. There were 22 students in the online section. The mean and the standard deviation were 69.87 and 31.191. Levene's test for equality of variances was significant,  $F(1, 64) = 4.539, p = 0.037$ . The results of the  $t$  test, with adjusted degrees of freedom for heterogeneity of variances, were not significant,  $t(32.347) = 1.289, p = 0.206$ . The mean percentages for the two sections were not significantly different.

#### Research Question Two

What is the impact of distance learning on teaching practices? The research interview portion of this study included sending an instructor interview survey attached to 39 emails to the distance education and adjunct faculty of PCC. Of the 39 distance-education faculty, eight are support personnel. Five of the emails were undeliverable. Of the remaining 26 potential survey takers, four participants completed the interview. The researcher sent a second email in addition to phone calls to the remaining 26 instructors.

This study reflects the results from the four interview takers who completed the entire interview for a 15.38 percent return of the interview.

An interview with four instructors answering a series of questions provided the data for this research question (see Appendix A). One instructor taught the online and face-to-face classes for this study. The questions and the responses verbatim are:

*1. What prompted you to start teaching online?*

Instructor KF: “Assigned.”

Instructor PP: “I was looking forward to the challenge of a new and different way to deliver classes. I also believed that distance learning was not just a fad but also a sound way to deliver quality course work for the near future. Thus, I wanted to be sure that my teaching skills were marketable in the event I was looking for a new teaching position.”

Instructor JB: “Desire to expand my knowledge, as well as, just simply having the knowledge to know that learning was taking a new direction-technology.”

Instructor RP: “The first course I did online was in 1999 and I volunteered to do it. I think it was the excitement of doing something new and different.”

*2. Has distance learning changed your approach to teaching?*

Instructor KF: “Somewhat. The manner in presenting information changes.”

Instructor PP: “Yes.”

Instructor JB: “Yes, it has made me rely on the cyberworld (sic) more than I was taught to do so. It has made me more of a global educator.”

Instructor RP: “You have to be much more detail oriented. The course documents you put online have to be exact and specific. I try to anticipate potential questions from students and answer them within the narrative of the text publish (sic) online.

*3. If distance learning has changed your approach to teaching, what has been the impact?*

Instructor KF: “Manner of presentation as well as keeping the information in a user friendly format.”

Instructor PP: “I believe it has made me more organized. I will now plan in more detail an entire course in advance of teaching it. Previously, I had an overall general view of the class and what I wanted to cover. Nevertheless, my planning has gone into more detail and more precise scheduling of assignments and projects. I also spend more time online communications (sic) to students especially with e-mail. I am also now available to students on nights and/or weekends if I so choose.”

Instructor JB: “It has caused me to reeducate myself with regards to technology and the available avenues technology such as video steaming (sic), podcasting, emails, attachments, virtual discussion forums, etc.”

Instructor RP: "I'm probably more detail oriented in all my classes now-not just online, but the traditional face-to-face as well."

4. *What do you see as the greatest benefit of online learning and getting one's college degree online?* "

Instructor KF: "Students who would not normally be able to attend school can now do so because of the distance learning format. Flexible studying."

Instructor PP: "It allows more people to have access to college courses. I find that students who work varying hours now complete college classes. With a traditional schedule, students might not have been able to attend a class that meets every Tuesday and Thursday for example. Students who hold jobs that require them to travel have better access to college courses via distance learning. And, in a sad commentary on the times we live in, some people will take online classes instead of venturing out to a college at night."

Instructor JB: "Greatest benefit is diversity of learning. Students and instructors are not limited to the four walls of a classroom."

Instructor RP: "Convenience!"

5. *What was the biggest challenge you faced in creating an online course for a distance learning curriculum?*

Instructor KF: "Ensuring that needed information is provided in a friendly format and keeping up with the e-mailing."

Instructor PP: “Setting a reasonable schedule of assignments and associated due dates.”

Instructor JB: “Software changes.”

Instructor RP: “Same answer as number 2. (You have to be much more detail oriented. The course documents you put online have to be exact and specific. I try to anticipate potential questions from students and answer them within the narrative of the text published online)”

*6. What surprised you about teaching online?*

Instructor KF: “It’s really a good and legitimate alternative to face-to-face instruction”.

Instructor PP: “How time consuming it is in relation to a traditional class, especially in responding to student questions and concerns. I often found myself typing the same e-mail to several students. So I created a database of common responses and will copy and paste those replies, with some modifications, as needed.”

Instructor JB: “That I wouldn’t miss the physical student contact.”

Instructor RP: No response.

*7. What were your secrets of success for conducting an effective online course?*

Instructor KF: “Tailor the coursework so that it is conducive to meeting course standards and learning as well as keeping it

simplified to the point that students can grasp information and maneuver around the site and complete assignments effectively.”

Instructor PP: “Being organized; giving students prompt feedback; staying in touch with the students through e-mail, discussion boards and chat sessions; clearly stating policies for assignments, submission of work, deadlines, etc.; making sure that the class Web site is easily (sic) to navigate and that students can easily find whatever they need.”

Instructor JB: “Do not procrastinate and still understand that even though you can’t see them they are still there. Computer access is 24/7”.

Instructor RP: “Communication, communication, communication. Reply to students’ emails as soon as possible.”

*8. How do you see online teaching evolving?*

Instructor KF: “I believe we will see more and more courses offered and more students taking advantage of online learning—and probably more degree offerings online.”

Instructor PP: “I see more use of multimedia such as streaming audio and video.”

Instructor JB: “I am not sure. I know more and more opportunities will be available.”

Instructor RP: “More use of video (that reduces the need for detail in written course documents) and social networking.

9. *What advice would you give to students pursuing their college degree online?*

Instructor KF: “Get REAL familiar with online procedures, ahead of time. Attend orientations.”

Instructor PP: “You must be disciplined to stay on task. You cannot get behind and try and (sic) catch up. I also advise them to refrain from completing a course too quickly as well. They can easily turn the class into a cram session and fail to retain new knowledge.”

Instructor JB: “Be careful not to take on too much. Online learning for some have (sic) provided the misconception that since the course is available to you 24/7 that (sic) you can take on more than you would if you were in a seated course. Personally, I think online studies require more student participation and discipline.”

Instructor RP: “You have to be self motivated. You have to keep up and not get behind. Online courses can be harder and take more time than the traditional format.”

10. *Comments:* No instructor had additional comments.

Online courses are very convenient to students with jobs and families. Students fail to realize that online courses, in most cases, take much more of their time than classroom courses. They must allow the necessary time to complete the reading and assignments. Many students feel that they can take more than one course at a time because they want to complete their degree very quickly. This approach may work as

long as everything in their life stays the same, but many students run into problems quickly if something in their life changes. Not every student is successful as an online student. There were students who did much better with the weekly class sessions where they could see the instructor and other students.

### Research Question Three

What is the students' satisfaction with instructions? An online survey disseminated to students of a CIS 110 course allowed the researcher to gather helpful insights to students' preferences of learning environments. The students completed surveys at the end of each class term. Students participated on a voluntary basis however, all students in attendance were encouraged to complete a survey. Those agreeing to participate indicated their consent by completing and submitting the survey. Nine online students completed the survey. Huitt (2003) defines instruction as "the purposeful direction of the learning process". He also lists instruction as one of the major teacher class activities (along with planning and management). Professional educators have developed a variety of models of instruction, each designed to produce classroom learning.

Joyce, Weil, & Calhoun (2003) describe four categories of models of teaching/instruction (behavioral systems, information processing, personal development, and social interaction) that summarize the vast majority of instructional methods. Each model differs in the specific type or measure of learning that was targeted. Therefore, as decisions are made about "best educational practices" educators must be certain to connect recommended practices with specific desired outcomes. This point was often omitted; discussion of best practices then becomes a debate about desired outcomes

rather than a discussion of how to achieve them. Information collected in the survey from questions 2, 6, and 12 dealt with students' perception of the teacher's and distant learning staff's performance. Over 70% of the respondents rated the instructor good or excellent in these areas for question number two, Teacher Performance:

- Apparent knowledge of the subject matter
- Degrees to which subject matter was made stimulating or relevant
- Fairness in assigning grades
- Concern and respect for individuals as students

Teacher Performance had the highest rating average of 3.29 for the degrees to which subject matter was made stimulating or relevant. Thirty to forty percent of the respondents rated the teacher performance poor or fair in these areas:

- Success in communication or explaining subject
- Administration of class and organization of material
- Encouragement and management of class interaction
- Responsiveness to queries outside of class

Teacher performance had the lowest average rating of 2.44 for success in communicating and explaining subject matter.

Question six asked, "How would you characterize communication with the instructor and others in the course?" Although one respondent felt isolated from others, the top three choices were:

- Course procedures were clearly posted
- Necessary information was received on time
- Clear instructions for using all materials

When asked, “If needed, were the distance learning staff members helpful?”, 33.3% of the respondents were very satisfied and 44.4% of the respondents were satisfied.

Eighty-nine percent of the respondents took the online course from home with one using the facilities on campus. Eighty-nine percent registered with no trouble and think that they will take another online course in the future. Again, 89% percent agreed or strongly agreed to being well advised about the self-motivation and commitment needed to fulfill course requirements. For 56% of the respondents, CIS 110 was a requirement in their major field. One hundred percent felt that they had sufficient access to the online library resources needed to fulfill course objectives and complete assignments. Sixty seven percent reported never experiencing technical problems with Blackboard with one reporting occasional technical problems. Table 6 depicts the survey response to the major reasons for taking the course online rather than in a traditional classroom setting. The survey sample size may have affected the results.

Table 6 Major Reason(s) for Taking Course Online

Item	Number	Percentage
It fit my schedule-flexibility of hours	9	100.0%
It fit with my employment schedule	5	55.6
I had health related reasons	2	22.2
The college was too far from my home	1	11.1
The college was too far away from my work	1	11.1
I had too many family responsibilities (e.g. child, parent care)	3	33.3
I had too many job related responsibilities	4	44.4
The courses was only offered online	2	22.2

Questions 7, 8, and 9 were of a self-report nature, which may be prone to some inaccuracy because of less than accurate recall, lack of information, or discomfort with self-disclosure. In response to question number seven, 89% agreed or strongly agreed that the course was intellectually challenging. Table 7 shows the respondents rating the difficulty of the online course as compared to a traditional course:

Table 7: Difficulty of Online Course Compared to Traditional

Item	Number	Percentage
Online course are easier	2	22.2%
Online courses are more difficult	2	22.2%
Online courses are about the same difficulty as traditional courses	5	55.6%

When asked how many hours spent preparing materials for the online course, including doing readings, reviewing notes, writing papers and any other course-related work, the majority of the respondents spent two to three or four to five hours. One spent three to four hours.

#### Chapter 4 Summary

This chapter discussed the results from analyses of the study data to describe the research sample and to answer the research questions. The changing demographics of college students support the need of a flexible postsecondary educational delivery system. The students are older (66% of the survey population) than 26 years of age.

The first research question was “What was the impact of virtual learning on student outcomes?” There was no significant difference between the test scores and final grades of the online class when compared to the traditional face-to-face delivery of content.

The second research question explored the impact of virtual learning on teaching practices through an interview with the instructor of both formats. Virtual learning had the following impact on the instructor's teaching practices. The instructors:

- Became more aware of the needs of the students.
- Worked much harder in the discussions and focus on reaching the different types of learning styles.
- Presented the information in many different forms – reading, seeing, and doing.
- Spent more time creating and communicating with students due to 24/7 student access.

The third research question focused on the students' survey conveying their reason for taking the course, satisfaction with the online course, and teacher performance. The participants answered providing more in-depth knowledge of the beliefs for the need to be a part of a class setting and the need of some assistance from an instructor. Chapter 5 presents a more detailed summary and a discussion of the findings.

## CHAPTER 5: SUMMARY AND DISCUSSION

### Introduction

As an aid to the reader, this chapter restates the research problems. This chapter reviews the major methods used to generate data results. The chief sections of this chapter reiterated the results of the study and discussed their implications.

### Statement of the Problem

Increased student achievement is often the ultimate desired outcome of an educational activity. Chapters 1 and 2 introduced and presented research pertaining to the challenges affecting student achievement. This presumption can pose significant challenges when evaluating a project that is just one part of an ongoing, integrated education effort (South Eastern Regional Vision for Education, 2004). This is a problem particularly if the theories driving project design expect that project strategies will result in some outcome, which eventually has a positive effect on student learning. In addition to this, the accountability of teachers is to prepare students to pass a plethora of achievement tests. Therefore, an examination of pedagogy, new advancements in technology, teacher preparation, professional development, student attitude, and student perception of learning laid the foundation for this study.

A few issues addressed in this study included today's online technology advancements, the NCLB demands and its accountability, and the changing demographics of students. Strickland's (2007) study addressed demographic and effective characteristics of the distance learner. The problem is how to blend all these 21<sup>st</sup>-century technology and training together to improve student achievement. A contributing element of improving student achievement is the opportunity of bringing communities and parties

separated by great distances closer together with various online tools. This study examined the long-standing benefits of traditional face-to-face delivery of curriculum and compared it to similar guidelines applied to the online delivery of content. When conducted within an established structure and with reasonable expectations, the online approach to content delivery provides an alternative to the traditional face-to-face endeavor.

The research problems for this project were:

1. What is the impact of distance learning on students' test scores and final grades when compared to the traditional, face-to-face scores?
2. What is the impact of distance learning on teaching practices?
3. What is the students' satisfaction with instructions?

#### Review of the Methodology

Students enrolled in CIS 110 experienced course content in the online format and the traditional face-to-face environment. Students accessed Blackboard course management software for the Internet-based instruction. Both the distance learning and traditional students completed the tests using Blackboard's automated graded testing system. The instructor of the course used ExamView®, a testing tool that creates paper and online tests, to develop the test for the online and face-to-face classes. Students had five tests per semester. Each test had two components, a set of true/false multiple-choice questions, and then a hands-on component for Microsoft Office 2003. The instructor used the ExamView® software supplied with the text, which randomly generated 25 to 50 true/false and multiple-choice items from the test pool of questions. Based upon lab

assignments students had done the previous weeks, the instructor assigned the hands-on components from the textbook An Excel grade book held the test scores and final grades.

The five tests centered on the following content:

- 1) Email and the Internet
- 2) Word processing (Word Software)
- 3) Spreadsheets (Excel)
- 4) Presentation software (PowerPoint)
- 5) Database (Access)

This study performed a series of *t* tests to compare the mean scores for the face-to-face sections and the online section using SPSS software. As mentioned previously, there were combined scores for the two face-to-face sections. Whenever a violation of assumption of the equality-of-variances occurred, the researcher performed an adjustment to the degrees of freedom before computing the observed significance level. Because of the lack of random assignment of students to classes, caution was taken when interpreting the results of these tests. The Levene Test for equality of variance tested to see if the samples had equal variances across samples and because of the departures from normality. The researcher transferred scores and general data to SPSS software. Since the study included one online class, the researcher combined the two face-to-face classes.

At the time of the research, PCC had 37 full, part-time, and adjunct instructors that taught in the distance education department. For this study, the survey participants were instructors of CIS courses in the business department. The business department at PCC had three full time and two adjunct online instructors. First distributed to one instructor of the CIS online and face-to-face participants, the instructor's interview was

made available to the distance education department. The instructors of the online and face-to-face courses at PCC shared their insight and advice on distance-education through a structured interview. The researcher analyzed the 10-question interview developed by Distance Learning (2008) using the hermeneutic and holistic methods. The researcher looked at how all the statements made by the interviewees were interrelated. The researcher observed and noted any contradictions or consistencies in the interviewees' responses. Finally, all the components of data from the interviewees provided a synopsis that surpassed any one single component of data.

Results from the instructors' interviews provided helpful qualitative and narrative data to determine how each of the instructors uses online tools in the teaching and learning process. The interview presented subjective knowledge, opinions, and beliefs of the individual instructors. The analysis of that knowledge, opinions, and beliefs provided a holistic view of the data. Educators voluntarily participated in the interview through email. The interview was completed and submitted as an attachment in email.

A survey tool, developed by PCC, recorded the student satisfaction with the instructors' teaching. First, the student voluntarily completed the survey distributed by the college. Teacher performance and student satisfaction comprised the two primary components of the survey. Secondly, the PCC's academic computing analyzed and compounded the results. Appendix F contains the results.

### Summary and Discussion of the Results

Online courses, and the colleges, universities, and businesses that offer them, are continuing to rise steadily in enrollment (Shea & Boser, 2001). This increased enrollment is due, in part, to the opportunity online education presents for global competition, an

important topic in times of shrinking budgets (Schwartzman & Tuttle, 2002). Students and consumers who want learning on their own time and schedule additionally attribute to the increases. Finally, this increase coincides with the growth of research supporting the notion that technology can help teachers teach and students learn (Ferdig, 2001). The objective resulting from this study was to consider and determine how the online approach compared to a traditional face-to-face approach in terms of student achievement.

Inferential and descriptive statistics determined means, standard deviations, and correlations between the two course formats for the five tests and final scores. A series of *t* tests conducted to compare the mean scores for the face-to-face sections and the online section provided data to determine any significance. Scores for the two face-to-face sections combined. Microsoft Excel and SPSS for Windows were the data analysis tools used.

The first test, Test 1-Email and the Internet, had 43 students in the face-to-face section. The mean and the standard deviation respectively were 93.81 and 4.615. There were 20 students in the online section. The mean and the standard deviation were 91.00 and 7.881. Levene's test for equality of variances was significant,  $F(1, 61) = 6.268, p = 0.015$ . The results of the *t* test, with adjusted degrees of freedom for heterogeneity of variances, were not significant,  $t(25.254) = 1.483, p = 0.150$ . The mean scores for the two sections were not significantly different.

The second test, Test 2 Word, had 41 students in the face-to-face section. The mean and the standard deviation respectively were 86.83 and 15.081. There were 20 students in the online section. The mean and the standard deviation were 88.30 and 9.137.

Levene's test for equality of variances was not significant,  $F(1, 59) = 1.160, p = 0.286$ . The results of the  $t$  test were not significant,  $t(59) = -0.401, p = 0.690$ . The mean scores for the two sections were not significantly different.

The third test, Test 3 Excel, had 38 students in the face-to-face section. The mean and the standard deviation respectively were 86.92 and 12.395. There were 17 students in the online section. The mean and the standard deviation were 87.41 and 8.360. Levene's test for equality of variances was not significant,  $F(1, 53) = 1.029, p = 0.315$ . The results of the  $t$  test were not significant,  $t(53) = -0.148, p = 0.883$ . The mean scores for the two sections were not significantly different.

The fourth test, Test 4 PowerPoint, had 39 students in the face-to-face section. The mean and the standard deviation respectively were 88.38 and 13.996. There were 16 students in the online section. The mean and the standard deviation were 88.25 and 11.475. Levene's test for equality of variances was not significant,  $F(1, 53) = 0.033, p = 0.856$ . The results of the  $t$  test were not significant,  $t(53) = 0.034, p = 0.973$ . The mean scores for the two sections were not significantly different.

The fifth test, Test 5 Access, had 37 students taking the test in the face-to-face section. The mean and the standard deviation respectively were 84.19 and 10.375. There were 15 students in the online section. The mean and the standard deviation were 86.80 and 11.156. Levene's test for equality of variances was not significant,  $F(1, 50) = 0.002, p = 0.965$ . The results of the  $t$  test were non-significant,  $t(50) = -0.806, p = 0.424$ . The mean scores for the two sections were not significantly different.

The  $t$  test on the final grades, and its implication, are somewhat different from those conducted on the five tests. Previously, the researcher treated the case as missing

when a student missed a test. In other words, the study analyzed only valid scores. In the  $t$  test reported herein, all students are included. This is because there are no systematic ways to exclude certain students, if they all had valid percentage values. There were 44 students in the face-to-face section. The mean and the standard deviation respectively were 79.50 and 22.565. There were 22 students in the online section. The mean and the standard deviation were 69.87 and 31.191. Levene's test for equality of variances was significant,  $F(1, 64) = 4.539, p = 0.037$ . The results of the  $t$  test, with adjusted degrees of freedom for heterogeneity of variances, were not significant,  $t(32.347) = 1.289, p = 0.206$ . The mean percentages for the two sections were not significantly different.

For this study, the researcher combined the two face-to-face classes into one section. This allowed for a more comprehensive analysis. However, the attendance for both of the courses was sporadic. The classes started with 44 students in the face-to-face group and 22 students in the online group. As the term continued, students did not take the test, withdrew or stopped attending classes. Table 8 shows the number of students taking each test.

Table 8 Number of Students Taking Each Test

Test Name	# of Students	# of Students
	Face-to-Face	Online
Test 1 Email and the Internet	43	20
Test 2 Word	41	20
Test 3 Excel	38	17
Test 4 PowerPoint	39	16
Test 5 Access	37	15

The histograms, Appendix I, show the distributions of the final percentages for the three sections. Note that all students, including those who missed some exams and those who failed to pass the course are included. Based on this study alone, it was difficult to be certain about the factors affecting student achievement in online and face-to-face classes.

The second research question explored the impact of virtual learning on teaching practices through an interview with instructors of both formats. The researcher sent a 10-item interview attached to 39 emails to the distance education and adjunct faculty of PCC. Of the 39-distance education faculty, eight are support personnel. Five of the emails returned undeliverable. Of the remaining 26 potential interviewees, four participants completed the interview. The researcher sent a second email in addition to phone calls to the remaining 26 instructors. This study reflects the results from the four interview takers who completed the entire interview for a 15.38 percent return of the interview. The four instructors answered the series of questions that follows:

1. What prompted you to start teaching online?
2. Has distance learning changed your approach to teaching?
3. If distance learning has changed your approach to teaching, what has been the impact on your approach?
4. What do you see as the greatest benefit of online learning and getting one's college degree online?
5. What was the biggest challenge you faced in creating an online course for a distance learning curriculum?
6. What surprised you about teaching online?
7. What are your secrets of success for conducting an effective online course?

8. How do you see online teaching evolving?
9. What advice would you give to students pursuing their college degree online?
10. Comments:

The researcher looked at how all the statements made by the interviewees were interrelated. The researcher documented the interviewees' responses whether contradictory or consistent. Finally, all the components of data from the interviewees provided a synopsis of teaching and learning in the online environment. Virtual learning had the following impact on the instructors' teaching practices:

- Became more aware of the needs of the students
- Work much harder in the discussions and focus on reaching the different types of learning styles
- Present the information in many different forms – reading, seeing, doing
- Spent more time creating and communicating with students because of the 24/7 student access

The instructors also had the following advice for students seeking to take online classes.

- Do not procrastinate.
- Do not complete the course too quickly.
- Familiarize yourself with the online procedures by attending orientations.
- Be prepared to motivate yourself to keep up.
- Be careful not to take on too much.
- You must have self-discipline.

An online survey disseminated to students of a CIS 110 course allowed the researcher to gather helpful insights to students' preferences of learning environments as well as instructor interaction. Students participated on a voluntary basis and were informed that this study would be used to examine preference of instructor interaction in relation to online and on-campus courses and its potential influence on student achievement. Nine students completed the survey. Some of the findings were:

- a. Over half, 52%, often got things done ahead of time
- b. Fifty-two percent sometimes needed help to understand the text
- c. Eighty percent felt comfortable approaching the instructor for clarification and understanding of the subject
- d. The majority of these students were between the age of 18 and 45
- e. Eighty percent were female

Nine of the 25 participants gave open comments. Some of the comments centered on preferring face-to-face classes due to:

- the lack of instructor feedback online
- amount of work online
- needing instructor explanations
- lack of high-speed internet

Nine participants responded to the revised survey. The results from this survey were very similar to the pilot except the majority of these respondents' comments preferred online.

The following list included their responses:

- easier to get online during the week
- not having to be in a classroom with teenagers

- online fit schedule of a full-time job
- convenient 24/7 access to course materials

When asked for suggestions to make the course better, one respondent suggested incorporating discussion postings as part of the grade to encourage online students to do more than submit work.

#### Relationship of the Current Study to Prior Research

The statistical data gained from this study's research resembled similar studies by Nachmias & Shany (2002) and the American Federation of Teachers Report (2001). These studies confirmed that the vast majority of differences in student achievement relied on factors like the student's natural ability or aptitude, the socioeconomic status of the student, and the student's home environment. Unfortunately, these are all difficult areas to change by an educational institution's delivery formats. While the online course suited about 40% of the students, a certain type of student tended to succeed more than his face-to-face counterpart in three areas:

1. Sincere desire to learn independently with consistent self-motivation
2. Maintained self-discipline and avoided procrastination
3. Communicated effectively with the instructor and finished course requirements in a timely manner.

Prompted by The Federal No Child Left Behind Act, the U.S. department of education incorporated a goal in the federal education law ensuring that every 8th grader will be proficient in the use of technology by 2005. According to Trotter (2003), though the federal goal on technology literacy lacks the regulatory teeth that the No Child Left Behind law provides for some other goals, such as improving reading and math skills, it

underscores assertions by many school and corporate leaders that schools were not preparing students for a technology-rich society.

The new literacy intention is to go far beyond the basics of simply operating technology, to include such skills as evaluating the quality of Web pages and using online content appropriately for school research and assignments. In this particular realm, suggested research topics would be:

- How were schools and states doing in their efforts to help students meet the requirement?
- Should the law do more to hold schools accountable if they do not meet the expectations?
- Updated standards should continually reflect technology changes.

Fletcher (1997) reported that technology in education was a substantial enterprise and technology expenditures were near the \$5 billion level. The Clinton administration made technology in education one of its main priorities. Four pillars have been outlined that address professional development, Internet connections, content and hardware.

- Every teacher in the US trained to help students learn with computers and the Internet.
- Every teacher and student will be equipped with modern equipment.
- All classrooms connected to the Internet.
- Online learning resources and educational software will be a central part of every school's curriculum.

The changing demographics of college students support the need of a flexible postsecondary educational delivery system. The students in the study were older (66% of

the survey population) than 26 years of age. Online courses, and the colleges, universities, and businesses that offer them, are continuing to rise steadily (Shea & Boser, 2001). This is due, in part, to the opportunity online education presents for global competition, an important topic in times of shrinking budgets (Schwartzman & Tuttle, 2002). In addition to this, a new type of student and consumer wants learning on his or her own time and schedule. Finally, this increase coincides with the growth of research supporting the notion that technology can help teachers teach and students learn (Ferdig, 2001).

### Theoretical Implications of the Study

The primary premise for this study articulated in Chapter 2 was the *Theory of Action*. This theory stated that student learning and achievement will increase when powerful interactions occur between students and teachers around challenging content. This theory also purports that the critical path for improving student achievement is to improve the quality of teaching (Kurtenbach & Frazier, 2005). The objective of this study was to examine and compare student achievement in online and face-to-face learning environments at the post-secondary level. This study also considered the perspective of the instructors of the online and face-to-face courses concerning how information and communication technologies have influenced their teaching pedagogies and practices. In the wake of accountability measures, teachers feel powerless to make a difference for students deemed failures (Copeland, 2006).

The growth in the number of distance education courses has raised questions about the effectiveness of online instruction (Wardrope, 2001). Russell Baker (2004) addressed online quality based on the research of Ralph Tyler (1949) and Benjamin

Bloom's (1953, 1956) body of research for traditional curriculum development. Tyler's Basic Principles of Curriculum and Instruction (1949) used the application of objective-centered principles to curriculum as: 1) Objectives, 2) Experiences, 3) Organization, and 4) Evaluation. Tyler's (1949) Principles provided a rationale by which to examine troubles of online teaching and learning. Bloom's (1953, 1956) Taxonomy applied specific verb terminology related to learning objectives. These specific terms made it possible to characterize detailed behaviors and appraise successful attainment of learning objectives.

#### Implications for Practice

In the online environment at the post secondary level, educators control the consistency of the program, the quality of instruction, and the relationship with the students. The synergistic result provides some additional insights as to the requirements in future practice to meet the needs of all learners. The following listing includes participant suggestion to improve learning:

- Clearly define the rights of learners and the responsibilities of the educator. The impetus for learning begins with the learner. The learner then retains the control of and responsibility for decisions about what and how to learn. This means that teachers, classes, and other educational features in learning are secondary, as aids to the learning process.
- The educator should intervene in self-directed learning activities to clarify and instruct. This intervention is in association with various kinds of helpers, such as tutors, mentors, resource people, and peers. There is a lot of support among a group of self-directed learners whether online or in the traditional classroom.

- Create better resources for self-directed learners, such as high quality learning guides, improved self-study packets, and improved mechanisms for using currently available resources
- Provide professional development for adult educators and train others to facilitate the self-directed learner outside of institutional settings

An ongoing procession of new software and hardware tools as well as a flood of web-based resources presents a considerable challenge for educators to catch up and keep up simultaneously. When you add to this mixture, new learning on brain functioning, multiple intelligences, language processing, assessment, and other relevant topics, getting up-to-speed seems a daunting task (Johnson, 2000). The good news is that much of the new learning for educators can be highly synergistic; to practice using digital tools for information access, organization and processing, teachers can focus on epistemology, pedagogy or subject area content with equal ease. The wide proliferation of online tutorials as well as both free and for fee web-based professional development courses, including on-line degree programs, has allowed teachers to take charge of their own learning.

An instructor's effectiveness is a large factor influencing gains in achievement. The proof of whether the right direction was taken with distant learning will show forth when the students of today become tomorrow's fully functioning members of society (Woodard, Woody & Richardson, 2002).

#### Recommendation for Educators

The data from this study showed no significant difference between the mean scores of the online and face-to-face students. However, the participants of this study

relayed some powerful data within the surveys and interviews. These recommendations centered on the student, educator, organization, and technology.

The student. Online as well as face-to-face students need to experience a well-designed course, permitting them to navigate through it with little confusion and gain a clear sense of what is expected. Students need a mandatory orientation to both formats to receive the necessary information to assist them in knowing what to expect and to prevent them later having to withdraw or drop classes. A means of interacting with the instructor through wikis, discussion boards, real –time chat rooms, blogs, pod casting, and other means is necessary.

The educator. The constant and fast change of information and communication technology requires a continuous process of development of competencies online and face-to face teachers should have. To keep up with this technology, demands lifelong professional preparation and proper pedagogical training. Effective online and face-to-face programs require an initial serious planning of the proposed objectives of the course and careful studies of the profile, characteristics and needs of the student. Instructors need time to collaborate with other professionals. To encourage faculty members to offer online classes, colleges could offer stipends or release time. Training can come from many sources, including technology consortia, regional service centers, vendor training, and in-house training from veteran online faculty members or technology departments.

To take advantage of the use of synchronous and asynchronous communication in online courses, instructors need to reflect upon the objectives of the course. Then design and implement activities that integrate these tools to the course. Select technology only

after a critical analysis of the appropriateness to the objectives and the content of the course. Even then, consider the technology use with and by the students.

The organization. Technical support is a required component of any distance education program. The organization provides technology departments that play a role in the support of the infrastructure and maintenance of servers, computers, computer labs, testing centers, and other key components. In addition to its infrastructure, the organization also provides services, such as trainings, professional development, technical assistance, and evaluations.

The technology. The technology behind the course should work reliably, simply, and economically. Technical assistance should be available whenever needed by students or teachers (National Education Association, 2006).

#### Delimitations of the Study

The study's sample size relative to student enrollment was limited to the number of students taking CIS online and face-to-face classes. Random samplings are samples selected by a chance procedure so that every member of the population has an equal probability of being selected (Ary, Jacobs, Razavieh & Sorensen, 2006). This type of selection of respondents produces samples that are reasonably representative of the course enrollment. However, there was no random selection for the virtual or face-to-face course because any student enrolled in CIS could volunteer to participate. Some students dropped the class and/or did not take one of the five tests, which may serve to bias the sample in ways that are not readily evident.

There were some other limitations in this study. First, the sample sizes were small. The number of online subjects taking each test fluctuated between 15 and 20. The

entire 22 students enrolled were not available for all tests taken. The face-to-face subjects fluctuated from 43 to 37 and never reached the maximum enrollment of 44. Usually large sample sizes detect differences between sub-groups in a study's population. With small sample sizes, the confidence intervals associated with prevalence estimates tend to be quite large. In the case of many sub-groups within a study, the error terms may be so large there is little confidence in the findings. Most researchers agree that it is essential to survey large samples of respondents to establish reliable prevalence estimates, particularly for sub-groups in the population.

The statistics reported in the sample survey was a percentage of the sample that gave a particular response. The discrepancy between the known sample proportion and the unknown population value is sampling error. Researchers know that sampling error decreases as the size of the sample increases.

Second, because of the negative skew, homogeneity of variances was tested by Levene's test for equality of variances, with F value and corresponding significance. Levene's test is part of SPSS output for two independent sample t-tests. The t-test may be unreliable when the two samples are unequal in size and have unequal variances (Gardner, 1975).

Third, the study was not an experiment and, thus, the assignment of the participants to the three conditions was not random. The researcher could not randomly assign the subjects to the two delivery formats.

The study conducted over a four-month period, produced a snapshot of the enrollment during this particular fall term. It was possible that student enrollment and demographics differed depending on the term of the year. The make-up of the student

population may change over time. This change could be in response to changing social and economic conditions. Regional changes such as factory closings and unemployment can have an impact on student enrollment as well.

Information collected in the survey was of a self-report nature, which, depending on the subject queried, may be prone to some inaccuracy because of less than accurate recall, lack of information, or discomfort with self-disclosure.

#### Suggestions for Additional Research

Although there was a tremendous increase in the number of online classes offered by universities and other institutions, unfortunately, professional development for teaching online courses has not increased in kind. Thus, many educators are uncertain of the most appropriate ways to put content online (Ferdig et. al. 2003).

New problems and further research could center on these topics:

- Budgeting to teach online courses
- Bureaucracy governing instructional materials at the state and district levels and an inherently flexible online delivery system
- Professional development
- The infrastructure for massive delivery of content in a fair and equitable way for all students
- Virtual high schools and how they deal with standards, accountability and the NCLB law

#### CHAPTER 5: SUMMARY

This study fills various needs for examining the effective application of online distance education and its effect on student achievement. Educational administrators,

teachers, and the public want assurance that online distance teaching is a valid and proven instructional method. Furthermore, administrators and teachers need to know what to expect when planning, operating, and teaching in an online environment.

Through historical analysis and the presentation of a practicing Internet-based course, this study examined these needs.

The prevalence of online distance education courses requires university and high school faculty to face new challenges and make new decisions in the areas of course management and design, delivery method, student communication media, creation of an engaging learning environment, assessment, and use of new technologies. The increase in online learning demands all educational institutions to change the way information is distributed to students; therefore, administrators need to be aware of the changes that must occur in the area of faculty preparation. The faculty and departments need to be accountable for creating learning environments that were real, meaningful to all students and conducive to student achievement.

According to Levy (2003), many new situations face faculty members when teaching online as opposed to a traditional class. One of these situations is the administration, organization and management of online courses. One of the instructors completing the interview listed the time required to administer and manage online courses. He mentioned responding to students questions and concern online consumed a large amount of time until he designed a database to manage frequently asked questions.

The course layout, design, and delivery caused another instructor to make assignments more detail oriented. He had to make his document instructions exact and

specific. He viewed his online content anticipating potential questions from students and answered them in the narrative of the text published online.

The literature review also revealed that most studies place much emphasis on the medium used to deliver instruction. However, effective instructional practices are essential in any type of learning environment. For instance, maintaining constant communication with students while providing sufficient feedback creates a learning environment filled with dynamic interaction. This strategy is an effective instructional practice in both online and traditional learning environment (ADEC, 2003, Singh & Pan, 2004). If the exact same media used to deliver instruction in both the traditional classroom and the distance education settings serves different purposes. In the online setting, media connects the instructor with the students, while in the traditional classroom it supports or supplements instruction (Gaytan, 2006).

Most studies reviewed lacked internal validity such as control of inequalities. Pedagogical tools that foster active learning need further development to become more effective in any type of learning environment. Regarding the limitations and lack of control of this study, the best course of action was to assess the strengths and weaknesses of the research methodologies (Bernard, et al., 2004). Finally, faculty development to include issues related to effective student learning in the distance education setting was highly considered necessary.

This research project examined the delivery of curriculum content utilizing online tutorials and activities in the online environment as compared to the face-to-face delivery and their effects on student achievement and level of proficiency. This study further examined some of the relationship between students' time spent online and their

achievement in the course. Demographic and belief data collected using an online survey of a self-report nature. Achievement scores obtained using web-based criterion referenced tests, stored in Excel, and analyzed in SPSS showed no significant difference in the two delivery formats. Data were analyzed using descriptive summaries and tests for correlations and significant differences among groups.

The second research question explored the impact of virtual learning on teaching practices through an interview with instructors of both formats. Virtual learning had the following impact on the instructor's teaching practices:

- Became more aware of the needs of the students
- Work much harder in the discussions and focus on reaching the different types of learning styles.
- Present the information in many different forms – reading, seeing, doing
- Spent more time creating and communicating with students because of the 24/7 student access

The third research question centered around the students beliefs and preferred instructor interactions. The participants answered providing more in-depth knowledge of the beliefs for the need to be a part of a class setting and the need of some assistance from and instructor.

Virtual Learning: Is it conducive to student achievement? Numerous factors influence student achievement: a historical resistance to changes in education, secondary and postsecondary standards, methods, local, state and federal mandates, curriculum quality, teacher qualifications, even the demographics and characteristics of the student

themselves. These factors interact in a complex manner, affecting each other and in turn influencing student achievement.

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APPENDICES

## APPENDICES

## Appendix A: Interview Questions for Instructor

Interview Questions for Instructor of  
Online and Face-to-Face Courses

Directions: To assist in the completion of this study, please share your insights on distance learning and its impact on teaching practices, as well as some advice for current and prospective students.

1. What prompted you to start teaching online?
2. Has distance learning changed your approach to teaching?
3. If distance learning has changed your approach to teaching, what has been the impact on your approach?
4. What do you see as the greatest benefit of online learning and getting one's college degree online?
5. What was the biggest challenge you faced in creating an online course for a distance learning curriculum?
6. What surprised you about teaching online?
7. What are your secrets of success for conducting an effective online course?
8. How do you see online teaching evolving?
9. What advice would you give to students pursuing their college degree online?
10. Comments:

Interview questions were used from the Distance learning article Online Learning Teacher – Interview with Judy Kristan online at [www.jobmonkey.com/distancelearning/online\\_teacher\\_interview.html](http://www.jobmonkey.com/distancelearning/online_teacher_interview.html)

## Instructor KF's Response

Interview Questions for Instructor of  
Online and Face-to-Face Courses

**Directions:** To assist in the completion of this study, please share your insights on distance learning and its impact on teaching practices, as well as some advice for current and prospective students.

1. What prompted you to start teaching online? *Assigned*
2. Has distance learning changed your approach to teaching? *Somewhat, the manner is presenting information changes.*
3. If distance learning has changed your approach to teaching, what has been the impact? *Manner of presentation as well as keeping the information in a user-friendly format (sic).*
4. What do you see as the greatest benefit of online learning and getting one's college degree online? *Students who would not normally be able to attend school can now do so because of the distance learning format. Flexible studying.*
5. What was the biggest challenge you faced in creating an online course for a distance learning curriculum? *Ensuring that needed information is provided in a friendly format and keeping up with the e-mailing.*
6. What surprised you about teaching online? *It's really a good and legitimate alternative to face-to-face instruction.*
7. What are your secrets of success for conducting an effective online course? *Taylor the coursework so that it is conducive to meeting course standards, learning, as well as keeping it simplified to the point that students can grasp information and maneuver around the site and complete assignments effectively.*
8. How do you see online teaching evolving? *I believe we will see more and more courses offered and more students taking advantage of online learning—and probably more degree offerings online.*
9. What advice would you give to students pursuing their college degree online? *Get REAL familiar with online procedures, ahead of time. Attend orientations.*
10. Comments:

## Instructor PP's Response

### Interview Questions for Instructor of Online and Face-to-Face Courses

**Directions:** To assist in the completion of this study, please share your insights on distance learning and its impact on teaching practices, as well as some advice for current and prospective students.

1. What prompted you to start teaching online?

*I was looking forward to the challenge of a new and different way to deliver classes. I also believed that distance learning was not just a fad but a sound way to deliver quality course work for the foreseeable future. Thus, I wanted to be sure that my teaching skills were marketable in the event I was looking for a new teaching position.*

2. Has distance learning changed your approach to teaching?

*Yes*

3. If distance learning has changed your approach to teaching, what has been the impact?

*I believe it has made me more organized. I will now plan in more detail an entire course in advance of teaching it. Previously, I had an overall general view of the class and what I wanted to cover (sic). But my planning has gone into more detail and more precise scheduling of assignments and projects. I also spend more time with online communications to students especially through the use of e-mail. I am also now available to students on nights and/or weekends if I so choose.*

4. What do you see as the greatest benefit of online learning and getting one's college degree online?

*It allows more people to have access to college courses. I find that students who work varying hours may now complete college classes. With a traditional schedule, they might not have been able to attend a class that meets every Tuesday and Thursday for example. Students who hold jobs that require them to travel have better access to college courses via distance learning. And, in a sad commentary on the times we live in, some people will take online classes instead of venturing out to a college at night.*

5. What was the biggest challenge you faced in creating an online course for a distance learning curriculum?

*Setting a reasonable schedule of assignments and associated due dates.*

6. What surprised you about teaching online?

*How time consuming it is in relation to a traditional class, especially in responding to student questions and concerns. I often found myself typing the same e-mail to several students. So I created a database of common responses and will now copy and paste those replies, with some modifications, as needed.*

7. What are your secrets of success for conducting an effective online course?

- a. Being organized*
- b. Giving students prompt feedback*
- c. Staying in touch with the students through e-mail, discussion boards and chat sessions.*
- d. Clearly stating policies for assignments, submission of work, deadlines etc.*
- e. Making sure that the class Web site is easily to navigate and that students can easily find whatever they need.*

8. How do you see online teaching evolving?

*I see more use of multimedia such as streaming audio and video.*

9. What advice would you give to students pursuing their college degree online?

*You must be disciplined to stay on task. You cannot get behind and try and catch up. I also advise them to not try (sic) to complete a course too quickly as well. They can easily turn the class into a cram session and fail to retain new knowledge.*

10. Comments:

## Instructor's JB's Response

### Interview Questions for Instructor of Online and Face-to-Face Courses

**Directions:** To assist in the completion of this study, please share your insights on distance learning and its impact on teaching practices, as well as some advice for current and prospective students.

1. What prompted you to start teaching online? *Desire to expand my knowledge, as well as, just simply having the knowledge to know that learning was taking a new direction- technology.*
2. Has distance learning changed your approach to teaching? *Yes, it has made me rely on the cyberworld (sic) more than I was taught to do so. It has made me more of a global educator.*
3. If distance learning has changed your approach to teaching, what has been the impact? *It has caused me to reeducate myself with regards to technology and the available avenues technology such as video streaming, podcasting (sic), emails, attachments, virtual discussion forums, etc.*
4. What do you see as the greatest benefit of online learning and getting one's college degree online? *Greatest benefit is diversity of learning. Students and instructors are not limited to the four walls of a classroom.*
5. What was the biggest challenge you faced in creating an online course for a distance learning curriculum? *Software changes*
6. What surprised you about teaching online? *That I wouldn't miss the physical student contact.*
7. What are your secrets of success for conducting an effective online course? *Do not procrastinate and still understand that even though you can't (sic) see them they are still there. Computer access is 24/7.*
8. How do you see online teaching evolving? *I am not sure. I know more and more opportunities will be available.*
9. What advice would you give to students pursuing their college degree online? *Be careful not to take on too much. Online learning for some have provided the misconception that since the course is available to you 24/7 that you can take on more than you would if you were in a seated course. Personally, I think online studies require more student participation and discipline.*
10. Comments:

## Instructor RP's Response

Interview Questions for Instructor of  
Online and Face-to-Face Courses

**Directions:** To assist in the completion of this study, please share your insights on distance learning and its impact on teaching practices, as well as some advice for current and prospective students.

1. What prompted you to start teaching online?  
*The first course I did online was in 1999 and I volunteered to do it. I think it was the excitement of doing something new and different.*
2. Has distance learning changed your approach to teaching?  
*You have to be much more detail oriented. The course documents you put online have to be exact and specific. I try to anticipate potential questions from students and answer them within the narrative of the text I publish online.*
3. If distance learning has changed your approach to teaching, what has been the impact?  
*I'm probably more detail oriented in all my classes now – not just online, but the traditional face-to-face as well.*
4. What do you see as the greatest benefit of online learning and getting one's college degree online?  
*Convenience!*
5. What was the biggest challenge you faced in creating an online course for a distance learning curriculum? *Same answer as number 2.*
6. What surprised you about teaching online?
7. What are your secrets of success for conducting an effective online course?  
*Communication, communication, communication. Reply to students' emails as soon as possible.*
8. How do you see online teaching evolving?  
*More use of video (that reduces the need for detail in the written course documents) and social networking.*
9. What advice would you give to students pursuing their college degree online?  
*You have to be self motivated. You have to keep up and not get behind. Online courses can be harder and take more time than the traditional format.*
10. Comments:

## Appendix B: Virtual Learning Environments

Virtual Learning Environments		
Product	Organization	URL
ARIADNE	EPF Lausanne (EC DG XIII)	<a href="http://ariadne.unil.ch/tools/">http://ariadne.unil.ch/tools/</a>
Asymetrix Librarian	Asymetrix	<a href="http://www.asymetrix.com/">http://www.asymetrix.com/</a>
CoMentor	Huddersfield University	<a href="http://comentor.hud.ac.uk">http://comentor.hud.ac.uk</a>
CoSE	Staffordshire University	<a href="http://www.staffs.ac.uk/cose">http://www.staffs.ac.uk/cose</a>
CourseInfo	Blackboard, Inc.	<a href="http://www.softarc.com/">http://www.softarc.com/</a>
FirstClass Classrooms	SoftArc	<a href="http://www.softarc.com/">http://www.softarc.com/</a>
Learning Landscapes	TOOMOL Project, UW - Bangor	<a href="http://toomol.bangor.ac.uk">http://toomol.bangor.ac.uk</a>
Learning space	Lotus Education of Lotus Institute	<a href="http://www.lotus.com/">http://www.lotus.com/</a>
TopClass	WBT Systems	<a href="http://www.wbt systems.com/">http://www.wbt systems.com/</a>
Virtual -U	Virtual Learning Environments Inc.	<a href="http://www.vlei.com/">http://www.vlei.com/</a>
Web Course in a Box	MadDuck Technologies	<a href="http://www.madduck.com/">http://www.madduck.com/</a>
WebCT	WebCT, Univ. British Columbia	<a href="http://www.webct.com/">http://www.webct.com/</a>

Virtual Learning Environments (Britain & Liber, 2000, p. 6)

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## Appendix C: NC Providers of Online High School Courses

<sup>1</sup> NC Providers of Online High School Courses		
2007-2008 School Year		
NCVPS	Learn and Earn Community Colleges	Learn and Earn UNCG iSchool
The purpose of the North Carolina Virtual Public School (NCVPS) is to provide courses that students were unable to take at their local schools.	North Carolina high school students can earn college credits through a special Learn & Earn Online initiative. Qualified students in participating high schools can take a variety of online college-credit courses at no cost to them or to their families. Students can earn both high school and college credit for completed courses. Access to these courses was provided during the regular school day and an online course facilitator assist students in the classroom	The Division of Continual Learning (DCL) offers a program to help any junior or senior in high school get ready for the UNCG iSchool. The UNCG iSchool is a way for high school juniors and seniors advance toward graduation and college by taking college classes while still in high school.

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## Appendix D: SREB State Virtual Schools Online Courses Offered

SREB State Virtual Online Courses Offered			
Developed Courses	Contract Courses	Purchased Courses	Total
ACCESS—Alabama Connecting Classrooms, Educators and Standards Statewide			
0	0	7	7
Arkansas Virtual High School			
3-4	0	0	3-4
Delaware Virtual School			
0	18	0	18
Florida Virtual School			
98	0	0	98
Georgia Virtual School			
67	0	75	142
Kentucky Virtual School			
31	29	0	60
Louisiana Virtual School			
3-4	0	0	3-4
Maryland Virtual Learning Opportunities Program MVLO			
5	31	0	36
MOLLI—Mississippi Online Learning Institute			
2	26	0	28

SREB State Virtual Online Courses Offered			
Developed Courses	Contract Courses	Purchased Courses	Total
<sup>2</sup> North Carolina Department of Public Instruction—Distance learning			
33	276	0	309
TN—No Virtual School-e4TN High School Pilot with LEA Partners underway			
0	23	0	23
Virginia Virtual Advanced Placement School			
15	6	0	21
West Virginia Virtual School			
4	198	0	202

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<sup>2</sup> North Carolina Virtual Public School –The North Carolina Legislature has established the NCVPS. Courses were offered 2007-08.

## Appendix E: Validation of PCC's Student Survey Instrument



**Validation of Survey Instrument via Telephone  
With Mike Dossett at Piedmont Community College  
Interim Vice President, Instruction and Student Development  
May 8, 2009**

The developers of the student survey instrument consisted of the deans, division chairs, and Vice President for Instruction and Student Development. The developers of the instrument met with the Southern Association of Colleges and Schools (SACS), the accrediting body of community colleges. After approval from SACS, the developers met with Noel-Levitz, a company that specializes in assisting colleges in managing student data and enrollment. They analyzed, recommended changes, and approved the instrument. Dossett (2009) relayed that if the process is followed, it is 100% valid. The instrument is administered to the students by other faculty members. Sometimes the dean of the division is the administrator. The instrument is a Likert scale where the students specify their level of agreement with a statement. Students bubble choice of agreement on a scantron sheet. The scantron sheets are then collected and delivered to Academic Computing for analysis and computations of results. For the validity of the instrument Dossett (2009) suggest guarding against faculty members giving their own instructor/course evaluation. Another limitation to the validity of the instrument is making sure every student answers every question.

  
Mike Dossett, Interim Vice President  
Instruction and Student Development

## Appendix F: Student Satisfaction Survey

<b>. Teacher Performance</b>						
	<b>poor</b>	<b>fair</b>	<b>good</b>	<b>excellent</b>	<b>Rating Average</b>	<b>Response Count</b>
Apparent knowledge of the subject matter.	0.0% (0)	25.0% (2)	<b>37.5% (3)</b>	<b>37.5% (3)</b>	3.13	8
Success in communicating or explaining subject matter.	<b>33.3% (3)</b>	11.1% (1)	<b>33.3% (3)</b>	22.2% (2)	2.44	9
Degree to which subject matter was made stimulating or relevant.	0.0% (0)	14.3% (1)	<b>42.9% (3)</b>	<b>42.9% (3)</b>	3.29	7
Fairness in assigning grades.	0.0% (0)	28.6% (2)	<b>42.9% (3)</b>	28.6% (2)	3.00	7
Concern and respect for individuals as students.	14.3% (1)	14.3% (1)	28.6% (2)	<b>42.9% (3)</b>	3.00	7
Administration of class and organization of materials.	28.6% (2)	14.3% (1)	14.3% (1)	<b>42.9% (3)</b>	2.71	7
Overall rating of this instructor.	28.6% (2)	14.3% (1)	14.3% (1)	<b>42.9% (3)</b>	2.71	7
Encouragement and management of class interaction.	28.6% (2)	0.0% (0)	<b>42.9% (3)</b>	28.6% (2)	2.71	7
Responsiveness to inquiries outside of class.	14.3% (1)	<b>42.9% (3)</b>	0.0% (0)	<b>42.9% (3)</b>	2.71	7
	<i>answered question</i>					<b>9</b>
	<i>skipped question</i>					<b>0</b>

<b>3. I would recommend</b>						
	<b>strongly disagree</b>	<b>disagree</b>	<b>agree</b>	<b>strongly agree</b>	<b>Rating Average</b>	<b>Response Count</b>
This online class to others.	14.3% (1)	0.0% (0)	<b>57.1% (4)</b>	28.6% (2)	3.00	7

This instructor to others taking an online course.	14.3% (1)	14.3% (1)	<b>42.9% (3)</b>	28.6% (2)	2.86	7
That others take a totally online course.	0.0% (0)	14.3% (1)	<b>42.9% (3)</b>	<b>42.9% (3)</b>	3.29	7
	<b>answered question</b>					<b>7</b>
	<b>skipped question</b>					<b>2</b>
<b>4. For me, this course was (select one)</b>						
					<b>Response Percent</b>	<b>Response Count</b>
<b>A required course in my major field</b>					<b>55.6%</b>	<b>5</b>
An elective to fulfill a requirement					22.2%	2
A free elective outside my major field					0.0%	0
A required course outside my major field					11.1%	1
A free elective in my major field					11.1%	1
Not applicable					0.0%	0
	<b>answered question</b>					<b>9</b>
	<b>skipped question</b>					<b>0</b>

<b>5. For this online course I felt that (check all that apply)</b>			
		<b>Response Percent</b>	<b>Response Count</b>
<b>I registered with no trouble</b>		<b>88.9%</b>	<b>8</b>
Fee payment was processed efficiently		33.3%	3
There was easy bookstore access		44.4%	4
Access to services was limited or difficult		0.0%	0
I could take this course because it was online		22.2%	2
not applicable		11.1%	1
		<b>answered question</b>	<b>9</b>
		<b>skipped question</b>	<b>0</b>
<b>6. How would you characterize communication with the instructor and others for this course (check all that apply)</b>			
		<b>Response Percent</b>	<b>Response Count</b>
<b>Course procedures were clearly posted</b>		<b>66.7%</b>	<b>6</b>
<b>Necessary information was received on time</b>		<b>66.7%</b>	<b>6</b>
<b>Clear instructions for using all materials</b>		<b>66.7%</b>	<b>6</b>
Grades returned in a timely manner		55.6%	5
Discussion groups well organized		33.3%	3
I felt isolated from others		11.1%	1
Technology prevented access to others		0.0%	0
not applicable		22.2%	2
		<b>answered question</b>	<b>9</b>
		<b>skipped question</b>	<b>0</b>

<b>7. I found this course intellectually challenging.</b>			
		<b>Response Percent</b>	<b>Response Count</b>
strongly agree		11.1%	1
<b>agree</b>		<b>77.8%</b>	<b>7</b>
disagree		11.1%	1
strongly disagree		0.0%	0
not applicable		0.0%	0
		<b><i>answered question</i></b>	
		<b>9</b>	
		<b><i>skipped question</i></b>	
		<b>0</b>	
<b>8. Rate the difficulty of this online course as compared to a traditional course.</b>			
		<b>Response Percent</b>	<b>Response Count</b>
Online courses are easier		22.2%	2
Online courses are more difficult		22.2%	2
<b>Online courses are about the same difficulty as traditional courses</b>		<b>55.6%</b>	<b>5</b>
		<b><i>answered question</i></b>	
		<b>9</b>	
		<b><i>skipped question</i></b>	
		<b>0</b>	

<b>9. How many hours per week did you spend preparing materials for this online course, including doing readings, reviewing notes, writing papers and any other course-related work?</b>			
		<b>Response Percent</b>	<b>Response Count</b>
Under 2 hours		0.0%	0
<b>2-3 hours</b>		<b>44.4%</b>	<b>4</b>
3-4 hours		11.1%	1
<b>4-5 hours</b>		<b>44.4%</b>	<b>4</b>
5-6 hours		0.0%	0
Over 6 hours		0.0%	0
		<b><i>answered question</i></b>	<b>9</b>
		<b><i>skipped question</i></b>	<b>0</b>
<b>10. Before starting my online course, I was well advised about the self-motivation and commitment needed to fulfill my course requirements.</b>			
		<b>Response Percent</b>	<b>Response Count</b>
<b>strongly agree</b>		<b>44.4%</b>	<b>4</b>
<b>agree</b>		<b>44.4%</b>	<b>4</b>
disagree		0.0%	0
strongly disagree		0.0%	0
not applicable		11.1%	1
		<b><i>answered question</i></b>	<b>9</b>
		<b><i>skipped question</i></b>	<b>0</b>

<b>11. I had sufficient access to the online library resources I needed to fulfill my course objectives and complete all assignments.</b>			
		<b>Response Percent</b>	<b>Response Count</b>
<b>always</b>		<b>77.8%</b>	<b>7</b>
usually		22.2%	2
seldom		0.0%	0
never		0.0%	0
not applicable		0.0%	0
<b><i>answered question</i></b>			<b>9</b>
<b><i>skipped question</i></b>			<b>0</b>
<b>12. If needed, was the distance learning staff members helpful?</b>			
		<b>Response Percent</b>	<b>Response Count</b>
very satisfied		33.3%	3
<b>satisfied</b>		<b>44.4%</b>	<b>4</b>
dissatisfied		0.0%	0
very dissatisfied		0.0%	0
not applicable		22.2%	2
<b><i>answered question</i></b>			<b>9</b>
<b><i>skipped question</i></b>			<b>0</b>

<b>13. Did you experience technical problems with Blackboard?</b>			
		<b>Response Percent</b>	<b>Response Count</b>
<b>never</b>		<b>66.7%</b>	<b>6</b>
seldom		22.2%	2
occasionally		11.1%	1
most of the time		0.0%	0
all of the time		0.0%	0
not applicable		0.0%	0
<b>answered question</b>			<b>9</b>
<b>skipped question</b>			<b>0</b>
<b>14. The major reason(s) for taking this course online rather than in a traditional classroom setting was (check all that apply)</b>			
		<b>Response Percent</b>	<b>Response Count</b>
<b>It fit my schedule--flexibility of hours</b>		<b>100.0%</b>	<b>9</b>
It fit with my employment schedule		55.6%	5
I had health-related reasons		22.2%	2
The college was too far from my home		11.1%	1
The college was too far away from my work		11.1%	1
I had too many family responsibilities (e.g. child, parent care)		33.3%	3
I had too many job-related responsibilities		44.4%	4
Commuting to the college was a problem		0.0%	0
The course was only offered online		22.2%	2
All of the traditional courses were full, so I decided to take this course online		0.0%	0
Other (please specify)		0.0%	0
<b>answered question</b>			<b>9</b>
<b>skipped question</b>			<b>0</b>

<b>15. How far from the Person or Caswell campus did you live when taking this course? (select one)</b>			
		<b>Response Percent</b>	<b>Response Count</b>
<b>zero to five miles</b>		<b>33.3%</b>	<b>3</b>
six to ten miles		22.2%	2
eleven to twenty miles		22.2%	2
twenty-one to fifty miles		11.1%	1
fifty-one to one hundred miles		11.1%	1
more than one hundred miles		0.0%	0
		<b><i>answered question</i></b>	<b>9</b>
		<b><i>skipped question</i></b>	<b>0</b>
<b>16. Where did you take this online course?</b>			
		<b>Response Percent</b>	<b>Response Count</b>
<b>At home</b>		<b>88.9%</b>	<b>8</b>
Where I worked		0.0%	0
Facilities on campus		11.1%	1
Public library		0.0%	0
Other (please specify)		0.0%	0
		<b><i>answered question</i></b>	<b>9</b>
		<b><i>skipped question</i></b>	<b>0</b>

17. Do you think you will take another online course in the future?			
		Response Percent	Response Count
Yes		88.9%	8
No		11.1%	1
Not sure		0.0%	0
<i>answered question</i>			<b>9</b>
<i>skipped question</i>			<b>0</b>
18. What would you like the college to implement to make online courses a better learning experience for students? (Please type your answer below)			
			Response Count
 <a href="#">view</a>			3
<i>answered question</i>			<b>3</b>
<i>skipped question</i>			<b>6</b>

## Appendix G: Research Sample: Male &amp; Female Students

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Gender	Online Section	Face-To-Face Section
Male	7	13
Female	15	31
Total Number	22	44

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## Appendix H: Student Survey Demographic Data

Variable		Number	Percentage
Gender:	Male	5	20.0
	Female	20	80.0
Age	18-25	11	44.0
	26-35	4	16.0
	36-45	4	16.0
	46-55	3	12.0
	56+	3	12.0
Need for Course	High-Need immediately for a specific goal	12	48.0
	Moderate-Could take latter or another course	10	40.0
	Low-Could be postponed	3	12.0
Time Constraints	More than enough for an on campus course	8	32.0
	The same as for a class held on campus	7	28.0
	Less than for a class held on campus	10	40.0
Ease of Campus Attendance	Extremely difficult-Commitments (family, work)	5	20.0
	A little difficult-Can arrange my priorities	10	40.0
	Easy for me	10	40.0

Appendix I: Test 1-5 and Final Grade Histograms

Figure 1: Test 1 Email & Internet Histogram

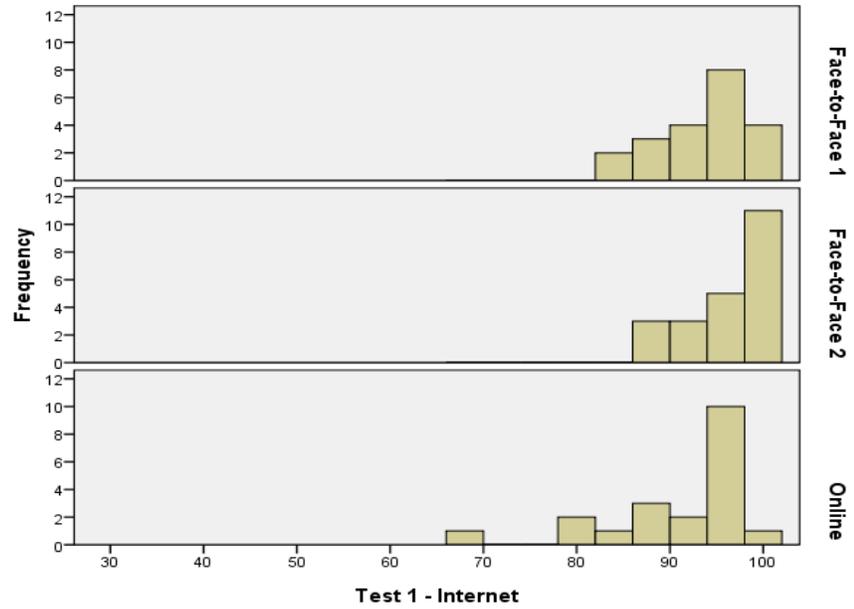


Figure 2: Test 2 Word Histogram

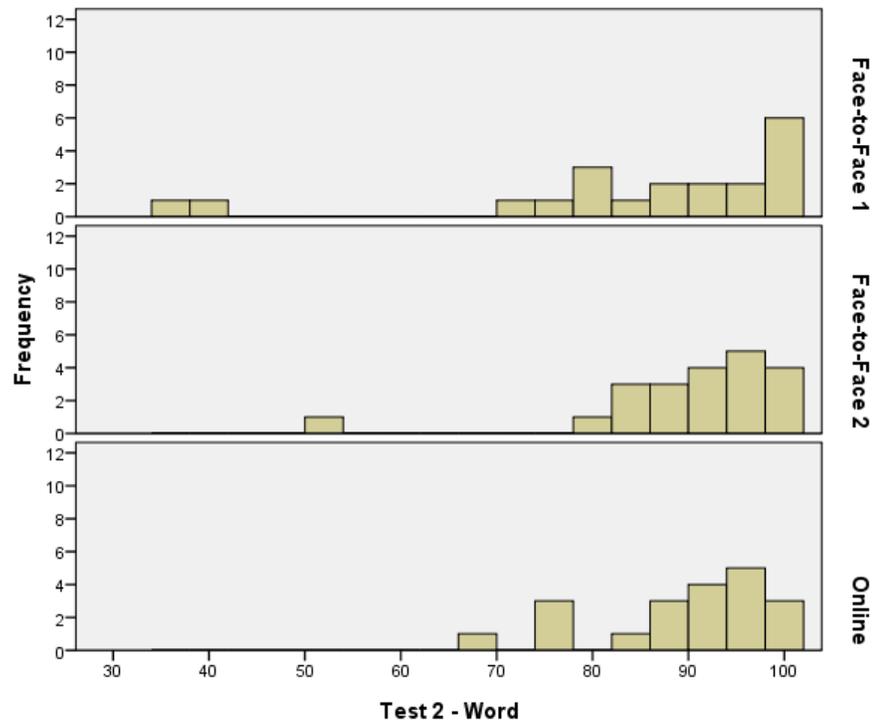


Figure 3: Test 3 Excel Histogram

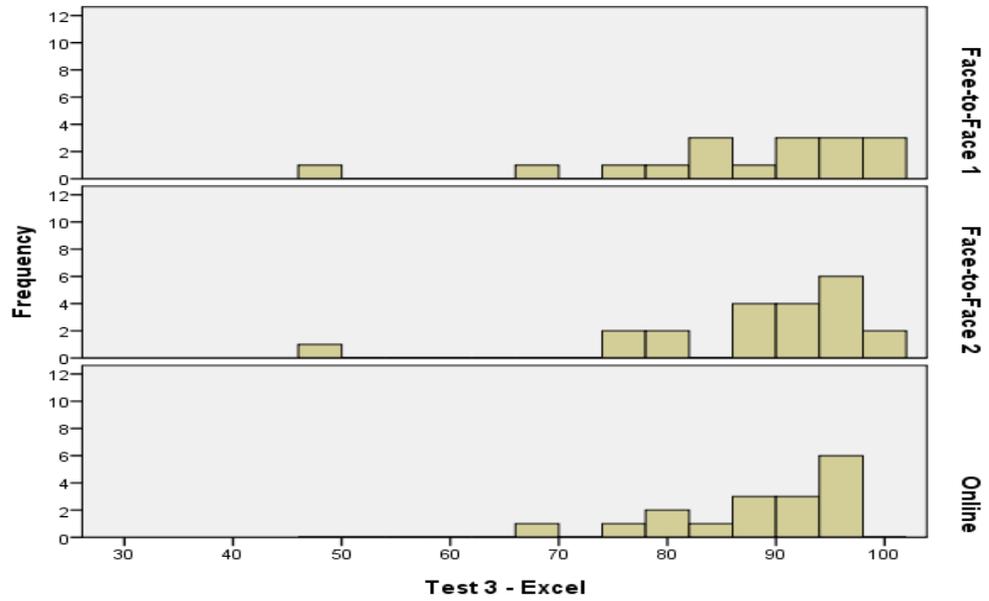


Figure 4: Test 4 PowerPoint Histogram

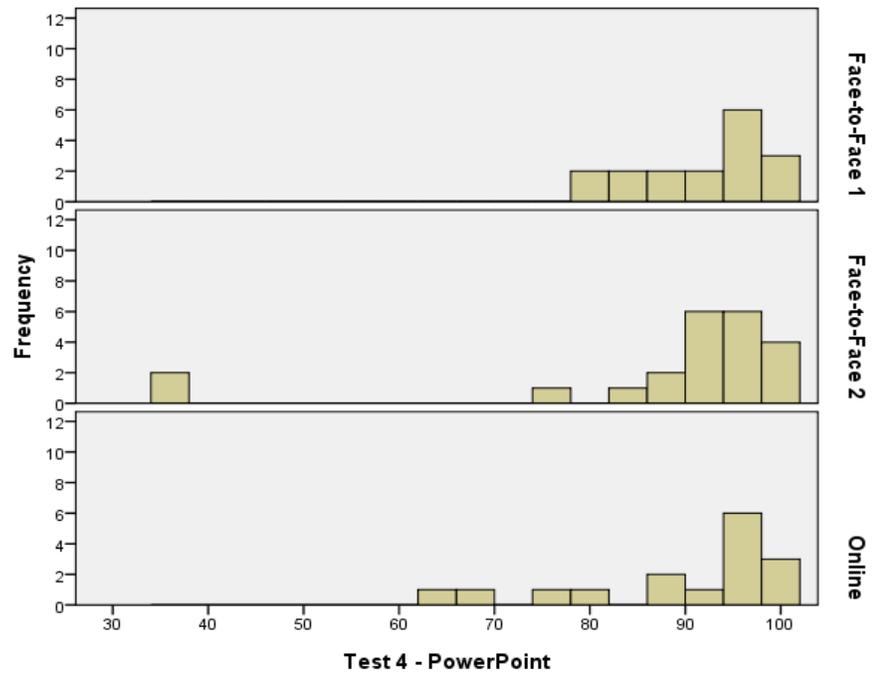


Figure 5: Test 5 Access Histogram

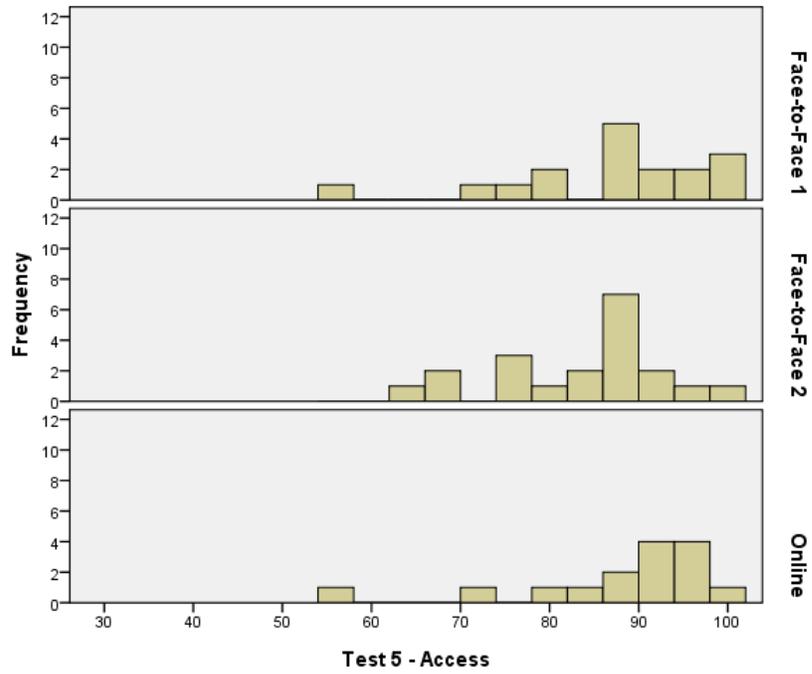
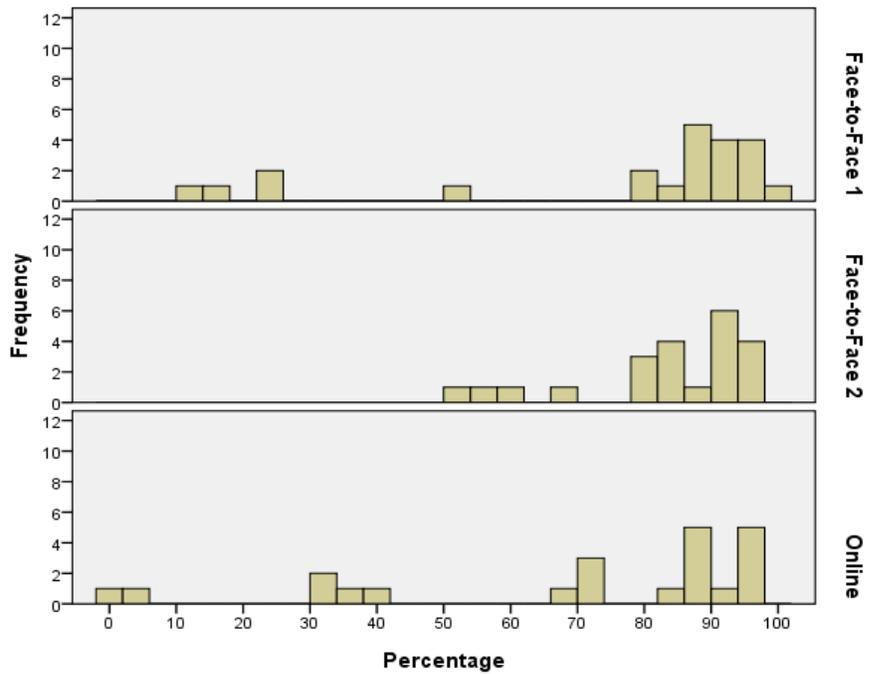


Figure 6: Final Grades for the Courses Histogram



## Appendix J: Test 1-5 Levene's Test for Equality of Variances

## Email and Internet

## Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Test 1 - Internet	Equal variances assumed	6.268	.015	1.783	61	.080	2.814	1.578	-.342	5.970
	Equal variances not assumed			1.483	25.254	.150	2.814	1.898	-1.092	6.720

## Word

## Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Test 2 - Word	Equal variances assumed	1.160	.286	-.401	59	.690	-1.471	3.670	-8.815	5.873
	Equal variances not assumed			-.472	56.043	.639	-1.471	3.118	-7.717	4.775

## Excel

## Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Test 3 - Excel	Equal variances assumed	1.029	.315	-.148	53	.883	-.491	3.306	-7.121	6.140
	Equal variances not assumed			-.172	44.385	.864	-.491	2.856	-6.244	5.263

## PowerPoint

## Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Test 4 - PowerPoint	Equal variances assumed	.033	.856	.034	53	.973	.135	3.958	-7.803	8.073
	Equal variances not assumed			.037	33.911	.971	.135	3.640	-7.264	7.533

## Access

## Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Test 5 - Access	Equal variances assumed	.002	.965	-.806	50	.424	-2.611	3.241	-9.120	3.898
	Equal variances not assumed			-.780	24.337	.443	-2.611	3.346	-9.512	4.290

## Appendix K: Bloom's Original, Revised, and Digital Taxonomy

## Level 6 Key Terms: Evaluating and Creating

Higher Order Thinking Skills (HOTS)					
Blooms Taxonomy		Blooms Revised Taxonomy		Blooms Digital Taxonomy	
Key Terms	Verbs	Key Terms	Verbs	Verbs	Communication Spectrum
Evaluating	Argue	Creating	Designing	Programming	Collaborating
	Assess		Constructing	Filming	Moderating
	Choose		Planning	Animating	Negotiating
	Value		Producing	Blogging	Debating
	Evaluate		Inventing	Video blogging	
			Devising	Mixing	
			Making	re-mixing	
				wiki-ing	
				publishing	
				video casting	
		podcasting			
		directing,			
		broadcasting			

## Level 5 Key Terms: Synthesis and Evaluating

Blooms Taxonomy		Blooms Revised Taxonomy		Blooms Digital Taxonomy	
Key Terms	Verbs	Key Terms	Verbs	Verbs	Communication Spectrum
Synthesis	Assemble	Evaluating	Checking	Blog	Commenting
	Collect		Hypothesizing	Commenting	Net meeting
	Manage		Critiquing	Reviewing	
	Organize		Experimenting	Posting	
	Propose		Judging	Moderating	
			Testing	Collaborating	
			Detecting	Networking	
			Monitoring	Refactoring	
			Testing		

## Level 4 Key Terms: Analysis and Analyzing

Blooms Taxonomy		Blooms Revised Taxonomy		Blooms Digital Taxonomy	
Key Terms	Verbs	Key Terms	Verbs	Verbs	Communication Spectrum
Analysis	Analyze	Analyzing	Comparing	Mashing	Skyping
	Categorize		Organizing	Liking	Video
	Criticize		Deconstructing	Validating	Conferencing
	Distinguish		Attributing	Reverse	Reviewing
	Test		Outlining	Engineering	
			Finding	Cracking	
			Structuring	Media clipping	
			Integrating		

## Level 3 Key Terms: Application and Applying

Blooms Taxonomy		Blooms Revised Taxonomy		Blooms Digital Taxonomy	
Key Terms	Verbs	Key Terms	Verbs	Verbs	Communication Spectrum
Application	Apply Choose Illustrate Solve Write	Applying	Implementing Carrying out Using Executing	Running Loading Playing Operating Hacking Uploading Sharing Editing	Questioning Replying Posting Blogging Networking

## Level 2 Key Terms: Comprehension and Understanding

Blooms Taxonomy		Blooms Revised Taxonomy		Blooms Digital Taxonomy	
Key Terms	Verbs	Key Terms	Verbs	Verbs	Communication Spectrum
Comprehension	Classify	Understanding	Interpreting	Advanced searches	Contributing
	Describe		Summarizing	Boolean searches	Chatting
	Identify		Inferring	Blog journaling	E-mailing
	Report		Paraphrasing	Twittering	Twittering
	Restate		Classifying	Categorizing	
			Comparing	Tagging	
			Explaining	Commenting	
	Exemplifying	Annotating			
			Subscribing		

## Level 1 Key Terms: Knowledge and Remembering

Blooms Taxonomy		Blooms Revised Taxonomy		Blooms Digital Taxonomy	
Key Terms	Verbs	Key Terms	Verbs	Verbs	Communication Spectrum
Knowledge	Arrange	Remembering	Recognizing	Bullet	Blog
	Define		Listing	Pointing	Instant
	duplicate		Describing	Highlighting	Messaging
	memorize		Identifying	Book marking	Texting
	recognize		Retrieving	Social	
			Naming		
			Locating		
			Finding		
Lower Order Thinking Skills (LOTS)					