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Teachers' Perceptions on the Impact of Blogs and Wikis Regarding the Acquisition of 21st Century Skills in the Classrooms for the Future Classroom: A Study of Two Pennsylvania High Schools

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Title: Teachers' Perceptions on the Impact of Blogs and Wikis Regarding the Acquisition of 21st Century Skills in the Classrooms for the Future Classroom: A Study of Two Pennsylvania High Schools

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For the past few decades, the world has experienced a technological explosion that has revolutionized many areas of life and has left educators with the responsibility of incorporating technology into their classroom pedagogy. Experts in the field of technology and education have compiled a list of skills that they believe are essential for all students to achieve as part of the K-12 curriculum. These skills, referred to as basic economic, technological, and scientific literacy; global awareness, self-direction, creativity, effective communication, and interpersonal skills. The Pennsylvania Department of Education embraced the need for all students to acquire these skills with the Classrooms for the Future (CFF) program in 2006. This study examined teachers' perceptions about the impact of the CFF program relative to the acquisition of the 21st Century Skills associated with the use of blogs and wikis by students and teachers who have been involved with the program since its inception in 2006. Results from this study indicate teachers believe students who used either a blog or a wiki increased their 21st Century Skills. Collaboration, communication, basic literacy, digital literacy, and global awareness skills all increased after using a blog or a wiki. In addition, results indicated a change in teacher practice from a teacher led classroom to a student centered classroom environment. And finally, teachers perceived that as students acquired 21st Century Skills and teachers changed their classroom practice, students became empowered to take control of their learning.

DEDICATION

I dedicate this work and give special thanks to my dear sister Shawne and to my exceptional daughter Jessica for being there for me throughout the entire doctorate program. Both of you have been my best cheerleaders. Your encouragement and frequent reminders to take time for myself provided the support I needed to persevere. This work is also dedicated to my loving husband David for his patience and understanding during this lengthy process.

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CHAPTER ONE: INTRODUCTION

Our students live in a global, digital world where information is changing at a rapid pace. Students use laptops, instant messaging, video games, and cell phones as part of their daily interaction with friends, family, and educators. Given the rapid rate of change, the vast amount of information to be acquired and managed, and the influence on life in general, students need to acquire a set of skills, outcomes, and supports to succeed in work and life in the 21st century (National Commission on Excellence in Education and Metiri Group, 2003). These skills are referred to as 21st Century Skills and include speaking, listening, reading, writing, information processing, problem solving, communication, technical, self direction, creativity, interpersonal, and team building (National Commission on Excellence in Education and Metiri Group, 2003).

This same concern was documented in *The World is Flat* by Thomas Friedman (2005). Friedman's work addresses the issue of Globalization 3.0 and contends that the skills of our workforce must continually be upgraded to actively and effectively participate in the current global economy. Globalization 3.0 refers to the world we live in today in which technological and political forces have converged. The result is a global web-enabled playing field that allows for multiple forms of communication and collaboration without regard to geography and distance. Students live in and have grown up in a Global 3.0 world. Students currently in high school have always used technology and are often referred to as digital natives. Marc Prensky (2005) defines digital natives as students who have grown up, or are growing up, in the digital age. Digital natives assimilate digital tools and methods for communication easily and effortlessly. They are accustomed to using technology and learn differently than the way their teachers did. According to Diana and James Oblinger (2005), digital natives learn differently than previous generations and therefore feel disconnected from schools that were designed for a

different type of learner. Prensky (2001b) agrees that digital natives do think differently. Current research in neurobiology provides information to support Prensky's thinking. It was previously thought that the brain was not physically altered based on stimulation it received from external stimuli. That theory has been shown to be incorrect. Research conducted by C. Reid Lyon during the 1990s, in which he studied brain patterns and changes, resulted in the current theory that the brain constantly reorganizes itself throughout life, both as a child and as an adult. External stimuli do indeed impact and cause changes in the brain. Digital natives are accustomed to responding to external stimuli from various modes of communication and interactions. The term rewired is used to describe the reorganization of the brain that takes place from exposure to external stimuli and is appropriate to describe how digital natives think (Prensky, 2001b).

In contrast to the needs of digital natives, many aspects of the public school system have not changed much in the last 50 years. The majority of public schools function using a calendar and teaching methods developed in the 1950s and 1960s (Thornburg, 2001). The 21st century high school requires new models of teaching, learning, and meaningful assessment. Technology is one of the most exciting and significant ways to support and facilitate high school reform. Some teachers have embraced technology for both personal use and as an instructional tool. These teachers are better prepared to work with digital natives since they have acquired the skill set to engage 21st century learners.

The Classrooms for the Future Program

The Pennsylvania Department of Education (PDE) sought to address these needs after studying current research, and consequently created the Classrooms of the Future program (CFF). The authors of Pennsylvania's CFF initiative focused on the acquisition of these

21st Century Skills for students, and the inclusion of these skills for teaching and learning as they developed the CFF initiative in 2006. The CFF initiative recognized and embraced the need for high school reform, enabling teachers to use technology as an effective tool for educating students, and preparing students to enter and successfully compete in the ever-expanding high-tech global marketplace. The CFF program required that teachers both embrace the use of technology and use it as an instructional tool (Pennsylvania Department of Education, 2008).

Digital Learners and Classroom Practice

Many high school teachers fall into the category known as digital immigrants in contrast to the students, who are digital natives. Marc Prensky (2001a) defines a digital immigrant as someone who has not grown up with technology, but has learned to use it as an adult. In some instances teachers become digital immigrants reluctantly, while others willingly embrace technology and its use in the classroom. One of the key principles of the CFF program was to provide teachers the necessary technology-related professional development to facilitate a change in teaching practices, which in turn should impact student learning. Professional development focused on 21st century teaching and learning is meant to equip teachers with the skills needed to bridge the gap between digital immigrant and digital native (Pennsylvania Department of Education, 2008).

As teachers work through the CFF professional development program, they also need to consider the work of Mayer, Mullens, and Moore (2000) that suggests students learn more from experienced teachers than from less experienced teachers. Veteran teachers have professional development needs that in most instances are different from those of the younger inexperienced staff. Successful 21st century lessons involving technology integration result from continuous

and differentiated staff development programs that are developed with all teachers' needs in mind (Mayer, Mullens, and Moore, 2000).

Professional development involving 21st Century Skills addresses the needs of both digital immigrants and digital natives. The Partnership for 21st Century Learning (2009) and EnGauge (2004) have both defined 21st Century Skills to include life and career skills, learning and innovation skills, information, media and technology skills, and core subjects. Reading, writing, speaking, and listening, otherwise referred to as literacy, continue to be included as core subjects (Partnership, 2009). Literacy has been an important part of the educational framework since the beginning of recorded history (Tyner, 2002). First defined as a set of marks on paper to form words and convey meaning, the definition now has expanded to include the images, sounds, and technology of our current culture (Tyner, 2002). Digital literacy must be defined for the current century to include Web 2.0 tools such as wikis, blogs, Really Simple Syndication (RSS) feeds, podcasting, and digital story telling. A literate student in the 21st century will have the ability to think in a dynamic and global capacity, utilizing Web 2.0 tools in the classroom and at home (Warlick, 2004).

Web 2.0 Resources

Web 2.0 refers to the current World Wide Web. It is a dynamic environment in which information is published, and mutual collaboration and information sharing is the norm. Web 2.0 is different from its predecessor Web 1.0 which was a static environment that only provided information. Wikis, blogs, and RSS feeds are dynamic tools created within the Web 2.0 environment. A Wiki is a webpage or collection of web pages designed to enable anyone who accesses it to contribute or modify content, using a simplified markup language. A Blog is a web page used for journaling, and may be either private or public. Finally, a RSS feed is a family of

web feed formats used to publish frequently updated articles or information posted on web pages. These tools are a significant component of the CFF program and classroom reform (Richardson, 2006).

Purpose for this Study and Primary Questions

The purpose of this study was to examine the perceptions of CFF teachers regarding students' acquisition of 21st Century Skills after using blogs and wikis as a classroom instructional tool. This study specifically targeted CFF teachers who used blogs and wikis as instructional tools, and then studied their perceptions on the impact of the blogs and wikis on their students' acquisition of the 21st Century Skills. Included as 21st Century Skills were the traditional core content skills for mathematics, language arts, science, and social studies. Other skills included were classified as life and career skills that involve information processing, problem solving, communication, technology, self-direction, creativity, interpersonal, and teaming. Dr. Kyle Peck from The Pennsylvania State University headed the evaluation team for the CFF program. His team collected data from all Pennsylvania school districts participating in the CFF program beginning in the 2006 school year, and continuing each subsequent school year. Though Dr. Peck's team collected data on the students' acquisition of 21st Century Skills, they did not evaluate the impact of blogs and wikis. These two Web 2.0 tools were included in the Boot Camp training provided to all first year CFF coaches and teachers. The Boot Camp training encouraged teachers to use blogs and wikis with their students as part of daily instructional practice. In addition, emphasis was placed on the use of blogs and wikis as part of professional development sessions provided in subsequent years of the CFF initiative. Blogs and wikis were selected for this study because of the value placed on these tools in the CFF

professional development component of the initiative, and because they have not been studied by The Pennsylvania State University CFF research group (Clausen & Peck, 2008).

Primary Questions for this Study

The following two primary questions with supporting sub-questions were posed within this study:

1. Which 21st Century Skills do teachers perceive their students have acquired after using a blog?
    - To what degree and for what purpose are students using blogs?
    - What do teachers perceive is the impact on students' writing skills, such as content organization and focus, mechanics, and publishing,, as a result of using a blog?
    - What do teachers perceive is the impact on students' electronic and traditional communication?
    - What do teachers perceive is the impact on students' presentation skills?
2. Which 21st Century Skills do teachers perceive their students have acquired after using a wiki?
    - To what degree and for what purpose are students using wikis?
    - What do teachers perceive is the impact on students' writing skills such as content organization and focus, mechanics, and publishing as a result of using a wiki?
    - What do teachers perceive is the impact on students' electronic and traditional communication?
    - What do teachers perceive is the impact on students' presentation skills?

Background Information

David T. Gordon (2002) suggested in his book *The Digital Classroom: How Technology is Changing the Way We Teach and Learn* that if teachers are not trained to use and teach with technology, then all of the hardware in the world will not improve education. Many teachers and administrators believe that technology can be a catalyst for changing instructional practice. A result of technology use and reformed classroom practice, the roles of students and teachers will shift. Teachers will act more as facilitators by helping students to actively search out information, process it, and communicate their understanding. Work conducted by Almog and Salomon (1998) suggested that the reason for the lack of improvement is directly related to the way teachers are using technology. Many high school teachers who have received technology tools have not changed their classroom methodology because they have not received adequate professional development (Abrami, 2001). Cuban's (2001) research supports this finding from Abrami. Cuban studied the use of computers in the classroom environment and their impact on student achievement. "Computers have been oversold and underused, at least for now" claims Larry Cuban (2001, p. 179) in his most recent study on computers in the classrooms. Cuban's book *Oversold and Under Used* offers a compelling look at how computers are being utilized in the educational environment and engages readers to consider how teaching and learning have changed since schools have embraced the use of technology.

Evidence from a recent study by Nagle (2009) on the impact of the Enhancing Education Through Technology (EETT) grant concluded that a link exists between student achievement and technology integration. The federal government through Title II Part D funded the EETT grant. The grant began in the 2004 school year and ended in the 2008 school year. The grant provided funding for school districts to purchase and implement technology for classroom instruction.

The study by Nagle (2009) suggests that further research is needed regarding the direct impact of Web 2.0 tools. Blogs, wikis, and other Web 2.0 tools are current applications and were not readily available for use when the EETT grant was in place.

The Impact of Classroom Practice

Teachers frequently struggle with how to effectively change classroom strategies and pedagogy to meet the needs of all students. They are comfortable with the academic content, discipline, and classroom management but struggle to provide for the individual needs of all students. Technology has further complicated the issue. Many teachers grapple with how to use technology to provide a meaningful learning experience for all students (Seamon, 2001).

Students who are involved with active learning experiences have shown increased achievement over those who are involved in the traditional classroom where they are passive recipients receiving instruction primarily from teacher lecture. The inclusion of literacy skills with active learning strategies fosters critical thinking and promotes collaborative decision-making. Reconsideration of traditional classroom practice to include 21st Century Skills has resulted in classrooms that are active learning environments that include teachers as facilitators of student learning and students collaborating and dynamically participating in their learning process (Robertson, 2000). Computers and telecommunications have unique capabilities for enhancing instructional practice and learning. Some of these capabilities include focusing the curriculum on authentic problems for students to solve collaboratively, virtual communities, bridging the gap between the classroom and the real world, and providing special needs students with tools for success (Gordon, 2002).

Dede (2000) also examined the effects of involving students as active participants using information technology and describes how it is changing the nature of education. Students, or

rather digital natives, need to be actively involved and not passive recipients of information. Digital natives have been raised with technology and it's associated multi-tasking and active learning. These students respond to and expect to be actively involved in the learning process (Prensky, 2001a). Technology and the use of the information will provide students with the opportunity for collaborative learning, global communication and information retrieval (Dede, 2000).

Current federal and state technology standards advocate for teachers to change classroom instructional practice for all students to include both the 21st Century Skills and the standards for students developed by the International Society for Technology in Education (ISTE). Some educators believe implementation of these skills and standards will level the playing field for all students and help to close the gap in the digital divide (Swain, 2002).

David Thornburg has long been a proponent of using technology to engage students in active learning experiences. Thornburg (2006) emphasized the importance of how technology is used in the classroom. He has been concerned with the proper integration of technology as part of classroom instruction. Thornburg maintains that if technology is not used properly, then it should not be used at all. Thornburg further discussed how to use technology to support modern pedagogical thought and suggested that all students are capable of learning, but that the learning experience may be different for each learner.

The Impact of the Internet on Teaching and Learning

The learning experiences described by Thornburg (2006) have been dramatically impacted by the introduction of the Internet. The Internet, also known as the World Wide Web (WWW), was introduced to the K-12 classroom in the mid-1990s and has been used as a vehicle for the both the acquisition and sharing of information. Solomon and Scrum (2007) developed a

timeline for the development of the WWW. According to the timeline, hypertext markup language (html) was released in 1993 and used to create web pages. Mosaic, the first graphical user-interface (GUI) for the Internet was released in April 1993 to replace the text version of the Internet. Soon after the introduction of the GUI the WWW was produced. In 1993 there were 26 web servers online. Microsoft released the browser Internet Explorer in 1995 as part of Windows 95, and Google opened its first office in September 1998. During this time the web was used by educators to gather information for research purposes and was known as Web 1.0. It continued to expand and provide information for many years. By August 2000 there were nearly 20 million web sites online, and on January 2001, Jimmy Wales founded the online encyclopedia Wikipedia. With the advent of Wikipedia and the ability for users to publish information, the web began to change from a static resource into one promoting and encouraging interaction from its users. With the advent and ease of publishing, the web now became known as Web 2.0 and offers a variety of options for publishing. These options are known as Web 2.0 tools and include blogs, wikis, podcasts, and RSS feeds (Solomon & Schrum, 2007). Knobel (2009) referred to the current state of the Internet and Web 2.0 tools as Literacy 2.0. He identified three interlocking functions associated with Web 2.0: participation; collaboration; and distribution. These interlocking functions combined with online services and affordable editing software offer Web 2.0 users the opportunity to produce and publish a variety of media.

Knobel (2009) maintains that wikis, blogs, and online collaborative games are readily available and easily used by today's students. In addition, the function of distribution provides the opportunity for students not only to publish their work but also to share it with a global audience. Davis and McGrail's (2009) work with students and blogging has shown that students are more motivated to write when their audience is the whole world. Web 2.0 has changed the

definition of literacy for today's digital natives (Warlick, 2004). The ability to interact and publish using the web has changed the way in which students and teachers need to view the use of the Internet in their classrooms. It should be commonplace to use these tools in the 21st century classroom. Today students have moved beyond the concept of teacher lecture, even if our classrooms have not (Valenti, 2002).

Overview of Research Methodology

A case study approach was the primary qualitative research method used for this study (Glatthorn, 1998). The study combined both quantitative and qualitative data collection strategies. The intent of this study was to examine the CFF teachers' perception of the impact of blogs and wikis on the acquisition of 21st Century Skills in the CFF classroom. Teacher surveys provided quantitative data. Teacher focus groups were used to collect qualitative data (Creswell, 1997).

Teacher surveys were used to collect data on the perceived impact on the use of blogs and wikis by students on the acquisition of 21st Century Skills. Focus group interviews with the CFF teachers were also conducted by the author of this study and were scheduled after the surveys were completed. Teachers were grouped according to school district for the focus group interviews. Language arts, mathematics, social studies, and science were the four content areas included in the CFF program. Each focus group contained 8 to 12 teachers within these content areas. The focus group interviews were 90 minutes in length. Teachers were invited to attend, and attendance was voluntary. All participants signed consent forms.

The study involved teachers from two high schools located in the Commonwealth of Pennsylvania. All students and teachers were current participants in the CFF program. The teachers had worked with the CFF program for four years since its inception in the 2005-2006

school year. Study participants, both male and female, had a minimum of five years teaching experience. Teachers were credentialed in one of the four core curriculum areas defined by the PDE for inclusion in the CFF program. These four core curriculum areas are language arts, mathematics, science, and social studies (Pennsylvania Department of Education, 2008).

The two high schools were designated as High School Q and High School Z for this study. Due to the nature of high school scheduling, classes were a mix of students in grades 9, 10, 11, and 12. Both high schools were using block scheduling with four 90 minute blocks, a homeroom and lunch period. Students were both male and female, and included students of all academic levels.

Definitions of Key Terms

The following terms are defined for use with this study:

21st Century Skills: Digital literacy, inventive thinking, effective communication and high productivity (National Commission on Excellence in Education, 2003).

Blog: A frequently updated personal journal chronicling links at a Web site, intended for public viewing (Richardson, 2006).

Chi Square Test: A test used in statistics to find out how accurate a theory was by comparing it with the actual event (Macmillan, 2011).

Classrooms for the Future: Classroom reform initiative involving 21st Century Skills, technology and classroom instruction (Pennsylvania Department of Education, 2008).

Correlation: Correlation is a statistical measurement of the relationship between two variables (Fields, 2009).

Digital Immigrant: Users of technology who have not grown up using technology (Prensky, 2001a).

Digital Native: Students who have grown up or are growing up with technology (Prensky, 2001a).

Efficacy: Efficacy is defined as the desire to produce an effect. For this study the term efficacy is defined as teachers' comfort level with using technology and 21st Century Skills. Two categories of efficacy are defined. The first is for teachers who use technology organically. They are classified as digital natives. The second category is for teachers who have over time learned to use technology and 21st Century Skills. These teachers are classified as digital immigrants.

High School Reform: Changes in methodology, pedagogy, scheduling, and the classroom environment (Reeves, 2005).

Instructional Practice: Pedagogy used by teachers in the classroom (Guest, 2001).

Net Generation: Net Generation students consider computers a natural part of their environment; the virtual world is an extension of their real world (Oblinger & Oblinger, 2005).

Podcasting: An audio broadcast that has been converted to an MP3 file or other audio file format for playback in a digital music player (Richardson, 2006).

Really Simple Syndication (RSS) Feed: RSS is an acronym for Really Simple Syndication and is a family of web feed formats used to publish frequently updated works—such as blog, entries, news headlines, audio, and video—in a standardized format (Pensky, 2005).

Teacher Centered: Instructional practice in which the teacher controls the lesson (Seamon, 2001).

Technology: Electronic or digital products or systems (Thornburg, 2006).

Student Centered: Instructional practice that is facilitated by the teacher and involves the student in an active role as part of the lesson (Seamon, 2001).

Wiki: A page or collection of web pages designed to enable anyone who accesses it to contribute or modify content, using a simplified markup language (Richardson, 2006).

Assumptions, Limitations, and Delimitations of the Study

In any research study, the researcher makes assumptions. The assumptions included in this study were: (1) the participating teachers would respond to the survey and focus group questions honestly; (2) the instruments used for the survey and focus groups would be reliable and accurate, thus providing accurate data; and, (3) there would be a sufficient response to the survey questions and focus groups sessions from the teachers asked to participate.

This study was limited by the following variables: (1) the teachers' and students' skill level and knowledge of technology and 21st Century Skills; (2) the teachers' and student' access to technology; (3) the teachers' efficacy with technology; (4) the teachers' instructional practice; (5) the teachers' willingness and ability to change his/her instructional practice; (6) the interventions and staff development available for teachers; (7) the quality of the staff development; and, (8) the number of years of teaching experience for each teacher. In addition the author of this study has worked with and promotes the use of technology in the K-12 classroom. She currently teaches and models the use of Web 2.0 tools in the K-12 classroom. Her bias toward the positive impact of technology will be a limiting factor in this study.

Delimiters for the study included the limits placed on the study by the author. These consisted of: (1) CFF teachers who have five or more years of teaching experience; (2) CFF teachers who had participated in the CFF program for all four years; (3) CFF teachers who were highly qualified in the areas of mathematics, science, language arts, and social studies; (4) limiting the sample size to two high schools; and, (5) restricting the geographic location to Montgomery County, Pennsylvania.

Summary

This chapter described 21st Century Skills and the need for students and teachers to understand and use them in a globalized society. It was noted that the majority of skills listed as 21st Century Skills were not new, but are currently emphasized in education due to the importance of preparing students for success in a globalized work place.

In 2006 Pennsylvania initiated a program to address the acquisition of 21st Century Skills. The CFF program provided teachers and students with technology resources to change classroom practice and acquire 21st Century Skills. Professional development was a major component of the CFF program and included training for the high school teachers involved in the program. A CFF coach was provided as another professional development resource to work with CFF teachers both in and out of the classroom.

The CFF training program included 21st Century Skills, information about digital learners, and the development and use of Web 2.0 tools. All CFF schools were required to use the approved training program, but were permitted to design the delivery of the training program.

The Pennsylvania Department of Education (PDE) contracted with the Pennsylvania State University (PSU) to evaluate the CFF program. Classroom observations, surveys for both students and teachers, and interviews with building administration were used to evaluate the CFF program. The evaluation from PSU dealt with classroom practices but did not specifically target students' use of blogs and wikis. Because these two Web 2.0 tools were emphasized in the CFF training required for all CFF teachers, they were selected for the focus of this study.

The questions for this study were formed by combining the importance of students acquiring 21st Century Skills, and the use of blogs and wikis as instructional tools. Two primary

questions were developed, one for blogs and one for wikis, to research the perception of teachers regarding the acquisition of 21st Century Skills by students who had used either a blog or a wiki.

A brief overview of the methodology was also included in this chapter. The methodology combined both qualitative data collected using focus group interviews, and quantitative data collected a survey for CFF teachers. The data was to be collected from two Montgomery County high schools using teachers from all four content areas and who had at least three years of teaching prior to their participation in the CFF program. At the end of the chapter key terms were defined and the limitations, delimitations, and assumptions were acknowledged.

Organization of the Remainder of the Study

The dissertation is organized into five chapters including a reference section and appendices. Chapter One introduced the topic, a statement of the problem with supporting background information taken from existing literature, a purpose statement with sustaining rationale, definitions of terms that were significant to the study, both the limitations and delimitations of the study, and a chapter summary. Chapter Two presents a review of literature relevant to the implementation of the Classrooms for the Future program, 21st Century Skills, Web 2.0 tools, digital natives and immigrants, and the subsequent impact on teaching and learning. Chapter Three describes, in detail, the methodology utilized to conduct the study. The chapter consists of an introduction, a description of the case study qualitative and quantitative research method, the instruments used for data collection, a description of the participants either interviewed or surveyed, and the data analysis process. Chapter Four provides a review of the results for the data collected as part of the qualitative and quantitative study. These results will be taken from focus group interviews, classroom observations, and teacher surveys. Finally, Chapter Five describes the conclusions based on the results of the data

analysis from Chapter Four. The chapter also discusses the significance of the results, concerns about the study, and recommendations for future research. A reference list and appendices are included after Chapter Five is completed.

CHAPTER TWO: A REVIEW OF THE LITERATURE

The PDE responded to the call for classroom reform to address the need for 21st century teaching and learning with the commencement of the CFF program in 2006. The authors of Pennsylvania's CFF initiative focused on the acquisition of 21st Century Skills for students, and the inclusion of these skills for teaching and learning as they developed the CFF initiative in 2006. The CFF initiative recognized and embraced the need for high school reform, enabling teachers to use technology as an effective tool for educating students, and preparing students to enter and successfully compete in the ever-expanding, high-tech, global marketplace. The CFF program required that teachers both embrace the use of technology and use it as an instructional tool. Web 2.0 tools such as blogs and wikis were included in the professional development sessions provided for all CFF teachers. Teachers were encouraged to use blogs and wikis for their own professional growth and also as an instructional tool with their students (Pennsylvania Department of Education, 2008).

The work of Knobel (2009) maintains that wikis, blogs, and online collaborative games are readily available and easily used by today's students. In addition, the function of distribution provides the opportunity for students not only to publish their work, but also to share it with a global audience. Additional support for using blogs and wikis is found in research conducted by Davis and McGrail (2009). Their work with students and blogging has shown that students are more motivated to write when their audience is the whole world. These Web 2.0 tools have changed the definition of literacy for today's digital natives to include the ability to interact and publish using the web. Consequently, the way in which students and teachers need to view the use of the Internet in their classrooms has also changed. It should be commonplace to use these tools in the 21st century classroom (Warlick, 2004).

Combining the apparent importance of blogs and wikis to student learning with the CFF initiative, it is important to examine how blogs and wikis are being used as an instructional tool. The acquisition of 21st Century Skills as a result of students using blogs and wikis will be a central part of this study as it seeks to determine what CFF teachers perceive is the impact of using blogs and wikis.

Literature Review

Ever since *A Nation at Risk* (1982) highlighted the inadequacies in American education, there has been a push to better prepare students for their future in the workplace. According to the study, there was a "rising tide of mediocrity that threatens our very future as a Nation and a people" (p. 5). The report warned that Americans, in their toleration of poor schools, had "been committing an act of unthinking, unilateral educational disarmament" (p. 5). *A Nation at Risk* was published when the United States was involved in the Cold War with the Soviet Union and the American government was looking for ways to surpass its enemies, especially in areas of science and technology (Dyer, Reed and Berry, 2006). The report concluded that there was a lack of skills in employees entering the workforce due to inadequate educational experiences. This same concern exists today as documented in *The World is Flat* by Thomas Friedman (2005). Friedman's work speaks to the issue of Globalization 3.0 and contends that the skills of our workforce must continually be upgraded to actively and effectively participate in the current global economy.

The literature review focuses on four topics to support researching the impact of blogs and wikis as part of the instructional practice of CFF teachers. A review of a study addressing 21st Century Skills, their definition, development, and importance for current teacher and students begins the literature review. The second topic includes studies that support the creation

of the CFF program and recommendations from the CFF program evaluation team located at The Pennsylvania State University. The third topic reviews literacy in the 21st century, its definition, development of the definition, and the recommended changes for instruction including the expansion from traditional literacy instruction to include the Web 2.0 tools, such as blogs and wikis. The fourth section of the literature review focuses on studies about the factors that motivate students and how digital natives learn followed by a review of Cuban's work on his book *Oversold and Underused*. The literature review concludes with a review of the Kaiser Report and other studies relating to the use of blogs and wikis as instructional tools.

21st Century Skills

Many educational classrooms are incorporating 21st Century Skills and proficiencies into school curricula within the context of academic standards. The Metiri Group in partnership with the North Central Regional Education Laboratory developed these skills. The list of skills include speaking, listening, reading, writing, information processing, problem solving skills, communication, technical, self direction, creativity, interpersonal, and team building skills (Metiri Group, 2003). The list of 21st Century Skills was compiled from publications about teaching and learning in the 1990s, contemporary literature, emerging research, and representatives from education, business, and industry. The Metiri Group published the 21st Century Skills in 2003.

The methodology for the development of these skills involved a process that included literature reviews, research on the emerging characteristics of the Net-Generation, a review of the current reports on workforce trends from business and industry, an analysis of nationally recognized skill sets, input from educators, data from educator surveys, and reactions from constituent groups. Information gathered from each of these sources was cross-matched and put

into a matrix. In addition, data were gathered from educators at state level conferences in 10 states, educator surveys, and focus groups in Washington, D.C. and Chicago. An analysis of the matrix resulted in the list of skills that were then classified as the EnGauge 21st Century Skills. Experts in the field reviewed initial drafts of the EnGauge 21st Century Skills, and revisions were made prior to the final publication (Metiri Group, 2003).

These skills focus on digital age proficiencies combined with the technological skills required for students to realize their intellectual potential in the 21st century political, social, and economic environment. The list of skills is divided into four categories and is summarized in Table 1 (Metiri Group, 2003).

Table 1

EnGuage 21st Century Skills

Digital Age Literacy	Inventive Thinking	Interactive Communication	Quality and Results
Basic, scientific, and technological literacy	Adaptability, managing complexity, and self-direction	Teaming and collaboration	Prioritizing, planning, and managing for results
Visual and information literacy	Curiosity, creative thinking, and risk taking	Personal and social responsibility	Effective use of real world tools
Cultural literacy and global awareness	Higher order thinking and sound reasoning	Interactive communication	High quality results with real world applications

The Partnership for 21st Century Skills was formed in 2002 through the efforts of government and education organizations as well as interested individuals. These entities and

individuals included: U.S. Department of Education; AOL Time Warner Foundation; Apple Computer, Inc.; Cable in the Classroom; Cisco Systems, Inc.; Dell Computer Corporation; Microsoft Corporation; National Education Association, Ken Kay, President and Co-Founder; and, Diny Golder-Dardis, Co-Founder of the Partnership for 21st Century Skills. The mission of the Partnership for 21st Century Skills was to serve as a catalyst to position 21st Century Skills at the center of U.S. K-12 education by building collaborative partnerships among education, business, community, and government leaders (Partnership for 21st Century Skills, 2004).

Chris Dede, professor of learning technologies at the Harvard Graduate School of Education and an advisor to the Partnership, contends that these skills are not new skills, but are skills that educators have endorsed for many years. In addition these skills were embraced by stakeholders from business, K-12 schools, higher education, and government, which gives them credibility and indicates that the skills were not a passing fad (Sapleter, 2003).

The work of the Partnership for 21st Century Skills extends the 21st Century Skills identified by Metiri and the North Central Regional Education Laboratory (NCREL) into the Framework for 21st Century Learning. The framework combines a focus on 21st century student outcomes with innovative support systems to help students master the abilities required of them for success in the 21st century. These outcomes are separated into four themes with four support systems. The Framework, illustrated in Figure 1, shows the set of outcomes opposite the list of supports necessary for success.

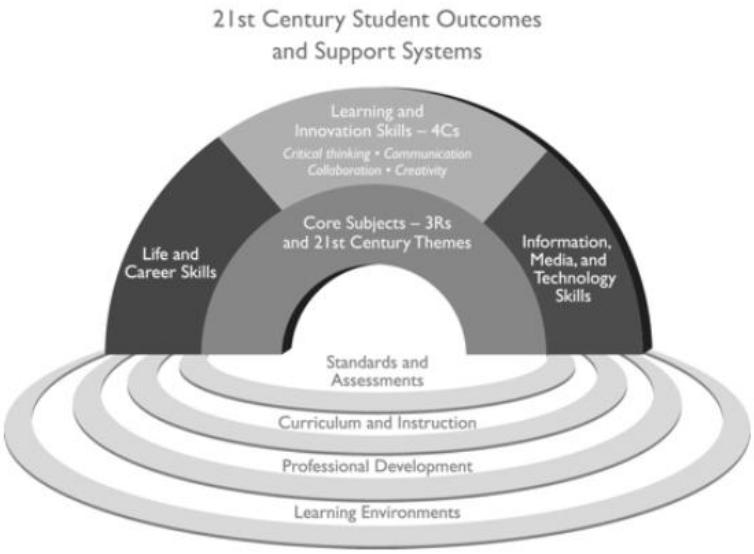

Figure 1. The framework for 21st Century Skills, which shows the set of skills opposite the corresponding supports necessary for success. Adapted from Partnership for *21st Century Skills* (2004). 21st Century Skills.

Both the Partnership for 21st Century Skills study and the EnGauge study do not focus on the technology but instead on the delivery of the 21st Century Skills and their importance in preparing our students for success (Sapleter, 2003).

Classrooms for the Future

The authors of Pennsylvania's CFF initiative focused on the acquisition of these 21st Century Skills for students and the inclusion of these skills for teaching and learning as they developed the initiative in 2006. The CFF initiative is about recognizing and embracing the need for high school reform, enabling teachers to use technology as an effective tool for educating students, and preparing students to enter and successfully compete in the ever-expanding, high-tech, global marketplace (Pennsylvania Department of Education, 2008). Materials such as textbooks are still important, but in order to adequately prepare students for life beyond the classroom, teachers must incorporate a greater level of technology into their classrooms. By

introducing students to these resources, teachers ensure that students will be best prepared to grasp new technological trends and utilize them to their fullest advantage (Prensky, 2001a).

The CFF goals include: (1) improving teaching and learning in English, mathematics, science, and social studies; (2) changing classroom instructional practice; (3) changing student-teacher relationships; (4) increasing student engagement; (5) increasing student responsibility for learning; (6) developing 21st century skills in students; and (7) increasing academic achievement. The CFF project recognizes the need for teachers to adopt practices that may be unfamiliar. As teachers receive professional development from the CFF program they move from lecturer to facilitator of student-driven work in order to achieve these goals (Pennsylvania Department of Education, 2008).

The Creation of the Classrooms of the Future Program

Over 450 districts throughout Pennsylvania have implemented the CFF program. Implementations were varied in each district. In some cases, the first classrooms to get the equipment, professional development, and instructional technology coach support were the language arts and mathematics classes. In others, the building principal decided that all subjects in a particular grade level were to get the equipment. Still other districts implemented CFF with strictly volunteer participation. The CFF program includes a leadership team composed of principals, technology directors, central office administrators, librarians, and coaches. The leadership teams met regularly and discussed not only installation issues, but also the impact of teaching and learning as a result of the CFF program (Pennsylvania Department of Education, 2008).

Research Basis for the Classrooms for the Future Program

The CFF website (Pennsylvania Department of Education, 2008) indicates that the methodology used to develop the CFF program involved research from laptops in education studies, the International Society for Technology in Education (ISTE) standards for students and teachers, and the results from the Pennsylvania Technology Inventory (PATI) survey. The authors of the CFF program studied the following one-to- one computer programs:

- K-12 One-to-One Computing Handbook;
- One-to-One Laptop Initiatives; and,
- TurningPoint.edu: The Next National Turning Point in Education.

These studies involved K-12 schools located across the United States and involved students at either the middle school or high school level.

The CFF authors also reviewed the Conceptual Frameworks of the Exemplary Technology-Supported Schooling Case Studies Project. The project studied the following topics:

- contributions of professional community to exemplary use of technology;
- leading the learning: expertise and technology integration support staff;
- new teacher and student roles in the technology-supported classroom;
- sustainability and transferability of instructional reforms; and
- methodology of the exemplary technology-supported school case studies.

And finally, the CFF authors reviewed the work of The Northeast and the Islands Regional Technology in Education Consortium (NEIR*TEC). NEIR*TEC helps educational leaders at the state, district, and school levels address the many challenges involved in putting technology to effective use, particularly in schools in underserved urban and rural communities.

The CFF authors reviewed work from NEIR*TEC that included publications on the following topics:

- Lessons learned about providing laptops for all students; and,
- One-to-one computing evaluation consortium (policy brief).

From their review of these projects the CFF authors were able to develop the CFF program goals and determine the scope for the project. Students in grades 9 through 12, and teachers from the four core content areas were selected to participate in the CFF project (Pennsylvania Department of Education, 2008).

The Pennsylvania Technology Inventory

The Pennsylvania Technology Inventory (PATI) is conducted on an annual basis in order to obtain a current snapshot of the infrastructure installed in Pennsylvania's school districts and the use of technology. The PATI also provides a means to investigate changes in teaching practices that result from technology, and to ascertain educators' opinions on the impact of technology on student achievement. The PATI consists of separate surveys for teachers, building administrators, building technical staff, and the district technology director. In 2006 when CFF was started, the PATI data collected from the 2005-2006 school year indicated that although technology was used throughout Pennsylvania's school districts, there was a lack of consistency in the availability of technology for both teachers and students. As a result, teachers did not regularly incorporate technology into their lesson plans (Pennsylvania Department of Education, 2008).

Results from the 2005-2006 PATI survey indicated that:

- 52% of teachers responded as "mostly true" or "completely true" that they "have timely access to technology-supported assessment data that allows me to use those data to make instructional decisions, e.g., which students need additional assistance."
- 37% of teachers reported that they "are expected to use technology regularly."
- 55% indicated that they "choose whether and how often they will use technology."
- 60% of teachers "agree" or "strongly agree" that "when designing my lessons, I regularly think about whether technology could enhance my teaching or student learning."
- 29% of teachers responded that they are "exposed to innovations and best practices in teaching with technology" on "an ongoing basis."
- 75% of technology directors reported that LEAs do not use online professional development or use such online resources on an "occasional" basis. (PDE, 2008).

These results from the PATI surveys provided the baseline data used in designing the CFF program. The data indicated a definite need for professional development for classroom teachers and additional technology resources for high school classrooms that would be available for students and teachers to use on a regular basis. Dr. Kyle Peck and Robin Clausen from the Pennsylvania State University also used this data to establish a baseline for their evaluation of the CFF program also used this data.

Classroom Resources Provided with the Classrooms of the Future Program

The CFF initiative provided a complete classroom set of instructional tools. These resources included laptops, cameras, software, projectors, interactive white boards, and printers for classroom use. Extensive professional development and support for teachers was provided by the CFF Coach. Participating schools did not have to use grant funds to purchase all of these resources if some were already available for classroom use. A requirement of the grant was that all classrooms have access to each technology resource. A critical component of the CFF program was the instructional technology coach who worked with a district leadership team to ensure effective implementation (Pennsylvania Department of Education, 2008).

Evaluating the Classrooms of the Future Program

The CFF project evaluation conducted by the Pennsylvania State University used classroom observations by administrators who were trained to use the CFF Classroom Observation Tool that was created for the CFF project by the Metiri Group (Clausen & Peck, 2008). This classroom observation tool was used to gather data about the classroom environment, technology availability and access, instructional activities, and level of student engagement. In addition data were also collected using teacher and student surveys and interviews with CFF coaches, principals, and technology coordinators to assess the progress being made. Evaluations were conducted each year during the first two months of the school year and again during the last two months of the school year. Evaluations were conducted by building or district administrators who trained to use both classroom observation tools (Clausen & Peck, 2008).

In addition to classroom observations, teachers and students completed online surveys both at the beginning of the school year and at the end of the school year. These student surveys

collected information about student learning styles, students' access to technology, and the instructional styles of the classroom teacher used the technology. All data from the surveys and classroom observations were recorded online. Researchers at The Pennsylvania State University (PSU) under the direction of Dr. Kyle Peck analyzed the data. The lead researcher for the CFF evaluation project was Robin Clausen (Clausen & Peck, 2008). After two years of the CFF program, the results in the PSU evaluation report were considered preliminary since the teachers and students were still developing 21st Century Skills, and contract negotiations delayed the arrival and installation of the equipment, limiting their use by teachers and students (Pennsylvania Department of Education, 2008).

Results from the Classrooms of the Future Evaluation

According to Clausen and Peck (2008), the primary purpose of the evaluation was to look for signs of change in progress which included changes in teaching activities, student activities, teacher attitudes, and student attitudes. Evidence collected from the evaluation process indicated that the desired changes appeared to be occurring. Observers in both years one and two reported that the physical organization of some classrooms was changing, from the familiar pattern of desks in rows (designed to promote the delivery of information from the teacher to the student) to classrooms that were organized as clusters of three to five desks. In these classrooms collaboration, group work, and student led research were evident (Clausen & Peck, 2008). Observers in both years one and two reported that in the post observations teachers were spending significantly less time in whole class lecture and were spending more time working with individual students, walking through the room observing, and interacting with students. This observation was verified by data from the teacher and student surveys, and comments from CFF principals, technology coordinators, and coaches (Clausen & Peck, 2008).

Teacher and student surveys and interviews with CFF leaders all provided evidence that teachers were more likely to engage students in activities requiring higher order thinking as a result of the CFF program. There were significant increases, defined as an increase of 47% from the first year to the second year, in the use of project- or problem-based learning, authentic learning, multi-modal teaching, peer teaching, and informal collaborative learning. Significant increases from pre- to post-observations were observed in time spent focusing on the development of most of the identified 21st Century Skills, including visual literacy, teaming or collaboration skills, electronic communication skills, personal responsibility, self direction, creativity, use of real world tools, the ability to produce high-quality products, and planning, prioritizing, and managing work. Significant differences were not found for scientific literacy, cultural literacy, global awareness, and higher order thinking (Clausen & Peck, 2008).

The Teaching Performance Record (TPR) classroom observation protocol, developed by the University of Virginia for the CFF project, was used to evaluate teacher activities based on five domains of activity that have been linked, through prior research, with increases in student achievement. The five domains used by teachers who teach strategically include: (1) a focus on the objectives of the lesson, (2) a concentration on the sequence of activities in the lesson, (3) the use of strategies to maintain and enhance student participation, (4) the establishment of a classroom environment that encourages students to work productively, and (5) the provision of opportunities to evaluate students' contributions. Statistically significant increases in teacher behaviors associated with all of the five domains were identified, implying that teachers are working in ways that are more directly associated with increasing student achievement (Clausen & Peck, 2008).

The pre/post analysis of surveys, classroom observations, and interviews indicated that

students spent 58% less time listening to the teacher in large group settings. Students spent more time working independently and in groups. They were more likely to be working on reports, projects or presentations, to choose projects based on interest, and to work at their own pace. Student work was more likely to be assessed using a rubric to determine the quality of the product or project (Clausen & Peck, 2008).

Teachers and observers reported that students spent significantly less time off task (doing things other than what the teacher had intended), but students reported that they spent slightly more time off task. The percentage of students engaged was relatively high in both pre- and post- observations. Significant pre/post differences on the teacher survey indicated that more students were engaged, and the classrooms observations confirmed that the percentage of students engaged had increased during the last third of the class. Evidence from the class observations also showed that the level of student engagement and the degree of interest being shown, was also greater during each third of the class session (beginning, middle, and end) (Pennsylvania Department of Education, 2008).

There was a decrease in the number of students who were observed not using technology at all during the lesson, and a corresponding increase in the number of students observed to be using technologies almost the entire class period. On the post-survey, only 4% of teachers reported that their students used the computers 80% or more of the time, and 39% still reported that their students used the computers less than 20% of the time. Student reports of the time they spend using computers were much higher, with 19% reporting that they used the computers more than 80% of the time, and 15% reporting that they used the technologies less than 20% of the time (Clausen & Peck, 2008).

Changes in Classroom Practice

Changes in teacher attitudes related to the value of technologies exhibited between the pre- and post-surveys were small, perhaps because approximately 75% of teachers perceived technologies as either valuable (47%) or very valuable (28%) at the time of the initial survey. The percentage reporting that they felt technologies were very valuable had increased by 10% by the time of the post-survey. At the end of the school year, 14% more teachers reported that given the tools and resources available to them, the experience they were able to offer their students was very good (up from 7% to 48%) or excellent (up from 7% to 29%). Approximately 73% of teachers feel better prepared to teach this year than the first year, although about 20% expressed the belief that they did not yet have the technology skills needed to teach their subjects using the best methods available. Ninety-one percent of teachers reported that they had worked harder than they were in past years, and approximately the same number (85%) reported that they are also working longer. Approximately 76% of the teachers reported that the CFF coach had been either valuable (40%) or very valuable (36%), and the three services the coaches provide that were considered by teachers to be most important were: (1) suggesting ways to incorporate technology to teach the content in their classes; (2) teaching them to operate computers, networks, or software programs; and (3) providing professional development. These results indicated that the CFF project has had a positive effect on teachers' instructional practice after two years of involvement with the CFF project.

Acquiring 21st Century Skills

One of the primary purposes of the CFF program is to help Pennsylvania's students develop 21st Century Skills. Although these skills and attributes are very difficult to measure, the CFF staff continues to develop processes and measures that will allow progress to be

monitored in these areas, which include critical thinking, problem solving, creativity, teamwork, online research, electronic communication skills, and self-directed learning (Pennsylvania Department of Education, 2008).

In summary, the CFF program was implemented in the 2006 school year by the Pennsylvania Department of Education and continues to be an important curriculum initiative. The primary goal of the CFF program is to change instructional practice to include 21st Century Skills both for teaching and learning. The CFF program provides classroom technology such as laptops, projectors, software, cameras, printers, and interactive white boards. Ongoing professional development for all CFF teachers and classroom coaches are critical components of the grant process.

Digital Natives: Motivation and Learning Styles

Students currently in high school, grades 9 through 12, were born in early 1990s. Ninth grade students who will graduate in June 2013 were born in 1995, and began school in 2000. The personal computer was introduced into most public schools around 1980. By the time the current high school students began their education, schools had used computers for more than a decade (Solomon & Scrum, 2007). Current high school students have grown up with technology. These students are often referred to as digital natives (Prensky, 2001a). Prensky defines the digital native as a student who has grown up in, or is growing up in, the digital age. This type of student assimilates digital tools and digital methods for communication easily. Teachers who are newer to the profession might be classified as digital natives. Most teachers however have not grown up with technology. Instead they have learned to use digital tools later in life and are working to learn the language associated with these tools. These teachers are considered to be digital immigrants (Prensky, 2001a). Digital immigrants have varying degrees

of acceptance and readiness to embrace the use of digital tools in their classrooms. Some digital immigrants embrace all tools enthusiastically and their students benefit from the integration of digital tools with teaching and learning. Other digital immigrants learn only what is necessary, and their classrooms reflect their resistance to change. Prensky sums up the need to distinguish between the digital native and immigrant, and to recognize their differences with his comment:

> But this is not a joke. It's very serious, because the single biggest problem facing education today is that our Digital Immigrant instructors, who speak an outdated language (that of the pre-digital age), are struggling to teach a population that speaks an entirely new language. This is obvious to the Digital Natives – school often feels pretty much as if we've brought in a population if heavily accented unintelligible foreigners to lecture them. They often can't understand what the Immigrants are saying. (Prensky, 2005)

Palfrey and Gasser (2009) contend that the term generation should not be used when defining digital native since only approximately one-sixth of the world has access to technology. Instead they suggest that the term digital native should be used to refer to a population that has grown up using technology. Their research about this population found that digital natives consider cyber space to be an extension of the real world. Digital natives do not make a distinction between the online and offline versions of themselves. In addition they consider creativity and innovation very important and are aware of global issues. The digital native considers himself/herself to be a global citizen (Palfrey & Gasser, 2009).

Wes Fryer (Salpeter, 2003), an educational consultant, proposed that there is a continuum in which teachers and students can find their efficacy with digital tools rather than just two classifications which describe the extremes. In addition to digital natives and digital immigrants,

Fryer offers two additional categories: digital refugees and digital bridges. Digital refugees are either ignorant about technology or in denial about its use and importance. A digital bridge is the category between a digital refugee and a digital immigrant where the person is aware of the technology but not comfortable using it. A digital bridge is not resistant to using technology but, needs ongoing support from others to embrace and use technology (Fryer, 2007). Fryer developed these definitions from his work with the Texas Immersion Pilot Project from 2004-2008.

The Texas Technology Immersion Project

The Texas Technology Immersion Project (TxTIP) project began in spring 2004 and continued through the 2007-2008 school year. The TxTIP project went beyond a typical 1:1 computer environment. Participants were immersed in technology and professional development. Technology immersion involves providing every teacher and every student at an implementing campus with six key resources. These resources have been identified as critical to successfully intertwining technology and teaching and learning. Each package contains the following core components:

1. a wireless mobile computing device for every student and teacher;
2. productivity software;
3. online content in the core curriculum areas;
4. online formative assessment tools;
5. ongoing professional development; and,
6. on demand technical support.

School districts participated in the TxTIP project under one of four campus configurations: as a whole district (all campuses); as a vertical team of campuses (one elementary school, one middle

school, and one high school within a feeder pattern); as a single secondary campus (a campus serving any combination of grades 6-12): or as a middle school campus serving only grades 6-8. The Texas Education Agency provided Title 2, Part D federal funding to participating schools to offset the cost of implementing a technology immersion package on their campus. Districts that implemented an immersion package on a grade 6-8 middle school campus used a package pre-approved by the Texas Education Agency. Districts that implemented an immersion package on any of the other three campus configurations used one of the pre-approved packages or created their own that included all six critical components (U.S. Department of Education, 2003).

The TxTIP project underwent a multi-year evaluation study funded by the United States Department of Education called the Evaluation of the Texas Technology Immersion Project (eTxTIP). The eTxTIP project research team analyzed the effects of technology immersion in grade 6-8 middle schools as compared to a control group of non-immersed grade 6-8 middle school campuses. Researchers assessed factors such as campus progress toward immersion, effects of immersion on campus culture, teacher innovation and productivity, and student learning. Results from the TIP include: (1) increased learning opportunities for lower socio-economic students; (2) a sense of equity for all students; (3) the need for additional policies and discipline for student use of laptops; and (4) a change in the manner in which students acquired information and knowledge. Fryer participated in the evaluation process. An outcome of his participation is the identification of additional classifications of digital learners (U.S. Department of Education, 2003).

Digital refugees are older adults who have chosen to "flee from," rather than integrate into the native digital culture. They fear technology and are resistant to change. Digital bridges are those people who are between the digital natives and immigrants on the continuum. They

have not completely grown up with digital tools, but have used them for a portion of their K-12 experience. They are not immigrants since they have not completely learned about these tools as adults. Digital bridges are able to communicate effectively with both natives and immigrants. The last group called digital undecided, are those individuals who have not made up their minds about which group they fit into, or want to fit into. They have not used digital tools enough to know which group best describes them (Fryer, 2006). Age is not always the determining factor when deciding the classification. Learning styles may be a better indicator of how quickly a person assimilates the use of digital tools for 21st century teaching and learning (Dede, 2000).

Students are coming into school ready to learn as digital natives. They do not always find themselves in classrooms and schools ready for 21st century learning. Some classrooms are still operating in the manner in which they were developed several decades ago. There is a disconnect between how students learn and how teachers teach is easy to understand. The school system was created to prepare students to work in factories and agriculture. Teachers are now preparing students for jobs that may not yet be created, a global society, and a world that produces and exchanges information at an exponential rate. Teachers and the education system must be willing to completely redesign themselves (Prensky, 2005).

Brain Research and Digital Natives

Digital natives are socialized in a way that is vastly different from their parents. As part of the Texas Technology Immersion Pilot Project (TxTIP), Fryer (2006) conducted classroom observations and surveys of digital natives and their involvement with technology both in and out of the classroom. The TxTIP project focused on using campus based technology immersion to increase student learning. The project also focused on teacher proficiency with using technology as a teaching tool. The project was part of a nine state educational technology

research effort launched in 2003 by the United States Department of Education. The numbers from the evaluation of the project are significant: more than 10,000 hours of playing videogames, more than 200,000 emails and instant messages sent and received; more than 10,000 hours of talking on digital cell phones; more than 20,000 hours watching TV, more than 5000,000 commercials seen, and all by the time they graduate from high school. This type of stimulation has an effect on the brain that causes digital natives to think differently. The brain changes and organizes itself differently based on the inputs it receives. Current brain research called neurobiology indicates that brain cells are replenished constantly (Prensky, 2005).

Data collected from a study at the University of California at Los Angeles (UCLA) Semel Institute for Neuroscience and Human behavior found that the brains of digital natives were more actively engaged when they were reviewing a website than reading printed text about the same topic. Gary Small, the director of the Semel Institute studied the connection between online search activity and brain activity. For the study, the UCLA team worked with 24 neurologically normal research volunteers who were also digital natives. The research volunteers performed Web searches while undergoing functional magnetic resonance imaging (fMRI) scans. The scans recorded the brain circuitry changes experienced during these activities. The study participants showed significant brain activity in the frontal, temporal and cingulated areas of the brain. These areas control decision-making and complex reasoning. The brain activity recorded during this study was unique for the digital native and vastly different from previous generations (Herther, 2009).

Small's work supports that of Fryer who found that digital natives (students) and digital immigrants (teachers) approach leaning differently. Table 2, derived from Fryer's work with the TxTIP project, portrays the differences between the two groups (Salpeter, 2003).

Table 2

The Difference between Digital Native Learners and Digital Immigrant Teachers

Digital Native Learners	Digital Immigrant Teachers
Prefer receiving information quickly from multiple sources	Prefer slow and controlled release of information from limited sources
Prefer parallel processing and multitasking	Prefer singular processing and single limited tasking
Prefer processing pictures, sounds, and video before text	Prefer to provide text before pictures, sounds, and video
Prefer random access to hyperlinked multimedia information	Prefer to provide information linearly, logically, and sequentially
Prefer to interact/network simultaneously with many others	Prefer students to work independently rather than to network with others
Prefer to learn "just in time"	Prefer to teach "just in case," prefer deferred gratification, and deferred rewards
Prefer instant gratification and instant rewards	Prefer to teach to the curriculum guide and standardized tests
Prefer learning that is relevant, instantly useful, and fun	

There are some key differences between digital natives and digital immigrants. Digital natives prefer receiving information quickly from multiple multimedia sources. Digital immigrants prefer a slow and controlled release of information from limited sources. Natives also prefer multitasking, while their counterparts favor singular processing. Pictures, sounds, and video take precedent over text in the digital native brain processes. Natives also choose to interact and work with others while immigrants tend to work independently. Digital native learners look to learn for "just-in-time" (as in, right before they need to use it) while oftentimes Digital immigrant teachers teach "just-in-case" (as in, it is on the test). Most importantly, digital

native learners would rather have instant gratification and learning that is relevant, useful, and fun (Swain & Peterson, 2002).

Kaiser Report on Media Use for Ages 8 to 18

The Kaiser Foundation has conducted a series of studies on the use of media by young people. In January 2010 the third report from the Kaiser Foundation was released and was titled "Generation M2: Media in the Lives of 8-18-Year Olds". The study focused on the amount and nature of media available and used by young people age 8 to 18. The study was based on results from a nationally representative survey completed by 2002 youth and a subsample of 702 students who also volunteered to complete a seven-day media use diary. The diaries were completed between October 20, 2008 and May 7, 2009 (Rideout, 2010).

The sample population was selected from public, private, and parochial schools and was obtained using a stratified two-stage national probability sample. Schools were randomly selected in stage one and the grades and classes were randomly selected in part two. Students were permitted 40 minutes to anonymously complete the survey. Trained proctors were in the classrooms while students completed the survey. The study results are based primarily on the survey results. Data from the media use diaries was used primarily to ascertain the level of media multi-tasking (Rideout, 2010).

Key Findings from the Kaiser Report

The researchers at the Kaiser Foundation compared results from this study with those from the previous study five years earlier. A comparison of the number of hours youth spend each day using media increased from 6.5 hours 5 years ago to the current amount of 7.5 hours each day. These figures do not factor in multitasking. Including the fact that most youth do multitask, the number of hours spent each day using media increased

to 10.75 hours. Usage of every type of media, except print media, increased from the time spent with media five years ago. The types of media that increased in use are: music or audio; TV content; computers; video games; and, movies. Mobile devices account for the increase in usage and account for 20% or 2 hours and 7 minutes of the time spent with media each day (Rideout, 2010).

The development of mobile media devices has encouraged young people to find even more opportunities for media use, often while they are on the go. The percent of youth who own a cell phone has increased from 39% to 67% in the last 5 years. The percent of youth who own and use either an iPod or MP3 player has also increased from 18% to 76% among all of the 8 to 18 year olds during this same 5 year time period. These two types of media account for the sizeable increase in time spent using media. The report also indicates an increase in laptop use from 12% to 29% mainly due to social networking, and an increase in the availability of home Internet access from 74% to 84% with an increase in wireless access from 31% to 59% (Rideout, 2010).

Other findings from the Kaiser report include data about grades, personal contentment, and ethnicity. Youth who spend the most time with media received grades of Cs or lower, and experienced lower levels of personal contentment. Youth in the heavy use group had a lesser number of friends, got into trouble more, or were often bored or unhappy. Authors of the report pointed out that there was not cause and effect relationship identified between the amount of use and personal contentment and grades. Another finding from the data collected was that children whose parents made an effort to limit media use through rules or through the home environment spent less time with the various types of media. Youth who were between 11 and 14 years of age exhibited the most use of media. This group of students spent an average of nine hours a day

using media. When multitasking is factored in, the number of hours with media increased to nearly 12 hours of exposure (Rideout, 2010). The Kaiser report emphasized the importance of media to digital natives and the need for teachers to be aware of that importance as they plan instruction.

Anderson (2000) contends that teachers need to learn and prepare to step away from lecturing and move toward the role of facilitator. Teachers must know how to act as the facilitator. They need to establish and foster cooperation among students and encourage students' curiosity and intrinsic motivation to teach. Teachers are entrusted with mastering the skills necessary to incorporate technology into the classroom and model those skills for the students.

Literacy in the 21st Century

Digital-age literacy includes the various competencies expected in a 21st century workplace. The levels of literacy range from basic literacy, being able to read, write, listen and speak, to global awareness, understanding how nations, individuals, groups, and economies are connected and how they relate to one another (National Commission on Excellence in Education, 2003). Literacy still includes the ability to read, write, and do basic mathematics. However, the concept of literacy in the 21st century involves more than the traditional concepts and is more comprehensive (Warlick, 2004).

Inventive thinking is the ability to think outside the box and ranges from adaptability and managing complex tasks to higher-order thinking and sound reasoning. This array of thinking begins with recognizing and understanding that change is critical to being able to analyze, compare, infer, interpret, evaluate, and synthesize (Metiri Group, 2003). In order to achieve these skills, students must be actively engaged in their learning, thinking, questioning, and

analysis of information. The computer brings a technological ability to store, sort, and analyze information that, as an ideal, can help release learners from tedious, low level tasks, allowing them to concentrate on higher-order learning tasks (Thornburg, 2006).

Effective communication is the ability to clearly communicate with a wide range of audiences and it is important to be able to communicate with collaborative groups as well as individuals. Communication revolves around teaming, intrapersonal skills, personal responsibility, and civic responsibility (National Commission on Excellence in Education, 2003). Jukes and Dosaj (2003) have shown that students who work with others for a specific purpose in a shared work area learn to collaborate more effectively. Students can communicate with each other using such tools as editing and writing tools, virtual communities of practice (VCOPs) and Wikis (McGee & Diaz, 2007). In a previous study on student use of technology, the CEO Forum Report (1999) indicated that students using various software applications, such as those available today, spent more time on task, were more engaged in the subject and conducted more sophisticated inquiries and analysis.

Digital Literacy

Digital literacy includes the ability to obtain and process information. This definition was derived from work conducted in March 2002 at the International 21st Century Literacy Summit. The summit convened experts from education, business, and government to examine the essential skills for 21st century literacy (Murray, 2003). The resulting white paper from the summit offered the conclusion that digital technologies provided new and better ways to teach and learn. Digital technologies are efficient and provide the ability to continually acquire and develop new knowledge and skills. In addition to the traditional three Rs, schools now need to include both information and digital literacy as part of the required curriculum. Literacy is a set

of complex skills including analysis, evaluation, synthesis and application. It is not sufficient to just include reading and writing as literacy. Instead reading and writing are the foundational skills upon which the other literacy skills are built (Murray, 2003).

David Warlick (2004) has done extensive work on the subject of literacy for the 21st century as part of The Landmark Project. The Landmark Project began in 1995 and ended in 2000. The project included extensive studies on the utilization of the Internet as part of literacy education. Included in the study were the topics of search engines, investigative strategies, and utilization of these tools by both students and teachers. Warlick studied K-12 schools across the United States through the use of surveys, focus groups, and classroom observations. Teachers and students participated in the study and were selected with the assistance of state education departments. As a result of his research, Warlick concluded the search engine and the associated investigative strategies as powerful and valuable literacy tools (Warlick, 2004).

Soon after the Internet became available for use by K-12 education in the late 1990s, the graphical user interface was introduced, and later became known as the WWW. The first generation of the WWW is now referred to as Web 1.0. It is characterized by static web pages that provided information or offered products for sale. Access was originally through a dial-up connection. The web began to change around 2001 and is now referred to as Web 2.0. Dynamic links and pages, the ability to publish and facilitate communication, interoperability, and information sharing characterize this second generation of the WWW. It is commonly referred to as the Read/Write Web (Richardson, 2006).

Web 2.0 tools refer to the online applications: weblogs or just blogs; wikis; podcasts; screencasts; Really Simple Syndication (RSS) feeds; and social networking sites. The Read/Write Web and the Web 2.0 tools are included with the current definition of literacy.

These tools expand the skill of reading and writing to communication, publishing, and collaboration. The current K-12 classroom utilizes these tools for active participatory learning (Richardson, 2006).

Information about Blogs and Wikis

A blog is a website that is easily created and updated. The author has the ability to publish instantly to the Internet from any Internet connection. A blog is distinguished from a typical website in that is not static, but rather dynamic. A blog is designed to publish not only the comments of its author, but also those comments from visitors to the site. A blog can include graphics, photos, video, and audio files in addition to text (Solomon & Shrum, 2007). This technology is popular among students and allows teachers to differentiate instruction for students with diverse needs (Colombo & Colombo, 2007).

Blogs are a constructivist-learning tool. The content of a blog is created and published by students, teachers, or both. Participants may be from the same class, school building or district, or from outside of the school district. Classroom walls are expanded beyond the physical classroom. Students have the opportunity to communicate and collaborate with a range of other students (Davis, 2009).

Shelbie Witte's (2007) work with blogging provides anecdotal evidence to support the idea that online writing strengthens both traditional and digital skills. A student from her eighth grade language arts class showed little interest in writing in class. During a conference with the student's parents they shared with Ms. Witte that their daughter wrote all of the time at home using the computer and online publishing tools. When later questioned the student responded, "That's online writing, not boring school writing" (Witte, 2007 p.92). This led Witte to investigate the options for online writing. In the fall of 2004 Witte attended a language arts

conference where she learned about a project involving pre-service teachers and middle school students. The project used online journaling to foster comprehension and writing skills with the middle school students while at the same time assisting pre-service teachers to interact with students and increase their basic literacy skills.

From this conference the Talkback Project was developed between Indiana University and a middle school class in spring 2005. The project involved both middle school students and pre-service teachers who used a blog to discuss the novels the students read in literature circles. Findings from this project included that the students' writing and comprehension skills improved. Additionally, pre-service teachers learned the importance of clarifying expectations and communication between all participants. When the program first started there were no problems with the technology but the pre-service teachers quickly realized that the project lacked structure and a clear definition of student expectations. These issues were addressed and the project continued in fall 2005. The structure still permitted the students the ability to express themselves but provided a more organized and collaborative approach. Students enjoyed the project and participation steadily increased. Unfortunately in November 2005 one of the students referenced the neighborhood where many of the students resided and an administrator became concerned for safety after reading the posting. This led to the type of online writing to be reduced to two-way journaling instead of using a blog. Students not only felt stifled but that their voice had been taken away (Witte, 2007).

A blog was also the focus of research conducted by Woo and Wang (2009) to determine if this type of online writing promotes critical thinking. Secondary students from a school in Singapore used a blog in place of a traditional writing assignment in the history classroom. Woo and Wang defined critical thinking as the "ability to indentify issues and assumptions, recognize

important relationships, make correct inferences, and evaluate evidence to deduce conclusions" (Woo & Wang, 2009 p.432). Their study involved forty-one secondary students studying History in a neighborhood school in Singapore. Students completed blogs associated with the topics from the class syllabus after they had received a session of hands on training and practice with using blogs. The blogs were then collected and analyzed using a coding system for measuring critical thinking. Study results indicated that blogging was an important tool to ascertain the types of critical thinking employed by students. These types included information sources, linking information to assignments, and justifying viewpoints. Findings from the study also indicated that critical thinking was more evident when information was readily available. Students lacked the ability to search for sources that were not readily apparent suggesting the need to teach information literacy skills (Woo & Wang, 2009).

Information literacy skills were also part of the findings from a study conducted by Frye, Trathen, and Koppenhaver (2010) reported in The Social Studies Journal. This study sought to examine the achievement of 21st Century Skills in the social studies classroom. The National Council for Social Studies urges teachers to design technology-enhanced lessons. A fourth grade class was selected for the study that was to include the topic of pirates. In part one of the lesson students were asked to use Internet resources to search, read, gather, organize, evaluate, and discuss information about pirates. Part two of the lesson involved refining and publishing the information through the use of a blog. Results from the study included that fourth grade students needed assistance with locating and evaluating Internet resources. A better approach would have been for the teacher to locate the resources and bookmark the sites prior to the start of the lesson. This would have allowed students time to focus on the content of the resources. Other results from this study included improvement in collaboration and organization skills. Using a blog

engaged the students and when given the opportunity to write with a purpose they presented a meaningful representation of their learning (Frye, et al., 2010).

Another online tool that belongs to the Web 2.0 generation is the wiki. A wiki is also a website that is created by a teacher and/or student. The purpose of a wiki is to share information. Students and teachers add content information to the site for others to use. In using wikis, students are not only learning how to publish their work, but also that it is important for the information to be accurate, relevant, and collaborative (Richardson, 2006).

An article published by the International Reading Association (2008) highlights the advantages of using a wiki and provides guidelines for its implementation and use. There are different types of wikis that are useful for classroom instruction. These include the classroom wiki, the report wiki, the school wiki site, and wikis used for large-scale interschool projects. A classroom wiki is used to publish student work, classroom assignments, and communicate with students and parents. Report wikis display research from a collaborative project, while school wiki sites offer information about many aspects of the school. Wikis can also be used when more than one school within a district, state, or country collaborate on a project (Morgan & Smith, 2008).

One study involving use of a wiki highlighted how a wiki was used to promote poetry writing for pre-service teachers. The quantitative study involved two groups of pre-service teachers. One group was from the United Kingdom and the second from Canada. The wiki was started to provide the pre-service teachers a vehicle to publish their work and offer each other suggestions. Pre-service teachers may not have the confidence to teach poetry or to write and share their poetry. The study used a mixed convenience sample group of 56 pre-service teachers in 2007. Some of the participants readily responded to the wiki and contributed frequently.

Others struggled with the digital media, poetry writing, or both. At the conclusion of the study comments from the pre-service teachers showed that their confidence in writing poetry increased and the use of the wiki provided them a model for future classroom use (Dymoke & Hughes, 2009).

Together blogs and wikis offer teachers writing tools that engage students and promote 21st century learning. Students will need training to become comfortable with using these tools, and assignments should be purposeful and connected to the curriculum. Students should be afforded the opportunity to practice with either resource prior to a graded assignment and the grading rubric should be reviewed with the students. The use of blogs and wikis as instructional tools increased students' engagement with the learning process and increased their ability to make real world connections (Higdon & Topaz, 2009).

The CFF program embraces 21st Century Skills both for teaching and learning. The use of Web 2.0 tools such as blogs and wikis engage students, encourages collaboration, and addresses the acquisition of 21st Century Skills.

Summary

Chapter Two presented a review of the literature to support the primary questions and provide background for the study. The primary questions for this study involved teachers' perceptions about the impact of blogs and wikis as an instructional tool for students to acquire 21st Century Skills. Four main themes were researched for the literature review: 21st Century Skills, the CFF Program, Digital Literacy, and Motivating Students with Technology.

The Metiri Group first developed 21st Century Skills in 2003 and included digital literacy, inventive thinking, communication, and the ability to produce quality work. Emphasis was placed on the importance for digital natives to acquire and use these skills in order to achieve

success in the globalized workplace of the 21st century. Information derived from Thomas Friedman's *The World is Flat*, Cuban's work with the use of technology as a tool to change classroom practice and how students learn, and Prensky's commentary about digital natives and the way they learn were included in this chapter.

The CFF Program was another theme included in the literature review. The CFF program was developed by the Pennsylvania Department of Education (PDE) and implemented at the high school level in 2006 (Pennsylvania Department of Education, 2008). Resources were distributed to high school classrooms for use with teaching mathematics, language arts, science, and social studies. The resources included computer equipment and peripherals, software, and professional development with the intention of changing classroom practice to engage and motivate students. The Pennsylvania State University (PSU) was contracted by PDE to evaluate the CFF program. Dr. Kyle Peck and Robin Clausen led the evaluation team from PSU. Their results were published on PDE's portal for the CFF program. A review of the evaluation results revealed that blogs and wikis were not specifically evaluated, which led to the decision to conduct this study.

This chapter also included a review of studies pertaining to digital literacy, which classified students as digital natives or students who have always been exposed to and used technology. Results from the Texas Technology Immersion Project showed that technology positively impacted students who have a lower socio-economic status, provided equity for students, and changed how students research and acquire information (Fryer, 2007). In addition, research studies from Solomon and Scrum (2007), David Warlick (2004), and William Richardson (2006) confirmed the importance for students to acquire 21st Century Skills and achieve digital literacy proficiency as a prerequisite for success in the current global society.

The topic of how digital natives think and learn was included in many of the research studies. Prensky's work commented on this topic and referenced that the brain for digital natives actually transmits information differently than with digital immigrants (Prensky, 2005). Brain research conducted by Gary Small at UCLA showed that brain activity increased for students who were engaged in reviewing a website. Brain wave activity was greater when the students were reading a website than when these same students read from printed information (Herther, 2009).

Chapter Two also reviewed a basic history of the Internet from its origin as a resource to find information to its current interactive environment that encourages publishing a variety of documents. The concept of using the Internet as a classroom resource was illustrated in several articles about two current web-based resources, blogs and wikis. The use of blogs and wikis for students to examine current issues, offer opinions, intensify motivation, increase engagement, collaborate with peers, and post information was presented a reason that the Internet has become a vital instructional tool.

The remainder of the study will contain a thorough examination of the methodology in Chapter Three, a systematic assessment of the data results in Chapter Four, and a review of the conclusions and suggestions for future research in Chapter Five. The study will conclude with final comments from the researcher.

CHAPTER THREE: THE METHODOLOGY

Information changes at a rapid pace for today's students who live in a global and digital world. They use laptops, instant messaging, video games, and cell phones as part of their daily communication with friends, family, and educators. Given this rapid rate of change, the vast amount of information to be acquired and managed, and the influence on life in general, students need to obtain a different set of skills, outcomes, and supports to succeed in work and life in the 21st century (Metiri Group, 2003). These skills are referred to as 21st Century Skills and include speaking, listening, reading, writing, information processing, and problem solving skills; communication, technical, self direction, creativity, interpersonal, and team building skills (National Commission on Excellence in Education, 2003).

Beginning in the 2005-2006, the PDE sought to address the need for students to acquire 21st Century Skills with the implementation of an initiative, called Classrooms for the Future (CFF), for all high schools in the Commonwealth. This program provided technology equipment for high school classrooms, intensive training for teachers who agreed to participate in the CFF project, and CFF coaches who would assist teachers to change their classroom practice to include 21st century teaching and learning. The CFF coaches received rigorous training in: (1) mentoring classroom teachers; (2) understanding 21st Century Skills; and, (3) the need for changing teaching and learning pedagogy to meet the needs of the 21st century learner (Pennsylvania Department of Education, 2008). This rigorous training was provided to all CFF teachers through online courses, pull out workshops, after school workshops, and an off-site technology boot camp. The integration of blogs and wikis was presented as fundamental 21st century learning tools that should be incorporated into the CFF classroom.

The authors of Pennsylvania's CFF initiative focused on the acquisition of 21st Century Skills for students, and the inclusion of these skills for teaching and learning. They believed classroom resources should not be restricted to textbooks and other traditional materials. Instead the CFF authors sought to add to the traditional tools used by teachers by including technology to engage students, change instructional practice, and address 21st Century Skills. The CFF initiative recognized and embraced the need for high school reform, enabled teachers to use technology as an effective tool to educate students, and prepare them to enter and successfully compete in the ever-expanding high-tech global marketplace (Pennsylvania Department of Education, 2008). Prensky's (2001b) research supports this need to adequately prepare students for life beyond the classroom with the inclusion of 21st Century Skills. His research supports the premise that students not only need 21st Century Skills, but also are prepared to grasp new technological trends and subsequently utilize them to their fullest advantage.

The Pennsylvania State University (PSU) evaluation team assessed the progress made in achieving these goals at the conclusion of each school year. Dr. Kyle Peck and Robin Clausen are the co-chairs for the PSU evaluation team. Data were collected twice each school year, once in September and again in May using student and teacher surveys, and recording data from classroom observations. Data collected by the district CFF program manager was collected during classroom observations and recorded electrically using an application called the Teaching Performance Record (TPR). The University of Virginia in partnership with the Metiri Group developed the TPR application specifically for the CFF project. The TPR application consists of several modules that assess changes in teacher practice. Data from the TPR application was downloaded and reviewed by the PSU CFF grant evaluation team. The team published the results of their data analysis. A review of the results provided the impetus for this dissertation

study. The results did not include an examination of the use of blogs and wikis in the CFF classroom. As mentioned above, blogs and wikis were included in the professional development activities presented to both CFF teachers and coaches. These activities emphasized publishing student work and increasing 21st Century Skills through the use of the bogs and wikis. The purpose of this dissertation study was to examine the use of blogs and wikis in the CFF classroom, and their impact on the acquisition of 21st Century Skills as a result of their use (Pennsylvania Department of Education, 2008). The timeframe for the distribution and completion of the survey, focus group interviews, data collection, and analysis was nine months.

Research Design

A case study approach was the primary qualitative research method used for this study. Case study methodology has been used for many years with a variety of disciplines to examine real life situations (Glatthorn, 1998). Researcher Robert K. Yin defines the case study research method as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context" (Soy, 2006). Both quantitative and qualitative data collection tools were used to examine teachers' perceptions regarding the impact of blogs and wikis on the acquisition of 21st Century Skills by students in their CFF classroom. A web-based survey (Appendix A) was created using the online application Zoomerang™ and was used to collect quantitative data from CFF teachers at both high schools. Focus groups involving CFF teachers at both high schools were used to collect qualitative data. A copy of the focus group questions is included in Appendix B. The following section describes the background and experience of the participants who made up the sample population for the study, the qualifications of the researcher who conducted the study, and the procedures used to collect the data.

This study involved a purposeful and homogeneous sampling of participants, who were CFF teachers employed at two high schools located in Montgomery County, Pennsylvania. For this study the two high schools were designated as High School Q (HSQ) and High School Z (HSZ). The composition of the sample population, selected to complete the survey and participate in the focus group interviews, was the same at both high schools and consisted of high school teachers involved with the CFF program since its inception in the 2005-2006 school year. By definition of the CFF program, all teachers were highly qualified with certification in one of the four core content areas: language arts; mathematics; science; or, social studies. The sample population of CFF teachers had worked with students in grades 9 through 12 for a minimum of three years and was classified as a sample of convenience because all CFF teachers were employed at either HSQ or HSZ and were conveniently accessible to the researcher. The definition of a sample of convenience is a sample that consists of respondents who are conveniently available to participate. Bias is inherent to a sample population of convenience. This fact will need to be taken into consideration when the results of the survey are reviewed (Creswell, 2003).

The researcher currently works as a Technology Director for a Montgomery County school district and had worked in public education for 32 years at the time the data were collected. Twelve of those 32 years was spent as a classroom mathematics and computer science teacher at the high school level, and the remaining 20 years as a Technology Director. The researcher has been involved with the CFF program since its inception. She completed the CFF grant applications for two different school districts, assumed the role of project manager for the implementation of the grant in each of those two school districts, and both received and conducted CFF professional development.

Survey participants were invited to complete the online survey through an email invitation sent from the researcher to the participants. Email invitations to complete the Zoomerang™ survey were sent to the 30 HSQ teachers and the 19 HSZ teachers. Teachers were given the option of completing the survey either during the school day as part of their preparation time, or after the school day. A completion rate of 80% was anticipated.

Prior to the email invitation, the CFF teachers received an overview of the project during a faculty meeting. After the overview, teachers were given the opportunity to ask questions, and were asked to complete consent forms for both the web-based survey and the focus group. Participants were notified that they were in no way obligated to participate in this study, and that all responses to both the web-based survey and the focus group questions would be reviewed only by the researcher. Their names would not be used either to record the data, in the analysis of the data, or the publication of the results.

Nineteen of 26 CFF teachers at HSQ signed consent forms, and 30 of the 38 CFF teachers at HSZ signed consent forms. Each high school contained a larger total number of CFF teachers but only those who met the criteria of four years with the CFF program and three years of classroom teaching were asked to participate in the study. Thus 77% of the eligible sample participated.

Permission to conduct the study was obtained from the superintendent of each school district. The building principal for each high school was present for the overview session and had been advised about the details of the study before meeting with the teachers.

Three focus group sessions were conducted, one at HSQ and two at HSZ. All focus group participants had previously completed the web-based Zoomerang™ survey and had also signed the consent form for the focus group session. Each focus group was made up of teachers

from one of the four core curriculum areas; mathematics, language arts, social studies, or science. An invitation to participate in a focus group was extended to the CFF teachers during the faculty meeting that provided an overview of the study, and again through an email invitation to participate in May 2010. Teachers were given two weeks to complete the online survey. At the conclusion of the two weeks 19 teachers from HSQ and 30 teachers from HSZ had completed the survey. The survey was closed and teachers who had completed the survey were invited to participate in the focus group sessions. These sessions were held at the conclusion of the school day in the school auditorium. Each session lasted approximately 90 minutes. Fourteen CFF teachers attended the first focus group session at HSZ and 16 attended the second session. Nineteen CFF teachers participated in the focus group session at HSQ.

Originally the researcher planned to conduct individual focus group sessions for each content area; however size of the sample population prohibited this configuration. Separating teachers by content area would have created groups that were homogeneous in their curricular area and use of blogs and wikis. Focus group methodology calls for groups with homogeneous participants rather than a diverse population (Krueger and Casey, 2000). A homogeneous focus group population was preferred since a group composed of highly different characteristics may decrease the quality of the data. Individuals may tend to censor their responses in the presence of others who differ from them (Tellis, 1997). The focus groups used in this study were homogeneous in that all teachers met the criteria of four years of involvement with the CFF program, three years of teaching experience, and they were highly qualified by definition of the PDE.

The researcher moderated each focus group session. An assistant recorded the order of responses, managed the audio taping equipment, and took notes regarding the setup of the room,

responses from the participants, body language, and frequency of individual responses. The researcher worked from a list of questions written prior to the focus group session that were developed with the intent to solicit data pertinent to the research study questions.

The researcher welcomed focus group participants at the beginning of the session. The researcher then reviewed the purpose of the session, how the results would be analyzed and reported, and assured the participants their responses would remain confidential. During all focus group sessions only ID numbers were used. A card with an ID number was placed in front of each participant to allow all participants ease of interaction. Responses were noted using the ID numbers (Krueger, 2003).

The assistant was a retired educator with 37 years of experience and served as the assistant for the focus group sessions in the public school system. Her credentials included certifications as a classroom educator, principal, supervisor for curriculum and instruction, and superintendent's letter of eligibility. In addition she has completed graduate programs for three master's degrees, including one for curriculum and instruction, and has completed two doctoral programs, ABD.

Instrumentation

Quantitative data were collected using the web-based Zoomerang™ survey whose questions were modeled after the survey questions that are currently used with the CFF program, and were developed and validated by the Metiri Group in October 2006. Prior to data collection the survey was reviewed and tested by CFF teachers at a local school district. Teachers from each of the four content areas, mathematics, language arts, science, and social studies made up the cohort that piloted the survey. Fifteen teachers completed the survey and provided feedback about its readability, content, and clarity of directions and purpose. Their feedback was used to

modify the survey. Modifications to the survey instrument included clarification of the directions and purpose and changes to the wording in some of the questions. After these edits were made, eight CFF coaches from school districts located in either Bucks or Montgomery County reviewed the survey and provided feedback. Final edits were then completed. These final changes included clarification to the rating scale and one change to the introduction portion of the survey.

Focus group questions were designed from the primary and secondary questions for this study. A team of 12 CFF coaches from across the Commonwealth reviewed the focus group questions and provided feedback. Changes in the composition and format of the questions were made based on feedback from the 12 CFF coaches. Four additional CFF coaches conducted a final review of the focus group questions and did not recommend any additional changes. The questions were then finalized for use with the study.

Data Collection Procedures

Teachers were assigned random ID numbers by the researcher as part of this study. The random numbers for all teachers at HSQ began with the letter Q, and the random numbers for all teachers at HSZ began with the letter Z. These numbers were used as part of the survey and focus group sessions. Teachers were sent an invitation to complete the survey using the email addresses supplied by the school district. The ID numbers were paired with an email address to ensure that each teacher took the survey only one time. The survey and subsequent data were hosted on a secure server provided by Zoomerang™. Teachers logged into their district network, accessed the Internet, and used the survey link that was provided in the email message in order to complete the survey. Results from the surveys were downloaded from Zoomerang™ as an Excel

spreadsheet. The tapes from the focus group session were transcribed and prepared for analysis, which is reviewed in detail in Chapter Four. An overview of the analysis process is provided.

Data Analysis

Three software applications, Microsoft Excel, Statistical Package for the Social Sciences (SPSS), and Statistical Analysis Software (SAS) were used to analyze the quantitative data. Data were first examined using Microsoft Excel in order to describe the demographics of the sample population and to quantify the responses to the survey questions. Excel was also used to record the raw data in preparation for analysis with SPSS, which was used to look for a correlation between data sets. The SAS application was used to review the frequency distribution of the observed responses and to compare them with the expected frequency distribution. A Chi-Square analysis was then conducted.

Results from the focus group questions provided data for the qualitative portion of the study. Responses from each focus group session were transcribed, reviewed, and separated into content themes. These themes were then reviewed to determine if any sub-themes existed and were later associated with specific quotes from the focus group responses. A review of the themes, subthemes, and quotes was conducted to map them to specific research questions presented in this study.

After the quantitative and qualitative findings were each completed, they were cross referenced and triangulated to determine if each set of findings supported the other and to further align the findings with the individual study questions. As the data were collected, reviewed and interpreted, bias from the researcher and/or other participants in the study was identified. These biases are referred to as assumptions, limitations, and delimitations and are listed in the next section (Creswell, 2003).

Assumptions, Limitations, and Delimitations

In order to conduct this study and gather data, an assumption was made that the sample population would respond candidly to both the survey and focus group questions. Another assumption was that the data collected from sample population of CFF teachers would be biased. This assumption was a result of the sample population being classified as a sample of convenience that is defined as a population that is chosen for their convenient accessibility. Bias is inherent to this type of population and also to a qualitative study (Creswell, 2003).

This study was limited by the following variables: the teachers' skill level and knowledge of technology and 21st Century Skills, the teachers' access to technology, the teachers' efficacy with technology, the teachers' instructional practice, the teachers' willingness and ability to change their classroom pedagogy, the interventions and staff development that was offered, the quality of the staff development, and the number of years of teaching experience for each teacher. Another limitation was the teachers' bias in their responses to both the survey and the focus group questions. Their bias was a result of the vast amount of time and effort they had invested in the CFF program to complete the Embedded Learning Courses, annual assessments and surveys, and other professional development sessions. The study was delimited due to the researcher's choice of school districts selected to participate in the study and the criteria for all teachers to have five years of prior teaching experience.

Summary

A mixed methods approach was used to for this study. The methodology involved using a survey to collect quantitative data and focus groups to collect qualitative data. Both instruments were created to collect data in order to examine the perception of CFF teachers concerning the impact blogs and wikis regarding the acquisition of 21st Century Skills. Two

school districts, each with one high school for grades 9 through 12, participated in the study. CFF teachers who had been teachers for a minimum of three years prior to the implementation of the CFF project participated in the study. These teachers were certified to teach mathematics, language arts, science or social studies. There were 64 teachers eligible from the two high schools to participate in the study, but only 49 choose to participate.

Both instruments were created by the researcher for this study and were validated using CFF teachers and coaches prior to being used to collect data. The survey was administered using the online application Zoomerang™. Permission was secured from the superintendent and building principal to collect data at each of the high schools. Teachers signed consent forms prior to their participation and agreed to complete the survey and participate in one focus group session. Teacher names were not used in the collection of the data. Instead random ID's were assigned to each teacher and all responses were anonymous and confidential.

Data from the survey was grouped into categories based on the National Education Technology Standards for students in order to perform a Chi-Square analysis. The same categories were used to group the data for the responses to the survey questions about both blogs and wikis.

Two focus group sessions were conducted at High School Z and one at High School Q. Each focus group contained teachers from all four of the content areas. Focus group responses were transcribed and then reviewed to identify key words and phrases, which were later grouped into themes and sub-themes. Statements from teachers were also identified to support each of the themes and sub-themes.

In preparation for chapter four, the results from the Chi-Square analysis were compared to the focus group themes and sub-themes to determine if common results existed. The results

and analysis from both the survey and focus group sessions will be presented in Chapter Four. The results that were common to both data sets will also be presented in Chapter Four. Chapter Five will follow and will contain conclusions derived from the Chapter Four results. Suggestions for future research and final observations from the researcher will conclude Chapter Five.

CHAPTER FOUR: RESULTS FROM THE DATA COLLECTION

This study was conducted to evaluate the acquisition of 21st Century Skills as a result of using blogs and wikis in a CFF classroom. The CFF program was created by the PDE in 2006 and focused on students acquiring 21st Century Skills as a result of intensive professional development for CFF teachers and an infusion of technology into the classroom. The program has been evaluated each year by a team of researchers at PSU. Evaluations from PSU have focused on many facets of the CFF program, but have not included the impact of using blogs and wikis on the acquisition of 21st Century Skills. The use of blogs and wikis as instructional tools was included as part of the intensive professional development required for all CFF teachers (Pennsylvania Department of Education, 2008). This chapter presents the results of the data collection from an online survey created using Zoomerang™ and questions from three focus group sessions. Quantitative data were collected from the online survey and qualitative data were collected from the focus group sessions.

Two of the 22 high schools located in Montgomery County participated in the study. Teachers were asked to participate in this study if they had been part of the CFF program since it began in 2006 and had also completed three years of classroom teaching prior to their participation in the CFF initiative. Details regarding the teachers who participated, the data collection process, and the analysis of that data are included in this chapter.

Descriptive statistics gathered from survey questions one, two, and three are presented first to describe characteristics of the sample population. Information about the CFF technology, its availability and the frequency in which blogs and wikis were used with students, was collected in questions 4, 5, 6, and 10. This information is presented to validate that the teachers

were properly equipped with the necessary CFF resources, that it was available for their use and that the CFF teachers utilized blogs and wikis as instructional tools.

The findings from survey questions 7, 8, 11, and 12 describe the quantitative results concerning the use of blogs and wikis and their impact on the acquisition of 21st Century Skills by students. Finally, survey questions 6, 9, and 13 were open-ended questions and were used to collect comments from CFF teachers about the use of blogs and wikis. A summary of these comments is included.

Content themes are used to represent the data from the focus group sessions. The following descriptive statistics and content theme analysis answer the primary and subgroup research questions for this study. The questions for this study were:

1. Which 21st Century Skills do teachers perceive their students have acquired after using a blog?
    - To what degree and for what purpose are students using blogs?
    - What do teachers perceive is the impact on students' writing skills, such as content organization and focus, mechanics, and publishing as a result of using a blog?
    - What do teachers perceive is the impact on students' electronic and traditional communication?
    - What do teachers perceive is the impact on students' presentation skills?
2. Which 21st Century Skills do teachers perceive their students have acquired after using a wiki?
    - To what degree and for what purpose are students using wikis?

- What do teachers perceive is the impact on students' writing skills, such as content organization and focus, mechanics, and publishing, as a result of using a wiki?
- What do teachers perceive is the impact on students' electronic and traditional communication?
- What do teachers perceive is the impact on students' presentation skills?

Both quantitative and qualitative data were collected to address these questions. As previously mentioned, quantitative data findings are presented first, followed by the qualitative findings.

Review of Methodology

Two instruments were used for data collection, a web-based survey created using the online application Zoomerang™ (Appendix A) and focus group sessions (Appendix B). CFF teachers were required to complete both the online survey and participate in one focus group session in order to participate in this study. The survey was used to collect quantitative data from CFF teachers at two high schools, HSQ and HSZ. CFF teachers received an overview of the study at a faculty meeting where they also signed consent forms. Copies of the consent forms for the online survey and participation in a focus group are included in Appendices C and D. Teachers who signed the consent forms were given access to the online survey using email. They completed the survey either at the end of the school day or during their preparation time. A secure server using a unique login and password for each CFF teacher was used to host the survey and store the collected data. Teacher names were not used when the data were collected. Instead random identification (ID) numbers were assigned to each teacher.

CFF teachers completed the online survey prior to attending one of the focus group sessions. Each focus group session lasted between 60 and 90 minutes, and consisted of teachers

from all of the four content areas: mathematics; science; social studies; and, language arts. Placards with the ID numbers were provided to each teacher before the focus group session began. These placards were placed in front of the teacher and used as a means of identification as the data were collected. Since the numbers were assigned randomly and a record was not maintained to record the teacher's name and the ID number, the responses were anonymous. A list of the ID numbers is included in Appendix E. Combining the high school identification of HSQ or HSZ, content areas LA, MA, SC, and SS, and a consecutive number generated the ID numbers.

Findings from Survey Questions 1-5

Results from survey questions 1 and 2 provided information about the number of years CFF had taught prior to their participation in the CFF program and the core content area each teacher represented. There were 26 CFF teachers at HSQ who were eligible to participate in the study and 38 eligible CFF teachers at HSZ. Nineteen of the 26 (73%) CFF teachers at HSQ signed consent forms to participate in the survey and the focus group session. Question 1 collected information regarding the content area for each of the CFF teachers. The 19 teachers from HSQ consisted of 5 mathematics teachers, 3 science teachers, 4 social studies teachers, and 7 language arts teacher. At HSZ, 30 of the 38 (79%) eligible CFF teachers signed consent forms to participate in the survey. The group of 30 teachers from HSQ included 10 mathematics teachers, 4 science teachers, 5 social studies teachers, and 11 language arts teachers.

Survey Question 1: Number of Years Teaching Results

One of the criteria for teachers to participate in this study was that they had to have a minimum of three years classroom teaching prior to the staff of the CFF program in 2006. The three year criteria was determined based on research from Hoy (2008) regarding the expectations and challenges of teachers in their first three years in the classroom. During the first year teachers are involved in the induction process and are assigned a mentor. The mentor provides information about the school system, classroom management, and content specific information. Mentors continue to work with new teachers in the second and third years as the novice teachers continue to gain confidence in and out of the classroom. Hoy's study on teachers' efficacy during the first three years of teaching indicates that during this time teachers are establishing their teaching style and gaining confidence in their classroom management abilities. As a result, teachers who agreed to participate in this study and having also completed their first three years of teaching were able to focus on the CFF goals and expectations.

Figure 2 illustrates the number of classroom teaching years for the CFF teachers at HSQ. Twelve of the 19 (64%) HSQ CFF teachers had been teaching between 6 and 20 years; 2 of the 19 (11%) had been teaching 3 to 5 years; and 4 of the 19 (21%) had been teaching 21 to 30 years. Only one teacher, which was 5% of the sample, had been teaching for more than 30 years.

The data for HSZ is contained in Figure 3. Again the majority of teachers, 25 of 30 (83%) teachers had been teaching between 6 and 20 years. The remaining 5 teachers (17%) had been teaching between 21 and 30 years. The sample population for HSZ did not contain teachers in either the 3 to 5 years or the over 30 year's categories.

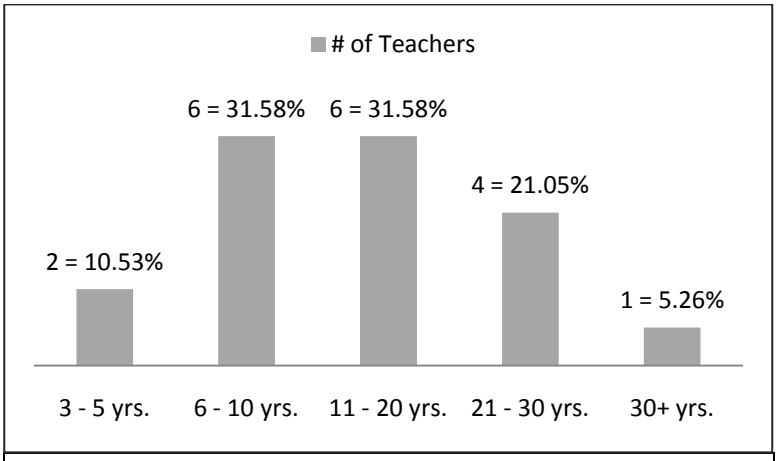

Figure 2. HSQ teachers per range of teaching years

Figure 2. HSQ teachers per range of teaching years.

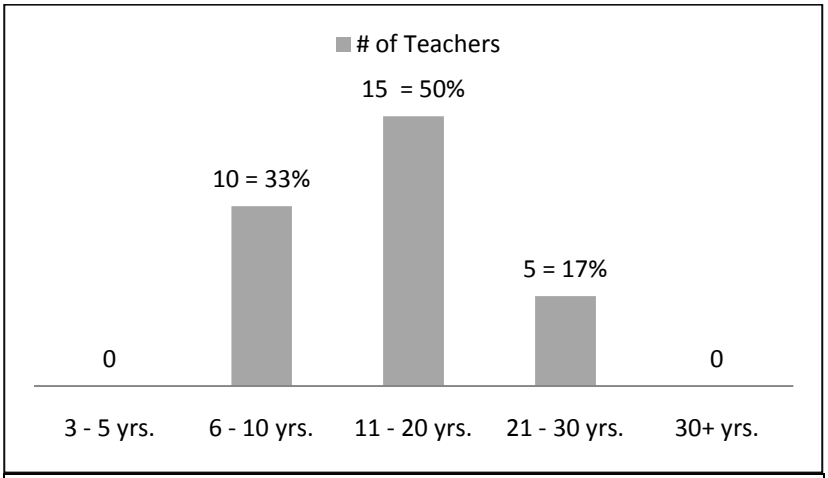

Figure 3. HSZ teachers per range of teaching years

Figure 3. HSZ teachers per range of teaching years.

Figure 4 shows that collectively 2 of the 49 (4%) CFF teachers had been teaching between 3 and 5 years, 37 of 49 (78%) CFF teachers had been teaching between 6 and 20 years,

and 9 of 49 (17%) CFF teachers had been teaching between 21 and 30 years. The remaining one teacher, or 2% of the total sample population, had been teaching for more than 30 years.

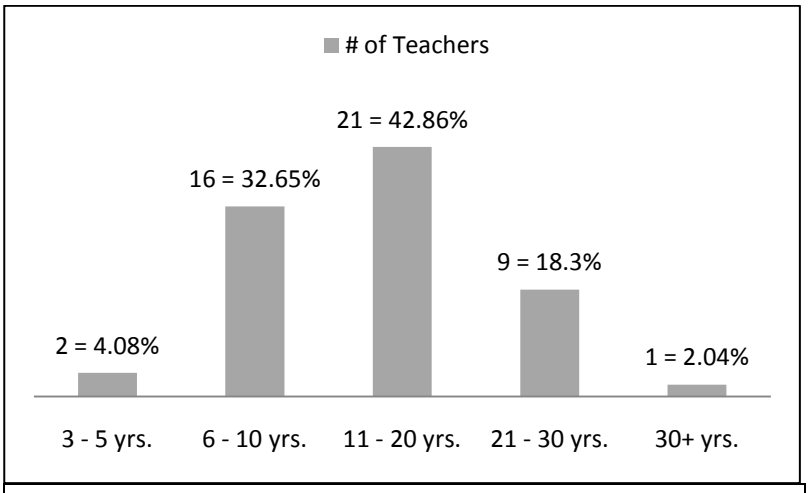

Figure 4. HSQ + HSZ teachers per range of teaching years

Figure 4. HSQ + HSZ teachers per range of teaching years.

Survey Question 2: Curriculum Content Areas

Collectively between both high schools there were 64 eligible CFF teachers, of which 49 (77%) signed consent forms to participate in the study. Separated by content area there were 15 mathematics teachers, 7 science teachers, 9 social studies teachers, and 18 language arts teachers. Information regarding teacher efficacy with 21st Century Skills and the total number of teaching years per CFF teacher was also collected in the online survey.

Efficacy with Using Technology as an Instructional Tool

Prensky (2001a) defines the digital native as a student who has grown up in, or is growing up in, the digital age. This type of student assimilates digital tools and digital methods for communication easily. Teachers newer to the profession may have been exposed to technology resources in either high school or college and therefore might consider their comfort

level with using technology to be the same as the digital native. Many teachers, however, have not grown up with technology. Instead they have learned to use digital tools later in life and are working to learn the language associated with these tools. These teachers consider their comfort level when using technology to more closely aligned with the definition for the digital immigrant. Digital immigrants have varying degrees of acceptance and readiness to embrace the use of digital tools in their classrooms. Some digital immigrants embrace all tools enthusiastically and their students benefit from the integration of digital tools with teaching and learning. Other digital immigrants learn only what is necessary, and their classrooms reflect their resistance to change. Those teachers whose efficacy aligns with the digital native may parallel more closely the efficacy of their students.

Survey Question 4: Digital Native or Digital Immigrant

The level of efficacy with 21st Century Skills was separated in two categories, digital natives or digital immigrants. Prensky (2001a) defines the digital native as a student who has grown up in, or is growing up in, the digital age. This type of student assimilates digital tools and digital methods for communication easily. In contrast digital immigrants have varying degrees of acceptance and readiness to embrace the use of digital tools. Some digital immigrants embrace all digital tools enthusiastically while others resist change learning only what is necessary. Teachers were asked to self report whether they considered themselves to be a digital immigrant or a digital native.

Data collected from CFF teachers at HSQ indicated that more of the CFF teachers consider themselves to be digital immigrants than digital natives. Figure 5 includes a chart that illustrates the data collected from HSQ. Four of the 19 (21%) HSQ teachers self identified as digital natives while the remaining 15 of the 19 (79%) HSQ teachers self identified as digital

immigrants. The chart also reveals that all of the CFF teachers for the content areas of science and social studies consider themselves to be digital immigrants.

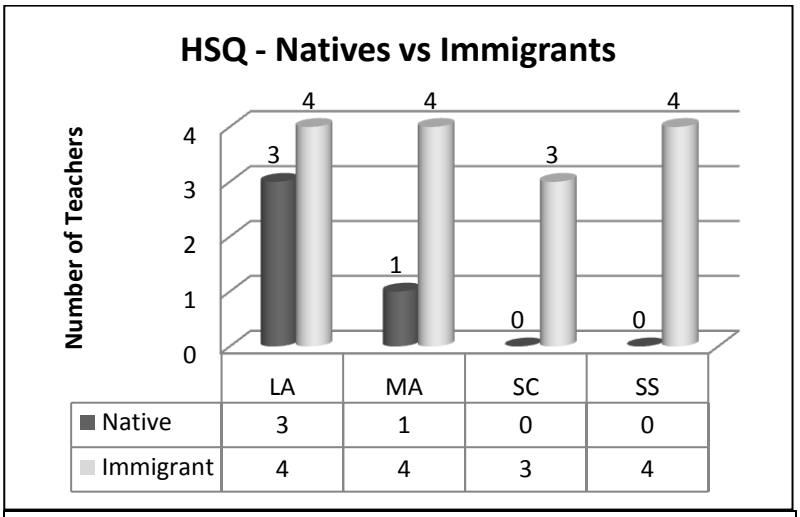

Figure 5. HSQ teachers self report of efficacy

Figure 5. HSQ teachers' self report of efficacy.

Data for the HSZ CFF teachers indicate more teachers considered themselves to be digital natives than digital immigrants. Figure 6 shows that 18 of the 30 (60%) HSZ CFF teachers self identified as digital natives, and the remaining 12 of the 30 (40%) identified themselves as digital immigrants. The results from HSZ indicated that a majority of the teachers reported themselves as digital natives. These results differed from HSQ, which had a majority of teachers who categorized themselves as digital immigrants. Figure 6 also shows that all four content areas have teachers in each of the categories, digital native and digital immigrant.

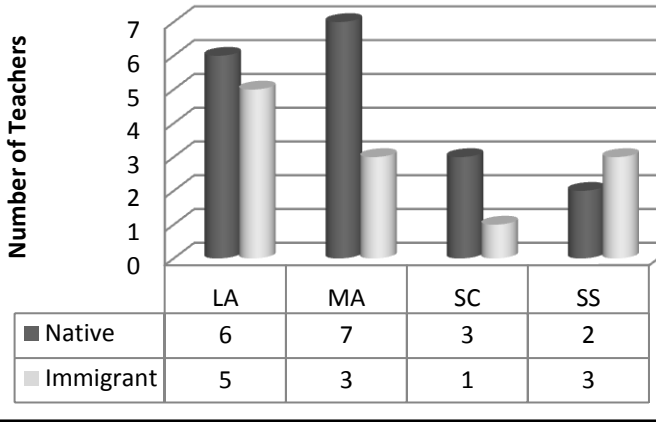

Figure 6. HSZ teachers' self report of efficacy

Figure 6. HSZ teachers' self report of efficacy.

The combined data from both high schools, HSQ and HSZ, show that there is a more constant distribution of digital natives and digital immigrants across the total sample population. The total number of CFF teachers involved in the study was 49. Figure 7 indicates 22 of the 49 (45%) HSQ and HSZ teachers reported themselves as digital natives. The remaining 27 (55%) of the CFF teachers from both high schools considered themselves digital immigrants. Figure 7 also lists the content areas of the teachers and shows a minimal difference in the number of digital immigrants and natives for language arts, mathematics, and science. There were however more Social Studies teachers who self reported as digital immigrants.

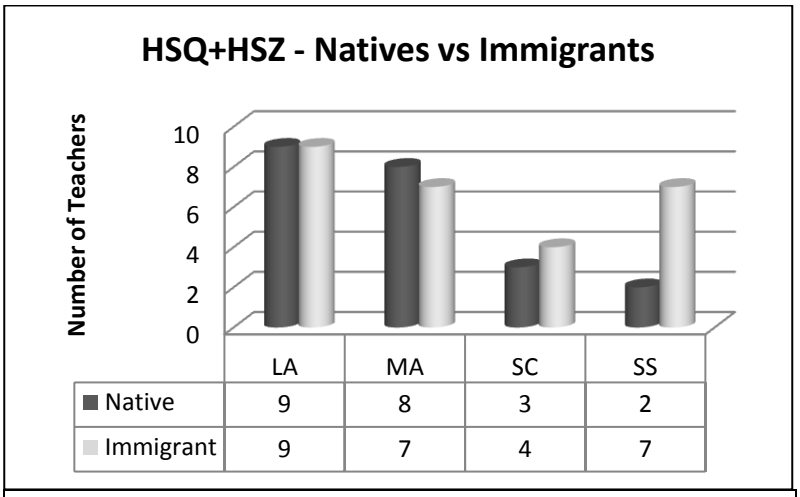

Figure 7. HSQ + HSZ teachers self report of efficacy

Figure 7. HSQ + HSZ teachers' self report of efficacy.

Correlation between the Number of Years Teaching and Efficacy

Data for both efficacy and years of teaching were entered into SPSS version 9.0 in order to determine if a correlation existed between the two variables using a 2-tailed Pearson Correlation. A point-biserial coefficient was used for the correlation. The point- biserial coefficient is used when one variable is a discrete dichotomy (Field, 2009). In this study efficacy was the variable that was a discrete dichotomy since there were two distinct and separate choices, digital immigrant or digital native.

The calculations from the SPSS analysis are included in Table 3 where N indicates the sample size of 49 CFF teachers from the two high schools. The 2-tailed correlation value (*r)* was equal to .027. The value -.338 indicates a negative correlation between the number of teaching years and efficacy. This means that as the number of teaching years increased, efficacy favored the digital immigrant category.

Table 3

Correlation between the Number of Teaching Years and Efficacy

		Correlation	
		Years	Efficacy 1
Years	Pearson Correlation	1	-.338
	Sig. (2-tailed)		.027
	N	49	49
Efficacy 1	Pearson Correlation	-.338	1
	Sig. (2-tailed)	.027	
	N	49	49

Note. Correlation is significant at p = 0.05.

Survey Questions 4 and 5: Utilization of Available Technology Resources

The CFF grant provided financial resources to provide each participating classroom with an interactive white board and projector, a teacher laptop, wireless access point, a cart of 25 student laptops, 1 printer, 1 digital still camera, and 1 digital video camera. Question 4 (Q4) confirmed that the technology resources were available for each of the CFF teachers who participated in the study. The results from Q4 indicated that each of the CFF classrooms from both high schools HSQ and HSZ were outfitted with the equipment designated by the grant.

Survey question 5 (Q5) collected data about the availability of the technology equipment. During the first year of the grant, funding was provided to outfit individual classrooms with all of the designated equipment. In the second and third years of the grant,

funding was reduced and the state level. Each classroom still received an interactive white board, projector, and teacher laptop, while each cart of laptops was now shared by up to four adjacent classrooms. The results from Q5 indicated that each classroom was outfitted with the above items as per the grant and that some of the equipment was available at any time for classroom use, while some of the laptop carts needed to be shared and therefore were not available for every classroom every day.

Results indicated that 26 of the 49 (53%) CFF teachers were able to use all of the technology every day, while 16 of the 49 (33%) of the CFF teachers had use of the technology 3 to 4 days each week, and the remaining 7 (14%) CFF teachers had access to the technology 1 to 2 days each week. While not all CFF teachers had access to all of the CFF technology resources every day, the technology was available regularly each week. This was the intention of the CFF initiative and confirms that the CFF teachers had access to the technology to use with their students on a regular basis.

Survey Questions 6 and 10: The Frequency of Using a Blog or a Wiki

HSQ and HSZ CFF teachers were asked to report in question 6 (Q6) the number of times they had used a blog as an instructional tool with their students. Thirty-two of the 49 (65%) CFF teachers who participated in the study used a blog with their students. Two of the 32 (6%) used a blog 1 to 3 times, 7 of the 32 (22%) used a blog 3 to 5 times with their students, and the remaining 23 CFF teachers (72%) used a blog more than 5 times with their students.

Question 10 (Q10) asked teachers to report the same type of information about the number of times they used a wiki with their students. All 49 CFF teachers used a wiki with their students. Twelve of the 49 (24%) CFF teachers used a wiki with their students 3 to 5 times. The

remaining 37 CFF teachers (76%) used a wiki with their students more than 5 times during the school year as an instructional tool.

Introduction to the Chi-Square Analysis

The Pearson Chi-square test was used to analyze the data collected from questions 7, 8, 11, and 12 of the survey. Questions 7 (Q7) and 11(Q11) collected information from the CFF teachers about students' outcomes to using a blog (Q7) or a wiki (Q11) as an instructional tool. Question 8 (Q8) referenced the 21st Century Skills acquired after using a blog while question 12 (Q12) referenced the 21st Century Skills acquired after using a wiki. The Chi-square test is one of the most popular statistics tests because it is easy to calculate and interpret. There are two kinds of Chi-square tests. The first is a one-way analysis, and the second a two-way analysis. The one-way analysis is frequently used to report nonparametric tests in journal articles. The one-way analysis is used in educational research when the number of responses falls into two or more categories. This procedure is also called a goodness-of-fit statistic. Goodness-of-fit refers to whether a significant difference exists between an observed number and an expected number of responses, people or objects falling in each category designated by the researcher. The expected number is what the researcher expects by chance or according to some null hypothesis (Field, 2009).

The purpose of both is to determine whether the observed frequencies or counts are markedly different from the expected frequencies we would expect from chance. This definition is defined mathematically as $\chi^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$ where: O_i = an observed frequency for the i^{th} bin and E_i = an expected frequency for the i^{th} bin (Field, 2009).

In order to interpret the Chi-square test the values for the degree of freedom (*df*), the probability level (*p)*, and the Chi-square result must be compared. If the Chi-square value is

greater than the critical value than the null hypothesis must be rejected. Consequently, if the Chi-square value is smaller than the critical value then the null hypothesis should not be rejected. Table 4 shows the *df* value and corresponding probability level used to determine the critical value.

Table 4

Matrix of Degrees of Freedom (d) and Probability Level (p)

df	0.5	0.10	0.05	0.02	0.01	0.001
1	0.455	2.706	3.841	5.412	6.635	10.827
2	1.386	4.605	5.991	7.824	9.210	13.815
3	2.366	6.251	7.815	9.837	11.345	16.268
4	3.357	7.779	9.488	11.668	13.277	18.465

Q7 and Q11 listed seven outcomes that students may have demonstrated when using a blog or a wiki: level of engagement; interest in the topic; grammar; focused writing; spelling; and, a well-written writing sample. There were nineteen 21st Century Skills listed in both Q8 and Q12 that may have been acquired as a result of using a blog or a wiki: writing was focused; good writing technique; grammar; spelling; global awareness; social and cultural awareness; personal responsibility; cultural literacy; interpersonal skills; teaming; collaboration; technical literacy; information literacy; self direction; creativity and curiosity; higher order thinking; sound reasoning; personal responsibility; and, the ability to produce high quality results.

In order to use a Chi-square test the expected frequency of any cell needed to be greater than 50. To ensure frequencies greater than 50 the 7 outcomes in Q7 and Q11, and the 19 21st

Century Skills from Q8 and Q12 were combined into groups based on the International Society for Technology Integration (ISTE) National Education Technology Standards (NETS) for students. The same groups of outcomes were used in the Chi-square analysis for Q7 and Q11, and for Q8 and Q12. The results of the Chi-square test and the description of the groups for each question are provided in the next four sections.

Survey Question 7: Students' Outcomes after Using Blogs

CFF teachers were presented with seven different outcomes in Q7 and asked to rate each outcome in one of the four ranges for the percentage of time they were exhibited. The ranges were 0% to 25%, 26% to 50%, 51% to 75%, and 76% to 100%. Outcomes were divided into two groups, 7.1 Engagement and 8.2 Literacy. Group 7.1 contained outcomes relative to student engagement and student interest in the writing topic. This group had a sample size of 64, which exceeded the minimum value of 50 needed for the Chi-square analysis. The Chi-square analysis calculated value for Group 7.1 was 50.75 which was larger than the critical value 16.27 for when $df = 3$ and $p = .001$. This means that the outcomes, student engagement, and interest in the topic were significant. The results from the collected data showed that 57.81% of the results were in the 51%-75% range and 32.81% in the 76%-100% range. These results are included in Table 5.

Table 5

Group 7.1 Engagement: Engaged in Topic, Interested in Topic

Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0% - 25%	1.00	1.56	1.00	1.56
26% - 50%	5.00	7.81	6.00	9.38
51% - 75%	37.00	57.81	43.00	67.19
76% - 100%	21.00	32.81	64.00	100.00

	0% - 25%	26% - 50%	51% - 75%	76% - 100%
Expected	16.00	16.00	16.00	16.00
Observed	1.00	5.00	37.00	21.00
Difference	-15.00	-11.00	21.00	5.00

Note. N = 64, *df* = 2, p <.001, Chi-square = 50.75.

Group 7.2 contained outcomes pertaining to literacy, grammar, spelling, focused writing, and good writing technique. The sample size for this group was 160. The Chi-square value calculated to 19.40, which was greater than the critical value of 16.27. The middle two ranges were significant for this group of outcomes with 41.25% of the sample selecting the 26%-50% range and 35% of the sample size selecting 51%-76%. Another 6.25% of the CFF teachers self reported their students achieved these outcomes in the 76% - 100% of the time. Collectively 82.50% of the CFF teachers reported their students achieved these outcomes between 25% and 100% of the time. This information is included in Table 6.

Table 6

Group 7.2 Literacy: Grammar, Spelling, Comprehension, Focused Writing, Well Written

Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0% - 25%	28.00	17.50	28.00	17.50
26% - 50%	66.00	41.25	94.00	58.75
51% - 75%	56.00	35.00	150.00	93.75
76% - 100%	10.00	6.25	160.00	100.00

	0% - 25%	26% - 50%	51% - 75%	76% - 100%
Expected	40.00	40.00	40.00	40.00
Observed	28.00	66.00	56.00	10.00
Difference	-12.00	26.00	16.00	-30.00

Note. N = 160, *df* = 2, p <.001, Chi-square = 49.40.

The results from Q7 indicate that students significantly achieved the outcomes for the 7.2 literacy group, and that they had begun to achieve the outcomes for the second group after working with a blog. The literacy group included the outcomes of grammar, focused writing, spelling, and a document that was well written. Because these individual outcomes were combined into a literacy group in order to meet the criteria to use a Chi-square analysis, it cannot be determined if each of the individual outcomes were significantly realized, but rather as a group there was a significant increase in the 25%-50% and 51%-75% categories.

Survey Question 11: Students' Outcomes after Using Wikis

Q11 referenced the same outcomes that were listed in Q7, however for Q11 wikis were used instead of blogs. CFF teachers were presented with seven different outcomes in Q11 and asked to rate each outcome in one of the four ranges for the percentage of time they were exhibited. The ranges were 0% - 25%, 26% - 50%, 51% - 75%, and 76% - 100%. Outcomes

were divided into two groups, 11.1 Engagement and 11.2 Literacy. Group 11.1 had a sample size of 80, which exceeded the minimum value needed for the Chi-square analysis. The Chi-square analysis calculated value was 37.30 which was larger than the critical value 16.27 for when *df* = 3 and p = .001. This means that the outcomes, student engagement and interest in the topic were significant. The results from the collected data showed that 52.50% of the results were in the 76%-100% range.

Table 7

Group 11.1 Engagement: Engaged in Topic, Interest in Topic

Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0% - 25%	5.00	6.25	5.00	6.26
26% - 50%	14.00	17.50	19.00	23.75
51% - 75%	19.00	23.75	38.00	47.50
76% - 100%	42.00	52.50	80.00	100.00

	0% - 25%	26% - 50%	51% - 75%	76% - 100%
Expected	20.00	20.00	20.00	20.00
Observed	5.00	14.00	19.00	42.00
Difference	-15.00	-6.00	-1.00	22.00

Note. N = 90, *df* = 2, p <.001, Chi-square = 37.30.

Group 11.2 contained outcomes pertaining to literacy, grammar, spelling, focused writing, and good writing technique. The sample size for this group was 198 and the Chi-square value calculated to 41.80 which was greater than the critical value of 16.27. The upper two ranges were significant for this group and revealed that 38.89% of the sample selected the 51%-75% range and 30.30% of the sample size selected 76%-100%. Teachers reported that more than half of the time their students made progress with the outcomes in this group. The result of

combining the two ranges was 69.19% of the teachers reported that their students had acquired the outcomes for group 11. 2.

Table 8

Group 11.2 Literacy: Grammar, Spelling, Comprehension, Focused Writing, Well Written

Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0% - 25%	15.00	7.58	15.00	7.58
26% - 50%	46.00	23.23	61.00	30.81
51% - 75%	77.00	38.89	138.00	69.70
76% - 100%	60.00	30.30	198.00	100.00

	0% - 25%	26% - 50%	51% - 75%	76% - 100%
Expected	49.50	49.50	49.50	49.50
Observed	15.00	46.00	77.00	60.00
Difference	-34.50	-3.50	27.50	10.50

Note. N = 198, *df* = 2, p <.001, Chi-square = 41.80.

Survey Question 8: Students' Acquisition of 21st Century Skills Using Blogs

The nineteen 21st Century Skills were categorized into four groups based on the ISTE standards for students. Microsoft Excel was used first to analyze the data. The initial analysis using MS Excel provided results that appeared to be significant. The Chi-square analysis was used to statistically determine if there was a significant result from the collected data. As with Q7 and Q11, groups of data were used instead of analyzing individual data sets for each of the 21st Century Skills. This was necessary to achieve the criteria that a minimum of 50 instances is needed for each cell in order to use the Chi-square test.

Group 8.1: Basic Literacy

Group 8.1 contained skills identified as the Basic Literacy Skills (International Society for Technology in Education, 2007) acquired after using blogs. Question 8 (Q8) provided three options for the teachers to select, "Not at All," "Somewhat," and "Significantly." A comparison of the expected and observed frequency for each option shows a lesser number of observed than expected outcomes for the "Not at All" and "Significantly" options. The "Somewhat" option however, indicated a result of 28.8 more observed than expected outcomes. The Chi-square test indicates that the 21st Century Skills included for this group were somewhat acquired after using a blog.

Table 9 for Group 8.1 has a sub-sample size or *n* value of 128, which results in an expected value of 42.67. It should be noted that not all of the CFF teachers who completed the survey responded to every question on the survey, which accounts for the variance in sub-sample size. The Chi-square test produced a Chi-square value of 32.45 using a *df* of 2 and *p* value of .001. Using the matrix in Table 4 the critical value was 13.82. Because the Chi-square value of 32.45 was greater than the critical value of 13.82, the test is interpreted that there are factors other than chance involved in this test and the number of responses for the "Somewhat" category is significant for acquiring 21st Century Skills using a blog. Teachers were asked to select the "Somewhat" category if they had begun to see changes in specific 21st Century Skills that were attributed to the use of blogs. The results from this question indicate that teachers had begun to see changes in grammar, spelling, writing technique, and the focus of their students writing.

Table 9

Chi-square Calculations for Group 8.1 Basic Literacy

Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	38.00	29.69	38.00	29.69
Somewhat	71.00	55.47	109.00	85.16
Significantly	19.00	14.84	128.00	100.00

	None	Somewhat	Significantly
Expected	42.67	42.67	42.67
Observed	38.00	71.00	19.00
Difference	19.00	28.33	-23.67

Note. N = 128, *df* = 2, p <.001, Chi-square = 32.45.

Group 8.2: Digital Citizenship Skills

The 21st Century Skills global awareness, social and cultural awareness, responsibility, and cultural literacy were combined into Group 8.2 Digital Citizenship (International Society for Technology in Education, 2007). The sample size or n value for this group of skills was 96 and the expected value was 32.00. Table 9 provides the calculations for group 8.2 and shows *p* = .001, *df* = 2, a critical value of 13.82 and a Chi-square value of 45.81. Since the Chi-square value is greater than the critical value there is a significant result for the "Somewhat" option for this group of 21st Century Skills, meaning that students had begun to show changes in skills that were attributed to using blogs. Table 10 provides the data used in the Chi-square analysis.

Table 10

Chi-square Calculation for Group 8.2 Digital Citizenship

Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	13.00	13.54	13.00	13.54
Somewhat	63.00	65.63	76.00	79.17
Significantly	20.00	20.83	96.00	100.00

	None	Somewhat	Significantly
Expected	32.00	32.00	32.00
Observed	13.00	63.00	20.00
Difference	-19.00	31.00	-12.00

Note. N = 96, *df* = 2, p <.001, Chi-square = 45.81.

Group 8.3: Communication and Collaboration Skills

Interpersonal skills, teaming and collaboration were assigned to Group 8.3 Communication and Collaboration (International Society for Technology in Education, 2007) and the Chi-square calculations are included in Table 10. The sub-sample size for this group was 94 which resulted in an expected value for each option of 31.33. The *df* value was 2 and the *p* value was .001. The Chi-square value was 26.32 and was greater than the critical value of 13.82. For Group 8.3 the critical value was associated with the "Significantly" option, which shows a change in the acquisition of 21st Century Skills after using blogs that was significant. Teachers were asked to select the "Significantly" category if they had seen continuous and numerous changes in 21st Century Skill for their students after using a blog. The results from this question

are provided in Table 11 and, indicate that students had exhibited continuous and numerous changes in collaboration, teaming, and interpersonal skills.

Table 11

Chi-square Calculations for Group 8.3 Communication and Collaboration

Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	8.00	8.51	8.00	8.51
Somewhat	41.00	43.62	49.00	52.13
Significantly	45.00	47.87	94.00	100.00

	None	Somewhat	Significantly
Expected	31.13	31.13	31.13
Observed	8.00	41.00	45.00
Difference	-23.33	9.67	13.67

Note. N = 94, *df* = 2, p <.001, Chi-square = 26.32.

Group 8.4: Technology and Information Literacy Skills

Group 8.4 was labeled Technology and Information Literacy and contained the 21st Century Skills, technical literacy and information literacy skills. For this group n = 64 which yielded an expected value of 21.33. The critical value, 13.82, was associated with the "Significantly" option for this group and since the Chi-square value was greater than the critical value, again there was a significant change in the acquisition of the 21st Century Skills in this group for the Significantly" option. Table 12 contains the calculations for Group 8.4. Teachers were asked to select the "Significantly" category if they had seen continuous and numerous changes in 21st Century Skill for their students after using a blog. Therefore the results from this

question indicate that students had exhibited continuous and numerous changes in technical literacy and information literacy.

Table 12

Chi-square Calculations for Group 8.4 Technology and Information Literacy

Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	4.00	6.25	4.00	6.26
Somewhat	22.00	34.38	26.00	40.63
Significantly	38.00	59.38	64.00	100.00

	None	Somewhat	Significantly
Expected	21.33	21.33	21.33
Observed	4.00	22.00	38.00
Difference	-17.33	0.67	16.67

Note. N = 64, *df* = 2, p <.001, Chi-square = 27.13.

Group 8.5: Creativity and Innovation Skills

The last group for Q8 was labeled 8.5 Creativity and Innovation (International Society for Technology in Education, 2007) and contained the skills: Self Direction; Higher Order Thinking; Creativity; and, Curiosity. The Chi-square calculations are included in Table 13. The sub-sample size for this group was 224 resulting in an expected value of 74.67. As with the other groups, p = .001, *df* =2, and the critical value was 13.82. The Chi-square value for this group was 79.62, which was larger than the critical value therefore statistically confirming a significant finding for the "Somewhat" option after using blogs.

Table 13

Chi-square Calculations for Group 8.5 Creativity and Innovation

Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	21.00	9.38	21.00	9.38
Somewhat	130.00	58.04	151.00	67.41
Significantly	73.00	32.59	224.00	100.00

	None	Somewhat	Significantly
Expected	74.67	74.67	74.67
Observed	21.00	120.00	73.00
Difference	-53.67	55.33	-1.67

Note. N = 224, *df* = 2, p <.001, Chi-square = 79.62.

To summarize the results from Question 8, the Chi-square analysis identified a significant finding for one of the options in each group. The options included in question 8 of the online survey were: "None at all;" "Somewhat;" and, "Significantly." These options pertain to the teachers' perceptions of their students' acquisition of 21st Century Skills after using a blog. CFF teachers were asked to select one option for each of the 19 21st Century Skills. The skills were combined into groups to ensure an expected frequency value greater than 50 in order to calculate a Chi-square analysis for each of the groups. ISTE standards for students were used to determine how the 19 21st Century Skills were combined into the groups used with Q8.

Table 14 provides a summary of the significant findings for each of the Q8 groups. The significant findings for groups 8.1, 8.2, and 8.5 fell into the "Somewhat" category. The "Somewhat" category was defined to mean that teachers had begun to observe changes in student

work that could attributed to the use of blogs. The findings for the remaining two groups, 8.3 and 8.4, fell in to the "Significantly" category. Directions contained on the survey asked teachers to select the "Significantly" category if they had seen continuous and numerous changes in student work that could be attributed to the use of blogs.

Table 14

Summary of Question 8 Results

Group	Significant Option
8.1 Basic Literacy	Somewhat
8.2 Digital Citizenship	Somewhat
8.3 Communication and Collaboration	Significantly
8.4 Technology and Information Literacy	Significantly
8.5 Creativity and Innovation	Somewhat

Survey Question 12: Students' Acquisition of 21st Century Skills Using a Wiki

The sample population (N) continued to be same for the responses to question 12 (Q12). As was the case with Q8, Q12 provided CFF teachers with 19 21st Century Skills to examine and then select the option that best matched their perception of the degree that the students acquired these skills after using a wiki. In addition, the same groups were used to combine skills in order to meet the expected frequency requirement for the Chi-square test.

Group 12.1: Basic Literacy

Group 12.1 Basic Literacy Skills (International Society for Technology in Education, 2007) included skills for grammar, spelling, focused writing, and writing technique. Table 15 contains the results of the Chi-square test for this group. A comparison of the expected and observed frequency for each option shows a lesser number of observed than expected outcomes for the "Not at All" and "Significantly" options. The "Somewhat" option however indicated a

result of 23.67 more observed than expected outcomes. The Chi-square test indicates that the 21st Century Skills included for this group were somewhat acquired after using a wiki.

Table 15

Chi-square Calculations for Group 12.1 Basic Literacy

Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None				
Somewhat				
Significantly				

	None	Somewhat	Significantly
Expected			
Observed			
Difference			

Note. N = 253.33, *df* = 2, p <.001, Chi-square = 15.99.

Table 15 for Group 12.1 has a sub-sample size or *n* value of 160, which results in an expected value of 53.33. The critical value calculated from the observed and expected values was 13.82. The Chi-square test used a *p* value of .001 and a df value of 2. The calculated Chi-square value was 15.99. Because the Chi-square value of 15.99 was greater than the critical value of 13.82, the test is interpreted that there are factors other than chance involved in this test and the number of responses for the "Somewhat" category is significant for acquiring 21st Century Skills using a wiki. Teachers were asked to select the "Somewhat" category if they begun to see changes in their students' basic literacy skills if they had begun to see changes that were attributed to using a wiki.

Group 12.2: Digital Citizenship Skills

Responsibility and Cultural Literacy was labeled Digital Citizenship (International Society for Technology in Education, 2007). The sub-sample size or n value was 120, which resulted in an expected value of 40.00. Table 16 provides the calculations for group 12.2 using a $p = .001$ and $df = 2$. The Chi-square calculation was 10.55 and is greater than the critical value of 9.21. Since the Chi-square value is greater than the critical value there is a significant result for the "Somewhat" option for this group of 21st Century Skills. Survey directions directed teachers to select the "Somewhat" category if they had begun to see changes in students' skills. Results from this question are listed in Table 16 and indicate that students had begun to demonstrate changes in responsibility, social and cultural literacy, and global awareness.

Table 16

Chi-square Calculations for Group 12.2 Digital Citizenship

Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	26.00	21.67	26.00	21.67
Somewhat	39.00	32.50	65.00	54.17
Significantly	55.00	45.83	120.00	100.00

	None	Somewhat	Significantly
Expected	40.00	40.00	40.00
Observed	26.00	39.00	55.00
Difference	-14.00	-1.00	15.00

Note. N = 120, $df = 2$, $p < .001$, Chi-square = 10.55.

Group 12.3: Communication and Collaboration Skills

Interpersonal Skills, Teaming and Collaboration were assigned to Group 12.3 Communication and Collaboration (International Society for Technology in Education, 2007) and the Chi-square calculations are included in Table 17. The sub-sample size for this group was 96, which resulted in an expected value for each option of 32.00. The *df* value was 2 and the *p* value was .001. The Chi-square value was 29.50 and was greater than the critical value of 13.82. For Group12.3 the critical value was associated with the "Significantly" option, which shows a change in the acquisition of 21st Century Skills by students after using wikis that was significant. Teachers were asked to select the "Significantly" category if their students demonstrated continuous and numerous changes in 21st Century Skills. Results from this survey question indicate that students showed continuous and numerous changes in communication, teaming, and collaboration skills.

Table 17

Chi-square Calculations for Group 12.3 Communication and Collaboration

Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	8.00	8.33	8.00	8.33
Somewhat	38.00	39.58	46.00	47.92
Significantly	50.00	52.08	96.00	100.00

	None	Somewhat	Significantly
Expected	32.00	32.00	32.00
Observed	8.00	38.00	50.00
Difference	-24.00	6.00	18.00

Note. N = 96, *df* = 2, p <.001, Chi-square = 29.5.

Group 12.4: Technology and Information Literacy Skills

Group 12.4 was labeled Technology and Information Literacy and contained Technical Literacy and Information Literacy skills. For this group n = 80 which yielded an expected value of 26.67. Since the Chi-square value of 67.33 was greater than the critical value 13.82, again there was a significant change in the acquisition of the 21st Century Skills by the students after using wikis in this group for the "Significantly" option. Table 18 contains the calculations for Group 12.4. Teachers were directed to select the "Significantly" option if their students had shown growth in the 21st Century Skills. Results for this survey question indicate that students demonstrated continuous and numerous changes in their technology and literacy skills.

Table 18

Chi-square Calculations for Group 12.4 Technology and Information Literacy

Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	6.00	7.50	6.00	7.50
Somewhat	13.00	16.25	9.00	23.75
Significantly	61.00	76.25	80.00	100.00

	None	Somewhat	Significantly
Expected	26.67	26.67	26.67
Observed	6.00	13.00	61.00
Difference	-20.67	-13.67	34.33

Note. $df = 2$, $p < .001$, Chi-square = 67.33.

Group 12.5: Creativity and Innovation Skills

The last group for Q12 was labeled 12.5 Creativity and Innovation (International Society for Technology in Education, 2007) and contained the skills: Self Direction; Higher Order Thinking; Creativity; and, Curiosity. The Chi-square calculations are included in Table 19. The sub-sample size for this group was 204 resulting in an expected value of 68.00. The calculation used p = .001, df = 2, and a critical value = 13.82. The Chi-square value was 58.79, which was larger than the critical value and indicated a significant finding for the "Somewhat" option after using wikis. Results from this survey question indicate teachers perceived their students had begun to demonstrate changes in creativity, self-direction, and curiosity. Students had also begun to demonstrate changes in higher-order thinking, sound reasoning, personal responsibility, and they produced high quality projects.

Table 19

Chi-square Calculations for Group 12.5 Creativity and Innovation

Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
None	21.00	10.29	21.00	10.29
Somewhat	110.00	53.92	131.00	64.22
Significantly	73.00	35.78	204.00	100.00

	None	Somewhat	Significantly
Expected	68.00	68.00	68.00
Observed	21.00	110.00	73.00
Difference	-47.00	42.00	5.00

Note. N = 204, *df* = 2, p <.001, Chi-square = 58.79.

Summary for Question 12 Results

To summarize the results from Q12, the Chi-square calculation for each group identified a significant finding for one of the options in each group. The options included in Q12 of the online survey were: "None at all;" "Somewhat;" and. "Significantly." These options pertain to the teachers' perceptions of the acquisition of 21st Century Skills by students after using a wiki. CFF teachers were asked to select one option for each of the 19 21st Century Skills. The skills were combined into groups to ensure an expected frequency value greater than 50 in order for a Chi-square analysis to be used. ISTE standards for students were used to determine how the 19 21st Century Skills were divided into the groups used for Q12.

Table 20 provides a summary of the significant findings for each of the Q12 groups. The significant findings for groups 12.1, 12.2, and 12.5 fell into the "Somewhat" category. The "Somewhat" category was defined to mean that teachers had begun to observe changes in student work that could attributed to the use of blogs. The findings for the remaining two groups, 12.3 and 12.4, fell in to the "Significantly" category. Directions contained on the survey asked teachers to select the "Significantly" category if they had seen continuous and numerous changes in student work that could be attributed to the use of wikis.

Table 20

Summary of Question 12 Results

Group	Significant Option
12.1 Basic Literacy	Somewhat
12.2 Digital Citizenship	Somewhat
12.3 Communication and Collaboration	Significantly
12.4 Technology and Information Literacy	Significantly
12.5 Creativity and Innovation	Somewhat

Survey Questions 9 and 13: Open Ended Responses

CFF teachers shared information regarding blogs and wikis in questions 9 (Q9) and 13 (Q13). These questions were not mandatory and not all of the CFF teachers who participated in the study responded to these questions. Most of the comments referred to specific classroom projects. A summary of the responses is included in Appendix F.

Responses from Q9 reported the following projects involved blogs: literature circles; science lab reports; communication with students in other social studies classes; and, involvement with students who were absent for a extended period of time. Many of these comments paralleled teachers' responses at the focus group sessions.

Q13 asked for comments about the use of wikis. Teachers shared the importance of using wikis to share information and the importance of including all students in the assignment. In addition teachers emphasized the increased level of engagement and interest when using a wiki with their students. It was clear from the limited responses that teachers appreciated students' interest in using wikis. The comments shared in Q13 also parallel the comments obtained from the focus group sessions.

Focus Group Results

Focus group sessions were conducted to collect the qualitative data for this study. Three focus group sessions were conducted, one at HSQ and two at HSZ. All focus group participants had previously completed the web-based Zoomerang™ survey (Appendix A) and had also signed the consent form (Appendix C) for the focus group session. Each of the three focus groups was made up of teachers from one of the four core curriculum areas, mathematics, language arts, social studies, or science. The sessions lasted approximately 90 minutes. Fourteen CFF teachers attended the first focus group session at HSZ and 16 attended the second session. Nineteen CFF

teachers participated in the focus group session at HSQ. Focus group methodology calls for groups with homogeneous participants rather than a diverse population and a limit to the participants to between 8 and 12 (Krueger, 2003). A homogeneous focus group population was preferred since a group composed of highly different characteristics may decrease the quality of the data. Individuals may tend to censor their responses in the presence of others who differ from them (Tellis, 1997). The focus groups used in this study were homogeneous in that all teachers met the criteria of four years of involvement with the CFF program, five years of teaching experience, and they were highly qualified by definition of PDE.

Due to the configuration and availability of the CFF teachers, the size of the focus groups exceeded the preferred size of between 8 and 12. The size of a focus group was restricted to allow each participant time to respond (Krueger, 2003). While the size of the focus groups in this study exceeded the preferred size, all of the participants were CFF teachers and had worked together numerous times in professional development sessions and within their departments. The result was a focus group of CFF teachers who were comfortable with each other which allowed them to freely respond to the questions. Each of the CFF teachers in all three focus groups fully participated in responding to all of the focus group questions.

At the conclusion of the focus group sessions, the tapes were transcribed and printed for review. Responses from each of the three focus group sessions were first reviewed separately. The printed documents were reviewed question by question, and key words and phrases were highlighted using a marker. The key words and phrases were then placed into similar groups from which themes emerged. Themes were developed for each question in each of the focus group sessions. After the individual focus group sessions were analyzed, the themes from all three were reviewed by question to determine if there were themes common to all three of the

focus groups sessions. Themes common to all three focus group sessions were identified. The printed documents from the transcripts were then again reviewed to identify quotations that could support each of the themes. As the quotations were identified, it also became apparent that there were sub-themes for each of the themes. Quotations were also identified for the sub-themes.

Four main themes were identified from the focus group session transcripts: (1) Professional Development; (2) Changes in the Interactions between Students and Teachers; (3) The Level of Student Engagement and Interest; and, (4) Changes in Teacher Classroom Practice. The themes, subthemes and associated quotations are presented in the next section.

Theme One: Professional Development

Professional development with blogs and wikis, although configured differently at each high school, was seen as worthwhile. The delivery strategies, frequency of sessions, and the time of day scheduled for the professional development were not consistent at each school or within content areas. Comparing responses from each of the high schools, HSQ and HSZ, revealed that while the content of the training sessions was consistent, the methodology for the professional development sessions was different. Teachers from HSQ attended training sessions during the school day as one group with all content areas represented. One of the language arts teachers (HSQLA6) shared, "We were involved in a pull-out training day where we learned about the CFF program. Training was all day and we learned about blogs and wikis as part of the whole training experience." Teachers LA3 and LA5 from HSQ agreed that this description of the training format was accurate. Teacher HSQSS3 added that they also learned about blogs and wikis from the required online courses: "We also learned about blogs and wikis in the online courses we had to take. They were included in some of the articles."

Teachers at HSZ were not trained as one group, but by department. Teachers shared that the training lasted for two days the first year. The second year consisted of one full day of training followed by flex sessions. A language arts teacher (HSZLA1) remarked,

> The flex training was the best since we met with the CFF coach and tech director and told them what kind of training we needed. We also completed a survey with the same information. They listened to use and created flex sessions just for us.

Eight other teachers agreed with this statement and added that each department was able to design training specific to their needs. Also, after each flex session the CFF coach followed up with the teachers to determine if additional training was needed or if assistance was needed to implement what they had learned. Another language arts teacher (HSZLA2) shared:

> After the flex training the teachers used a blog to share what we were doing with the CFF laptops. After we used the blog for many months we had a good idea about what we wanted to do with it.

Efficacy with using blogs and wikis. Teachers HSQMA3 and HSQSC1 revealed that using both blogs and wikis were difficult and that they did not immediately feel comfortable with this type of digital resource. Language arts teacher LA6 who also taught at HSQ shared: "Using a blog is not easy. I am used to writing in a manner where I go through lots of revisions and have someone else take a look at it before submitting." Teacher HSQLA5 added, "The idea of publishing to the internet and others looking at it is not comfortable." Three other HSQ teachers agreed. Mathematics teacher MA3 made a similar remark at one of the focus groups at HSZ. She shared: "I was not immediately comfortable with posting online for either the blog or the wiki. After using them for awhile it became easier, but still did not feel right."

Teachers at HSZ indicated there was a higher level of satisfaction with the staff development they received compared to the level of satisfaction from the CFF teachers at HSQ. HSZ teachers reported that the department activities and collaboration resulting from their professional development opportunities increased their skill level and also their comfort level with using blogs and wikis as instructional tools.

Intensive professional development was a key component of the CFF initiative. The content intended for the training sessions was defined by the PDE. Delivery methodology, frequency of training sessions, and follow-up after training was determined at the local level. Responses from the three focus group sessions confirm the importance of professional development and the variation in presentation.

Theme Two: Interaction between Students and Teachers

Interactions between students and teachers changed as a result of using either a blog or a wiki as an instructional tool. Responses indicated that both students and teachers were held more accountable, and communication and collaboration increased as a result of using a blog or a wiki.

Accountability for both students and teachers. Several teachers shared that their students not only held themselves responsible to produce high quality assignments on time, but students also held teachers accountable to review and respond to those assignments. According to a science teacher HSZSC5 students required teachers accountable as a result of using a blog or wiki, "Not only are students held accountable, but so are we. My students let me know right away when I do not look at their work between one day and another." Similarly language arts teacher HSZLA10 said:

> My students asked me during the school day if I had read what they posted. They expected that the blogs were read and comments added almost immediately. If you do not read and respond then they won't take it seriously.

And another comment from a social studies teacher HSZSS4, "It takes time to check what they write every other day, and you have to keep up because they want to know you have read what they wrote before they post again." Fifty-five percent of the other teachers from both HSQ and HSZ agreed that it takes a lot of work to setup, monitor and grade a blog or wiki, and that it was more time consuming than just grading a single writing assignment. In addition these same teachers agreed that the benefits from using either a blog or wiki justified the increased effort required to organize and monitor this type of assignment.

Increased communication and collaboration. Communication from students was not limited to inquiries about their assignments, but was also used between students and others as a learning tool. Sometimes students collaborated with other students in their class or high school, while other students used the tools to communicate globally. Social studies teacher HSQSS3 shared "My students are using a blog to interact with other high school students in China. The Chinese students are practicing using English to communicate and my students are learning about their culture." HSQMA3 added, "I use a wiki to keep students who are temporarily on homebound instruction up to date about class work. It also keeps them connected to the rest of others."

An increase in communication and collaboration was also reported from CFF teachers at HSZ. Some teachers used blogs instead of a traditional writing assignment. Teacher HSZLA5 shared, "I used a blog with students when we read *The Secret Lives of Bees*. The students responded to questions from each chapter and also to what others had written." Other language

arts teachers (HSZLA1, HSZLA2, HSZLA6, HSZLA8 and HSZLA9) agreed that they had used a blog for this type of assignment. Teacher HSQSS9, summarized the issue of increased communication and collaboration with the quote, "Communication skills were practiced and promoted. Students' skills improved."

Theme Three: The Level of Student Interest and Engagement Changed with Blogs and Wikis

Teachers from both schools were enthusiastic to discuss their students' interest and level of engagement in using blogs and wikis. As teachers commented and shared experiences, others readily agreed with the comments made by other teachers at the focus group sessions and also added their own comments.

Student interest and engagement with blogs. While teachers at both high schools used blogs, all of the teachers at HSZ used blogs while only 42% used blogs at HSQ. Teachers used blogs for online journals, writing assignments for language arts and social studies classes, and laboratory reports in science. The teacher only read some of the blogs and others used blogs as a class project. Language arts teach HSZLA10 commented, "Using anything online keeps my students interested. They were definitely more engaged and into what they were doing." A math teacher HSZMA4 responded, "My students were excited with the new method to communicate."

Teachers also commented that students' writing improved due to the interest and engagement with blogs. Teachers HSZLA2's comment was representative of several others

> I had students blog throughout our study of The Great Gatsby. In addition to the high level of thinking and collaboration seen on the blog, the level of class discussion skyrocketed. Participation increased greatly, and the level of learning was much deeper. Students took more interest in their reading and writing. Both improved.

Student interest and engagement with wikis. All of the CFF teachers at HSQ and HSZ used a wiki with their classes. They expressed a similar reaction to the use of wikis as with blogs in that students enjoyed using a wiki, they spent more time working on the wiki than with a traditional writing or research assignment, and the level of interest increased. Teacher HSQMA2 commented:

> My students spent so much more time adding to the class wiki than they did with other assignments. I was amazed at how much time they spent. This was everyone in all of my classes, even the lower level classes. Their answers were very thorough, well thought out and presented in a manner that others could easily understand. A lot of the time my students work in small groups of 2 or 3 to work through a set of math problems. They were on task when using the wiki and spent a lot of time deciding what to post.

Other math teachers from HSQ (HAMA1, HAMA4, and HSMA5) agreed with this comment. Another math teacher from HSQ responded that parents appreciated the use of the wiki:

> I had parents call me to thank me for the wiki. It seems that kids showed the wiki to the parents and explained how it worked and what we were doing. The parents liked to see what was happening in class and if the students were absent they likes having the information for their kids to catch up.

Teachers from HSZ also used wikis and shared their enthusiasm about their students' level of engagement and interest. Teacher HSZLA11 shared, "My classroom wiki has greatly empowered my students to take an ownership role in their classroom assignments. It has maintained student interest." Another language arts teacher, HSZ7, responded with:

> Research skills increased from all of the time they spent working with the wiki. They not

only worked in class, but out of class. I could tell from their answers that they spent a lot of time getting the answers. I think they spent more time researching with the wiki information than when they just had a paper to write. Their research was more through and detailed.

A third language arts teacher, HSZLA3 summed up this question with. "The students are more engaged because it lets them use technology which they are comfortable with. I love using wikis with my students."

Theme Four: Teachers' Classroom Practice Changed

As teachers responded to the questions about student usage of wikis and blogs, they frequently included comments about their own classroom practice. These comments referred to how they changed from the lecture format to a student-centered classroom. Teachers who did not specifically make a comment about a change in instructional practice, readily agreed when a comment was made. The change in classroom practice to include using either a blog or a wiki was easier for some teachers than for others. Some comments indicated that teachers struggled with the changes, but did not give up and continued to use the tools. In addition, classroom practice changed as students became empowered to take ownership of their learning.

Transition from lecturer to facilitator. One of the goals for the CFF initiative was to change teacher instructional practice from one that was teacher centered to a classroom that was student centered. Comments from teachers indicate that this goal was achieved for some of the teachers who had participated in this study. Teacher HSZLA2 commented, "I have not spent one day lecturing or delivering notes this year due to the class wiki." A similar comment from HSZMA2 also illustrated the transition from teacher-centered classroom to student-centered

classroom, “My students need the school to meet them where they are in learning and that is using technology. Using a wiki keeps instruction focused on the students.”

Empowering students. A teacher at HSQ shared that classroom practice had changed due to using blogs and wikis with a shift toward student ownership for their learning. Teacher HSQSS4 shared:

> My students are online all of the time and they want to be able to share that way. They do not want to use a pencil and paper. My classroom has changed to allow them to use the technology and each other to learn.

Teacher HSZSC5 shared that students preferred to work together on science projects, “My students want to problem solve using the technology and through collaboration to come up with the answers. They prefer to chart their own course.” Teachers at all of the three focus group sessions agreed that students no longer wanted to sit and get from the teacher, but rather preferred to be in charge of their learning with facilitation from the teacher.

Some teachers struggled with change. The change in classroom practice did not come easily for some of the CFF teachers. Their lack of prior experience with using either a blog or a wiki prevented them from having the confidence to incorporate them into their lessons. As some CFF teachers began to experiment with using either a blog or wiki to communicate with other CFF teachers, their confidence increased. Teacher HSZLA11 shared, “The idea of posting my writing on the internet for others to read was not comfortable at first. I really had to work at it before I could use a blog with my students.” A math teacher (HSQMA3) also shared a similar comment, “It’s not easy to know that what you type is going to be read by a lot of people.” Practice with online writing gave teachers the knowledge and confidence to use these resources

with their students. Teachers also realized the need for organization, structure, and clear expectations when using online writing tools. Teacher HSZLA5 shared:

> I found that using a rubric and making sure the students know about it ahead of time made a difference in the kind of postings they made. First I tried using a blog without the structure and organization. It was not a success. The postings from my students were all over the place. Some were on topic, some were not. Some one word answers, some lots of different responses. Then I talked to other teachers and they told me to use a rubric. It worked a lot better.

Other teachers from HSZ agreed with this response and indicated that the need for good organization, structure, and clear expectations including a rubric were very important if online writing was going to be a success.

Summary

Results from both instruments used to collect data were presented in this chapter. The qualitative results included a correlation between the number of years of teaching and the efficacy level of teachers. The number of teaching years varied with the majority of teachers reporting between 6 and 20 years of teaching experience. More teachers reported an efficacy with 21st Century Skills at the digital immigrant level. A correlation between these two data sets showed that as the number of teaching years increased, more teachers indicated that they identified with the digital immigrant level of efficacy.

All four of the content areas, Language Arts; Mathematics; Science; and, Social Studies were represented at both HSQ and HSZ. Forty-nine teachers participated in the study which was 77% of the eligible population. These teachers taught in CFF classrooms that were equipped with the technology resources available from the CFF grant. Some of the classrooms received

equipment in years two and three of the grant when funding was reduced and therefore had to share carts of computers. Classrooms that had been funded in the first year of the grant had received one cart of 25 laptops for each classroom. Sharing carts reduced the availability of the laptops carts for student use, however all teachers were able to use the equipment each week.

Questions 7 and 11 used a Chi-square analysis to determine if students demonstrated specific outcomes after using a blog or a wiki. Questions 8 and 12 also used the Chi-square analysis to determine the significance of using a blog or a wiki to acquire 21st Century Skills. To calculate a Chi-square value the cell must contain a value of at least 50. To accomplish this, the seven outcomes listed in Q7 and Q11 were combined into two groups, Engagement and Literacy. Similarly the nineteen 21st Century Skills listed in Q8 and Q12 were combined into five groups, Basic Literacy, Digital Citizenship, Collaboration and Communication, Technology and Information Literacy, and Creativity and Innovation. The ISTE national education standards for students were used to determine how the outcomes and skills were grouped.

Qualitative data was collected from the focus group sessions and were analyzed to determine if the responses represented themes. Four main themes were identified. The themes were derived as the transcribed responses from each focus group were reviewed, coded, and again reviewed.

Theme One identified the differences in the quality and quantity of the professional development opportunities available to each high school. While each high school included the same topics for the professional development activities, they did not use the same strategies to deliver the professional development or provide the same number of training opportunities.

A second theme identified an increase in the interaction between students and teachers. Teachers reported the need to make sure they reviewed and responded to student work almost

immediately. Many felt overwhelmed by the need to respond quickly and regularly, but made the effort to validate the importance of the assignments.

The third theme involved communication and collaboration increased after using either a blog or a wiki. Students worked together and shared information both online and in class. Teachers reported an increase in the amount and quality of classroom participation and discussion both online and in the traditional setting. Also the students' level of interest in the assignments increased when using a blog or a wiki. They were more engaged in the topic, worked longer, and with better results when using either a blog or a wiki. Teachers repeatedly commented on their students' enthusiasm to work together to solve problems, share information, and present their results.

The fourth theme involved teachers' classroom practice. As a result of using these technologies as classroom tools, they moved from lecturer to facilitator. The classroom became a student-centered environment in which students took ownership of their learning and the teachers facilitated in the learning process. Both teachers and students learned as a result of using blogs and wikis.

Chapter Five presents the conclusions for this study using the results from Chapter Four aligned to both the primary and secondary questions for this study, and the research contained in Chapter Two.

CHAPTER FIVE: CONCLUSIONS AND RECCOMMENDATIONS

This study was conducted to evaluate the acquisition of 21st Century Skills as a result of using blogs and wikis in a Classrooms for the Future (CFF) classroom. The CFF program was created by the Pennsylvania Department of Education (PDE) in 2006 and focused on students acquiring 21st Century Skills as a result of intensive professional development for CFF teachers. The program also focused on changing teacher classroom practice to a student-centered environment and infusing technology resources into the classroom. Each year a team of researchers at Pennsylvania State University (PSU) has evaluated the program. Evaluations from PSU have focused on many facets of the CFF program but have not included the impact of using blogs and wikis on the acquisition of 21st Century Skills by high school students. Because the use of blogs and wikis as instructional tools was included as part of the intensive professional development required for all CFF teachers (Pennsylvania Department of Education, 2008), but not specifically evaluated by the PSU, this study was conducted to examine and analyze these Web 2.0 tools.

This chapter provides a review of the methodology used for the study followed by a summary of the data collection results from an online survey created using Zoomerang™ and questions from three focus group sessions. Conclusions derived from the results and aligned to the primary questions are presented and discussed. The limitations of the study will be identified and the chapter concludes with recommendations for future research.

Review of Methodology

A mixed methods approached was used for this study involving an online survey to collect qualitative data and focus group sessions to obtain the qualitative data. The survey was developed using the online application Zoomerang™. A copy of the survey is included in

Appendix A and a copy of the focus group questions is included in Appendix B. Questions for both instruments were developed by the researcher for this study and validated before distribution.

Two of the 22 Montgomery County school districts agreed to participate in the study for the data collection. These two high schools have been designated as High School Q (HSQ) and High School Z (HSZ). All CFF teachers at each high school attended an orientation session where the study was explained and the data collection processes were reviewed. After the orientation teachers who agreed to participate in the study signed consent forms for both the survey questions and focus group sessions. A copy of each consent form is located in Appendix C and Appendix D, respectively. Of the 64 teachers in the sample population, 49 teachers, each of whom had been involved with the CFF program since the beginning agreed to participate.

The link for the Zoomerang™ survey was emailed to the participating CFF teachers who were provided time either during their preparation period or after school to complete the survey. All teachers were assigned an identification (ID) number instead of using teacher names and anonymity was maintained. Survey results were stored on a secure server that was hosted by Zoomerang™. These results were exported to a password protected Excel file for analysis. Two additional software applications, Statistical Package for the Social Sciences (SPSS) and Standards Aligned System (SAS) were also used to analyze the results.

Three focus group sessions were conducted, one at HSQ and two at HSZ. Each session included teachers from all four content areas: language arts; mathematics; science; and social studies. The sessions lasted approximately 90 minutes. Fourteen CFF teachers attended the first focus group session at HSZ and 16 attended the second session. Nineteen CFF teachers participated in the focus group session at HSQ.

While the size of the focus groups in this study exceeded the preferred size, all of the participants were CFF teachers and had worked together numerous times in professional development sessions and within their departments. The result was a focus group of CFF teachers who were comfortable with each other which allowed them to freely respond to the questions. Each of the CFF teachers in all three focus groups responded to the questions.

At the conclusion of the focus group sessions, the tapes were transcribed and printed for review. Comments from each of the focus group sessions were reviewed separately and divided into themes. Once this was completed, the themes from each focus group session were compared and themes common to all three focus group sessions were identified. After identifying the themes, Chapter Two was reviewed to make a connection with the literature reviewed in that chapter. In addition to the themes, statements from individual teachers were also identified and included as part of the Chapter Four results.

Another Look at the Results from Chapter Four

Quantitative results were analyzed first. Microsoft Excel (Excel) provided the tools to separate and review the data into descriptive charts and graphs (Appendices E – H). Data pertaining to the number of teaching years, level of efficacy, and the answers to the survey questions specific to the acquisition of 21st Century Skills from using blogs and wikis were described using charts and graphs. Survey questions 1-5 provided information about the number of years the participating CFF teachers had been teaching prior to their participation in the is study. Information about the content area they taught, availability of technology, and their efficacy with 21st Century Skills was also provided from questions 1-5.

Data for both efficacy and years of teaching were entered into SPSS version 9.0 in order to determine if a correlation existed between the two variables using a 2-tailed Pearson

Correlation. The calculations from the SPSS analysis produced a 2-tailed correlation value, r = 0.027 and a correlation value of -0.338 which indicates a negative correlation between the number of teaching years and efficacy. This means that as the number of teaching years increased, efficacy favored the digital immigrant category.

Results from Question 6 and Question 10

Questions 6 and 10 asked teachers to self report the number of times they used a blog or a wiki as instructional tools. The results showed that not all teachers used a blog, but all had used a wiki. Focus group responses support these survey results, and indicate that some teachers were not comfortable using a blog or found a blog to be more difficult. The number of professional development opportunities as well as the quality of those sessions played a role in determining if teachers used these tools and also how comfortable they were with the tools. Teacher HSZLA11 shared about the uneasiness with using a blog:

> Using a blog is not easy. At least I did not find it to be easy. I am used to writing in a manner where I go through lots of revisions and have someone else look at it before submitting. I really had to work at it.

The importance of quality professional development is illustrated by the following comment from teacher HSZSS3:

> The reading supervisor also taught us about blogs. She is really terrific and is up on all of the new stuff. We had a workshop about writing across the curriculum and one of the ways she showed us how to get kids writing was to use a blog. From what we learned, a blog can be used in just about any class, not just reading and language arts.

A colleague, HSZSS2 agreed and added:

I agree. Our reading supervisor is the best. We learned so much about using blogs with any department. I teach language arts and I am always looking for ways to get my students interested in reading. This seems like a good way to do it. The training was helpful because she gave us specific sites that can be used with any student. She also gave us an article on how blogging has helped students write better. Focus, detail, structure. All those things are important to writing and are helped by using a blog. My students are online all of the time and want to be able to share that way.

Results for Question 7, Question 8, Question 11, and Question 12

The Pearson Chi-square test was used to analyze the data collected from questions 7, 8, 11, and 12 of the survey. Question 7 (Q7) and question 11 (Q11) focused on the outcomes teachers perceived students demonstrated after using either a blog or a wiki. Each question contained seven outcomes that were separated into two groups. The first group was labeled Engagement and the second, Literacy. Table 21 provides a list of outcomes for each group.

Table 21

Grouping of Outcomes for Question 7 and Question 11

Group Name	List Outcomes
7.1 and 11.1 Engagement	Students were engaged in the project Students were interested in the topic
7.2 and 11.2 Literacy	Grammar Spelling Focus writing Well written

Question 8 (Q8) referenced the 21st Century Skills acquired after using a blog while Q11 referenced the 21st Century Skills acquired after using a wiki. There were nineteen 21st Century

Skills listed in both Q8 and Q11. In order to use a Chi-square test, the expected frequency of any cell needed to be greater than 50. To ensure frequencies greater than 50, the nineteen 21st Century Skills combined into five groups based on the International Society for Technology in Education (ISTE) and National Education Technology Standards (NETS) for students. The same groups were used for both Q8 and Q11 and are listed in Table 22.

Table 22

Grouping of 21st Century Skills for Question 8 and Question 11

Group Name	List of 21st Century Skills
8.1 and 11.1 Basic Literacy	Writing was focused Writing technique Grammar Spelling
8.2 and 11.1 Digital Citizenship	Global Awareness Social & Cultural Responsibility Cultural Literacy
8.3 and 11.3 Communication and Collaboration	Interpersonal Skills Teaming Collaboration
8.4 and 11.4 Technology and Information Literacy	Technical Literacy Information Literacy
8.5 and 11.5 Creativity and Innovation	Self Direction Creativity Curiosity Higher-order Thinking Sound Reasoning Personal Responsibility Produce High Results

The results from the Chi-square analysis of Q8 identified a significant finding for one of the options in each group. Q8 collected data about teachers' perceptions for the students acquisition of 21st Century Skills after using a blog. The options for teachers to select in Q8 of the online survey were: "None at all," "Somewhat," and, "Significantly." CFF teachers were asked to select one option for each of the 19 21st Century Skills. Table 23 summarizes the significant option that was identified from the Chi-square analysis for each of the groups.

Table 23

Summary of Significant Results for Each Question 8 Group

Group	Significant Option
1.1 Basic Literacy Skills	Somewhat
1.2 Digital Citizenship Skills	Somewhat
1.3 Communication and Collaboration Skills	Significantly
1.4 Technology and Information Literacy Skills	Significantly
1.5 Creativity and Innovation Skills	Somewhat

The Chi-square test was also used with the data from Q11, and again a significant finding for one of the options was determined. These results pertain to the use of a wiki to acquire 21st Century Skills. Table 24 summarizes the significant option for each group.

Table 24

Summary of Significant Results for Each Question 11 Group

Group	Significant Option
12.1 Basic Literacy Skills	Somewhat
12.2 Digital Citizenship Skills	Somewhat
12.3 Communication and Collaboration Skills	Significantly
12.4 Technology and Information Literacy Skills	Significantly
12.5 Creativity and Innovation Skills	Somewhat

Comparing Tables 23 and 24 we see that the same groups of 21st Century Skills for blogs and wikis had the same range of results. Basic literacy skills, digital citizenship skills, and creativity and innovation skills were all rated in the "Somewhat" category. The remaining two groups, communication and collaboration and technology and information literacy skills were rated in the "Significantly" category.

Results from the Focus Groups

The analysis of the focus group data resulted in the identification of four themes. The four themes are professional development, changes in the interaction between teachers and students, the level of student interest, and how classroom practice changed. Multiple sub themes were also identified for each of the four sub themes.

Theme One: Professional Development

The first theme identified professional development. Teachers from each school were asked about their training to use blogs and/or wikis as an instructional tool. While they all received training with similar content, the delivery of the professional development was varied. Teachers from HSZ were trained by department and they had a voice in determining the structure of the professional development. Small department groups met several times using flex session after the initial training program. They expressed indicated they were better prepared to use technology with their students because of the delivery model that was used.

Teachers from HSQ received the same content, but they did not have a voice in how the training was delivered. Flex sessions were not an option for HSQ teachers. Their training was delivered using substitutes who covered their classrooms for a day of pull out training. These teachers indicated that they appreciated the training but felt more was needed.

Theme Two: Changes in the Interaction between Teachers and Students

A second theme involving the interaction between students and teachers emerged as the data from the focus group sessions were reviewed. Accountability for both teachers and students increased as a result of using blogs and wikis. Students frequently checked for responses from their teachers and if a response was not available, teachers were asked when one could be expected. It was clear from the teachers' comments that they felt it extremely important to respond to all student posts as soon as possible. Teachers expressed feelings of stress in making sure that they were able to respond quickly so that students would value the project and their work.

Teachers also commented that they felt a need to hold students accountable for not only posting a response, but also ensuring that the responses were well researched and presented. Rubrics were used to score the responses. Teachers felt their students devoted more time to online participation and that their students' work improved. Overall the results were positive, but it was a challenge at times for teachers to review and grade all of the posts.

Theme Three: The Level of Student Interest and Engagement Changed with Blogs and Wikis

CFF teachers from both high schools agreed that students were interested in using blogs and wikis. Not all teachers from HSQ used a blog as part of instruction, but all teachers at HSZ did. All teachers at both high schools used a wiki with their classes as an instructional tool.

Teachers reported that their students researched more, wrote more, read more, and contributed more to classroom discussions or projects. Some teachers even reported that they needed to give students a time limit to complete the research or project because their students

spent so much time working with blogs and wikis. Students were empowered to own the learning process due to their increased level of interest and engagement in using the technology.

Theme Four: Classroom Practice Changed

As teachers responded to the questions about student usage of blogs and wikis, they frequently included comments about their classroom practice. These comments referred to how teachers changed from the lecture format to a student centered classroom. Changes included that the classroom was student centered, that they (teachers) used more technology, students worked more collaboratively, and students were able to work independent of the teacher. Teachers at all of the three focus group sessions agreed that they had changed their classroom practice. They lectured less, provided more time for students to research and discover on their own or collaboratively with other students, and expected students to become an active participant in the learning process. While there was a spectrum of changes to classroom practice with some changing more than others, all agreed that a change had occurred.

Conclusions Aligned to Primary and Secondary Questions

Results from both the online survey and the focus group questions will be referenced together as they align with the questions for this study. There were two primary questions, one for the use of blogs and the second for the use of wikis in acquiring 21st Century Skills. Each primary question contained the same secondary questions specific to using either a blog or a wiki.

Research Question 1: Which 21st Century Skills do Teachers Perceive Their Students Have Acquired after Using a Blog?

Results from both the focus group discussions and survey questions indicated teachers believed students did acquire 21st Century Skills after using a blog. Not all students acquired the skills at the same rate and to the same degree; in fact a minimum number of students did not acquire 21st Century Skills at all.

Today's students are digital natives and prefer to use technology. Actually they expect to use it since, according to the Kaiser Report (2010), they are connected to media in excess of 7.5 hours each day, and that does not include multi-tasking. Teachers who attended professional development sessions at HSQ did not feel as prepared to use blogs with their students. Some of the teachers did not use blogs with their classes. Improved professional development opportunities may have resulted in all CFF teachers using a blog. That was the case for the teachers at HSZ who indicated they were provided with a better quality and quantity of professional development opportunities.

Comments from the focus group session at HSQ indicated some teachers were less comfortable using a blog and the professional development provided only a cursory overview of this tool. Teacher HSQLA6 commented, "Blogs were included in the training but we did not spend much time on them. I did not feel prepared to use a blog." This is in contrast to a comment from a teacher at one of the focus group sessions at HSZ. Teacher HSZLA4 responded:

> After the flex training the teachers in my department used a blog to practice and share what we were doing with the CFF laptops. . . . The blog helped me, and I guess the others in my department to really understand how a blog worked and how it could be

used in the classroom. I think after using a blog for many months we had a good idea about what we wanted to do with it.

Professional development was one of the key components to the CFF program. All teachers were required to attend training in which the content was provided by PDE. Delivery of the content was a decision left up to the individual schools. Results from this study point out one school, HSQ, did not spend as much time on blogs, and also did not have as many sessions overall. Professional development sessions for HSZ were more varied, richer in their delivery and the examples shared by the trainers, and occurred more frequently.

Research (Sparks and Loucks-Horsley, 1989) has shown us that in order for professional development to be effective, it needs to be aligned to the curriculum and skill level of the students, relevant, and ongoing. The differentiation of instruction is an important factor in the success of any professional development program. PDE required professional development and defined the content to be included, but did not require training sessions that were delivered using consistent strategies or were ongoing and relevant to each teacher. Including these criteria as part of the professional development program, teachers from both schools may have experienced a more productive learning environment. Future programs should include a more structured and differentiated professional development program that is research based.

There are options for professional development beyond large group instruction, or even small group instruction. The CFF program may have benefited from using a mentoring model to deliver staff development. Technology mentoring (Sparks and Loucks-Horsley, 1989) matches a small group of teachers with one mentor. The teachers are not necessarily at the same skill level. Instead of a one size fits all approach the mentor works with teachers of the same skill level to

provide ongoing training in small chunks that is relevant to what they are teaching. This type of training should be considered by PDE for future technology programs.

Purposes for using a blog. Teachers at both HSQ and HSZ reported a variety of purposes for using a blog. Some teachers reported using blogs to communicate with their department colleagues while other teachers reported using blogs as an instructional tool with their students. Focus group responses from both HSQ and HSZ teachers indicated that as an instructional tool blogs were used to chronicle project work completed by teams of students (HSZSS2), to respond to questions while reading a literature selection such as *The Great Gatsby* (HSZLA2) or *The Secret Lives of Bees* (HSZLA5), and as a tool to interact with students in other classes and in one instance with students in China (HSZSS3).

The purposes reported by teachers parallel those found by others in the field. Shelbie Witte (2007) concluded from The Talkback Project at Indiana University that there was a definite increase in both traditional and comprehension skills for the middle school students who participated in the project. Teachers reported an increase in writing, which in turn produced a better writing sample. If this is the case, and if teachers in the CFF program have found ways to have students participate then the successes experienced by teachers involved with the CFF program should be available to other teachers. The variety in how blogs were used would be helpful to teachers who are beginning to work with blogs. Having a repository of lessons and examples like those previously mentioned would provide resources to teachers so they do not have to re-invent the lessons. Teachers are sometimes resistant to take the time to learn new technology or to create lessons involving technology. Making technology lessons and activates available via the web enables all teachers to begin using these tools.

PDE has recently launched the Standards Aligned System(SAS) that is a web-based portal for teachers. Curriculum resources are aligned to standards and available for to any teacher. Many of the lessons do not include technology. The SAS would provide a framework that is already developed and available for CFF teachers to share their lessons and activities.

The impact on student writing. Outcomes from Group 7.2, and 21st Century Skills from Group 8.1 and 8.5 involve components of the writing process. Teachers reported that students showed an increase in the literacy skills of grammar, spelling, focus on their topic, and also produced a writing sample that was well written after using blogs. Results from survey questions 7 and 8 indicated 84.5% of the CFF teachers self reported an increase in literacy outcomes (grammar, focus, and spelling, well written) for their students. In addition, 92.42% of the CFF teachers self reported an increase in the 21st Century Skills for their CFF students who used a blog.

Teachers and administrators need to better understand the impact on the writing process after using a blog. Research from Frye, et al. (2010) concluded that when students were given the opportunity to write with a purpose, the result was a meaningful representation of their learning. Results from this study also lead to this same conclusion, in that online writing using a blog produces a well-written product. If blogs have this kind of positive effect on student writing, educators should find ways to regularly incorporate blogs into instruction.

Administrative support is critical. Our schools need instructional leaders who not only understand 21st century teaching and learning, but expect it from their teachers. Administrators were required to attend training sessions with the CFF coaches however, they were not required to demonstrate they had acquired an understanding of 21st century teaching and learning. The

CFF program should have required administrators to model the use of technology, which in turn would have encouraged more teachers to use technology.

The impact on students' electronic and traditional communication. Group 8.3 included the 21st Century Skills associated with communication and collaboration. Survey results indicated that 43.63% of the teachers reported they had begun to see changes in collaboration, communication, interpersonal skills, and teaming. Another 47.87% of teachers reported they had seen continuous and numerous changes for these same skills. CFF teachers also reported in the focus group session that students were engaged, were more interested in the assignment, and had increased communication skills when using a blog. Teacher HSQSS3 commented, "When we use CFF equipment my students are more involved and engaged in what they were asked to do." Another teacher HSZLA2 shared:

> I had students blog throughout our study of The Great Gatsby. In addition to the high level of thinking and collaboration seen on the blog, the level of class discussion skyrocketed. Participation increased greatly, and the level of learning was much deeper. Students took more interest in their reading.

This comment highlights the changes in both traditional and digital communication. Students' in-class discussion increased while their online collaboration produced a high level of thinking. Jukes and Dodai's (2003) work with students produced similar results. They concluded students who work together for a specific purpose learn to collaborate more effectively. This seems to be the case for the CFF students in this study who had the opportunity to use a blog. This result highlighted the idea that the use of blogs can actually help increase traditional classroom discussions. Teachers do not need to be concerned that communicating via

technology will replace traditional classroom communication. Instead, it may actually improve it.

Results from the Kaiser Study (2010) reported an increase in students' use of media from 6.5 hours per day to 7.5 hours currently, and this does not include multi-tasking. Our students are also encouraged to use media by the explosion of mobile devices. These devices provide 24/7 opportunities for communication and collaboration. CFF teachers self reported on the survey and during the focus group sessions the importance of using technology to promote collaboration and communication. Their responses aligned with the results of the Kaiser Study in recognizing the importance of technology in the daily lives of 21st century students.

The impact on presentation skills. Changes in presentation skills were discussed in all of the focus group sessions. CFF Teacher HSQLA1 shared, "My students used a blog with the study of Hamlet. They assumed different personalities in the play in order to contribute to the class blog. Their presentation of information and learning was remarkable." Another comment from teacher HSZLA2 also shared information about students' attention to presentation skills, "Some of them made a point of telling me that they made sure their posts were good because the rest of the class was going to see them." Results from this study seem to reflect the desire of students to present their best work when others are going to see or hear it. Students' aspiration to publish their best work is also acknowledged by Will Richardson (2006) in his book, *Blogs, Wikis, Podcasts and Other Powerful Web 2.0 Tools for Classrooms*. Richardson's study of students using online tools concluded that not only are students publishing online, but also they prefer this mode of writing and communication. Richardson (2006) contends that students' continued publishing using online tools has resulted in an improved work product plus the desire to publish their best work.

CFF teachers reported that they felt using blogs enabled students to acquire or improve their presentation skills. Given this evidence it seems that students need to have more opportunities not only to publish their work, have others critique their work, and for them to critique the work of other students. A student-centered classroom offers these types of opportunities for all students and develops the collaborative skills employers are demanding.

Summary of the impact of using a blog. For those teachers who used blogs, a variety of purposes for using blogs were exhibited. Students embraced the use of online writing. They were engaged in the blogging projects and as a result communication, collaboration, literacy, and presentation skills increased. This study has shown the benefits of using blogs with our students, and all administrators and teachers should be encouraged to learn about blogs and subsequently use them.

Research Question 2: Which 21st Century Skills do Teachers Perceive Their Students have Acquired after Using a Wiki?

Comments from the focus group interviews indicated many teachers felt more comfortable using a wiki than they did using a blog. Their responses also there were more professional development opportunities for wikis than for blogs. CFF Teacher HSQLA5 shared, "Blogs were included in the training but we did not spend much time on them. A few examples were shared." In contrast, CFF teacher HSZMA8 commented:

> The CFF Coach for our district really did a good job of sharing examples. She is great and seems to know so much about all kinds of lesson plans that are already made and can be downloaded. Another thing she does is ask what we want to use the wiki for and then looks for examples or even makes one for us.

Teachers perceived that students who used wikis acquired improved research and collaboration skills. In addition their presentation and writing skills also improved. It seemed that the success in using wikis was connected to the teacher using a rubric to score students' work. The use of a rubric communicated to students clear expectations for the assessment of the wiki. While it is important to be cognizant of new instructional strategies such as wikis, it seems advisable for teachers to also keep basic teaching and learning theory in mind. Currently PDE provides school district with writing prompts so that students can prepare for the PSSA. Since students prefer online writing, it would make sense to encourage PDE to offer rubrics with their writing prompts and to encourage the use of wikis to complete the writing prompt assignment. Both the prompts and the rubrics could also be added to the SAS website and made available for all teachers to use.

Purposes for using a wiki. Teachers at both HSQ and HSZ reported an array of reasons for using a wiki. Some used wikis for communication with their colleagues to share educational resources, while others used them as an instructional tool with students. Science teachers used wikis to post data from projects and experiments. Mathematics teachers used wikis as a classroom website to post content, assignments, links to websites, and problems of the week. Wikis were also used to communicate with students and parents outside of the classroom. Language arts and social studies teachers used wikis to post assignments, content, and links to other websites. In addition, some included a blog that was used for a literature circle or a forum for students to debate topics aligned to the social studies curriculum. It appears that wikis can be used successfully in multiple ways and this flexibility should appeal to teachers.

Many of the wiki projects were part of a class assignment between students within that class. A suggestion would be for teachers to consider expanding beyond their classroom to other

students within their district, in neighboring districts or globally. Only one teacher reported using a wiki with a class outside of the school district. As teachers learn how to use a wiki, they should be reminded of the global workplace students will be working in. Connecting with other students would provide students with the opportunity to exchange the learning experience beyond their classroom.

The impact on student writing after using a wiki. According to the data, teachers indicated that the majority of CFF students demonstrated increased outcomes in Group 11.2 Literacy. Results from Q11 indicate 92.42% of the CFF teachers self reported an increase in literacy outcomes for their students; 48.13% of the CFF teachers self reported their students had begun to acquire literacy skills; and 24.38% of the CFF teachers reported their students demonstrated continuous and numerous changes in literacy skills as a result of using a wiki. Comments from the focus group sessions support these results. CFF teacher HSQLA4 commented:

> My students used the wiki to respond to assignments and add information for class projects. Over time, their writing became more focused. Using the wiki motivated them to read and write more often, which led to improved literacy skills.

Teacher HSZLA1 also commented on the changes in student work after using a wiki:

> Research skills increased from all of the time they spent working with a wiki. They worked not only in class, but also out of class. I could tell from their answers that they spent a lot of time getting the answers. I think they spent more time researching with the wiki than they did when just typing a paper. Their research was more thorough and detailed.

The results from this study confirm the research (e.g. Prensky, 2001a; Richardson, 2006; Warlick, 2004) for digital natives and their preference to use technology as a learning tool. Students write more frequently and therefore their writing samples are improved. The use of wikis should be a writing resource for all students. Potentially the increased use of wikis will result in improved student writing and, if that is the case, efforts should be made school-wide to incorporate wikis.

Involving librarians and the school media center would have added another dimension to this project. Students use the library for research and gathering information. The inclusion of librarians may have resulted in a school-wide wiki that contained research needed for the various courses offered at the high school. Instead of one wiki, a number of wikis could have been created with the librarian collaborating with the individual curriculum departments. This would have provided students with some of the research they might have used for a class project, but would have also modeled the use of technology for both students and teachers.

The impact on students' electronic and traditional communication. Teachers indicated that CFF students acquired 21st Century Skills associated with communication. Results from Group 11.3 indicated that 39.58% of the CFF teachers reported students had begun to show changes in communication that could be attributed to using a wiki. Another 52.08% of the CFF teachers reported students had demonstrated continuous and numerous changes in communication skills. These results align with ideas presented by Prensky(2005) that focused on the need for digital natives to use technology as a means of communication and learning. CFF Teacher HSQSS4 sums up the results with the comment, "Communication skills were practiced and promoted. Their skills improved."

Today's students communicate regularly with cell phones and social networking sites. They are accustomed to using technology for their communication and online communication id preferred by digital natives. They expect to use online resources as part of their learning experiences. The CFF program appropriately matched the needs of today's students in asking teachers to use Web 2.0 tools such as wikis as an instructional tool. Employers expect their employees to have excellent communication skills, both written and oral. Since the current generation relies so much on technology to communicate, it is essential that written and oral communication now included technology. The use of online tools provides students with the opportunities to enhance their communication tools and to reach out to a global audience. Results from this study emphasize the need for all students and teachers to use 21st century teaching and learning resources. The choice not to use these resources jeopardizes the future for our digital natives.

The impact on presentation skills. The impact on presentation skills was included in many of the answers for communication. Oral and written communication skills are necessary for successful communication. Results from Group 11.3 indicated 91.66% of the CFF teachers self reported students acquired communication and collaboration skills after using a wiki. Students' posts of their research and answers to assignments on the wiki illustrated the ability to positively present their responses.

Along with communication skills, employers expect excellent presentation skills. Using wikis helped students to improve their presentation skills each time they posted their work. Requiring students to post their work also holds them accountable to produce high quality work.

Schools need to remember that students are digital natives who prefer to use technology to learn, communicate, and present information. Many of our teachers are digital immigrants

and need assistance to change their classroom practice to the student-centered approach promoted by the CFF project and with the use of wikis.

Summary of the impact of using a wiki. All teachers felt comfortable using a wiki with their students. Improved literacy, communication and presentation skills resulted from the use of wikis. The results from this study lead to the conclusion that all students and teachers should be using wikis with their students. Online writing serves to improve the writing process, expand communication, and enhance presentation skills. Why would teachers not want to use a wiki with their students?

Teachers used wikis for an assortment of class projects, writing assignments, research, communication, and presentation of results. Survey results and responses from the focus group sessions clearly revealed that students acquired the 21st Century Skills included in the primary and secondary questions. Students were at different stages in their acquisition of skills with some at the beginning stage, and others at a more advanced stage. In either instance it was apparent that the use of wikis and blogs positively impacted the acquisition of 21st Century Skills.

Limitations of the Study

The study was limited in the following areas: skill level with the technology resources; knowledge of 21st Century Skills; the fact that the teachers self-reported their answers; the number of years of experience of the CFF teachers; the professional development opportunities offered to the CFF teachers; the small sample population used in the study; and, the restriction of the study to only include CFF teachers. A final limitation is the researcher's experience with the CFF program. These limitations are described in detail and the impact they caused for the study will be examined.

Teachers' Knowledge of 21st Century Skills

The skill level with the technology resources and knowledge of technology and 21st Century Skills varied among the CFF teachers who participated in the study. Some teachers had experience using technologies such as the interactive white board, laptop computers, camera, blogs, and wikis prior to their involvement with the CFF program. Others learned how to use some or all of the technologies during the professional development sessions included in the CFF program. More of the teachers self reported their efficacy with the technologies and 21st Century Skills as digital immigrants instead of as digital natives. By definition digital natives are more knowledgeable about technologies and use 21st Century Skills themselves. The efficacy of the teachers combined with their skill level with the technologies may have impacted the frequency and degree to which CFF teachers used the tools with their students.

Not all CFF teachers were familiar with the 21st Century Skills prior to working with the CFF program. They were not at the same skill level with using the technology resources. Knowledge levels ranged from very little, to moderate knowledge, to very experienced. All CFF teachers received training to learn the skills needed for 21st century teaching and learning, however since they did not all begin at the same level of competency, they were not all at the same point after the training. This may have impacted the choices the CFF teachers made when self-reporting their answers to the survey and self reporting their perceptions of outcomes and 21st Century Skills demonstrated by their students after using blogs and wikis.

Teaching Experience and Professional Development

CFF teachers brought various years of teaching experience prior to the CFF program. All met the minimum requirement for the study, which was to have completed three years of teaching before they began working with the CFF program. The majority of teachers were in the

6 to 10 and 11 to 20 years of teaching ranges. Experience from more years of teaching may have positively impacted teachers in those ranges, or it may not have. This study did not look for any correlation between the number of teaching years and the answers self reported by teachers.

While all CFF teachers received the same content in the professional development sessions they attended, the information was not presented in the same manner and to the same degree. Teachers at HSQ received one day of training with minimal follow-up. This was not the case for teachers at HSZ who received an initial day of training followed up by flex sessions and pull out sessions conducted during the day. Additionally, HSZ teachers received training grouped by departments and were able to experiment with blogs and wikis prior to using them with their classes. Teachers at HSQ received whole group instruction without the same level of personal use prior to using blogs and wikis with their students. The examples presented during the training sessions as well as the time made available to experiment with blogs and wikis with colleagues may have impacted instructional use. Teachers who experienced a rigorous training session rich with examples for instruction, may have had a more successful experience when they used blogs and wikis with their students. In addition the responses from the focus group sessions presented two very different delivery strategies for the professional development sessions. Teachers at both schools received the same content as defined by the PDE. Prior to training CFF teachers at the school level, CFF coaches attended an intensive three day boot camp where they received training materials to share with CFF teachers at their individual schools (Pennsylvania Department of Education, 2008).

HSZ teachers were very satisfied with their training, while HSQ teachers appreciated the initial training but would have preferred follow-up. These differences in the type of professional development and the number of opportunities limit the study in that all teachers who participated

were not trained in the same manner. These differences may have affected teachers' efficacy with using blogs and wikis as instructional tools.

Too often professional development opportunities are once and done. It is often not relevant to the classroom teacher and does not include opportunities for feedback. The CFF project has shown us that professional development targeted to the skill level of the teacher, relevant to their curriculum, and ongoing to ensure continued learning and follow-up, makes a difference. We need to promote these professional development strategies for all teachers. In addition, technology and 21st Century Skills must be included in all professional development opportunities. No longer can we afford to view technology as an extra and 21st Century Skills as optional.

Restricting the Sample Population

The use of CFF teachers as the sample population limited the study in that a very unique group of teachers was selected to participate in the study. These teachers were selected simply because they were part of the CFF program. By their participation in the CFF program professional development opportunities were provided specific to the use of blogs and wikis.

Teachers from 2 of the 22 high schools in Montgomery County were asked to participate in the study. This limited the number of teachers to a small sample population. The combined total of teachers from both HSQ and HSZ was 49. This was not a sufficient number to use the Chi-square analysis with each of the outcomes or 21st Century Skills. Instead, the outcomes and skills had to be categorized into groups using the NETS from the ISTE. Grouping the outcomes and skills limited the study in that results could not be contributed to individual outcomes or skills. Instead the results had to be based on the group of outcomes or skills, which were not

specific to the individual outcomes in Q7 and Q11, or the individual 21st Century Skills in Q8 and Q11.

A final limitation for this study was the researcher's experience with 21st Century Skills and the CFF program. The researcher was involved with the CFF program since its inception in 2006 and has also been involved with educational technology initiatives for 20 years. Her bias for the use of technology, its importance as an instructional tool, and her belief that students require 21st century learning strategies for success in the classroom was a limitation for this study. As the results were reviewed from the quantitative instrument, the researcher relied on statistical analysis to remove the bias from the results. For the qualitative results the researcher followed procedures for qualitative analysis by first using the open-coding process. The number of times a specific response was given or agreed to was noted and is referred to as an open-coding process (Ryan, 1973). The words were then grouped and later developed into themes and sub themes.

Recommendations for Further Research

The CFF program is no longer funded by the PDE. However the evaluation of this program has continued. Classroom observations and surveys for both students and teachers remain in place, at least through the 2011/2012 school year. The evaluation from PDE has not focused on the use of blogs or wikis and a recommendation is for these tools to be specifically considered in the evaluation process. This research should include the acquisition of 21st Century Skills by both students and teachers.

Additional study on the impact on student achievement after acquiring 21st Century Skills may be the focus of a future study. The *No Child Left Behind* (NCLB) regulations have resulted in annual assessments of core content such as mathematics and language arts. The achievement

of 21st Century Skills is not a required assessment for all Pennsylvania schools. It is recommended that student achievement in both the content areas required for NCLB and 21st Century Skills should be routinely assessed with a focus on the use of technology as an instructional tool.

Further study on the impact of 21st Century Skills on instructional practices should be evaluated. Teachers involved in this study self reported that they felt their classroom instructional practice has changed. Teacher HSZLA3 shared, "I use my wiki on a daily basis. It is the foundation of my class. It has become a gathering place of ideas, documents and resources, and student work and visuals. It does it all." Teacher HSZLA2 further confirmed the change in classroom practice with the comment, "My classroom wiki has greatly empowered my students to take an ownership role in the classroom. It has maintained student interest, and I have not spent one day lecturing/delivering notes this year due to the class wiki." This study did not specifically focus on the changes that occurred in classroom practice. Future research involving classroom observations with the CFF teacher population using blogs and wikis would be a topic for further research.

During the focus group sessions teachers mentioned involvement by parents. Teacher HSZLA1 shared, "I had parents call me to thank me for the wiki . . . parents liked to see what was happening in class." Communication with parents using blogs and wikis might be a topic for additional research. Many parents already communicate with teachers using email and through parent portals for student grades and assignments. The ability for parents to view student work that is published on a blog or a wiki may be the next online resource for parent participation.

Closing Thoughts

Results from this study clearly confirm the need for teachers to continue with the work started with the CFF program. The CFF program was restricted to core content teachers and clearly more teachers, including special area teachers, need to be included. All teachers should be current in learning and using 21st century teaching and learning strategies. Today it is blogs and wikis that need to be included; tomorrow it may be something else entirely. Educators must always be aware of the newest technology students are using. Keeping current will allow educators to offer students instructional tools that are meaningful to them.

> The focus group responses revealed that many of the teachers changed their instructional practice after using a blog or a wiki with students. Their classrooms became more student centered as a result of using online tools. Evaluations conducted by Kyle Peck at PSU as part of the CFF program concluded that changes in classroom practice increased each year of the CFF program (Pennsylvania Department of Education, 2008). His research included classroom observations, student surveys, and teacher surveys. Data were collected each year of the program at the beginning of the school year and again at the end of the school year. Analysis of the data produced results similar to those from this study in that teachers lectured less, students became empowered to govern their learning, and the classroom became a student-centered environment. This study confirmed Peck's program evaluation.

CFF Teachers who participated in this study expressed the need for structured, organized, and clearly defined assignments when using a blog or a wiki. The use of a rubric was critical to the success of an assignment, and projects needed to be purposeful and aligned with the

curriculum. Several teachers needed time to practice with online writing themselves prior to using the tools as instructional tools. Practice provided the teachers time to experience how the tools worked and allowed them the opportunity to gain confidence both in using the tool themselves and as an instructional tool. These same comments and concerns were highlighted by Dymoke and Hughes (2009). Research was conducted with pre-service teachers using a blog or wiki to promote poetry writing. After using the online tools pre-service teachers gained confidence in using the online resources as instructional tools, and also gained confidence in their poetry writing. Morgan and Smith (2008) further emphasized the need for organization, structure, and a rubric for clear expectations in their article about using online writing resources as instructional tools.

Results from this study emphasize the need to redesign classrooms so that digital natives can learn as digital natives. The CFF Program was a good start toward achieving this goal, but current high school classrooms have not all made the changes necessary to completely meet this goal. All teachers need the opportunity to learn about 21st century teaching and learning. Administrators need to take the lead. As instructional leaders must model the use of 21st century teaching and learning methods, and must ensure these methods are included in all professional development opportunities for all teachers.

The CFF program provided schools throughout the Commonwealth of Pennsylvania with technology resources and professional development focused on changing teacher practice to include 21st Century Skills as part of teaching and learning. This study looked at a very small component of the CFF program. It provided the researcher opportunities to work with teachers in two high schools to specifically look at whether students acquired 21st Century Skills after using either a blog or a wiki. The results support prior research in that many of these skills such

as engagement, literacy, presentation, communication, collaboration, and digital citizenship increased for students after using a blog or a wiki. Quotations from two CFF teachers summarize the results of the study. From Teacher HSZLA5:

> Over time writing improved. I gave them a rubric and insisted they follow it. Using the online tool made them want to do their work more. I did not have to remind them as much to get to work. They were engaged and on task. At times they worked together and even then there was not a lot of talking about other things. They got their work done and wanted to publish their best work.

And from teacher HSZM2, "My students grew up using technology from when they were toddlers. They are familiar with iPods, cell phones, computers, etc. My students need the school to meet them where they are in learning, and that is using technology."

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Appendices

Appendix A

Zoomerang™ Teacher Survey

CFF Teachers' Perceptions Regarding the Acquisition of 21st Century Skills after Using Blogs and Wikis

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CFF Teachers' Perceptions Regarding the Acquisition of 21st Century Skills after Using Blogs and Wikis

INTRODUCTION:

The intent of this survey is to gather data about teachers' perceptions regarding the impact of blogs and wikis on the acquisition of 21st Century Skills in the CFF classroom. The survey should take you 20-30 minutes to complete. Your responses will be kept strictly anonymous. Teacher names will not be used in the collection, analysis, or reporting of the data. Thank you in advance for your time and participation.

Survey results will be analyzed as part of the doctoral dissertation process and will be included and published as part of the final document. Completion of this survey indicates that you agree to have your input included in the analysis and reporting of the data collected with this survey. You may choose to withdraw from the study by sending an email to rlutcher@comcast.net. This project has been approved by the East Stroudsburg University of Pennsylvania Institutional Review Board (IRB). You may also contact the chairperson of the IRB, Dr. Shala Davis, at 570 - 422 - 3336 with questions or concerns.

SECTION #1
This section is designed to gather information about the CFF teachers participating in this study.

Question 1 - Choice - One Answer (Bullets)

Select the number of years that you have been teaching.

- ❍ Less than 3 years
- ❍ 3 to 5 years
- ❍ 5 to 10 years
- ❍ 10 to 20 years
- ❍ 20 to 30 years
- ❍ More than 30 years

Question 2 - Choice - Multiple Answers (Bullets)

Select the subject(s) that you have taught or are teaching while participating in the CFF program. Select all that apply.

- ❑ Language Arts
- ❑ Mathematics
- ❑ Science
- ❑ Social Studies

Question 3 - Choice - One Answer (Bullets)

The professional development provided with the CFF program discussed the difference between digital natives and digital immigrants. How would you classify yourself? Select one of the choices below.

- ❍ Digital Native
- ❍ Digital Immigrant

SECTION #2
This section is designed to gather data about the technology located in your classroom, and its availability for use by your students.

Question 4 - Choice - Multiple Answers (Bullets)

Select the technology that is available in your classroom.
Select all that apply.

- ❑ Teacher Computer
- ❑ Interactive Whiteboard
- ❑ Wireless Internet Access
- ❑ Printer
- ❑ Laptop Computers for Students
- ❑ Digital Still Camera
- ❑ Digital Video Camera

Question 5 - Rating Scale - Matrix

How often is the technology available for use by the students?

	Every Day	3-4 Days Each Week	1-2 Days Each Week	Less than Once Each Week
Interactive Whiteboard	❍ 1	❍ 2	❍ 3	❍ 4
Wireless Internet Access	❍ 1	❍ 2	❍ 3	❍ 4
Printer	❍ 1	❍ 2	❍ 3	❍ 4
Laptop Computers for Students	❍ 1	❍ 2	❍ 3	❍ 4
Digital Still Camera	❍ 1	❍ 2	❍ 3	❍ 4
Digital Video Camera	❍ 1	❍ 2	❍ 3	❍ 4

SECTION #3
This section will focus on the use of blogs in your classroom.

Question 6 - Choice - Multiple Answers (Bullets)

Select the number of times your students have used a blog as part of your classroom instruction during the current school year.

- ❑ Never
- ❑ 1-2 Times
- ❑ 3-5 Times
- ❑ More than 5 Times

Question 7 - Rating Scale - Matrix

* Rate each question regarding your students' experience with using a blog.

	0% - 25% of the time	26% - 50% of the time	51% - 75% of the time	76% - 100% of the time
My students were engaged as they created and participated in the blog.	❍ 1	❍ 2	❍ 3	❍ 4
It was important to my students that the blog represented a relevant topic.	❍ 1	❍ 2	❍ 3	❍ 4
It was important to my students that their responses exhibited good writing technique.	❍ 1	❍ 2	❍ 3	❍ 4
It was important to my students that their responses were well thought out.	❍ 1	❍ 2	❍ 3	❍ 4
It was important to my students that their responses were grammatically correct.	❍ 1	❍ 2	❍ 3	❍ 4
It was important to my students that their responses contained no spelling errors.	❍ 1	❍ 2	❍ 3	❍ 4
It was important to my students that their responses were focused on the blog topic.	❍ 1	❍ 2	❍ 3	❍ 4

Question 8 - Rating Scale - Matrix

Rate each 21st Century Skill impacted by the use of blogs in your classroom.

"Not at all" means there has not been any impact from the use of blogs.
"Somewhat" means you have begun to see changes that can be attributed to the use of blogs.
"Significantly" means you have seen continuous and numerous changes that can be attributed to the use of blogs.

Select the NA column only if your students have not used blogs in your classroom.

	Not at all	Somewhat	Significantly	N / A
Basic Literacy - Writing was focused	❍ 1	❍ 2	❍ 3	❍ N / A
Basic Literacy - Writing technique	❍ 1	❍ 2	❍ 3	❍ N / A
Basic Literacy - Grammar	❍ 1	❍ 2	❍ 3	❍ N / A
Basic Literacy - Spelling	❍ 1	❍ 2	❍ 3	❍ N / A
Technological Literacy	❍ 1	❍ 2	❍ 3	❍ N / A
Information Literacy	❍ 1	❍ 2	❍ 3	❍ N / A
Cultural Literacy	❍ 1	❍ 2	❍ 3	❍ N / A
Global Awareness	❍ 1	❍ 2	❍ 3	❍ N / A
Self Direction	❍ 1	❍ 2	❍ 3	❍ N / A

Creativity	❍	1	❍	2	❍	3	❍	N / A
Curiosity	❍	1	❍	2	❍	3	❍	N / A
Higher-Order Thinking	❍	1	❍	2	❍	3	❍	N / A
Sound Reasoning	❍	1	❍	2	❍	3	❍	N / A
Collaboration	❍	1	❍	2	❍	3	❍	N / A
Teaming	❍	1	❍	2	❍	3	❍	N / A
Interpersonal Skills	❍	1	❍	2	❍	3	❍	N / A
Personal Responsibility	❍	1	❍	2	❍	3	❍	N / A
Social and Civic Responsibility	❍	1	❍	2	❍	3	❍	N / A
Ability to Produce High-Quality Products	❍	1	❍	2	❍	3	❍	N / A

Question 9 - Open Ended - Comments Box

Please share any other information regarding the use of a blog by your students as part of their classroom instruction.

SECTION #5
This section will focus on the use of wikis in your classroom.

Question 10 - Choice - Multiple Answers (Bullets)

Select the number of times your students have used a wiki as part of your classroom instruction during the current school year.

- ❑ Never
- ❑ 1-2 Times
- ❑ 3-5 Times
- ❑ More than 5 Times

Question 11 - Rating Scale - Matrix

Rate each question regarding your students' experience with using a wiki.

	0% - 25% of the time		26% - 50% of the time		51% - 75% of the time		76% - 100% of the time
My students were engaged as they participated in the Wiki.	❍	1	❍	2	❍	3	❍ 4
It was important to my students that the wiki represented a relevant topic.	❍	1	❍	2	❍	3	❍ 4
It was important to my students that their responses exhibited good writing technique.	❍	1	❍	2	❍	3	❍ 4
It was important to my students that their responses were well thought out.	❍	1	❍	2	❍	3	❍ 4
It was important to my students that their responses were grammatically correct.	❍	1	❍	2	❍	3	❍ 4
It was important to my students that their responses contained no spelling errors.	❍	1	❍	2	❍	3	❍ 4
It was important to my students that their responses were focused.	❍	1	❍	2	❍	3	❍ 4

Question 12 - Rating Scale - Matrix

Rate each 21st Century Skill impacted by the use of wikis in your classroom.

"Not at all" means there has not been any impact from the use of wikis.
"Somewhat" means you have begun to see changes that can be attributed to the use of wikis.
"Significantly" means you have seen continuous and numerous changes that can be attributed to the use of wikis.

Please use the NA column only if you have not used wikis in your classroom.

	Not at all		Somewhat		Significantly		N / A
Basic Literacy - Writing was focused	❍	1	❍	2	❍	3	❍ N / A
Basic Literacy - Writing technique	❍	1	❍	2	❍	3	❍ N / A
Basic Literacy - Grammar	❍	1	❍	2	❍	3	❍ N / A
Basic Literacy - Spelling	❍	1	❍	2	❍	3	❍ N / A
Technological Literacy	❍	1	❍	2	❍	3	❍ N / A
Information Literacy	❍	1	❍	2	❍	3	❍ N / A
Cultural Literacy	❍	1	❍	2	❍	3	❍ N / A
Global Awareness	❍	1	❍	2	❍	3	❍ N / A
Self Direction	❍	1	❍	2	❍	3	❍ N / A
Creativity	❍	1	❍	2	❍	3	❍ N / A
Curiosity	❍	1	❍	2	❍	3	❍ N / A
Higher-Order Thinking	❍	1	❍	2	❍	3	❍ N / A
Sound Reasoning	❍	1	❍	2	❍	3	❍ N / A
Collaboration	❍	1	❍	2	❍	3	❍ N / A
Teaming	❍	1	❍	2	❍	3	❍ N / A
Interpersonal Skills	❍	1	❍	2	❍	3	❍ N / A
Personal Responsibility	❍	1	❍	2	❍	3	❍ N / A
Social and Civic Responsibility	❍	1	❍	2	❍	3	❍ N / A
Ability to Produce High-Quality Products	❍	1	❍	2	❍	3	❍ N / A

Question 13 - Open Ended - Comments Box

Please share any other information about using wikis as part of your classroom instruction.

Conclusion:

Thank you for taking the time to complete this survey.
Survey results will be analyzed as part of the doctoral dissertation process and will be included and published as part of the final document. Teacher names will not be used in either the analysis or reporting of data. Your input is important and appreciated.
Completion of this survey indicates that you agree to have your input included in the analysis and reporting of the data collected with this survey.

Appendix B

Focus Group Questions

The Impact of Blogs and Wikis on the acquisition of 21st Century Skills in the CFF Classroom Focus Group Questions

Introduction: These questions will be used to assess the impact of blogs and wikis in the CFF Classroom. The results will be analyzed and published as part of a doctoral dissertation.

1. Describe your training and subsequent efficacy to use a blog as a tool to communicate and/or collaborate with colleagues.

2. Describe how you have used a blog to communicate and/or collaborate with colleagues.

3. Describe your training and subsequent efficacy to use a blog as an instructional tool with your classes.

4. Describe how you have used a blog with your students as an instructional tool.

5. Describe the results of using a blog with your students:
    a. What was their level of engagement?
    b. What impact did using a blog have on the acquisition of 21st Century Skills?
    c. What impact did using a blog have on the acquisition of basic literacy skills – reading and writing?
    d. Any other results?

6. Describe your training and subsequent efficacy to use a wiki as a tool to communicate and/or collaborate with colleagues.

7. Describe how you have used a wiki to communicate and/or collaborate with colleagues.

8. Describe your training and subsequent efficacy to use a wiki as an instructional tool with your classes.

9. Describe how you have used a wiki with your students as an instructional tool.

10. Describe the results of using a wiki with your students:
    a. What was their level of engagement?
    b. What impact did using a wiki have on the acquisition of 21st Century Skills?
    c. What impact did using a wiki have on the acquisition of basic literacy skills – reading and writing?
    d. Any other results?

11. Please take time now to share anything else you want to convey about the impact of blogs and wikis on the acquisition of 21st Century Skills in your CFF classroom.

Appendix C

Survey Consent Form for Classrooms of the Future Teachers

Principal Investigator: **Robin L. Lutcher** **ESU IRB Chairperson: Dr. Shala Davis**
215-258-2465
570-422-3336

Teachers' Perceptions on the Impact of Blogs and Wikis Related to the Acquisition of 21st Century Skills in the CFF Classroom: A Study at Two Pennsylvania High Schools.

INFORMED CONSENT FORM – ZOOMERANG™ SURVEY

I HAVE BEEN INFORMED THAT:

1. Robin L. Lutcher, who is doctoral student at East Stroudsburg University, has invited me to participate in a research study. It is my understanding that the data to be collected will be used in a dissertation.

2. The purpose of the research is to study teachers' perceptions regarding the impact of using blogs and wikis on the acquisition of 21st Century Skills in the Classrooms for the Future (CFF) classroom.

3. My participation will involve completion of an online Zoomerang™ survey. I understand that the survey will take approximately 30 minutes to complete. Approximately 200 CFF teachers from two Pennsylvania high schools will be invited to participate in the survey. Participation is voluntary and the results will be published, but teacher names will not be used either during the collection of data or in the dissertation document. Zoomerang™ assigns a random ID number to each record when the survey data is exported. These ID numbers will be used in place of teacher names. All responses will remain anonymous.

4. There may be a risk to the participant if he or she feels uncomfortable responding freely about the CFF program in his or her high school. Risks will be minimal due to the anonymity of the participants.

5. The study will provide the following benefits: 1) information concerning the impact of blogs on the acquisition of 21st Century Skills, 2) information concerning the impact of wikis on the acquisition of 21st Century Skills, 3) information about how wikis and blogs are being used and their result on teaching and learning in the CFF classroom.

6. Confidentiality of the identity of all participants and their responses to the survey will be strictly maintained. Teachers will be assigned a random ID number. This number will be used instead of the teachers' names. The online survey results will be exported, downloaded and stored on a secure server. The server will be accessible with a login and password. Once the data

is stored on the server, it will be stored in a private folder that is accessible only by the principal investigator. Data will be backed up nightly.

7. I will not be paid for my participation.

8. Any questions I may have concerning the research study, before or after my consent, will be answered by **Robin L. Lutcher, at 215-258-2465, or Dr. Patricia Smeaton, Doctoral Committee Chair at 570-422-3374**. Questions can also be directed to the chairperson of the ESU Institutional Review Board, **Dr. Shala Davis, at 570 - 422 - 3336**.

9. The nature, demands, benefits and any risk of the project have been explained to me. I understand that I may withdraw my consent and discontinue participation at any time without penalty or loss of benefit to myself. A copy of this consent form will be given to me.

THIS PROJECT HAS BEEN APPROVED BY THE EAST STROUDSBURG UNIVERSITY OF PENNSYLVANIA INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS.

Principal Investigator: **Robin L. Lutcher** **ESU IRB Chairperson: Dr. Shala Davis**
215-258-2465
570-422-3336

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10. Federal law requires that all copies of consent forms be retained for a minimum of three years after completion of the research. All hard copy documents associated with the study will be stored in a locked filing cabinet.

11. I have read and understand the information provided in the above informed consent form, and have been provided the opportunity to ask questions.
Subject's
Signature_____Date_____

12. "I certify that I have explained to the above individual the nature and purpose, the potential benefits, and possible risks associated with participation in this research study, have answered any questions that have been raised, and have witnessed the above signature. I have provided the participant a copy of this signed consent document."
Signature of
Investigator_____Date_____

THIS PROJECT HAS BEEN APPROVED BY THE EAST STROUDSBURG UNIVERSITY OF PENNSYLVANIA INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS.

Appendix D

Focus Group Consent Form for Classrooms of the Future Teachers

Principal Investigator: **Robin L. Lutcher** **ESU IRB Chairperson: Dr. Shala Davis**
215-258-2465
570-422-3336

Teachers' Perceptions on the Impact of Blogs and Wikis Related to the Acquisition of 21st Century Skills in the CFF Classroom: A Study at Two Pennsylvania High Schools.

INFORMED CONSENT FORM – FOCUS GROUP

I HAVE BEEN INFORMED THAT:

1. Robin L. Lutcher, who is doctoral student at East Stroudsburg University, has invited me to participate in a research study. It is my understanding that the data to be collected will be used in a dissertation.

2. The purpose of the research is to study teachers' perceptions regarding the impact of using blogs and wikis on the acquisition of 21st Century Skills in the Classrooms for the Future (CFF) classroom.

3. My participation will involve participation in a focus group for my content area. I understand that the focus group will take 60-90 minutes to complete. Approximately 200 CFF teachers from two Pennsylvania high schools will be invited to participate in the focus group process, and each group will contain 8-10 participants. Participation is voluntary and the results will be published, but teacher names will not be used either during the collection of data or in the dissertation document. Random ID numbers will be used in place of teacher names. All responses will remain anonymous.

4. There may be a risk to the participant if he or she feels uncomfortable responding freely about the CFF program in his or her high school. Risks will be minimal due to the anonymity of the participants.

5. The study will provide the following benefits: 1) information concerning the impact of blogs on the acquisition of 21st Century Skills, 2) information concerning the impact of wikis on the acquisition of 21st Century Skills, 3) information about how wikis and blogs are being used and their result on teaching and learning in the CFF classroom.

6. Confidentiality of the identity of all participants and their responses to the focus group questions will be strictly maintained. Teachers will be assigned a random ID number. This number will be used instead of the teachers' names. Focus group sessions will be audio taped. The tapes will transcribed as electronic documents and stored on a secure server. The server will

be accessible with a login and password. Once the data is stored on the server, it will be stored in a private folder that is accessible only by the principal investigator. Data will be backed up nightly.

7. I will not be paid for my participation.

THIS PROJECT HAS BEEN APPROVED BY THE EAST STROUDSBURG UNIVERSITY OF PENNSYLVANIA INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS.

Principal Investigator: **Robin L. Lutcher** **ESU IRB Chairperson: Dr. Shala Davis**

215-258-2465

570-422-3336

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8. Any questions I may have concerning the research study, before or after my consent, will be answered by **Robin L. Lutcher, at 215-258-2465, or Dr. Patricia Smeaton, Doctoral Committee Chair at 570-422-3374**. Questions can also be directed to the chairperson of the ESU Institutional Review Board, **Dr. Shala Davis, at 570 - 422 - 3336**.

9. The nature, demands, benefits and any risk of the project have been explained to me. I understand that I may withdraw my consent and discontinue participation at any time without penalty or loss of benefit to myself. A copy of this consent form will be given to me.

10. Federal law requires that all copies of consent forms be retained for a minimum of three years after completion of the research. All hard copy documents associated with the study will be stored in a locked filing cabinet.

11. I have read and understand the information provided in the above informed consent form, and have been provided the opportunity to ask questions.

Subject's Signature_____Date_____

12. "I certify that I have explained to the above individual the nature and purpose, the potential benefits, and possible risks associated with participation in this research study, have answered any questions that have been raised, and have witnessed the above signature. I have provided the participant a copy of this signed consent document."

Signature of Investigator_____Date_____

THIS PROJECT HAS BEEN APPROVED BY THE EAST STROUDSBURG UNIVERSITY OF PENNSYLVANIA INSTITUTIONAL REVIEW BOARD FOR THE PROTECTION OF HUMAN SUBJECTS.

Appendix E

Classrooms of the Future Teacher Identification Numbers

HSQ ID Codes

LA	MA	SC	SS
HSQLA1	HSQMA1	HSQSC1	HSQSS1
HSQLA2	HSQMA2	HSQSC2	HSQSS2
HSQLA3	HSQMA3	HSQSC3	HSQSS3
HSQLA4	HSQMA4		HSQSS4
HSQLA5	HSQMA5		
HSQLA6			
HSQLA7			

HSZ ID Codes

LA	MA	SC	SS
HSZLA1	HSZMA1	HSZSC1	HSZSS1
HSZLA2	HSZMA2	HSZSC2	HSZSS2
HSZLA3	HSZMA3	HSZSC3	HSZSS3
HSZLA4	HSZMA4	HSZSC4	HSZSS4
HSZLA5	HSZMA5		HSZSS5
HSZLA6	HSZMA6		
HSZLA7	HSZMA7		

HSZLA8	HSZMA8
HSZLA9	HSZMA9
HSZLA10	HSZMA10
HSZLA11	

Appendix F

Open Ended Responses

Survey Question 9 Open Ended Responses

1. I used a blog for writing assignments and my students liked using them.
2. Literature Circle Project
3. Students preferred using a blog for their chemistry lab reports
4. I did not use a blog. Not enough training.
5. I use a blog sometimes to keep absent students up to date about class work.
6. Good luck with your dissertation
7. Using a blog is a great way for kids to write and write and write
8. They appreciate the use of blogs instead of study guides!

Survey Question 13 Open Ended Responses

1. The students are more engaged because it lets them use technology, which they are more comfortable with.
2. I love using the Wikis!
3. Because of the risk involved in having an interactive wiki, my wiki focuses on dispersing information to the students in order to have a more paperless environment.
4. I have created a wiki, but it is for teachers, not students.
5. My classroom wiki has greatly empowered my students to take an ownership role of the classroom. It has maintained student interest, and I have also not spent one day lecturing/delivering notes this year due to use of a class wiki.
6. Communication skills were practiced.
7. I use my wiki on a daily basis. It is the foundation of my class. It has become a gathering place of ideas and documents and resources and student work and visuals...it does it all.
8. I need help really organizing my wiki and with learning how to use it before I can use it with kids.
9. The students really enjoy the online collaboration with other students. The seemed to be more enthusiastic about the instruction and the projects etc.
10. My math wiki is used almost daily.

Appendix G

Sample Focus Group Responses

Q5: Describe the results of using a blog with your students: a. What was their level of engagement? b. What impact did using a blog have on the acquisition of 21st Century Skills? c. What impact did using a blog have on the acquisition of basic literacy skills – reading and writing? d. Any other results?	
HSZLA10	One of my students was traveling with her parents. I asked her to blog about what she saw and what she learned as she traveled from country to country. It really worked to keep her connected to the class and encouraged collaboration.
HSZMA3	I use the NCTM site with my students. They submit answers to problems and contribute to discussions with students from other schools about their solutions.
HSZSC2	My students blogged with other students about environmental issues. They collected and shared data, which led to discussions about the results. They were eager to connect with other students and spent hours outside of class posting to the blog.
HSZSS1	I used a blog to have students share their thoughts about current events. IT was neat to see how students who were hesitant to share in class opened up using the blog.
Q10: Describe the results of using a wiki with your students: a. What was their level of engagement? b. What impact did using a wiki have on the acquisition of 21st Century Skills? c. What impact did using a wiki have on the acquisition of basic literacy skills – reading and writing? d. Any other results?	
HSQLA1	Research skills increased from all of the time they spent finding information to add to the wiki and using sites posted by other students.
HSQMA3	My students used the wiki to communicate their solutions to math problems. I feel they responded more using the wiki than they would have just in class.
HSQSC1	My students worked in groups to post information about Chemistry problems and research to the class wiki. They preferred working online to working in class without technology.
HSQSS2	Using a wiki immediately caught the interest of my students. They wanted to read what others had posted and to add information they had found.