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A CASE STUDY OF 21ST CENTURY SKILLS IN HIGH ACHIEVING ELEMENTARY SCHOOLS IN PENNSYLVANIA

A Dissertation

Submitted to the School of Graduate Studies and Research

in Partial Fulfillment of the

Requirements for the Degree

Doctor of Education

Gregory P. Egnor

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May 2013

Indiana University of Pennsylvania
School of Graduate Studies and Research
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Title: A Case Study of 21st Century Skills in High Achieving Elementary Schools in Pennsylvania

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This study examines if practices that advocate for 21st century skills are in conflict with the mandates of NCLB. Interviews with influential school leaders of high achieving elementary schools focused on collecting data about 21st century skills. This study was designed to (a) Determine if 21st century skills are addressed in high achieving elementary schools while maintaining the proficiency requirements of NCLB. (b) Investigate the extent 21st century skills are being implemented into instruction and learning practices in high achieving elementary schools (c) Explore how 21st century skills are addressed in high achieving elementary schools.

The sample for this study consisted of nine influential school leaders of high achieving elementary schools in Pennsylvania. A pilot study was conducted with five influential school leaders outside of the formal participant pool. Following the pilot study, a formal study was conducted and its data underwent a descriptive analysis. Results were analyzed to make recommendations to help address 21st century skills in elementary schools. This study offers ways the state of Pennsylvania can help facilitate the implementation of 21st century skills in elementary schools.

ACKNOWLEDGMENTS

The completion of this study marks the end of a significant effort that never would have been fulfilled without the support of several people. Their encouragement was instrumental in helping me achieve my goals.

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To my wife Cathy, and daughter Olivia, I hope this work makes your proud. You are my inspiration and without your understanding and support, this study would never have been completed. Cathy was always there to hear my frustrations and could be relied upon to help me move forward. Likewise, I will always remember my daughter Olivia reading her books along side of me while I wrote. These efforts helped me achieve my goal of completing this study, while not sacrificing my family, an accomplishment I am truly proud of.

I would also like to extend a special thank you to my staff and colleagues from Burrell School District. Your words of support and understanding were appreciated throughout this journey. Finally, I thank each of my classmates from cohort 9. We truly did support each other through our individual journeys!

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CHAPTER ONE

A CASE STUDY OF 21ST CENTURY SKILLS IN HIGH ACHIEVING ELEMENTARY SCHOOLS IN PENNSYLVANIA

For as long as educators can recall, our primary responsibility has been to teach reading, writing, and arithmetic. Attaining these basic skills was necessary for employment and citizenship in the 20th century. Instructional practices hardly changed during this time, as student achievement was believed to be pre-determined by intelligence. This approach continued for decades until educational reform efforts began to surface in the early 1970's. Currently, American education is entrenched in No Child Left Behind (NCLB). NCLB is a standards-based reform effort that is established on the belief that setting high standards and establishing measurable goals will improve education. The cornerstone of this effort is mandated state assessment that determines if students have met these standards, thus attaining the necessary knowledge and skills needed to be productive learners, workers, and citizens. Do these state assessments truly measure skills that are necessary for life in the 21st century (Wagner, 2008)? This study is about 21st century skills and focuses on the instructional, curricular, and assessment practices of elementary schools that consistently produce high achievement scores on Pennsylvania System of State Assessment (PSSA).

The emergence of the global economy has changed the demands of citizenship and employment in the 21st century. New technologies are changing at a rapid pace, and we face ever-changing and complex societal issues. However, our schools are not designed to prepare students for this reality (Wagner, 2008). The basic premise of public education in America is still built on a model designed for the turn of the 20th

century when factory and mill jobs were abundant. Those jobs however, required discipline and repetition and were heavily entrenched in centralized decision making by managers and administrators. Only college prep students were truly taught how to think, problem solve, and communicate effectively. Today, "work, learning, and citizenship….. demand that we *ALL* know how to *think* – to reason, analyze, weigh evidence, problem solve, and communicate effectively (Wagner, 2008, p. xxii).

The 21st century necessitates a transformation of public education. Our curricula, philosophies, assessments, and teaching methods were "created in a different century for the needs of another era" (Wagner, 2008, p. 9). NCLB is rooted in this same philosophy. It has created an environment of accountability in education developed with well intended reform efforts. Politicians believe the mandates set forth in NCLB will serve as the cornerstone of a philosophy that a quality education will better prepare Americans for jobs and productive lives. However, these reform efforts have left American educators stuck in test mode as schools have basically adopted one curriculum; standards test prep (Wagner, 2008). With educational philosophies heavily entrenched in the mindset of the early 20th century, a growing gap in job openings and qualified workers is increasing every day. "As the world continues to shift from an industrial economy to a service economy driven by information, knowledge, and innovation, cultivating 21st century skills is vital to economic success". (Report: Teach 21st-century skills-or U.S. will fail, 2008, pg 2). Educators can address 21st century skills by integrating the four C's; critical thinking, communication, collaboration, and creativity. *Note*. From The Partnership for 21st Century Skills, 2011, retrieved from (www.p21.org). Copyright 2011 by The Partnership for 21st Century Skills. Reprinted with permission.

To more adequately arm students with these 21st century skills, a shift in instructional practices will need to take place in elementary classrooms.

Elementary schools are faced with a dilemma of converging philosophies from the past, present and future. Presently, it is believed that all children can learn given quality instruction. A multitude of professional development, research based instruction, and more specialized certifications are a testament to educators' desire to improve instruction. However, a shift from instructing for content to process skills will be the desired approach in the 21st century. In today's classrooms, students need to be provided with relevant instruction rich in these skills that will be needed in a new Globalization 3.0 era. (Friedman, 2007). But, elementary schools are charged with the duty of teaching basic academic skills in reading, math, writing, and science then demonstrate this learning in federally mandated assessments. Are these two educational goals in conflict (Wagner, 2008)? Does the focus on data now present in public schools promote 21st century skills (Schmoker, 2008)?

Problem Statement

Recent economic difficulties have shed light on the loss of jobs to foreign countries. From 1995 – 2005, the United States lost three million manufacturing jobs. During this same time, 17 million service-sector jobs were created (Report: Teach 21st-century skills-or U.S. will fail, 2008). As foreign countries transformed their educational programs, an under-prepared American workforce failed to fill these jobs. Foreign countries have made the leap from isolated territories to collaborative agents, resulting in more and more foreign workers competing for American jobs (Friedman, 2007). A new global economy is surfacing and most Americans seem unaware of the

ramifications of this new environment. Technology has allowed individuals to be more informed, and more connected than ever before which now seems to be the driving force of a shifting economy (Friedman, 2007).

A different set of skills, 21st century skills, will require workers to posses the ability to problem solve, collaborate, innovate, communicate, adapt, and analyze information. Public education needs to acknowledge the need to teach the four C's to enhance these skills and embrace the opportunities that exist in this economy. However, public education is embedded in a national reform effort driven by NCLB that requires students to demonstrate 100% proficiency in reading and mathematics by 2014. Though well intended, this effort is putting our children further behind in acquiring the skills necessary for the shifting global economy. Throughout America, schools are succeeding at making adequate yearly progress but failing their students. (Wagner, 2008) This study will examine the practices of high achieving elementary schools to investigate the extent the four C's are being implemented into instruction and learning practices.

Purpose of Study

Presently, there is not a wealth of research regarding the conflict of 21st century skills and NCLB reform efforts. The purpose of this study was to determine if 21st century skills are addressed in high achieving elementary schools while maintaining the proficiency requirements of NCLB. It is the belief of the researcher that the intense focus to attain proficiency on state assessments mandated by NCLB limits the opportunity to address 21st century skills. More specifically, this study intends to answer the following questions:

1. To what extent do instructional leaders of high achieving elementary schools perceive 21st century skills?
2. To what extent are 21st century skills addressed in high achieving elementary schools?
3. What are the most common instructional strategies used to implement 21st century skills in high achieving elementary schools?

High achieving status will be defined as a K-5 school that has attained 90% proficiency on the Pennsylvania System of School Assessment (PSSA) in math and reading among fifth graders in 2009, 2010, and 2011.

Need for Study

In an effort to be successful in today's high stakes testing environment, elementary schools have focused a great deal of attention towards reading and math instruction. More specifically, these efforts address test preparation and remediation. In some cases, schools have greatly reduced instruction in other core subjects such as social studies, science, art, and music. Recess has even become a topic of interest as some view it as a reduction of instructional time. Some evidence suggests that these strategies appear to be effectively addressing reading and math achievement. However, this intense focus on reading and mathematics instruction negatively affects writing, science, the arts, and ultimately, 21st century skills. Skill instruction is limited to basic skills in reading and math with little attention to application. Are students gaining the skills needed for learning, work, and citizenship in the 21st century? Many elementary schools and their communities are uncomfortable facing these questions as doing so may jeopardize achievement and the Adequate Yearly Progress (AYP) mandated

through NCLB. The reality of today's shifting global economy necessitates the need to instruct 21st century skills in our schools.

Conceptual Framework

The framework for this qualitative case study was investigated through the globalization theories of Thomas L. Friedman (2007). His review of current globalization shifts offer insight into the need to teach 21st century skills in our schools. He also provides a timeline for the forces that led to this need. Friedman's insights offer the first indicators that American education does not adequately address the 21st century skills needed for life in a shifting global economy.

Friedman provides a clear picture of the shifting global economy in his book *The World is Flat*. He describes in detail the evolution of the job market and national economies that have resulted from ten "flattening forces" that have occurred since the early 1990's. These forces have contributed to the current global economy and require a new set of skills from individuals that wish to flourish or survive in this economy. These "globalization skills" need to be addressed by society as a new focus of education in order to prepare a new generation for a future economy that hangs in the balance. Friedman's theories were used as a framework of globalization used in this study.

Friedman describes the evolution of globalization as having occurred during three great eras; globalization 1.0, 2.0, and 3.0. The evolution of these eras can best be described as the global community moving from one that operated in isolation, to one that operates collaboratively. This has been made possible by "the convergence of the personal computer and fiber optic cable" (Friedman, 2007). Communication has grown

exponentially, and will continue to do so as technology catches up with infrastructure. Currently, globalization 3.0 provides *individuals* the opportunity to collaborate and communicate from anywhere, regardless of the distance between them (Friedman, 2007). With the ease of communication and sharing of information, individuals will need to compete internationally for jobs. In this era, employees will need to possess specific skills that will allow them to be marketable in the new global economy. Education will play a vital role in American society's ability to survive and thrive in this economy.

Friedman refers to ten events, innovations, companies, and forces that have converged to create the globalization 3.0 era. These events are presented in figure 1. If these forces have defined today's global economy, education would be well served to embrace their lessons with an eye toward the future. A quick review of the ten flattening forces indicates that each of the flatteners was in part shaped by previous events, innovations, or opportunities. The convergence of the technology and communication afforded by the ten flattening forces will allow for individual collaborative efforts of global proportions. Educators that comprehend these forces and embrace the instructional opportunities they present can better prepare students for future innovation. This new era of globalization necessitates a renewed purpose to educate relevant skills needed for the 21st century.

#	Flattener	Description
1	11/9/1989	The fall of the Berlin wall which opened up capitalism around the world and the release of the first version of Windows making computers more user friendly
2	8/9/1995	The day Netscape went public allowing for the emergence of the world wide web, the internet, and international connectivity.
3	Workflow software	The standardization of digital content that allowed for seamless transfer of documents through email and internet.
4	Uploading and e-Communities	Allows for web based collaboration to create software, share ideas, communicate, and upload software. (Blogs, Wikipedia, Community developed Software)
5	Outsourcing	Moving jobs or projects to foreign employees in an effort to save money and improve efficiency.
6	Off shoring	Moving factories/ business's to foreign countries in an effort to save money on labor, taxes, health care.
7	Supply-Chaining	Digitized inventory that more efficiently coordinates suppliers, retailers, wholesalers to keep pace with consumer demand.
8	In-sourcing	Third-party managed logistics companies use to specialize services
9	In-forming	The emergence of Google and other search engines
10	Mobile Media	Real time, mobile, digital communication of information

Figure 1. The ten forces that flattened the world. This figure illustrates Friedman's Ten Forces that Flattened the World (2007)

Significance of Study

Recent economic difficulties have shed light on the new global economy that is emerging. Most Americans seem to be unaware of the ramifications of this new environment though it is apparent that a new set of skills will be required to survive and thrive in this setting. Emerging jobs will require workers to problem solve collaboratively and utilize technology to communicate and share information. Schools will play a vital

role in teaching these 21st century skills while meeting proficiency requirements of NCLB. This study will reflect this paradigm shift as it occurs simultaneously with proficiency requirements of NCLB.

It is hoped the results of this study will be utilized by districts, policy-makers, and educators when considering curriculum and instruction decisions, in particular at the elementary level. Teacher preparation programs at the university level can utilize findings to prepare teachers for a profession needing to undergo a transformation. Ultimately, results can be used by policymakers as they guide education to meet the current and future demands of industry. Ultimately, American society will benefit from the findings of this study as it will shed light on the need to embrace the skills needed for students to be competent in the 21st century. This study will shed light on continued reform efforts brought on by NCLB, while a total transformation of the purpose and function of American public education is needed.

Study Design

A qualitative method was chosen as it favorably fit the purpose of this study, which is to determine if it is possible to address 21st century skills while maintaining proficiency requirements of NCLB. The case study design offered the researcher a chance to examine more deeply the practices of high achieving elementary schools. Quantitative analysis unfortunately limited the researcher's ability to thoroughly investigate these practices.

There are several factors to consider when identifying practices of high achieving elementary schools, and every effort was made to consider all these factors. This study was principally concerned with understanding educational practices of high achieving

elementary schools. Interviews with influential school leaders focused on collecting data about 21st century skills in participating schools. Based on the desire to explore how 21st century skills are addressed in high achieving elementary schools, the case study was determined to be the best method for studying these practices.

Participants

The participants for this study were selected from school leaders of high achieving elementary schools that instruct students in Kindergarten, first, second, third, fourth, and fifth grades in Pennsylvania. School leaders consisted of individuals that have influence over instructional or curricular practices within their school. Principals, curriculum coordinators, department chairs, or grade level leaders were considered as school leaders for the purposes of this study. High achieving status was defined as the attainment of 90% proficiency on the Pennsylvania System of School Assessment (PSSA) in math and reading among fifth graders in 2009, 2010, and 2011. The PSSA is the standards based assessment that is used to determine student proficiency, and Adequate Yearly Progress (AYP) in the state of Pennsylvania. PSSA data was accessed through the public record of PSSA results on the Pennsylvania Department of Education's website. Third and fourth grade results were not used to determine high achieving status. Fifth grade results were focused on as they represent a culminating effort in an elementary school. The instructional practices in third and fourth grade were looked at as contributing to the results in fifth grade, which further merited investigation.

Participants were selected through purposive sampling. School leaders of high achieving elementary schools were used as the purposeful sample due to their understanding of and influence over instructional practices. Selecting schools that attain

90% proficiency on the PSSA in fifth grade provides a sample that clearly demonstrates the attributes of a school that is preparing students for the 21st century as suggested by the NCLB.

Limitations of Study

Limitations that affect the ability to generalize beyond the borders of Pennsylvania were identified in this study. Additionally, interview responses could be subject to misinterpretations or beliefs of 21st century skills. The nature of this study creates concerns regarding the control of responses from interviews. Schools will offer various types of technology instruction that is used to promote 21st century skills. Interviews were limited to school leaders that did not include superintendents, school board members, parents, or students. Finally, the findings of this study may be difficult to embrace by different administrators, politicians, and educators.

Summary

No Child Left Behind has created an environment of accountability in education. However, education is still entrenched in a model designed for the turn of the 20th century when factory and mill jobs were abundant. Foreign countries have made the leap from isolated territories to collaborative agents that have benefited from the convergence of the technology and communication. Educators that comprehend these forces and embrace the instructional opportunities they present can better prepare students for future innovation and the opportunities they present. This new era of globalization necessitates a renewed purpose to educate relevant skills needed for the 21st century

Chapter one looks at the need for this study, the purpose of the study, and the theoretical basis for the study. Chapter two will provide a review of American education in the early 20th century, past educational reform efforts, the need for 21st century skills, promoting 21st century skills, STEM education, and web 2.0 educational practices.

CHAPTER 2

LITERATURE REVIEW

The emergence of the global economy has changed the demands of citizenship and employment in the 21st century (Friedman, 2007; Wagner, 2008). This shift has created a need for a transformation of educational practices in America. However, the demands of No Child left Behind (NCLB) limits the opportunity to instruct 21st century skills (Wagner, 2008). The purpose of this study was to determine if 21st century skills are addressed in high achieving elementary schools while maintaining the proficiency requirements of NCLB. In order to design a study that will answer these questions:

1. To what extent do instructional leaders of high achieving elementary schools perceive 21st century skills?
2. To what extent are 21st century skills addressed in high achieving elementary schools?
3. What are the most common instructional strategies used to implement 21st century skills in high achieving elementary schools?

Information and research on 21st century instruction, curriculum, and assessment was examined. Additionally, early 20th century education, past reform efforts and globalization theories were examined.

A recent review of research related to 21st century skills indicates the immediate need to shift classrooms from a model for 20th century education, to a model that facilitates 21st century skills. The majority of this literature does not refer to making this shift in an environment of high stakes assessment and No Child Left Behind. Most studies involve the impact of 21st century instructional practices on student learning, but

not to what extent these practices are present in our schools. Chapter Two reviewed literature that is relevant to the study. First, early 20th century American education and 20th century educational reform will be presented. Second the standards based reform movement will be explored, including information about the Secretaries Commission for Achieving Necessary Skills report (SCANS). The No Child Left Behind reform effort will be explored, with detail about its vision of preparing students for life in the 21st century. The need for 21st century skills will be explored including information about the 21st century skills achievement gap. Next, 21st century education will be defined. Several examples of promoting 21st century skills will be presented followed by a presentation of the conceptual framework of this study.

Early 20th Century American Education

The turn of the 20th century saw America in the midst of a shift from an agrarian economy to an industrial economy. Immigrants were entering the country at unprecedented rates and businesses were rapidly expanding. Industrialization had truly redistributed the American family from rural farm communities to urban cities joining an ever-expanding immigrant population. Because of the industrial revolution, and immigration, formal education was more of a necessity than ever before (Whelton, 2009).

Schools were influenced by this economy. They needed to present new skills and knowledge to a population without formal education. Public schools were charged with assimilating immigrants, both domestic and foreign to urban life. Schools were primarily concerned with deportment, diet, hygiene and cleanliness. They were also a social mechanism for changing the behaviors of children who were transported from farms and

villages to the ghettos and crowded areas of America's larger cities such (Progressive Period , 2009). The prevailing purpose of education at that time was to prepare students to meet the specifications of the needs of the 20th century.

By 1916, John Dewey published *Democracy and Education; an Introduction to the Philosophy of Education*. This began the Progressive Education Movement, which contradicted the industrialized purpose of education by advocating for deep learning experiences and discovery. Progressive educational theorist presented a model of learning that was based on the best available scientific theories of learning at the time (20th Century Education, 2009). The traditional curriculum of the 19th century, rooted in rote memorization and skill practice, was viewed obsolete as an effective pedagogical skill. It was a system that lead to a high dropout rate and was strongly differentiated by economic level. Progressive educators aimed to make schools more effective agents of democracy (American Educational History Timeline, 2009). According to John Dewey public education was not just preparation for life, but the social process needed for life (20th Century Education, 2009). Progressive educators emphasized learning by doing, hands-on projects, experiential learning, problem solving, and critical thinking. Thematic and cross-curricular activities were viewed as the most effective way to make connections among disciplines and allow for deeper, conceptual knowledge.

20th Century Educational Reform

In 1945, World War II ended, and the Baby Boom generation was born. This resulted in unprecedented school population growth and massive social changes (American Educational History Timeline, 2009). With the onset of the Baby Boom, there was a need for larger schools and more teachers. Integration became the standard, and

the number of public schools increased dramitically (20th Century Education, 2009). Public schools were still charged with teaching reading, writng, and arithmetic, but the growing number of classrooms and students made this increasingly difficult. In May of 1954, the U.S. Supreme Court ruled in Brown v. Board of Education that separate educational facilities were inhernetly unequal. These social and cultural events had an immense impact on American education. Racial problems, social controversies, and budget shortfalls made it difficult to face the challenges of the time. The goals of education were unclear, though laws and policies continued to shape American education.

In 1957 the Soviet Union launched *Sputnik*, the first man made satelite to orbit earth. This event had an immediate and vital impact on American education. For the first time, Americans felt a sense of need for educational change. With the threat of communism, America needed highly trained scientist and technicians. Panic set in as popular opinion suggested fear of Soviet education supremecy. The National Defense Education Act (NDEA) increased funding for scientific research and science education. This would prove to be the first educational reform effort initiated at the federal level (Friedman, 2007).

The Discipline Centered Curriculum movement was created to produce individuals who would perform competently in the present society (Whelton, 2009). Discipline Centered Curriculum became a popular instructional model allowing for more specialized instruction of core content areas. Even elementary teachers abandoned single teacher self contained classrooms in favor of multiple specialized teachers of science, mathematics, english, and reading. This seemed to dismiss the Progressive

movement in favor of educators becoming experts in core areas of studies (Whelton, 2009). Achievment gaps due to racism, poverty, and learning difficulties became more apparaent as social inequalities became manifested in education. Though the prevailing pupose of public schools was still intended to prepare students for life in American society, there was growing sentiment that fewer students were in fact being prepared.

By 1963, efforts were undertaken to help eliminate an educational elitism that had resulted from the beliefs of Discipline Centered Curriculum (American Educational History Timeline, 2009). The Learning Disabilities Association of America was formed in 1964, ushering in special education in America. The Elementary and Secondary Education Act of 1965 provided federal funds to help low income students which resulted in Title I and Head Start. In 1975 the Education of All Handicapped Children Act determined that a free, appropriate education (FAPE) is to be offered to all handicapped students in a least restrictive setting (LRE). Federal law had truly made equality in public schools a national educational priority (Education D. o.).

In 1983, the National Commision on Excellence in Education published their report; *A Nation at Risk: The Imperitive for Educational Reform*. The report states that the United States educational system was failing to meet the national need for a competitive workforce. It set the tone for improving teaching and learning and compared American schools with those from other nations. Sweeping reforms of education were called for at the local, state, and federal level for the first time since. During the 1980's and 1990's, virtually all states had given unprecedented attention to their role in raising education standards.

SCANS Report

In 1990, the U.S. Secreatary's of Labor Commission on Achieving Necessary Skills (SCANS) "was asked to examine the demands of the workplace and whether young people were capable of meeting those demands" (The Secretary's Commision on Achieving Necessary Skills, 1991, pg viii). This investigation was ordered by the US Department of Labor to advise the U.S. Secreatary of Labor on the level and type of skills needed in the workplace. The commision worked with buisiness leaders, schools, teachers unions, and parents to define the skills students needed to attain, and acceptable levels of proficiency for them.

Workplace Competencies

The report re-defined what the modern workplace demanded of workers; "good jobs will increasingly depend on people who can put knowedge to work" (The Secretary's Commision on Achieving Necessary Skills, 1991, pg viii). The days of disciplined managerail hierarchy and decentralized decision making would now be replaced with collaborative work teams capable of solving problems and making decsions independently. This required a more sophisticated set of skills from workers. However, students were leaving school without the knowledge or skills to work in any career oriented job. SCANS research defined the competencies and foundations needed to be successful in a career oriented job. Eight requirements were identified as essential for all students to be prepared in. Figure 2 lists and describes each of the skills.

Resources	Allocating time, money, materials, space, and staff
Interpersonal	Working on teams, teaching, serving, leading, and working well with diverse backgrounds
Information	Acquiring and evaluating data, interpreting, communicating, using computers to process information
Systems	Monitoring and correcting performance, understanding different systems
Technology	Application to specific tasks, troubleshooting
Basic Skills	In reading, writing, arithmetic, speaking, listening
Thinking Skills	Decision making, problem solving, creativity
Personal Qualities	Responsibility, self management, sociability

Figure 2. SCANS defined work place know-how. This figure illustrates workplce skills recommended by the SCANS report.

Educational Implications of SCANS

SCANS was an early advocate for schools to determine new standards, curricula, and teaching methods. In fact, SCANS believed a total over haul of the American education system was required to attain the work place know-how necessary for future employment. This over haul was rooted in cognitive science. Contextual learning was seen as the most effective way to teach core content in reading, math, writing, social studies, and science. Three principles were suggested to guide contextual learning in schools; basic skills and problem solving should not be taught

seperatley. Learning should be directed away from mastery and towards problem solving. The work place know-how skills should not be taught in isoloation because students need practice in the application of those skills.

These recomendations refelcted a tranforamtional shift in education as curriculum was rooted in content, not soft skills. The educational system and methodologies was effective for decades however, and was responsible for innovation and industry that lead the world's economy for most of the 20th century (Friedman, 2007). SCANS suggested that these days were over, and the new competitive workplace would require thinking skills, problem solving, adaptability, and team work. However, defining these skills would not be enough; "Schools must teach them and students must learn them" (The Secretary's Commision on Achieving Necessary Skills, 1991, pg vii). With these recomondations, and the need for schools to change so clearly defined, American education was poised for change.

Standards Based Reform

By 1995, a group of America's top CEO's known as the Business Rountable met to discuss the state of American education. They identified an agenda of nine essential components, the first four being state standards, state tests, sanctions and the transformation of teacher education programs (Origins and Purpose of NCLB, 2009). As a result, most states had implemented reform strategies that emphasized more frequent testing conducted by states, more effective state testing, and more state mandated curriculum requirements" (20th Century Education, 2009). Eventually, academic standards of learning were passed by state legislatures ushering in the age of assessment testing.

No Child Left Behind

The No Child Left Behind Act (NCLB) of 2001, a reathorization of the Elementary and Secondary Education Act of 1965, was passed in partial response to these same reform efforts and political pressures to make American education accountable for creating a competitive workforce in a shifting economy (Wagner, 2008). A bipartisan effort of Republican and Democratic lawmakers passed the bill in 2002. It was based on the theories of standards-based education reform, which is based on the belief that setting high standards and establishing measurable goals can improve individual outcomes in education (Bush, 2001). The act requires states to develop assessments to measure basic skills of all students in certain grades. These test have become high stakes test because results have serious consequences for students and schools, and have become the hallmark of this current reform environment (Origins and Purpose of NCLB, 2009; Bush, 2001; Armando Laguardia, 2009).

The purpose of No Child Left Behind was to eliminate the achievment gap that exist between disadvantaged students and other students through accountability and scientificly proven instructional methods(Origins and Purpose of NCLB, 2009; Bush, 2001) . Many touted this new law as the gateway to quality instruction in the 21st century. Supporters believe that NCLB will benefit students, empower parents, support teachers and strengthen schools. However, assessment and content have become the focus of NCLB with data driven decision making at the forefront of these efforts (Wagner, 2008). Educators have come to embrace data as an indispensable tool for school improvement (Schmoker, 2008; Wagner, 2008).

The Need for 21st Century Skills

The Partnership for 21st Century Skills, formed in 2002, has advocated for 21st century skills to be at the center of American K-12 education. In a 2008 report, the Partnership for 21st Century Skills provided the following wakeup call to leaders in education:

> From 1995 to 2005, the United States lost three million manufacturing jobs, but, during that same time, 17 million service sector jobs were created. It is critical that the United States graduate students capable of filling those jobs and keep pace with the change in skill demands" (p. 3).

Because other nations have a competitive advantage of a low wage structure, it is imperative for America to facilitate knowledge-based resources, especially in science and technology, which will revitalize industries and the well-paying jobs they bring (Skills, 2008). Schools willl play a vital role in America's respsone to this economic oppurtunity. For this to happen, schools will have to redefine their purpose to more appropriatley match the needs of the 21st century (Wagner, 2008). The emergence of the information age has changed the core skills employees need in the 21st century (Friedman, 2007). "In today's competitive global economy, all students will need new skills for college, careers, and citizenship. Employment in the 21st century demands that we know how to think; to reason, analyze, weigh evidence, problem solve, and communicate effectively (Wagner, 2008). As this new workplace continues to evolve, educators will need to alter their pedagogy to embrace essential skills needed in a connected world. Unfortunately, as the world has changed, American schools have not. Different from the age of industrialized learning, public education will need to adopt a

new purpose. The opportunity to do so is present. However, No Child Left Behind has created an environment of accountability in education that embraces knowledge over thinking.

Wagner's Seven Survival Skills

Our rapidly changing society will require a shift from instructing for memorization and recall to instructing the skills needed for life in the 21st century (Friedman, 2007; Schmoker, 2008; Wagner, Rigor Redefined, 2008). In today's classrooms, students need to be provided with relevant instruction, rich in the skills that will be needed for their futures. Wagner (2008) refers to "Seven Survival Skills for the 21st Century" as a new curriculum necessary to prepare all students to work and be citizens in the 21st century. They include:

1. Critical thinking and problem solving
2. Collaboration across networks and leading by influence
3. Agility and adaptability
4. Initiative and entrepreneurialism
5. Effective oral and written communication
6. Accessing and analyzing information
7. Curiosity and imagination

These skills are remarkably different from what is assessed in standardized test's across the country. A transformation of enormous proportions will need to take place in order for these skills to become prevalent in our schools. Unfortunately "the only debate taking place about education in America today is simply whether to modify certain provisions of NCLB. Few question what students are being taught or how" (Wagner,

2008). Americans blindly follow results on state assessment. Instructors employ different strategies to enhance student learning, focusing on endless data review to make educational decisions. “This raises the question; Does the focus on data now present in public schools promote 21st century teaching and learning” (Schmoker, 2009, p.70)? “In addition, parents and policy makers alike believe that high-test scores are the best, most reliable measure of a good school system. Accordingly test scores are still the most significant determinant of a community’s real estate value” (Wager,2008). Sadly, the standards that are regularly assessed are in direct contrast with the skills needed for life in the 21st century (Report: Teach 21st-century skills-or U.S. will fail, 2008). The longer policy makers, parents, and educators continue to misunderstand the implications of not teaching and testing the new survival skills, the more we lose our competitive advantage in the global economy.

21st Century Achievement Gap

Wagner (2008) has investigated what is being taught in American schools. What he has mostly seen is that the overwhelming majority of educational resources and efforts focus on basic level reading and math taught in isolation. These efforts appear to be paying off! Standardized test scores show that American students are learning to read and commutate. However, efforts are seldom spent on activities that promote thinking, communicating, understanding mathematical relationships, or scientific reasoning. Schools have shown they can make steady gains on standardized tests without offering students intellectually challenging tasks (Schmoker, 2009). “Rote memorization, content knowledge, and test prep appear to be the single most common curriculum taught in America today” (Wagner, 2008, p. 6).

This is particularly true in our most prestigious and high achieving schools as they continue to place a high priority on maintaining the status of high achieving. No Child Left Behind has necessitated a laser focus on reading and mathematics that has made teaching to think an afterthought. The reality of today's shifting global economy necessitates the need to swiftly implement modern instruction that properly prepares students for life in the third millennium.

21st Century Transformed Schools

There are examples of schools that are making the transition into 21st century instruction and the seven survival skills while maintaining federal accountability mandates. These schools are even flourishing! High Tech High, a network of K-12 charter schools in California exist in a project based environment that incorporates writing, communication, and critical thinking in all aspects of inquiry and research. There are no AP classes taught, though all students still take the California High School Exit Exam. The Metropolitan Regional Career and Technical Center (the Met) is a network of more than fifty alternative and charter schools in New England that are backed by the Bill and Melinda Gates foundation. These schools all operate as project based schools that focus on communication, empirical reasoning, quantitative reasoning, and social reasoning. The Francis W. Parker charter essential school teaches in two domains; Arts and Humanities, and Science and Technology. Their primary focus is on core habits of mind.

These example schools do not teach to standardized tests, rather they start with instruction that is standards based. They all rank among the highest 'achieving" schools in their states, and have almost 100% college acceptance and graduation with

almost half entering Science, Technology, Engineering, and Mathematics (S.T.E.M.) related fields. Their graduates report back to schools as advisors, and they continually consult with outside/ business community when developing instruction.

Producing Citizens for the 21st Century

Armando Laguardia and Arthur Pearl (2009) further researched the need for educational reform for the 21st century. They offered a theoretical argument for "the preparation of citizens in U.S. public schools" (p.352). This preparation hinges on citizenship preparation, and the skills needed to be a citizen in the 21st century. Citizenship preparation in a classroom necessitates that skills such as persuasion, debate, and negotiation are applied throughout instruction. Laguardia's study (2009) states:

> In today's rapidly changing world students need to master the tools of education not to fit into the world or to meet the expressed current employer desires; students now must know how to use knowledge to change the world. If they are not provided such knowledge, that change will be made by a small number of privileged elites (p.364).

According to the authors, the current reform efforts facilitated by No Child Left Behind maintain the status quo, further under preparing young people, even advantaged young people, for life in the 21st century. Students and schools that do not pass state assessments are required to change. The majority of the time, this change is preparing for the test. Democratic schools place value on learning as well as creativity, application, and ownership. Currently, some students are actively encouraged to learn, while others are paralyzed by testing and discouragement. Today's students will need to

master these skills to thrive in the new world of work. In addition, these skills are the same ones that will enable students to become productive citizens in the 21st century (Wagner, Rigor Redefined, 2008). Unfourtunatley, “even our best schools are failing to prepare students for 21st century careers and citizenship” (Wagner, Rigor Redefined, 2008).

Assessing 21st Century Skills

Wagner (2008) suggests that 21st century education needs to start with assessment. He presents a compelling case that all American schools are teaching to a test, and these tests are driven by state standards. The transformation towards 21st century education should begin with standards and assessment. Rather than assess solely for comprehension, computation, and recall, we should move towards a more meaningful accountability system that assess essential 21st century skills (Wagner, 2008). Assessment is the driving force behind quality instructional practice It stands to reason that if assessment can be upgraded to address 21st century skills, than instructioanl practices will follow (Wagner, The global achievement gap: Why even our best schools don't teach the new survival skills our children need, and what we can do about it, 2008).

Several new kinds of standardized tests have been developed that address this need. The Educational Testing Service has developed the Information, Communication, and Technology Literacy Assessment called the “ISkills” test, which requires students to perform a number of tasks including; acquiring and assessing information online, searching for data, creating a graph, and developing a power point presentation using the information researched. Assessment and Teaching of 21st

Century Skills (atc21s) was launched with the mission of delivering a framework for assessment and teaching of 21st-century skills. According to Anthony Salcito (2012), they are motivated by a specific problem:

> Traditional assessment methods do not properly evaluate the skills needed to prepare learners for working in the modern world. Skills such as critical thinking and problem solving, communication, collaboration, creativity and innovation are all vital attributes for students but not currently measured effectively by most countries. These skills can prepare a student for the workforce and provide stronger economic opportunities for the future (Salcito, 2012)

Furthermore, accountability driven assessment utilize tradional assessment to measure the acquisition of content driven standards. Current assessment systems lend themselves to simple recall of content knowledge and are relatively inexpensive. Measuring a students ability to communicate, collaborate, critically think, and be creative can be expensive and time consuming (Wagner, The global achievement gap: Why even our best schools don't teach the new survival skills our children need, and what we can do about it, 2008). The work of atc21s has developed a viable assessment that can assess 21st century skills in a affordable and efficient manner (Salcito, 2012). The Programme for International Student Assessment (PISA), a worldwide evaluation of school pupils' performance, will be including Collaborative Problem Solving as a component in their 2015 study. According to Anthony Salcito (2012), Andreas Schleicher, Head of Indicators and Analysis Division, Education Directorate, Organization for Economic Co-Operation and Development (OECD) adequately summarizes the importance of this development:

> ATC21S has played an essential pathfinder role to move the assessment agenda forward. It fills a critical gap between existing basic research on assessment design and methodologies, on the one hand, and the implementation of large-scale assessments that provide reliable data at reasonable cost, on the other. Its latest venture, the piloting of tasks to assess collaborative problem-solving skills, provides important insights for OECD's efforts to broaden future PISA assessments to encompass interpersonal skill dimensions (Salcito, 2012).

These assessments are still in the early stages of development, and are not widely utilized by states or school districts. Nebraska however, has tried to bridge this gap by developing the School based Teacher-led Assessment Reporting System (STARS). Nebraska is the only state that does not give multiple choice, norm referenced tests. Rather, they require a writing test provided by the state, as well as requiring every district to develop its own assessment system. The district-developed assessment must be approved by the state, but are scored locally. These assessments are performance based allowing for the application of knowledge and problem solving, rather than simple recall of facts and figures. They are required to satisfy quality criteria set forth by the state, and are regularly reviewed to maintain validity (Leon Dappen, 2005).

Leon Dappen (2005) examined criterion-referenced and norm-referenced student achievement and district assessment portfolio ratings from STARS. He concluded that:

> The philosophy of Nebraska STARS is based on the premise that the purpose of assessment is to drive curriculum and instruction to produce student

> academic achievement gain. STARS is a locally driven system designed from the classroom up which recognizes that improved student achievement will best occur with the focus on the interaction of teachers and students. Teacher designed standards, instruction, and assessments become part of a continuous improvement cycle. Based on this belief, Nebraska developed STARS to keep teaching and learning at the center of the educational process, promoting high-impact, not high-stakes, assessment.

The STARS has been identified by the Partnership for 21st Century Skills (2005) as "the nations' most innovative assessment system" (p. 13). The system is affordable to administer and score, and allows for state standards, as well as 21st century skills to be assessed. Not only are these assessment an accurate measure of learning but they show significant achievement gains for students and schools across the state. This is a direct result of the development of tests occurring at the local level, allowing assessment to drive instruction (Leon Dappen, 2005). STARS is an example of a truly more effective accountability system that focuses on the skills that matter most in the 21st century (Wagner, 2008).

What is 21st century education?

21st century education simply address's "what students need to learn *now* to be successful in school, work, family, and community life" (Trilling, 2010, p. 9). It combines a discrete focus on 21st century student outcomes (a blending of specific skills, content knowledge, expertise and literacies) with innovative support systems to help students master the multi-dimensional abilities required of them in the 21st century" (Partnership for 21st century skills, 2011). "The most prominent advocates of

21st century education stress the importance of learning essential content by way of authentic intellectual skills" (Schmoker, 2008, p.70). This is not to suggest that schools, in particular elementary schools should overlook teaching the basics of reading and math. 21st century skills should not replace "what" is being taught, but rather "how" instruction is provided (Wagner, 2008; Schmoker, 2008). 21st century skills need to be thoughtfully taught and assessed to be sure students attain these skills.

The Partnership for 21st Century Skills

21st century education is not necessarily defined by instruction alone. Rather, a 21st century education simply places emphasis on outcomes students should leave high school with in order to be productive members of this society (Wagner, The global achievement gap : why even our best schools don't teach the new survival skills our children need--and what we can do about it, 2008; Schmoker, 2008). Instructional methods, as well as technological methods, and curriculum are taken into account when addressing these outcomes. To help educators integrate these skills into curriculum and instruction, The Partnership for 21st Century Skills has developed a framework for 21st century learning (2011).

> The Framework presents a holistic view of 21st century teaching and learning that combines a discrete focus on 21st century student outcomes (a blending of specific skills, content knowledge, expertise and literacies) with innovative support systems to help students master the multi-dimensional abilities required of them in the 21st century. The graphic represents both 21st century student

outcomes (as represented by the arches of the rainbow) and 21st century skills support systems (as represented by the pools at the bottom) (p.1).

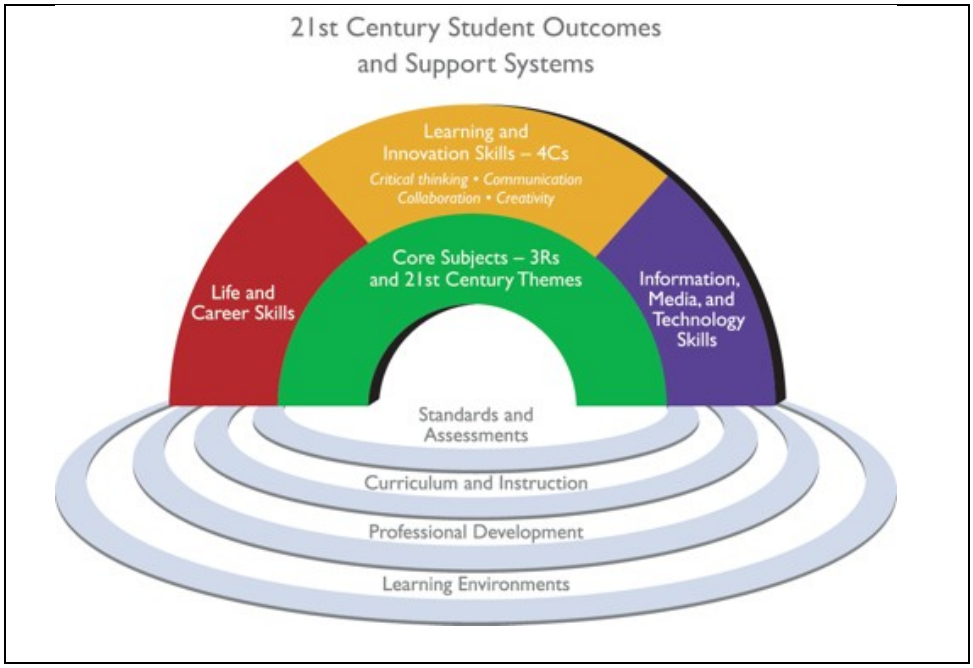

Figure 3. 21st century student outcomes and support systems. This figure illustrates the outcomes and skills advocated by Partnership for 21st Century Skills.

Educators can enhance 21st century outcomes by integrating critical thinking, communication, collaboration, and creativity in the classroom (Partnership for 21st century skills, 2011). Often times however, these 21st century skills are overlooked for technology literacy, application, or problem solving. Though many would not argue the value of these skills, they cannot be fully realized without the ability to collaborate, communicate, think, or be creative. 21st century education demands that these skills "be at the center of educational planning" (Scardamalia, 2001, p. 173). Just as innovative skills need to be at the heart of a 21st century education, innovation needs to be at the

heart of planning and instruction. Fortunaltey, there are innovative ways to teach 21st century skills.

Promoting 21st Century Skills

The emering global economy "demands a next generation of students and workers who are independent thinkers, problem solvers, and decision makers" (Silva, 2009, p. 630). This will require a significant transfromation in educational practices. Current curriculum and instruction is devoted to content knowldege and recall. Assessing this knowledge is mostly limited to low level recall that reveals very little about how a student can think and apply skills (Jacobs, 2010). "An emphasis on what students can do with knowedge they have is the essence of of 21st century skills" (Silva, 2009, p. 630).

Implementing these skills into educational practices can seem daunting and overwhelming. Most educators feel that 21st century skills are just one more thing to teach, a separate subject of sorts. Indeed, many courses are developed with 21st century skills in mind. This, unfortunatley, underminds the transformation that need to occur in our schools. 21st century skills need to be measurable outcomes that enhance content acquisition, not compete with it. 21st century skills are essential to the modern workplace. Today's worker needs to find and analyze information, and use the information to make decisions and create new ideas (Silva, 2009). In fact, work that requires only routine skills is more often done with a computer (Murnane & Levy, 2004). It is vital that classroom practices do not reinforce these obsolete skills.

Emerging technology, along with a renewed focus with science and mathematics has resulted in intriguing practices that promote 21st century skills. These practices

prove to be meaningful and relevant to students and the world they live in. Not to be confused as additional subjects, these practices enhance learning of tradiotional courses. Considering 21st century skills and content are best learned together (Silva, 2009), it is clear to see that benefits of these practices from both an instruction and learning standpoint.

Web 2.0

Web 2.0 offers educators the opportunity to apply 21st century skills in meaningful, relevant activities. Web 2.0 is best explained as “a collection of technologies that create a participatory, common space where multimedia can be shared, discussed, and manipulated” (Caverly, Nicholson, Battle, & Atkins, 2008). It promotes three functions: participation, collaboration, and distribution (Knobel & Wilber, 2009). These skills are the backbone of 21st century employment, and are embraced by students as part of the social networking culture that exist today. Web 2.0 allows these skills to be applied on an unprecedented scale. Web tools such as YouTube, Google, Wikipedia, Skype, Twitter, Facebook, and Blogs allow students to particpate, collaborate, and tap into distributed expertise and knowledge”(Knobel & Wilber, 2009). Web 2.0 is not simply the devlopment of new ways of doing things, but an entire paradigm shift.

Knoble and Wilber present the term Literacy 2.0 as a shift in literacy instruction that closely resembles the shift with Web 2.0. They suggest that “people are appropriating digital applications, networks, and services; and are reading, writing, viewing, listening, and recording in a way that embodies the Web 2.0 ethos” (Knobel & Wilber, 2009) They explain that Web 2.0 can be applied to quality literacy instruction

that involoves particpation, collaboration and the sharing of expertise and inteligence. Knoble and Wilber suggest that “2.0 literacies will challenge how schools tradionally have valued a single author laboriously working alone to create a unique text. Literacy 2.0 recognizes that although there will always be varying levels of innovation, producing something truly new or originial is impossible” (Knobel & Wilber, 2009). The implications of this statement suggest not only the need to switch instruction practices, but also accept the reality that the current technological revolution has created.

Literacy 2.0 is grounded in achieving authentic purposes and completing meaningful tasks.This doesn’t mesh well with such practices as book reports, comprehension questions, leveled reading tasks, and weekly spelling tests (Knobel & Wilber, 2009). When it comes to specifying in detail what is to be taught and tested, understanding is typically replaced by factual knowedge (Scardamalia, 2001). Knoble and Wilber (2009) explain that current Web 2.0 websites like Fanfiction.net allow students to practice relevant literacy skills not accesible in school. Fanfiction.net allows individuals to post stories, and receive feedback about grammar, narrative structure, style, or spelling that can be used in revision efforts. This collaborative oppurtunity extends well beond the classroom and exposes students to copyright laws, creative license, and even the creation of creative commons licenses that define the extent to which others can reuse their work. Webpages like this demonstrate the educational power of web 2.0, and what it means to read and write, *as well as* to collaborate, particapte, and share knoweldge and expertise (Knobel & Wilber, 2009) There are many cases like these in American schools today that are in contrast to what students do literacy wise. With web 2.0 and its set of social networking and mass authoring tools, a

shift in learning structure in content, process, and outcome is emerging (Huang & Behara, 2007).

Blogs and Wiki's

Among the most accessiable and usable of Web 2.0 oppurtunities are blogs. Blogs are simply a venue for writing in which an author or group of authors post their work on Web pages that can be read by anyone with internet connections and allowed to leave comments (Davis & McGrail, 2009). Many studies focus on beneficial uses of blogs in the classroom. Shifflet investigated how blogs are used by K-12 teachers and how they can affect instruction. "A qualitiative case study approach suggested that the availability of an authentic audience was a significant motivation for participants to use blogs with their students" (Shifflet, 2008). Davis and McGrail believe that "when their audience is the whole world, students are motivated to be the best writers they can be" (Davis & McGrail, 2009). They go on to point out that blog repsonses offer the oppurtunity for students to reflect on their thinking and writing styles than more traditional instructional practices cannot elicit. "But, dialogue in the classroom was also essential. Students needed practice and guidance from their teachers to learn to be clear, convincing, and precise" (Davis & McGrail, 2009). Students could pursure their own learning needs in a way that allowed them to explore their own understandings. Reflecting on various comments requires a student to deal with critisisms in a productuve way. " Brain research indicaes that growth is enhanced when students move beyond their comfort zone and into the unknown. Blogging lends itself well to this knid of exploration" (Davis & McGrail, 2009). Higdon and Topaz offer methodologies that support this evidence.

In their study on Blogs and Wiki's as Instructional Tools, five instructional objectives are presented as vital to using blogs and other related Web 2.0 technologies in an effort to promote deep, conceptual understanding of core concepts. The first objective is to foster mastery-goal orientation among students. The second, to promote metacognitive reflection among students. The third, to promote active transfer of course concepts. The fourth, to respond to individual differences among learners. The fifth, to increase the amount of effortful time students spend on material. Their study discovered that three of these instructional goals were successful toward utilizing Web 2.0 technologies like blogs and wiki's to promote deep, conceptual understanding of core concepts: promoting metacognitive reflection, respsonding to individual differences among learners, and increasing effortful time. "Quantitative measures show remarkably high results: on average, students received a satisfactory grade—demonstrating metacognition and completion of the reading" (Higdon, 2009). This study suggest that Web 2.0 technologies can improve learning of traditional, core material and that reflective thinking promotes active knowledge transfer.

Churchill (2009) studied the use of blogs to determine in what ways a blog environment supplements classroom teaching and leads to an improved learning experience. He observed an astounding amount of applications of blogs in his classroom observations. Student perceptions of blogging were favorable and indicate that blogging facilitated and contributed to their learning and that due to the use of blogs, the facilitator appeared to be more involved in their learning (Churchill, 2009). The "study demonstrated that blogs can be effective educational technology, and useful blog-based activities for learning were: (1) reading blogs of others, (2) receiving

comments and (3) previewing tasks of others and reading feedback received in relation to these" (Churchill, 2009).

Collaboration and Technology

In our connected society, "teamwork is no longer just about working with others in your building" (Wagner, Rigor Redefined, 2008, p. 21). Technology has allowed for collaboration to occur without any physical boundries. Teams of workers can collaborate on any project from anywhere around the world. Workers will no longer work in isollation on single, independent task. Students are not prepared for this work environment. They lack the general collaborative skills necessary to succeed with their international coutnerparts. Schools can easily correct this issue with a simple shift in instructional practices. Most American classrooms continure to employ the same instructional strategies from two gernations ago when indepenedent thought was valued. Today, collaborative problem solving oppurtunties are imperitive for 21st century learning. To succeed in the new global economy, workers need to be able to apply critical thinking skills in conjunction with other team members, often with differeing opinions and problem solving capabilites. Schools must prepare students for these demands and provide the means, both technological and interpesonal, to collaborate.

STEM Education

STEM is an acronym for *Science, Technology, Engineering, and Mathematics* and is an economic initiative geared towards graduating more students capable of filling an increasing number of STEM related jobs. According to the National Research Council of the National Academies (2011):

> The primary driver of the future economy and concomitant creation of jobs will be innovation, largely derived from advances in science and engineering….. 4 percent of the nation's workforce is composed of scientists and engineers; This group disproportionately creates jobs for the other 96 percent (p. 3)

At the heart of these jobs will be scientific and technological literacy (Murcia, 2007). "In contemporary times it seems increasingly important to achieve scienctific literacy as an educational outcome. It may now even stand along side langauage literacy and numeracy as an essential tool for living in the twentu first century" (Murcia, 2007, p. 16). STEM education offers an opportunity to apply these 21st century skills within traditional content-based courses. At the heart of a STEM education is a deep understanding of the nature of science, application of math, and how engineering interacts with these two content areas. The cross curricular nature of STEM allows for a broader, deeper understanding of process as well as content. These processes involve essential 21st century skills such as problem solving, innovation, communication, collaboration, and critical thinking. However, STEM is not a separate subject; it is the thoughtful and deliberate integration of science, technology, engineering, and mathematics throughout a curriculum. "Today, an understanding of scientific and mathematical principles, a working knowledge of computer hardware and software, and the problem solving skills developed by courses in STEM are necessary for most jobs. Therefore, STEM education is an enormous and pressing need" (STEM Education Caucus homepage, 2011).

More and more, job applicants lack the content, technology, and process skills needed to fill even the most common jobs, nonetheless more elite STEM positions

(National Research Council of the National Academies, 2011). Our workforce has changed. A generation of practices has enabled students to fear the sciences and mathematics. Students avoid these courses in high school, and especially college where “the proportion of student’s obtaining degrees in science, technology, engineering and math from American universities has dropped from 32 to 27 percent during the past decade” (Costello, 2010). This statistic can be attributed to questionable educational practices as well as Americans obsessed with earning a grade or passing a test. These obsessions have affected student’s ability to inquire, test, predict, or be innovative, since these practices have no concrete answers. As a result, our best students enter science or engineering programs aiming to earn a grade or pass a test, only to be challenged by a process that necessitates failure. Our top students are not wired to fail, and therefore are not competent with scientific or engineering processes. This is a major reason students are dropping out of STEM related programs. This trend is threatening to the innovative spirit Americans have enjoyed for several decades (Costello, 2010). However, the emerging economy is driven by constant innovation. “The foundation of innovation lies in a dynamic, motivated and well-educated workforce equipped with STEM skills” (STEM Education Caucus homepage, 2011).

STEM Learning

STEM education offers an opportunity for students to utilize science, technology, engineering, and mathematics concepts in modern applications. Robotics is an ever expanding field of study with appropriate curriculums for elementary through high school students. LEGO Mindstorms®, created by LEGO® Education and National Instruments, engages students in science, technology, engineering, and math with robotics. LEGO

Mindstorms® can be used as a “platform for teaching science, technology, engineering, and math concepts while also fostering 21st-century skills (Lego Education, 2011). It also allows students to learn soft skills like purposeful collaboartion, critical thinking, and problem solving that aren’t really addressed in most courses (Waters, 2011). Through these expereinces, highly sophistaicated robots are created to conquer such tasks as retrieving trash, shooting balls, or even navigating through a maze. Students are required to apply scientific and engineering design processes while making necessary mathematical and technological calculations. However, robotics programs are not designed for just the technologically talented students. Robotics serves as a “catalyst for getting kids excited about science, technology, engineering, and mathematics” (Waters, 2011, p. 32). Students learn a great deal of engineering through the process of designing robots, and do so in an un-intimidating way. This means understanding key science, technology, engineering, and math concepts – not just on paper, but also in practice. Teachers channel the power of robotics to create learning opportunities that will help students develop the skills needed for a lifetime of creating, solving, and contributing to a global society (Lego Education, 2011).

Robotics curriculums are growing in popularity throughout the country as educators embrace the value of applied learning. Despite the clear benefits of a robotics curriculum, it still seems to compete with core subjects areas in many schools. In these situations, STEM and robotics are viewed as separate courses. This is unfortunate as STEM, especially robotics, is delivered most appropriately in a cross curricular manner. What better way to get students to understand certain concepts and get interested than to have them build robots around a concept you are trying to address (Waters, 2011). In

response, competitions and after-school clubs are emerging as a primary provider of robotics and STEM programs (Waters, 2011). The nonprofit organization For Inspiration and Recognition of Science and Technology (FIRST) sponsors annual robotics competitions. Jennifer Kobrin states in her blog, Language and Literacy for All (2011)

> Through FIRST, girls and boys ages 8-18 years old, representing a range of ethnicities and socioeconomic backgrounds, work together in teams to create robots, which they then race against others from across the country in a "Superbowl of Science" culminating event. For many students, the experience is life-changing. Young people who participate in FIRST are more likely to go to college and twice as likely to major in science; the girls are four times as likely to study math and science.

FIRST robotics competitions are the driving force behind after school robotics programs. Historically, athletics and entertainment ruled the after-school intra-murals of most students, and elementary students often times are not yet exposed to these experiences. After-school robotics programs offer a competitive avenue for any student, regardless of athletic or academic talent. In his review of after-school robotic programs, John Waters (2011) state:

> Today, as it was twenty years ago, there's a tremendous amount of attention paid to, and celebration of athletes and entertainers. Yet, the percentage of kids who play high school football, for example, and then go on to become professional football players is minuscule. But the percentage of kids who can participate in robotics competition and then go on to become engineers is

> virtually 100 percent. We don't expect all to become engineers, but they could if they wanted to (p.32)

Though this fact may not be attractive to youngsters as they begin these programs, it becomes quite clear as the engage with robotics and STEM education. It is this application that needs to be at the heart of public education. Instruction and curriculum that address 21st century skills tend to not fully realize the application that is hallmark to these after-school activities. Too often, curriculum is in competition with standards and traditional content, which is in dirrect conflict with 21st century skills through STEM and robotics.

STEM Education as an Economic Necessity

The United States has historically enjoyed success in the STEM fields. This can be attributed to the advantages of our public education system compared to the rest of the world. However, according to a report by the Institute for a Competitive Workforce:

> The advantages that carried the United States through the past century appear far less likely to carry it through the next. With other nations making dramatic educational gains and challenging American supremecy in technology, finance, and research, our nation's continued success requires dramatic inmprovement when it comes to educating our youth in math and science (p. 3)

The report continues to make recommendations of the American education system to improve STEM education. The report values STEM education as the primary delivery of essential 21st century skills and sees school reform as necessary. These recomendations also take into account the rather difficult task of changing the organization of schools. Several recommendations are made to facilitate true reform for

STEM incuding; school redsign, changed teacher preperation programs, rethinking the full time teacher job description, and personalizing instruction for individaul needs. These recommendations are connected by the need to work with buisiness leaders to create meaninful curriculum and application oppurtunities. “Because science and technology firms will be hiring future graduates for STEM careers, buisiness leaders have an innate understanding of what students will need to know to be successful” (Hess, Kelly, & Meeks, 2011, p. 4). These recomendations are being realized in southwest Pennsylvania through the Pittsburgh Technology Council. In the summer of 2011, the Technology Council convened The STEM Summitt Pittsburgh sponsored by Bayer, Lanxess, Google, PPG industries, and the University of Pittsburgh Medical Center Technology Development CenterI. The summit is summarized in the report Moving Toward U.S. Goals for STEM Education. In the report, several recommendations are presetned for K-12 education that center around STEM including; stregthening curricula to ensure access to STEM education for ALL students, and collaboration with business to publicize STEM career awareness. Though only recommendations, business and educators alike are made aware through regional education collaborations, grant foundations, and even the department of education. It is these sources that will power the implementation in K-12 practices.

Conceptual Framework

There is no doubt that the realities of the global economy have re-defined the skills needed for work, life, and citizenship in the 21st century. This shift has occurred with little or no response from educators in American public schools. For decades, Americans have operated in isolation from the rest of the world, while other countries

have worked to improve their educational systems and technology infrastructure. Americans now face growing competition for jobs, both local and abroad and educational practices have changed very little. However, there are successful schools that have transformed their practices to prepare students for work, life, and citizenship in the 21st century.

The globalization theories of Thomas Friedman offer insight into the need to teach 21st century skills in our schools. His review of current globalization shifts provides a clear picture of the shifting global economy. describes in detail the evolution of the job market and national economies that have resulted from ten "flattening forces" that have occurred since the early 1990's. These forces have contributed to the current global economy and require a new set of skills from individuals that wish to flourish or survive in this economy. These "globalization skills" need to be addressed by society as a new focus of education in order to prepare a new generation for a future economy that hangs in the balance.

In his book *The World is Flat* (2007), Friedman describes the evolution of globalization as having occurred during three great eras; globilization1.0, 2.0, and 3.0. The evolution of these eras can best be described as the global community moving from one that operated in isolation, to one that operates collaboratively. This is made possible by the convergence of the personal computer and fiber optic cable (Friedman, 2007). Communication has grown exponentially, and will continue to do so as technology catches up with infrastructure. Currently, globalization 3.0 provides *individuals* the opportunity to collaborate and communicate from anywhere, regardless of the distance between them (Friedman, 2007). With the ease of communication and

sharing of information, individuals will need to compete internationally for jobs. In this era, employees will need to possess specific skills that will allow them to be marketable in the new global economy. Education will play a vital role in American society's ability to survive and thrive in this economy.

Friedman refers to ten events, innovations, companies, and forces that have converged to create the globalization 3.0 era. If these forces have defined today's global economy, education would be well served to embrace their lessons with an eye toward the future. Figure 1 provides a quick review of the ten flattening forces. The convergence of the technology and communication afforded by the ten flattening forces will allow for individual collaborative efforts of global proportions. Educators that comprehend these forces, and embrace the instructional opportunities they present, can better prepare students for future innovation and the opportunities they present. This new era of globalization necessitates a renewed purpose to educate relevant skills needed for the 21st century.

#	Flattener	Description
1	11/9/1989	The fall of the Berlin wall which opened up capitalism around the world and the release of the first version of Windows making computers more user friendly
2	8/9/1995	The day Netscape went public allowing for the emergence of the world wide web, the internet, and international connectivity.
3	Workflow software	The standardization of digital content that allowed for seamless transfer of documents through email and internet.
4	Uploading and e-Communities	Allows for web based collaboration to create software, share ideas, communicate, and upload software. (Blogs, Wikipedia, Community developed Software)
5	Outsourcing	Moving jobs or projects to foreign employees in an effort to save money and improve efficiency.
6	Off shoring	Moving factories/ business's to foreign countries in an effort to save money on labor, taxes, health care.
7	Supply-Chaining	Digitized inventory that more efficiently coordinates suppliers, retailers, wholesalers to keep pace with consumer demand.
8	In-sourcing	Third-party managed logistics companies use to specialize services
9	In-forming	The emergence of Google and other search engines
10	Mobile Media	Real time, mobile, digital communication of information

Figure 4. The ten forces that flattened the world. This figure illustrates Friedman's Ten Forces that Flattened the World (2007)

In The Global Achievement Gap: Why Even our Best Schools Don't Teach the new Survival Skills our Children Need, and What we can do About it (2008), Tony Wagner investigates the highest achieving students in our most prestigous and high achieving schools across America. His works center around investigating what is being taught in American schools. What he has mostly seen is that the overwhelming majority of educational resources and efforts are spent on basic level reading and math. No

Child Left Behind has necessitated this laser focus. High achieving schools continue to blindly follow this path in an effort to maintain the status of prestige and achievement. However, the reality of today's shifting global economy necessitates the need transform modern instruction to properly prepare students for life in the 21st century.

Wagner argues that the emergence of our rapidly changing society will require a shift from instructing for memorization and recall to instructing the skills needed for work, life, and citizenship in the 21st century. In today's classrooms, students need relevant instruction rich in the skills that will be needed for their futures. Wagner refers to "Seven Survival Skills for the 21st Century" as a new curriculum necessary to prepare all students to work and be citizens. These skills are remarkably different from the standards assessed in standardized test's across the country. They include:

1. Critical thinking and problem solving
2. Collaboration across networks and leading by influence
3. Agility and adaptability
4. Initiative and entrepreneurialism
5. Effective oral and written communication
6. Accessing and analyzing information
7. Curiosity and imagination

Sadly, these skills are in direct contrast from the content and knowledge prevalent in classrooms today. The longer policy makers, parents, and educators continue to misunderstand the implications of not teaching and testing the new survival skills, the more we lose our competitive advantage in the global economy.

Wagner suggests the need for transformation of enormous proportions to take place in order for these skills to become prevalent in our schools. Unfortunately, the only debate about education in America today is simply whether to modify NCLB (Wagner, The global achievement gap: Why even our best schools don't teach the new survival skills our children need, and what we can do about it, 2008). Few question what students are being taught or how. In addition, parents and policy makers alike believe that high-test scores are the best, most reliable measure of a good school system.

Wagner presents examples of schools that are addressing the seven survival skills while maintaining federal accountability mandates. These schools are even flourishing! High Tech High, a network of K-12 charter schools in California exist in a project based environment that incorporates writing, communication, and critical thinking in all aspects of inquiry and research. There are no AP classes taught, though all students still take the California high school exit exam. The Metropolitan Regional Career and Technical Center (the Met) is a network of more than fifty alternative and charter schools in New England that are backed by the Bill and Melinda Gates foundation. These schools all operate as project based schools that focus on communication, empirical reasoning, personal qualities, quantitative reasoning, and social reasoning. The Francis W. Parker charter essential school teaches in two domains. Arts and Humanities, and Science and Technology and focus on core habits of mind. These example schools do not teach to standardized test, rather they start with instruction that is standards based. They all rank among the highest ‘achieving” schools in their states, and have almost 100% college acceptance and graduation with almost half entering S.T.E.M. related fields. Their graduates report back to schools as

advisors, and they continually consult with outside/ business community when developing instruction.

No Child Left Behind has created an environment of accountability in education. Nevertheless, education has not shown accountability for the development of skills necessary for life in the 21st century and a new global economy. Foreign countries have made the leap from isolated territories to collaborative agents that have benefited from the convergence of the technology and communication. Educators that comprehend these forces and embrace the instructional opportunities they present can better prepare students for future innovation and the opportunities they present. This new era of globalization necessitates a renewed purpose to educate relevant skills needed for the 21st century. The example schools are case studies in how to be successful in the current NCLB environment. It may be time for legislators to look at these samples to help create the tectonic shift that is necessary for American school more realistically prepare students for their future!

Summary

The results of the research and literature in this section suggest, if not validate, that the current shift in the global economy necessitates 21st education. Much like the industrial revolution of a century ago, America is in the midst of a significant shift in economy and paradigms. Once again, education will be at the forefront of preparing society towards a successful transition towards a new global economy. However, this shift will need to occur adjacent to the No Child Left Behind legislation, whose accountability mandates keeps educators rooted in 20th century practices.

No Child Left Behind has created an environment of accountability in education. Nevertheless, education has not shown accountability for the development of skills necessary for life in the 21st century and a new global economy. Foreign countries have made the leap from isolated territories to collaborative agents that have benefited from the convergence of the technology and communication. Educators that comprehend these forces and embrace the instructional opportunities they present can better prepare students for future innovation and the opportunities they present. This new era of globalization necessitates a renewed purpose to educate relevant skills needed for the 21st century. The example schools are case studies in how to be successful in the current NCLB environment. It may be time for legislators to look at these samples to help create the tectonic shift that is necessary for American schools to more realistically prepare students for their future! These practices have defined the current state of education despite a rapidly changing economy and advance in new technologies.

This researcher aimed to examine if high performing elementary schools, as defined by No Child left Behind, apply 21st century instruction and learning strategies. Research shows that 21st century skills are necessary for our economic well-being. However, very few research efforts have targeted 21st century instruction and learning in the No Child Left Behind era. The next section will discuss the methods used in the current study to try to address this gap.

CHAPTER THREE

METHODS AND PROCEDURES

"Work, learning, and citizenship in the 21st century demand that we know how to *think* – to reason, analyze, weigh evidence, problem solve, and communicate effectively" (Wagner, 2008, p. xxiii). However, most instructional and curricular practices in American schools today do not reflect these essential 21st century skills (A Nation at Risk, 2009). This gap can be attributed to the demands of the No Child Left Behind (NCLB) legislation that has created an educational landscape that is hyper sensitive to making yearly progress on educational standards created by politicians, not educators. The result of these efforts is instruction and assessment that is deeply rooted in an educational philosophy that was created for the turn of the 20th century (Wagner, 2008; Laguardia & Pearl, 2009; Skills P. f., 2008). A century later, "schools haven't changed; the world has, and our schools have become obsolete" (Wagner, 2008, p. xxi). The landscape of American education has become one of accountability. However, the assessment used for this accountability relies heavily on recall and knowledge leaving little room for the critical thinking, analysis, or problem solving skills necessary for life and learning in the 21st century. It is clear that the American educational system is at the cusp of a necessary change, but the reform mandates of the No Child Left Behind legislation provide a formidable obstacle to these transformation efforts. This conflict presents significant challenges to our educational system and merits investigation.

This study investigated the instructional, curricular, and assessment practices of high achieving elementary schools in Pennsylvania. More specifically, this study examined if practices that advocate for 21st century skills are in conflict with the

mandates of NCLB. A qualitative case study was used for this inquiry. Qualitative case study allows the researcher to explore an organization and define phenomenon in context through the use of a variety of data sources (Baxter & Jack, 2008; Yin, 2003). Quantitative analysis would unfortunately limit the researcher's ability to thoroughly investigate these practices.

Chapter three will describe the research method and procedures that will be used for this study including selection criteria, data collection, and analysis. The chapter will also identify how reliability and validity will be addressed in the collection of data. Finally, a pilot study will be discussed, as well as limitations of this study.

Research Method

This study is principally concerned with understanding the instructional, curricular, and assessment practices of high achieving elementary schools. Case study is a very reliable method of research and is particularly effective when investigating multiple cases (Baxter & Jack, 2008). Although several types of data can be collected to investigate multiple cases, the case study methodology allows a researcher to gather and examine data from a variety of sources (Baxter & Jack, 2008). Semi structured interviews will be used as the primary source of data collection for this study.

There are several factors to consider when identifying 21st century instructional practices. Every effort should be made to consider all these factors, and the case study allows the researcher to explore an organization and define phenomenon in context through the use of a variety of data sources (Baxter & Jack, 2008; Yin, 2003). Case study is a very reliable method of research and is particularly effective when investigating multiple cases (Baxter & Jack, 2008). Through interviews with influential

school leadership, this researcher aims to illuminate the strategies, best practices, and challenges of high achieving elementary schools. Based on the desire to explore the use of 21st century instructional practices, the case study has been determined to be the best method for studying these practices.

Participants

The participants for this study were selected from school leaders of high achieving elementary schools that instruct students in Kindergarten, first, second, third, fourth, and fifth grades in Pennsylvania. School leaders consisted of individuals that have influence over instructional or curricular practices within their school. Principals, curriculum coordinators, department chairs, or grade level leaders were considered as school leaders. In an effort to maximize the confidentiality of interview participants, and avoid exposing their comments, every effort was made to avoid interviewing a lone representative of a district, department, or school.

For the purpose of this study, high achieving status was defined as the attainment of 90% proficiency on the Pennsylvania System of School Assessment (PSSA) in math and reading among fifth graders in 2009, 2010, and 2011. The PSSA is the standards based assessment that is used to determine student proficiency, and Adequate Yearly Progress (AYP) in the state of Pennsylvania. PSSA data was accessed through the public record of PSSA results on the Pennsylvania Department of Education's website. Third and fourth grade results were not used to determine high achieving status. Rather, the instructional practices in third and fourth grade were looked at as contributing to the results in fifth grade, which merited additional investigation.

A purposeful sample was used for this study. A purposeful sample allows the researcher to thoroughly understand a case and requires that a sample from whom the most can be learned be selected (Freebody, 2003). School leaders of high achieving elementary schools were used as the purposeful sample due to their understanding of and influence over instructional practices. Selecting schools that attain 90% proficiency on the PSSA in fifth grade provides a sample that clearly demonstrated the attributes of a school that is preparing students for the 21st century as suggested by No Child Left Behind. In the event several schools became identified as meeting the criteria for this study, 4-6 were to be selected from this pool based on the number of students in the school. A balance of smaller and larger schools best represented a purposeful sample for this study. The size of school was taken into consideration due to its impact on school and community culture.

Interview

One of the most important sources of case study information is the interview (Yin, 2003). The main purpose of this interview is to understand 21st century instruction and learning of the study participants. For this study, semi structured interviews were used to discover information about the 21st century instructional practices of high achieving elementary schools. To uncover and describe multiple views of a case, the interview is an effective tool (Stake, 1995). The semi structured interview allows the researcher to be in control, while allowing the flexibility to obtain information from the interviewee such as beliefs, attitudes, and perceptions. Interviews allow the researcher to gain information that would otherwise not be easily reached through a survey (Freebody, 2003; Creswell, 2007). Semi-structured interviews are conducted with a somewhat open

framework which allow for focused, two-way communication. They can be used to give and receive information. Unlike a questionnaire, semi structured interviewing starts with general questions or topics. Relevant topics are initially identified and the possible relationships between these topics become the basis for more specific questions. The majority of questions can be created during the interview, allowing both the interviewer and the person being interviewed the flexibility to look into details or discuss issues. The semi structured interview can be particularly helpful in gaining insight into the presence of 21st century educational practices.

The researcher contacted the district superintendent to describe the study and request approval to interview district employees (see Appendix A). Following this approval, suggestions were solicited for possible candidates. The researcher proceeded to contact possible candidates by email (see Appendix B). An official invitation to participate in the study was then provided (see Appendix C), as well as an informed consent document (see Appendix D).

After acceptance to participate in the study, a meeting was arranged at a mutually agreed upon location and time. Prior to this meeting, a brief online survey soliciting demographic information (see Appendix E) was provided. In addition, a flyer (See Appendix F) was provided to help introduce what 21st century skills are for the purposes of this study. The flyer included a table defining the four “C’s”, as well as a link to a video that provides a thorough synopsis of 21st century skills.

At the beginning of the actual interview, the informed consent form was collected, and an additional copy of the 21st century skills flyer (See Appendix F) was provided. The candidate was then made aware that candid responses are encouraged and that

questions are open ended with no specific response desired. The interview lasted approximately 30-40 minutes. An audio device was used to transcribe the interview to ensure accuracy and maintain accuracy of responses and inference. An interview instrument was used to gather in-depth information from the participants (see Appendix G). All questions asked in the interview instrument are reflective of the study's research questions.

Validity and Reliability

Several considerations were made concerning the validity and reliability of this study. Of primary concern was the collection and management of data from several interviews. Nine interviews were conducted, allowing data to be reviewed from many different perspectives to help reduce limited point of view (Baxter & Jack, 2008).

Another way to enhance validity in this study was to use member checks (Lincoln & Guba, 1985; Baxter & Jack, 2008). The member check process allows the researcher's interpretations to be shared with the participants. The participants in turn have the chance to discuss, clarify, and contribute additional interpretation to the study (Creswell, 2007). Lincoln & Guba consider member checking to be "the most critical technique for establishing credibility" (pg. 314). Participants were given the opportunity to review the interview transcripts, and make suggestions or re-emphasize points of interest. Providing this opportunity to participants was a logical way to build rapport and further reduce bias.

Bias can be effectively prevented through in depth and prolonged exposure to the case being studied (Yin, 2003; Creswell, 2007). This allowed a rapport to be established with respondents which resulted in more effective communication of

responses, and an understanding of the nuances of this case. However, the researcher was cautious and made every effort to reduce the potential for desirable responses. The development and delivery of clear questions helped reduce this.

The reliability of this study was enhanced with an organized data collection procedure (Yin, 2003; Creswell, 2007). Interviews were recorded digitally, transcribed immediately, and added to a data collection. All data was maintained by the researcher in a secure setting.

Finally, a pilot study was conducted as a final gauge of validity that can provide clarification of research questions, sequencing of questions, and research design (Berg, 1998). The pilot study required an interview with five participants. Each participant was selected from a pool of people that currently serve in the capacities of school leadership outlined in this study, and were outside of the potential study population. The pilot study provided feedback about the interview protocol and its level of effectiveness.

Research Questions

The research questions this study intends to answer are:

1. To what extent do instructional leaders of high achieving elementary schools perceive 21st century skills?
2. To what extent are 21st century skills addressed in high achieving elementary schools?
3. What are the most common instructional strategies used to implement 21st century skills in high achieving elementary schools?

Interview questions have been carefully developed to address each of these research questions. Figure 5 illustrates how each interview question is aligned with the research questions.

Primary & follow up interview questions	Research Question #1	Research Question #2	Research Question #3
1. How would you describe student's ability to engage in process or inquiry at your school?		X	
Are there standards for students to demonstrate 21st century skills in your school or district?		X	
How do teachers in this school perceive these efforts?	X		
Does your school have a vision for 21st century skills?		X	
2. How would you describe the 21st century skills your school purposely utilizes?	X		
What were the factors that influenced your use of 21st century skills?		X	
What obstacles exist with the implementation of 21st century skills in your program?		X	
What are your perceptions of 21st century skills?	X		
3. What are the most commonly used instructional practices in your school?	X		
Describe your school's most common assessment practices.	X		
Describe your school's efforts to refine assessment practices.			X
4. What methods do you consider to have the most valuable impact on the PSSA?	X		
What data does your school review when making instructional decisions?			X
Describe your school's use of inquiry based or project based learning.	X		
What effect do you believe inquiry based or project based learning has on PSSA achievement?	X		
5. How would you describe your school's efforts to facilitate 21st century skills that have a positive impact on the PSSA?			X
How are these practices integrated by teachers?		X	
Describe how 21st century skills are purposefully integrated into your curriculum.			X
6. How would you describe your school's approach to improvement around 21st century skills?		X	
Describe the professional development your school offers.		X	
How would you describe the availability of professional development regarding 21st century skills?		X	
How active are administrators and teacher leaders around 21st century skills?			X

Figure 5. Interview question matrix. This figure illustrates the alignment of each interview question with the research questions.

Pilot Study

An interview instrument (Appendix G) was designed to reveal the delivery of 21st century skills in high achieving elementary schools. This instrument was piloted to refine interview questions, reaffirm length of interview and procedures, and to establish content validity. The pilot provided clarification for the research design as well. Five participants were asked to review each question of the survey instrument for clarity and relevance. Since influential school leaders were represented by a school principal, curriculum coordinator, department chair, or grade level leader, one of each was targeted to participate in this pilot. Individuals targeted to participate in the pilot study were not eligible for participation in the formal study.

The participants determined if each question and potential follow up questions were clearly stated and relevant. In order for a question to advance for final validation, four of the five pilot participants needed to determine if the question was acceptable. If the question was considered unclear or irrelevant by two or more of the participants, the question was removed or re-written and the process was repeated. The overall pilot process allowed for the refinement of interview questions and procedures.

Pilot Study Results

Piloting the interview questionnaire was necessary to establish validity and reliability of this study. Upon receiving permission from the Indiana University of Pennsylvania Institutional Review Board, a sample of five influential school leaders was chosen. The pilot group was comprised of a pool of candidates that currently serve in the leadership capacities identified in this study including; one curriculum coordinator, one principal, one department chair, and two grade level leaders.

Each of the participants was provided with a copy of the interview instrument, an overview of the purpose of the study, as well as the research questions. They were instructed to provide feedback about the wording of the questions, order of questions, and clarity of the questions. Follow up meetings were arranged for each of the participants to provide this feedback as well as walkthrough the interview process and procedures.

The pilot study provided detailed and honest feedback from each of the participants. The participants generally agreed upon the order of questions, but provided some feedback on the wording or clarity of some of the questions. The researcher asked for suggested phrasing of some of the questions, and followed up with a review of the reworded questions with each of the participants to provide additional feedback on. It was suggested to provide a copy of the interview questions during the interview as an additional strategy for improving understanding of questions by formal participants. With these suggestions implemented, it was generally agreed that the interview questions were both easy to understand, and made sense. The participants indicated that the interview questions addressed the research questions well.

The pilot study confirmed the interview procedure was appropriate to be used in the formal study. The pilot also identified an average time of 36 minutes to complete the interview. It was determined that the proposed interview questions would provide appropriate qualitative data in relationship to the interview questions, and that the data would sufficiently address the research questions.

Procedures

After obtaining Institutional Review Board approval from the Indiana University of Pennsylvania regarding informed consent for human subjects, the researcher contacted the superintendant of qualified elementary schools by email (see Appendix A). Following this approval, suggestions were solicited for possible candidates. The researcher then contacted each of the suggested candidates by email (see Appendix B) One week after this contact, an official invitation to participate in the study was provided (see Appendix C). After acceptance to participate in the study, a meeting was arranged with an influential school leader at a mutually agreed upon location and time. Prior to the beginning of the interview, the participant wasprovided with a flyer that presents the four "C's" as the 21st century skills referred to in this study. An informed consent document (see Appendix D) was then provided. This process is described in figure 6 below.

Step 1	Superintendent of qualified elementary schools contacted by email with suggestions solicited for possible candidates
Step 2	Potential candidates contacted by email
Step 3	Official invitation to participate in study and informed consent emailed to interested candidates
Step 4	Mutually agree upon an interview appointment
Step 5	Demographics survey emailed to interested candidates
Step 6	Advanced organizer emailed to interested candidates to provide back ground knowledge about 21st century skills
Step 5	Completed informed consent document collected prior to interview.
Step 6	21st century skills information flyer provided prior to interview with opportunity to clarify 21st century skills
Step 7	Interview

Figure 6. Data collection flow chart. This figure illustrates the steps that will be taken to collect data

Data Analysis

Case studies involve a detailed analysis of data and a detailed description of a particular case (Stake, 1995; Yin, 2003). Understanding a case does not need to begin after data is collected. “As in any other qualitative study the data collection and analysis occur concurrently” (Baxter & Jack, 2008, pg 554). Electronically recorded interviews were transcribed allowing for simultaneous collection and analysis of data.

To fully understand a case, however, more specific analysis procedures need to be employed. Cross case synthesis, pattern matching, and explanation building have been suggested by multiple authorities as being appropriate analysis methods for case study research (Yin, 2003; Hak & Dul, 2009; Baxter & Jack, 2008). Cross case synthesis involves studying two or more cases. Data are displayed from individual cases and analyzed for similarities and differences. Pattern matching is simply comparing an observed pattern with an expected pattern to see if they match (Hak & Dul, 2009). Explanation building is considered a form of pattern-matching, where the analysis of the case is carried out by building an explanation of the case. Ultimately, every effort will be made to ensure that data analysis is converged to allow the emergence of a true understanding of the overall case.

Limitations and Assumptions

Limitations regarding the design of this study must be considered when interpreting and placing any significance on the results obtained.

Researcher Bias

Researcher bias is a significant concern in most research, but is enhanced when studying 21st century learning. This topic can be quite foreign and radical in many

schools in area of Pennsylvania. Considering the extensive background knowledge of the researcher, personal beliefs can interfere with acquiring and interpreting results. To maintain validity and integrity of the study, the researcherused member checks and field notes to help guard against the threat of researcher bias. This is accomplished by providing transcripts to the participants and soliciting verbal feedback about responses. These measures helped guard against any expectations the researcher may have.

Participants

Participants will be limited to influential school leaders from qualified elementary schools in Pennsylvania. If this study was conducted with influential school leaders from across the United States, the results could be different. The rigorous qualification criteria of this study limited the amount of possible participants. Only 11 schools across the state qualified, which affected the amount of data that could have been collected and interpreted. Teacher contracts can provide varying amounts of in-service training, collaboration, or even curriculum adoption practices and must be considered when interpreting the results of this study. Interviews were limited to school leaders that did not include superintendents, school board members, parents, or students.

Reactivity

Reducing or eliminating the effect the researcher has on the participants in the study is difficult (Creswell, 2007). Steps were taken to minimize or eliminate facial expressions, statements of agreement, or disagreement. The researcher asked for clarification to ensure accurate recording of the interview, thus enhancing data accuracy.

Summary

This research will look at instruction, assessment, and learning in the 21st century, and the skills and technologies that will need addressed by American education in order to prepare a new generation for a global economy. The case study design was chosen for this study because the method provides a rigorous way to explore this topic with several different data sources (Yin, 2003), including recorded interviews, and assessment analysis. Rigorous qualification criteria was established to ensure that highly successful elementary schools are studied. Validity is established through a pilot study and member checks. Chapter four will provide the findings of this research based on themes and categories that emerged from the analysis of recorded interviews.

CHAPTER 4

DATA AND ANALYSIS

The primary purpose of this qualitative case study was to determine if 21st century skills are addressed in high achieving elementary schools while maintaining the proficiency requirements of NCLB. The study was designed to investigate the instructional, curricular, and assessment practices of high achieving elementary schools in Pennsylvania. More specifically, this study was designed to determine if practices that advocate for 21st century skills are in conflict with the mandates of NCLB. The study followed the methodology of qualitative case study and is intended for use by districts, policy-makers, and educators when considering curriculum and instruction decisions, in particular at the elementary level.

The study attempted to illuminate the strategies, best practices, and challenges of high achieving elementary schools. The purposeful sample used for this study focused on school leaders of high achieving elementary schools. Freebody (2003) suggests that in order to thoroughly understand a case, a sample from whom the most can be learned should be selected. From this viewpoint, the study interviewed school leaders of high achieving elementary schools due to their understanding of and influence over instructional practices. This researcher conducted semi structured interviews with nine school leaders with the goal of answering interview questions (Appendix G). The interview questions were developed to expose 21st century skills integrated into elementary programs.

This chapter provides demographic information of the study participants and includes a summary of each of their responses to the questions posed in the interview.

It then presents the following emerging categorizations: most effective ways 21st century skills are addressed; and most common misperceptions about 21st century skills. Next, this chapter will present an analysis of the themes in each of these categories. Additionally, data from a word analysis study will be presented in an effort to expose important terminology identified from the interviews. This analysis was conducted using nVivo software.

Demographics

Data for this research were gathered through in-depth interviews with school leaders of high achieving elementary schools in Pennsylvania. A comprehensive review of all elementary schools in Pennsylvania identified eleven qualifying schools. Four schools responded to my requests, and three school participated. Nine school leaders from these schools were interviewed. Each participant provided demographic information via an electronic survey prior to the interview process. An overview of the participants' leadership capacity and educational experience is presented in figure 7. It was observed that the leaders possess varying degrees of experience in education as well as in leadership roles.

Participant	Position	Years of experience in this position	Years of experience in education
A	Director of curriculum	2	20
B	6th grade head teacher	3	23
C	Elementary library leader	8	15
D	Principal	8	15
E	4th grade admin team leader	1	10
F	Director of Curriculum	2.5	31
G	Principal	16	34
H	Principal	18	29
I	3rd grade facilitator	10	24

Figure 7. School leaders information. This figure provides information about the work experience and jobs of the participating school leaders.

Analysis of Interview Responses

In an effort to categorize the amount of data collected in this qualitative study, the researcher first classified general categories that emerged from the participants' responses to the semi-structured interview questions. The categories that emerged were (a) most effective ways 21st century skills are addressed, (b) most common misperceptions about 21st century skills. Furthermore, additional themes were identified in each of these categories. Themes were identified as making several significant appearances in the transcribed interviews. These appearances ranged from five appearances to as many as twenty three appearances.

Category #1: Most Effective Ways 21st Century Skills are Addressed

Theme # 1: Identifying 21st century skills during formal curriculum review.

Five of the nine participants indicated that 21st century skills are identified during formal curriculum review. Most of the participants were not aware of any set of standards that addressed 21st century skills, and seemed to be guided by the vision of the various textbooks or programs that were being reviewed.

Participant A highlighted a directed curriculum review process. The participant explained that the district uses this process to focus in on 21st century learning as well as conducting research for several months prior to adopting any new program, textbook, or curriculum. The participant stated that "part of the review focuses specifically on the integration of technology and how students will utilize 21st century skills and the whole idea of project based learning into the acquisition of content". Participant A also added that the middle states accreditation process focused a great deal on the four "C's" of critical thinking, collaboration, creativity, and communication as a means to educate the whole child. In fact, these words are painted in the hallways of the school and are visible in classroom instruction across the disciplines. Participant C expanded on this perception by adding that even though the school district lacked any set of standards that specifically addressed 21st century skills, most teachers have knowledge of 21st century skills due to having several teachers involved in curriculum review. Participant C expanded by stating: "I've reviewed a great deal of research that addresses 21st century skills through the American association of school librarians. They have a whole set of standards that address 21st century skills and I use that in my implementation of the

new library program we've developed. Participant B stated that 21st century skills would be more effectively and meaningfully implemented upon the completion of a new elementary program that is being developed to focus on Science, Technology, Engineering, and Mathematics (STEM). Participant H explained that considerations were made to find ways to reinforce what was learned between grade levels, and that these considerations yielded the need to address 21st century skills. In similar fashion, participant D stated that 21st century skills could be addressed through the curriculum efforts necessary for implementation of the new PA common core standards that specifically address not only *what* students will learn, but also *how* they will learn.

Theme # 2: 21st century learning through science and inquiry. Seven of the nine participants indicated that Science, as well as inquiry based instruction, are primary ways of addressing 21st century skills in an elementary program.

Participant E noted that a great deal of emphasis is placed on inquiry based learning, especially through the science program. This allows students to deconstruct problems and learn how to think rather than just engage in drill. The participant believed that the emphasis on inquiry based learning had proven to be very effective on the Pennsylvania System of School Assessment (PSSA). Additionally, participant E stated:

> I believe that problem solving and critical thinking activities have the most valuable impact on the PSSA. This teaches kids to look at information and solve problems. We don't want students to look at a PSSA test item and regurgitate information. We want them to think their way through the test. If they can think through the work, they can accomplish and achieve. I think inquiry based

learning really is effective in teaching our students to think through problems on a test… or not on a test.

Participant A added that during a textbook adoption for science, all teachers took part in an inquiry learning institute. Through this, it was determined that inquiry did not need to occur in a silo, but could be transferred to mathematics instruction and even other subjects. Participant C noted that a fair amount of inquiry learning takes place during library instruction where there are a great deal of projects and research that occur. Participant G emphasized that the expectation is that students are using inquiry on a daily basis as a means to emphasize content deepening and active engagement in core subjects, especially Science. Participant I added by stating that inquiry is mostly addressed through the science program because it's the way the program is built. Science is intended to engage students in the scientific process rather than content acquisition only, and inquiry is part of the scientific process. Participant H added that inquiry is integrated into the elementary program. It was stated that "we don't stop our curriculum to implement inquiry; we do it as a part of our program. We offer students a great deal of opportunity to engage in inquiry, especially in science". Participant D, on the other hand, stated that having so many standards to address makes it difficult to address inquiry in subjects other than science.

Theme # 3: 21st professional learning communities. Participants C, E, and G presented detailed information about how professional learning communities (PLC's) are effective at implementing 21st century skills in their elementary program. Thirteen references were made about PLC's by these participants.

Participant C noted that being a facilitator of PLC's provides several opportunities to share research with other members of the PLC, especially anything that is in a teacher's interest area. This sometimes includes 21st century skills. Sharing research with a PLC allows for the practical application and refinement of practice and this has proven effective with 21st century skills. Participant E stated that there are no specific initiatives that address 21st century skills at this time, just what comes out of PLC's. Critical thinking, inquiry, and problem solving are skills that are efficiently implemented in this manner. Participant E continued that:

> This is what's best for students because it's what students need to be successful. I want my students to be prepared for the workforce. Community of practice and PLC's help facilitate critical thinking and problem solving. This has changed the culture of student participation during instruction. Students are more critical of their own thought processes now.

Refined assessment practices that occur through PLC efforts also address 21st century skills. Participant E added that "we want students to be better problem solvers and critical thinkers so we use our assessments to determine if this is happening. PLC's are trying to better assess problem solving and critical thinking". Participant G states that PLC's facilitate the modeling of 21st century skills further improving the effectiveness of their implementation. The sharing of constructive, research based practices has a positive impact. Participant G adds that " it's a chance for staff to see how innovative ideas are possible and incorporated into lesson design".

Theme # 4: higher order thinking skills and student growth. Five of the nine participants linked 21st century skills with the Pennsylvania Value Added Assessment

System (PVAAS) and higher order thinking skills (HOTS). PVAAS is a statistical representation of student growth from year to year on the PSSA. The PVAAS is another source of data schools use to address achievement. Higher order thinking skills were associated with rigor and content deepening and were related as a way to enhance learning and improve thinking. Most of the participants listed that PSSA scores were a driving force behind these efforts.

Participant D shared that the students from this school are all proficient, so they try to challenge them with higher order thinking and even 21st century skills. Additionally:

> Test scores are the driving factor of facilitation of the 21st century skills we wish to implement. We are always focused on making sure we are doing what we need to do for the test. Our PVAAS scores are not growing as we want, and to stay sharp we continually look for ways to stay on top of the game with our test scores. Some of these four "C's" help our strongest students grow, so we try to facilitate that type of higher order thinking and reasoning.

Participant H stated that PSSA scores several years earlier were not that great, but student ability was. It was decided that skills such as collaboration, communication, and inquiry needed to play a larger role in the elementary program in an effort to promote thinking, effective learning, and improved PSSA scores. Participant E stated that problem solving and critical thinking activities have the most valuable impact on the PSSA because they require students to use higher order thinking skills. "This teaches kids to look at information, think their way through the test, and solve problems rather

than regurgitate information". Participant I noted that efforts to enhance higher order thinking skills do not need to occur solely for the purpose of preparing for the PSSA.

> I believe the majority of us here do not use the word PSSA. We want to focus on teaching children to think. 21st century skills seem to address this focus well. Though we don't have a formal effort to focus on teaching 21st century skills as PSSA preparation, I think most of us really utilize these skills to teach children higher order thinking skills.

Participant A noted that "the way curriculum is now being written and the materials that are being made available, is putting us closer to accessing higher order thinking skills with all students". Participant A also added that these efforts had taken place in the past with gifted students, but now these opportunities are being afforded to all students.

Theme # 5: formative assessment. Participants C, E, and G propose that formative assessment is used regularly to assess skill acquisition, including 21st century skills. They all reference the professional development they've received around the practices advocated by Dr. Robert Marzanno. These practices are mostly instructionally based around formative assessment. These efforts have lead to reviewing what is assessed, and how it is assessed. Participant E shares that formative assessment is relied on to better assess problem solving and critical thinking. Student self assessment is even used to help determine "how much thinking is occurring in the classroom". This participant adds that self assessment is very motivating to students, mostly because it is not graded, so this can provide very worthwhile information about skill acquisition. Participant C notes that they are looking at different ways to assess students, especially

with open ended types of assessment. Participant C also notes that they are moving towards formative assessment.

> Staff development is going through Marzanno, which doesn't directly address 21st century skills. It address's formative assessment, which meshes well with21st century skills. Teachers are receptive to Marzanno especially in the way people are used to assessing students. Because of this training, we are looking at our assessments for other types of assessment other than paper and pencil.

Since formative assessment provides instructional feedback, teachers can better assess the effectiveness of learning through the four "C's". Participant G suggest that formative assessment allows for feedback about whatever students are doing in the classroom. It provides information about what instructional practices are working, as well as what skills students learn best with. Using formative assessment can better address how 21st are used during instruction.

Theme # 6: post PSSA instruction. Five of the nine participants indicated that 21st century skills are not addressed until after the administration of the annual PSSA test. Most indicated that prior to the PSSA, state standards needed to be addressed and that there was limited time to address 21st century skills. It was also suggested that after the administration of the PSSA, most of the curriculum and state standards were addressed allowing for time to more creative and fun lessons. These efforts proved effective from year to year. Participant C noted that the instructional focus prior to the PSSA was based on efforts that have proven effective in the past. 21st century skills were not necessarily pushed for PSSA success, but rather looked at as a more creative lesson appropriate for later in the school year. Participant B noted that after the PSSA is

administered, group projects and presentations occur more frequently. This allows for creativity and collaboration to take place. Participant F also noted that 21st century skills were usually addressed after the PSSA when there is less effort given to addressing state standards. Participant H noted that though there is not a high priority placed on preparing for the PSSA, the four "C's" tend to be addressed after the state assessment when a great deal of emphasis is placed on challenging students in more creative and fun ways. Participant D offered that project based learning occurs mostly after the PSSA, and that previously taught units are enhanced through projects or even inquiry during this time.

Category # 2: Most Common Misperceptions about 21st Century Skills

Theme # 1: 21st century skills as an instructional tool. Seven of the nine participants identified 21st century skills as an instructional tool. Though incorporating the four "C's" can enhance instruction, 21st century skills need to be considered as an outcome of any curriculum or set of standards. *21st century skills need to drive what is instructed, not how it's instructed.* Universally, these participants did not represent 21st century skills as desired outcomes, only as instructional goals. Participant B clearly stated that 21st century skills are "definitely another tool for the toolbox", further stating that using the four "C's" in instruction enhances student's skills and the rigor of the lesson. This participant added that teachers do integrate 21st century skills during instruction, and don't know they are doing so:

> Not knowing until today what the four "C's" are, I can say that we do that on a daily basis. Hitting that every day, the critical thinking, the collaboration, the communication, and creativity, we've been doing that already. Not knowing that

> we've been doing, but we have. Probably not at a hard core level, but we've definitely been using them. Critical thinking is definitely used on a daily basis. Sometimes at a basic level, sometimes we try to move students to a higher level of thinking. We always stress thinking outside the box with students during instruction, especially with reading and language arts.

Participant B added that through writing instruction, students have to demonstrate creativity and communication on a regular basis. Participant E stated that professional learning communities "focus on instruction and the implementation of skills like 21st century skills". These efforts have produced a positive change in instructional practice, especially the implementation of innovative instructional practices like 21st century skills. Participant H noted that there is an expectation to incorporate 21st century skills into instruction because "our vision is to do what we do better, and we do a bunch of the four "C's" because the four "C's" are strategies we use to teach. Additionally, it was stated that instructional and curricular practices are very aligned throughout the building. This participant also noted that "we had a lot of collaboration, communication, creativity, and critical thinking before the PSSA. I think this is just good teaching. Participant G noted several instructional methods that are related to 21st century skills including; novel studies, science instruction, social studies projects, and math discussions. These instructional practices were determined through professional learning communities to create a learning environment where students can achieve and grow academically. Furthermore,

> Teachers generally understand the need for 21st century skills, though some are slow to fully implement in day to day instruction. We have an emphasis on

> learning and teaching. Professional learning communities play a key role in the perceptions of 21st century skills. Some professional learning communities are not as focused on 21st century skills as an important instructional tool and that is why we all teachers are not fully implementing 21st century skill instruction.

Participant G added that 21st century skills are done mostly through math and science instruction, and even through language and literacy instruction. Participant I indicated that cooperative learning, team building, inquiry, and problem solving are integrated effectively into instruction. Participant C noted that skills such as communication and collaboration are addressed during library instruction. It was also stated that 21st century skills are not being purposely integrated into classroom instruction because teachers count on this to occur during library instruction. Participant D states that the four "C's" are not purposely utilized in the curriculum. "What we do focus on is relevance. Everything we teach needs to be connected to real life in a relevant manner in some way".

> Much of what we do does address the four "C's". I am not sure they are integrated as 21st century skills per say, but they are. Our staff is very focused on good instructional practices, and through these practices, the four "C's" are addressed. Often time, collaboration, critical thinking, communication, and creativity occur simply as sounds instructional practices.

Theme # 2: technology Five of the nine participants regarded 21st century skills as being related to technology, internet applications, or instructional technology. Educators need to be proficient with technology in order to benefit from all that technology has to offer, and how they are closely related to 21st century skills. However,

instructional technology and internet applications by themselves are not 21st century skills. The four "C's" still need to be the focus of 21st century skills so that one can use technology in effective and innovative ways. Participant H noted that there is a perception that 21st century skills are based around technology. The integration of critical thinking, collaboration, creativity, and communication activities are common, just not with technology. With so much effort on 21st century learning *tools* many are hungry for technology standards and training, but are not aware of the four "C's". This participant continued stating that there are pockets of instructional technology integration throughout the school, and teachers receive a great deal of training on the use of technology in the classroom. Participant F added that instructional technology integration is the way the district address's 21st century skills. Online courses are being written and used for instruction with some upper elementary students, and applications such as Google docs are used to help improve the delivery of 21st century skills. This participant notes that internet connectivity and computer equipment purchases help make the elementary program more ready to deliver 21st century skills. Participant A states that 21st century skills are limited in the elementary program because there is a lack of 21st century technology and infrastructure. This participant states that "this isn't exactly 21st century skills, but in order for us to feel confident, we need to have reliable technology and training". However, there is now a director of online learning and that is helping address 21st century skills in the elementary schools. Participant C notes that "sometimes technology is a large part of 21st century skills. Not being able to access technology at the elementary level is frustrating and limits the exposure students have to 21st century skills". Participant I states that 21st century skills are delivered to students

through technology, and that this occurs mostly through the library program. The librarian is most likely to require students to use power points, excel, or even Google docs during instruction. Most teachers are comfortable with this because technology is covered competently and "students are ultimately exposed to quality instructional technology and 21st century skills".

Theme # 3: unintended exposure to 21st century skills Four of the nine participants shared that students can demonstrate 21st century skills, but that this was not an intentional part of the elementary program. Expecting the four "C's" to be a purposeful outcome of an elementary program is pivotal to the delivery of 21st century skills. Students need to demonstrate the four "C's" through assessment, and learn core content through these skills. Educators need to deliberately make the acquisition of these skills a central focus in curriculum. Each of the responding participants indicated that they were not aware of 21st century skills, but understanding the four "C's", were confident that students could demonstrate them. Participant B noted that students regularly demonstrate creativity, collaboration, communication, and critical thinking. Most teachers in this school do integrate these skills, just not as 21st century skills. "Our students are good at creative thinking and thinking outside of the box and taking their skills and being able to use them in a different way". However, there is not any sort of strategic implementation of 21st century skills, and state standards lack any identification of them. Participant E emphasized that there was no specific effort towards the development around 21st century skills, though through the efforts of professional learning communities, the skills are addressed and reviewed. Participant G noted that students are expected to demonstrate collaboration, communication, critical thinking,

and creativity at all grade levels. However, these skills are not necessarily delivered as 21st century skills. Participant I added that though there is not a formal effort to focus on teaching 21st century skills, most teachers utilize these skills to teach children to think. PSSA results indicate this is a good strategy, and that children demonstrate these skills through this test.

Theme # 4: 21st century skills as best practice Four of the nine participants indicated that 21st century skills were delivered in their program as best instructional practice. Through focus on best practice, 21st century skills emerged. Participant G states that "the professional development committee does not address 21st century skills, rather best practices". Additionally, it was believed that the professional development committee most likely would not oppose a focus on 21st century skills since they are considered best practice anyway. Participant D added that

> Our curriculum offers a lot of opportunity for students to collaborate and think critically. I'm not sure these opportunities are integrated as 21st century skills, but they are. Often times, the collaboration, communication, creativity, and critical thinking occur as best practices. Our staff is very focused on best practices, and through these practices, the four "C's" are addressed.

Participant B notes that the four "C's" are implemented informally through best practice. Furthermore, this approach has worked successfully on PSSA testing. Participant C emphasizes that teachers implement what they think is the best way to learn. Through this, the four "C's" are addressed.

Analysis

To further summarize data gathered in this study, an analysis of the themes identified by each participant was completed. Further investigation was completed through an analysis of the frequency of interview responses recorded in each theme. Additionally, a word frequency study was conducted to expose important terminology identified from the interviews. This study was conducted using nVivo software.

Category # 1: Most Effective Ways 21st Century Skills are Addressed

All nine participants provided information about the most effective ways 21st century skills are addressed. Figures 8 and 9 illustrate the themes that were revealed, the participants that identified each theme during interviews, and the frequency of interview responses.

Themes	Participants								
	A	B	C	D	E	F	G	H	I
Identified 21st Century Skills During Formal Curriculum Review	X	X	X	X				X	X
21st Century Learning through Science and Inquiry	X		X	X			X		X
Professional Learning Communities			X		X		X		
Higher Order Thinking Skills and Student Growth	X			X	X			X	X
Formative Assessment			X		X		X		
Post PSSA Instruction			X	X		X		X	

Figure 8. Participant identification of themes in category # 1: Most Effective Ways 21st Century Skills are Addressed. This figure illustrates which participant identified each theme during interviews

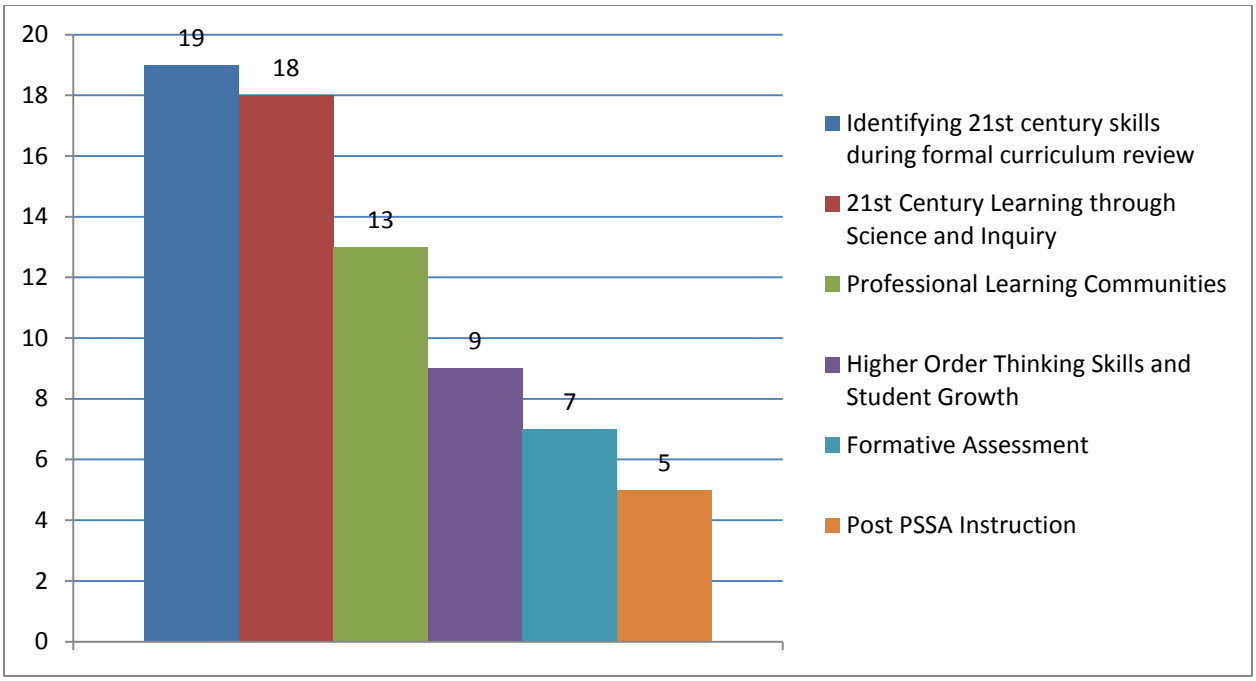

Figure 9. Frequency of interview responses. Number of references made by the participants to the themes in Category # 1: Most Effective Ways 21st Century Skills are Addressed.

In Category # 1, the participants were asked about the most common strategies used for implementation of 21st century skills. Remarkably, the participants indicated that the PSSA testing was a driving factor in implementing strategies that pushed students to perform at higher levels of achievement. These thoughts were well represented in a statement by Participant E:

> I believe that problem solving and critical thinking activities have the most valuable impact on the PSSA. This teaches kids to look at information and solve problems. We don't want students to look at a PSSA test item and regurgitate information. We want them to think their way through the test. If they can think through the work, they can accomplish and achieve.

A review of interview responses indicate that teaching students to "think" was related to 21st century skills as it facilitates critical thinking, creativity, collaboration, and communication. The participants indicated that this was best achieved through inquiry, higher order thinking, problem solving, and even formative assessment. Notably, formative assessment was deemed effective at implementing 21st century skills as it maintained a focus on these skills through instruction. Participants also indicated that there was a lack of formal standards or initiatives that are used to implement 21st century skills. However, formal curriculum review was referred to as providing the research and need for implementation of 21st century skills. These thoughts were exemplified by Participant A:

> As far as a written book or program, no we don't have something like that. Although when we create our curriculum review process every six years, part of that review focuses specifically on the integration of technology and how students will utilize 21st century skills. This directed curriculum review process requires that we do eighteen months of research before we present to the school board. This assures that these skills are being integrated into our program.

Category # 2: Most Common Misperceptions about 21st Century Skills

All nine participants stated misperceptions about 21st century skills. Figures 10 and 11 illustrate the themes that were revealed, the participants that identified each theme during interviews, and the frequency of interview responses.

Themes	Participants								
	A	B	C	D	E	F	G	H	I
21st Century Skills as an Instructional Tool	X	X	X	X	X		X	X	X
Technology	X		X			X		X	X
Unintended Exposure to 21st Century Skills		X			X		X		X
21st Century Skills as Best Practice		X	X	X			X		

Figure 10. Participant identification of themes in category # 2: Most Common Misperceptions about 21st Century Skills. This figure illustrates which participant identified each theme during interviews

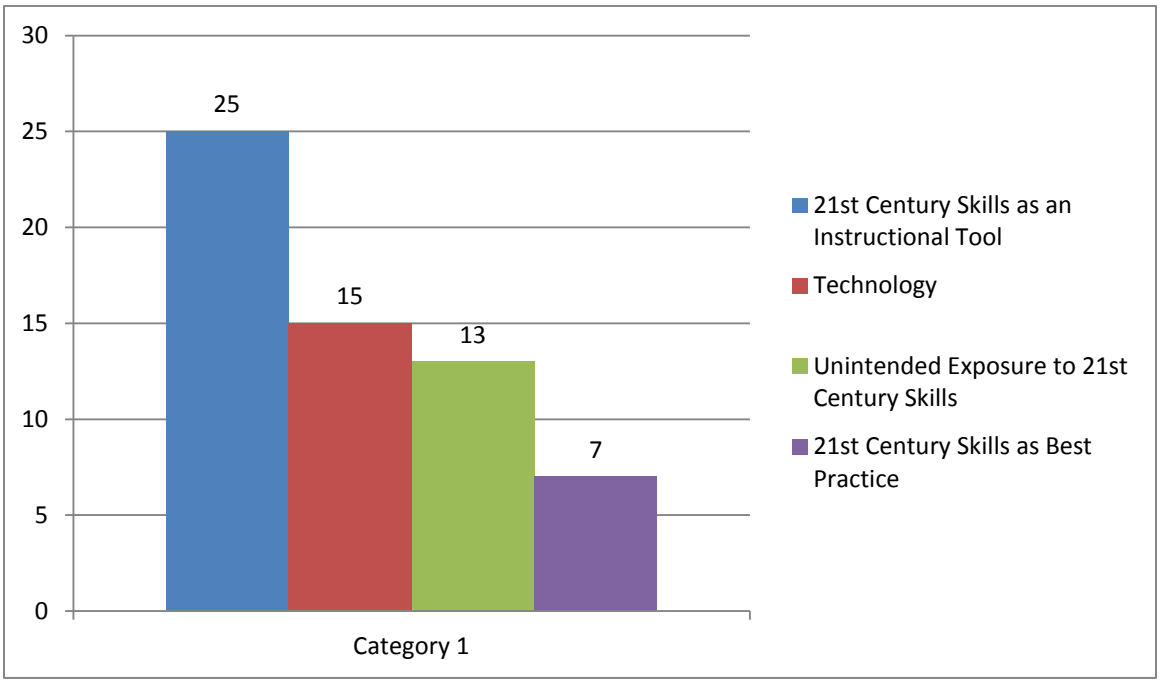

Figure 11. Frequency of interview responses. Number of references made by the participants to the themes in Category # 2: Most Common Misperceptions about 21st Century Skills.

Regarding Category # 2, participants failed to identify 21st century skills as desired outcomes in an elementary program or curriculum. Participants tended to emphasize the integration of 21st century skills from an instructional viewpoint. Participant B highlights this viewpoint, stating:

> Not knowing until today what the four "C's" are, I can say that we teach them on a daily basis. The critical thinking, the collaboration, the communication, and creativity, we teach them already. Sometimes we teach them at a basic level, sometimes we try to instruct them at a higher level of thinking. I believe that the teachers do integrate these practices and don't know they are doing it as far as having the 21sy century skills name on it. I see them being implemented every day by our teachers.

Similarly, Participant D indicated that 21st century skills are not purposeful or curricular based, but implemented as best practice:

> We don't purposely utilize the four "C's" in our curriculum, though much of what we do does address the four "C's". What we do focus on is relevance. Everything we teach needs to be connected to real life in a relevant manner in some way. Our staff is very focused on best practices to accomplish this, and through these practices the four "C's" are addressed. Our teachers offer a lot of opportunity for students to collaborate and think critically. I'm not sure they are implemented as 21st century skills per say, but they are instructed. Often time, collaboration, critical thinking, communication, and creativity occur as sound instructional practices, best practices.

Technology emerged as a common representation of 21st century skills. Though the application of technology is paramount in the 21st century, technology itself is not a 21st century skill. According to the participant's responses, technology, internet applications, or instructional technology was often referred to as 21st century skills. Participant F reported the following regarding the purposeful integration of 21st century skills:

> This is one of our calling cards. When I started, we had little technology in our schools. Now, every room in the district has an interactive white board. We use Google docs, especially in the secondary. We've made nice strides with the implementation of instructional technology. We are now using more Edline and surveys for parent communication. We are using some virtual learning networks and are looking into the flipped classroom concept in the elementary schools. We've also developed several eAcademy MOODLE courses and are beginning to do so at the elementary level. This has been slow to develop however due to connectivity issues. We have assigned a technology integration coach for the elementary's to get them up to speed with these 21st century skills.

Additionally, student demonstration of 21st century skills emerged from the participants' interviews as an unintentional part of the elementary program. These statements lacked the deliberate acquisition of 21st century skills as a central focus in the elementary program. According to the responding participants, students could demonstrate 21st century skills. Participant B reported the following by stating:

> Looking at writing, students can demonstrate creativity, especially when writing narratives and writing stories. They demonstrate critical thinking when it comes to informative of persuasive writing for the PSSA. They have to think how they want

to persuade someone or how to do something. Communication is definitely demonstrated because their writing skills have to be there. They have to put on paper what is in their minds in a way that makes sense to someone when they read it. We get to collaboration once testing is over. We get more into group projects and presentation where they have to re-interpret stories their own way. So again, I'm not sure teachers know that these are 21st century skills, but students do demonstrate them on a regular basis.

This perception leads to the belief that 21st century skills are "just one more thing to teach" rather than outcomes expected from curriculum in an elementary program.

Word Frequency Study

A word frequency study of all nine interview transcripts was conducted using nVivo software. This study was helpful in identifying general categories and themes due to the frequent occurrence of significant words. Throughout the process of identifying themes and categories, significant words were identified because of their frequent occurrence in interview transcripts. Results of this study indicate that words such as "assessment", "inquiry", "learning", and "skills" are strongly associated with themes that emerged from the interview transcripts. These words are also closely aligned with the literature associated with 21st century skills. Additionally, words such as "technology", "data", "thinking", and "development" were unexpected results from the study and added to the creation of emerging categories and themes. Interestingly, significant words from literature such as "program", "standards", and "process" showed a lower frequency of use than would be expected. The low frequency of these terms could be a result of a lack understanding of what 21st century skills are.

Selected Term	Frequency
skills	209
21st	186
century	186
students	118
learning	103
describe	91
pssa	83
based	80
professional	72
practices	67
teachers	67
inquiry	63
assessment	62
think	59
district	50
development	42
technology	39
curriculum	36
student	34
project	33
program	31
review	31
data	30
test	30
collaboration	29
time	29
communities	28
instructional	28
integrated	28
teacher	28
communication	26
standards	26
thinking	26
process	25

Figure 12. Word study results. This figure displays the results of a word study using nVivo software

Summary of Data

The following summarizes the results of the interviews conducted with leaders of high achieving elementary schools in Pennsylvania:

- Leaders of high achieving elementary schools believe that 21st century skills are implemented into elementary programs during formal curriculum review cycles.
- Leaders of high achieving elementary schools indicated that Science, as well as inquiry based instruction, are primary ways of addressing 21st century skills in an elementary program.
- Leaders of high achieving elementary schools emphasized that professional learning communities (PLC's) are effective at implementing 21st century skills in their elementary program. They also recognized formative assessment as an effective way to implement 21st century skills when incorporated as a focus of PLC's.
- Leaders of high achieving elementary schools identified the need to promote higher order thinking skills (HOTS) and student growth through the Pennsylvania Value Added Assessment System (PVAAS) as primary reasons for implementing 21st century skills into their elementary programs.
- Leaders of high achieving elementary schools indicated that 21st century skills are often times addressed after the administration of the annual PSSA test. Having addressed most of the curriculum and state standards was one example of highlighted by the leaders.

- Leaders of high achieving elementary schools commonly associated 21st century skills as being instructional in nature, rather than a purposeful outcome of curriculum or state standards.
- Leaders of high achieving elementary schools similarly discussed that 21st century skills were delivered in their program as best instructional practice.
- Leaders of high achieving elementary schools often regarded 21st century skills as being related to technology, internet applications, or instructional technology rather than communication, critical thinking, creativity, and collaboration skills.
- Leaders of high achieving elementary schools revealed that students can demonstrate 21st century skills, but that this was not an intentional part of the elementary program.

Summary of Chapter 4

This chapter included demographic information of each of the school leaders that participated in this study. A summary of each of the participant's responses was provided. The following emerging categorizations were presented: most effective ways 21st century skills are addressed; and most common misperceptions about 21st century skills. An analysis of the themes in each of these categories was conducted and data from a word analysis study was presented in an effort to expose important terminology identified in literature, and exposed from the interviews.

Chapter 5 will discuss the results of the study and address the interview findings as they relate to each of the research questions.

CHAPTER 5

SUMMARY, DISCUSSIONS, RECOMMENDATIONS, AND CONCLUSIONS

The purpose of Chapter 5 is to review the research problem, research questions of this study, and summarize the findings. Conclusions are presented, and recommendations for future studies are provided.

The purpose of this study was to determine if 21st century skills are addressed in high achieving elementary schools while maintaining the proficiency requirements of No Child Left Behind (NCLB). Few studies have been conducted that acknowledge the conflict associated with addressing 21st century skills while also maintaining an intense focus to attain proficiency on state assessments mandated by NCLB. However, as outlined in chapters 1 and 2, there is a wealth of information regarding the need for 21st century skills. Thomas Friedman provides a clear picture of these needs in, *The World is Flat: A Brief History of the Twenty First Century* (2007). His review of current globalization shifts offer insight into the need to teach 21st century skills in our schools. "There will be plenty of good jobs out there for people with the right knowledge, skills, ideas, and self motivation to seize them" (Friedman, 2007, p. 278). Schools will play an essential role in teaching students these skills. However, Tony Wagner concludes that our schools are "obsolete – even the ones that score the best on standardized tests" (Wagner, The global achievement gap: Why even our best schools don't teach the new survival skills our children need, and what we can do about it, 2008, p. xxi). For this reason, we need to re-concieve the purpose of schooling in America.

The Partnership for 21st Century Skills (P21) is an organization that seeks to be a catalyst to position 21st century readiness at the center of United States K-12 education. P21 states:

> In an increasingly complex, demanding and competitive 21st century, students need to learn more than what they are tested on in school. Every child in the U.S. needs 21st century knowledge and skills to succeed as effective citizens, workers and leaders. There is a profound gap between the knowledge and skills most students learn in school and the knowledge and skills they need in typical 21st century communities and workplaces. To successfully face rigorous higher education coursework, career challenges and a globally competitive workforce, U.S. schools must align classroom environments with real world environments. It's time for them to go above and beyond by embracing the "4C's" - communication, collaboration, critical thinking and creativity

This challenge is occurring simultaneously with reform efforts associated with NCLB, creating conflict among transformation efforts across America. Subsequently, this conflict has avoided scrutiny, especially as it pertains to what students of high achieving schools learn and are able to do. This study used a case study approach to investigate this issue. Input gathered from participants shed light on the perceptions and applications of 21st century skills in high achieving elementary schools. A semi-structured interview protocol was developed to gather this information. This study examined the perceptions of nine leaders of high achieving elementary schools across

Pennsylvania to answer the following questions:

1. To what extent do instructional leaders of high achieving elementary schools perceive 21st century skills?
2. To what extent are 21st century skills addressed in high achieving elementary schools?
3. What are the most common instructional strategies used to implement 21st century skills in high achieving elementary schools?

Discussion of the Research Findings

The following discussion is derived from interviews with leaders of high achieving elementary schools combined with a review of the research. Summaries are presented in response to each of the research questions established in this study.

Research Question 1: To what extent do instructional leaders of high achieving elementary schools perceive 21st century skills?

The findings indicate that instructional leaders of high achieving elementary schools understand what 21st century skills are, but believe they are skills that are taught rather than a student outcome. The leaders often referred to 21st century skills as an instructional strategy, or as higher order thinking skills that are used to instruct and improve student achievement on the PSSA. Leaders also viewed 21st century skills as skills that help student growth on the PSSA. Furthermore, leaders pointed out that students were able to demonstrate 21st century skills, but did so in the absence of formal standards or initiatives. This often occurred informally or even unintentionally.

Additionally, leaders regularly referenced 21st century skills as best practice. Many of the leaders regarded 21st century skills as quality instruction that occurred a

great deal prior to the PSSA, and has since diminished. Leaders also referenced 21st century skills as technology or use of technology. Twenty first century skills professional development was often regarded as a need for teachers to become proficient with technology.

Upon reflection of the responses from instructional leaders of high achieving elementary schools, this researcher concludes that their perception of 21st century skills is incomplete. Though the leaders are able to identify 21st century skills, they do not perceive them to be a cornerstone or outcome of their elementary program or curricula.

Research Question 2: To what extent are 21st century skills addressed in high achieving elementary schools?

The findings associated with this research question indicate that 21st century skills are addressed to a moderate degree in high achieving elementary schools. These findings are not completely consistent with the research literature as the research suggests the intense focus for test preparation is paramount in schools. The leaders indicate that 21st century skills are addressed most effectively when considered during formal curriculum review. This allows for district review teams to review literature associated with the latest curriculum programs. Additionally, curriculum review teams often refer to national level curriculum councils for guidance during curricular reviews. These councils often advocate for and outline 21st century skills to be considered. Leaders referenced formative assessment practices and professional learning communities (PLC's) as effective ways to address 21st century skills. However, these strategies only work when 21st century skills are the primary focus of these efforts. Participants also identified inquiry based instruction as an effective strategy of

addressing 21st century skills. However, this mostly occurs during science instruction. Leaders indicated the need to teach students to think, and that inquiry based instruction accomplishes this.

Additionally, participants pointed out that 21st century skills tend to be addressed after the mandated state assessment is conducted when the majority of content driven standards have been addressed. This finding is reflective of research literature.

Research Question 3: What are the most common instructional strategies used to implement 21st century skills in high achieving elementary schools?

Participants offered a variety of instructional practices used to implement 21st century skills in high achieving elementary schools. However, these practices are minimal, and oftentimes unintentional. Not surprisingly, 21st century skills were not identified as the cornerstone of the curriculum or program. More often than not, leaders attested to a desire to teach students to think on the state mandated PSSA, and 21st century skills and inquiry based instruction were effective in this effort. Leaders identified the following instructional practices used to implement 21st century skills: inquiry based instruction, formative assessment, writing projects, science based instruction, critical thinking activities, and problem solving activities. However, leaders identified these instructional strategies as effective ways to be successful on the state mandated PSSA.

This researcher did not expect the impact that preparing for the state mandated PSSA test would have on the implementation of 21st century instructional practices. School leaders indicated the desire to teach students to think through a test, rather than simply regurgitate facts and information. Though the implementation of 21st century

instructional practices in this manner were minimal or unintentional, it was the primary motive for these instructional shifts.

This interview process both supported and negated what the literature suggests occurs in our schools, especially our highest achieving schools. Though it was clear that school leaders were mainly focused on PSSA achievement and growth, they were also open to ways that will continue their commitment to this high standard. 21st century skills appear to be fulfilling this need.

Recommendations for Action

The Pennsylvania Department of Education, as well as various state education advocacy organizations, should view the results of this study as a declaration of the need to transform K-12 education. It is proposed to initiate this transformation with an overhaul of the mandated PSSA assessment to test for creativity, collaboration, critical thinking, and communication (the 4 “C’s”). Following this course of action would result in a trickledown effect that would effectively address 21st century skills at the classroom level. With so much emphasis placed on achieving Adequate Yearly Progress (AYP), educators effectively “teach to the test”. Creating an assessment that tests core content knowledge as well as the 4 “C’s” would make this a worthy effort (Wagner, The global achievement gap: Why even our best schools don't teach the new survival skills our children need, and what we can do about it, 2008). This can be achieved in the following ways:

1. Allow for more writing and open ended assessment problems. This facilitates communication, critical thinking, and creativity.

2. Eliminate or significantly reduce the multiple choice answer format currently used on the PSSA. Multiple choice questions greatly reduce the level of critical thinking, problem solving, and communication students can demonstrate.
3. Create more questions that require analysis or even inquiry.
4. Utilize writing and science assessments in calculations for AYP. Currently the writing and science assessments are not used in calculation for AYP. These assessments lend themselves well to communication and process allowing for sensible assessment of the 4 “C’s”.

It is generally understood that the multiple choice question format is affordable and easy to score. However, rapidly expanding online/ computer based assessments provide a wealth of assessment options that are very cost effective, especially when considering the variety of assessment formats offered. Online/ computer based testing can easily allow for problem solving and writing formats which are effective ways to assess for critical thinking, communication, and creativity as well as content knowledge. Such assessment would alter what needs to be taught at the district and classroom level which would allow for 21st century skills to be implemented into educational programs as well as address Wagner’s seven survival skills.

School districts would be served well by reviewing the results of this study. Districts can utilize currently installed practices as a means of considering 21st century skills as the cornerstone of their educational programs. The curriculum review process is one of these procedures that can effectively consider 21st century skills. Many school districts review or upgrade their curriculums through a variety of practices every few years. These practices range from comprehensive curriculum mapping, to simply

purchasing the latest textbook series. However, at the core of these practices should be research, collaboration with other districts, and consultation with advocates of 21st century skills. Careful consideration about program outcomes is when 21st century skills need to be reviewed so that these skills are among the desired outcomes of any curriculum or educational program. These efforts would begin to lay the foundation for making 21st century skills the cornerstone of educational programs.

Districts can also address 21st century skills through a formal review of assessment. A careful examination of assessment and assessment practices can yield a clear picture of what is taught in classrooms, as well as what student outcomes are expected from a curricular program. A procedure such as this would facilitate discussions around 21st century skills becoming desired outcomes in an educational program. Additionally, formative assessment practices could be examined as an initiative to address 21st century skills at the school and classroom level.

At the time this study was completed, the Pennsylvania Department of Education was in the process of unveiling the Common Core State Standards (CCSS) as a replacement of the Pennsylvania State Academic Standards. Fortunately, the CCSS not only address *what* is to be taught, but also *how* to teach it. This looming shift promises standardized instructional practices that are based in methods that promote 21st century skills. This researcher strongly recommends that the Pennsylvania Department of Education use this opportunity to facilitate 21st century skills in districts across the state.

And finally, educators themselves can benefit from a review of the findings in this study. An awareness of 21st century skills and the need to have them be central to the outcomes expected from students in an educational program is necessary for educators

to embrace. This study offers educators a variety of ideas for implementing 21st century skills in a high achieving educational program. This can serve as a starting point for transformation of instructional, assessment, and classroom practices.

Recommendations for Further Study

Based on the conclusions from this study, several considerations for additional and future research are suggested:

1. The input of various instructional leaders was vital in investigating the presence of 21st century skills in high achieving elementary schools. Students, school board members, and parent groups would also provide additional viewpoints in this area. The perspectives from these additional sources would enhance the perspective of 21st century skills in high achieving elementary schools
2. This study would be enhanced if data from lower achieving elementary schools was also gathered. The perspectives from these sources could be compared with the data from high achieving schools to shed additional light on the integration of 21st century skills.
3. Though a qualitative case study allows for in depth review of data, this case study would benefit from additional data to be gathered through a quantitative survey. This would provide additional analysis and enhance the case study investigation.
4. This case study would benefit from an analysis of assessments used in high achieving elementary schools. This review can shed light on actual instructional practices in these schools.

5. Legislative and educational policy makers should be interviewed to provide additional insight into transformation issues associated with the implementation of 21st century skills
6. This study could be expanded to allow data to be retrieved from secondary schools as well as elementary schools. With the Federal Department of Education advocating for graduating students college or career ready, it would be interesting to gain the perspective of secondary leaders.

Conclusions

The research findings in the area of 21st century skills indicate the need for transformation of public education. However, the intense efforts to achieve Adequate Yearly Progress has entrenched our schools in preparing for standardized test that offer little relevance of the skills needed for life in the 21st century. Our curricula, philosophies, assessments, and teaching methods were "created in a different century for the needs of another era" (Wagner, 2008, p. 9). This study sought to investigate if 21st century skills are addressed in high achieving elementary schools while maintaining high achievement scores on the PSSA. Influential leaders of high achieving elementary schools in the state of Pennsylvania were interviewed for this study.

Based on the results of this study, it was determined that 21st century skills are addressed to a moderate degree in high achieving elementary schools. However, they are done so sporadically, and oftentimes unintentionally. This study suggests a need for the state department of education, school districts, and individual educators to become more aware of 21st century skills and the need to make them the cornerstone of

educational programs. Considering we are 13 years into the 21st century, this effort should be undertaken with urgency.

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APPENDIX A

Email request to superintendent

Dear Superintendent…..

My name is Gregory Egnor, and I am a doctoral student in the Administration and Leadership Studies program at Indiana University of Pennsylvania. I am conducting a research study that examines the presence of 21st century skills in highly achieving elementary schools. The sample from which I seek to obtain data has the criteria of being an elementary school that has achieved 90 percent proficiency on the PSSA Reading and Math test in fifth grade, and has done so for the last three years. I am emailing you because your district has a school that has met the standard necessary for this study.

This study will use an interview method that solicits responses from influential school leaders of high achieving elementary schools. School leaders consist of individuals that have influence over instructional or curricular practices within their school. Principals, curriculum coordinators, department chairs, or grade level leaders can qualify as school leaders. I am requesting your approval to interview qualified leaders. The interview will last approximately 20 to 30 minutes.

If you have any leaders that would be willing to participate in this study, please contact me by phone or email at the information below:

Cell phone: (412) 719-1171
Email: gegnor@comcast.net

Thank you for your time considering participating in this study.

Sincerely,

Gregory Egnor

APPENDIX B

Email request to participate

Dear …..

My name is Gregory Egnor, and I am a doctoral student in the Administration and Leadership Studies program at Indiana University of Pennsylvania. I am conducting a research study that examines the presence of 21st century instruction and learning in highly achieving elementary schools. The sample from which I seek to obtain data has the criteria of being a high achieving elementary school that has achieved 90 percent proficiency on the PSSA Reading and Math test in fifth grade, and has done so for the last three years. I am emailing you because your school has met the standard necessary for this study.

This study will use an interview method that solicits responses from influential school leaders of high achieving elementary schools. You have been suggested for participation in this study by the superintendant of your district. The interview will last approximately 20 to 30 minutes. I would like to invite you to participate in this study.

If you would be willing to participate in this study, please contact me by phone or email at the information below:

Cell phone: (412) 719-1171
Email: gegnor@comcast.net

I will later provide an official letter of invitation and a copy of an informed consent form for any interested participant.

Thank you for your time considering participating in this study.

Sincerely,

Gregory Egnor

APPENDIX C

Official letter of invitation to participate

Date……..

Dear….

My name is Gregory Egnor, and I am a doctoral student in the Administration and Leadership Studies program at Indiana University of Pennsylvania. I am conducting a research study that examines the presence of 21st century instruction and learning in highly achieving elementary schools. The sample from which I seek to obtain data has the criteria of being an elementary school that has achieved 90 percent proficiency on the PSSA Reading and Math test in fifth grade, and has done so for the last three years.

You are invited to participate in this study. In order to help you make an informed decision as whether to participate, additional details and information regarding the research methods used in this study are below:

This study will use an interview method that solicits responses from influential school leaders of high achieving elementary schools utilizing the attached interview questions. School leaders consist of individuals that have influence over instructional or curricular practices within their school. Principals, curriculum coordinators, department chairs, or grade level leaders will qualify as school leaders. Specifically, I would seek to interview you for approximately 20 to 30 minutes at a mutually agreed-upon location that is convenient for you. The interview will be recorded using a small audio recording device. After conducting the interview. You will receive a transcript of your responses. You will then have the opportunity to review the transcript to verify its accuracy, as well as communicate to me any necessary clarifications via email, phone, or personal conversation. Your responses in this study will remain confidential. If you are willing to participate in this study, you will sign a consent form indicating your agreement to participate prior to your involvement in the study. You will be free to refuse to answer any question, as well as withdraw from the study at any time by contacting me through personal conversation, written communication, phone call, or email.

Please complete and return the enclosed copy of the informed consent form in the addressed envelope. If you choose not to participate, please return the form with only your name provided and the word “NO” printed on the form.

If you have any questions regarding this study you may contact me by phone or email at the information provided below:

Cell phone: (412) 719-1171
Email: gegnor@comcast.net

You time and cooperation is very much appreciated. Thank you for considering my invitation to participate in this study.

Sincerely,

Gregory Egnor

Principal Investigator:
Gregory Egnor
Doctoral Candidate, IUP
174 Birchwood Way
Irwin, PA 15642
(412) 719-1171

Faculty Sponsor:
Dr. Joseph Marcoline
Professor Professional Studies in Education
311 Davis Hall
Indiana University of Pennsylvania
Indiana, PA 15705
(724) 357-2419

This project has been approved by the Indiana University of Pennsylvania Institutional Review Board for the Protection of Human Subjects (Phone: 724-357-7730)

APPENDIX D

Informed Consent Form

Title of Study:
A Case Study of the 21st Century Skills in High Achieving Elementary Schools in Western Pennsylvania

Researcher:
Gregory Egnor
174 Birchwood Way
Irwin, PA 15642
gegnor@comcast.net
412-719-1171

Advisor:
Dr. Joseph Marcoline
Professor Professional Studies in Education
311 Davis Hall
Indiana University of Pennsylvania
Indiana, PA 15705
(724) 357-2419

1. Purpose of the Study:
The purpose of this study will be to determine if 21st century skills are addressed in high achieving elementary schools while maintaining the proficiency requirements of NCLB. For the purpose of this study, the practices of high achieving elementary schools will be investigated because of their success on state assessment, which, according to No Child Left Behind, is a demonstration of effective education that prepares students for work and citizenship (Wagner, 2008). More specifically, this study will examine if practices that advocate for 21st century skills are in conflict with the mandates of NCLB.

2. Procedures to be Followed
After your acceptance of participation in this study, I will arrange a meeting with you at a time and location of your convenience. At this meeting you will participate in an interview focusing on the instruction, learning, assessment, and professional practices in your school. The interview will last approximately 20 to 30 minutes in length. An audio recording instrument will be used to transcribe the interview after its completion. You will receive a copy of the transcript and be asked to review the transcript to ensure accuracy and help clear up any miscommunications.

3. Risk and Benefits
There are no risks to participate in this study.
The importance of this study lies in revealing the practices of high achieving elementary schools. It is the practices of high achievement that need to be reviewed for evidence of 21st century practices. The findings of this study will shed light on the need to embrace

the skills needed for students to be competent in the 21st century. The results of this study will be will be beneficial to both district administrators and educators when considering curriculum and instruction decisions. Results can also be used by policymakers as they guide education to meet the current and future demands of industry.

4. Compensation
There will be no compensation for participating in this study

5. Duration/ Time
The face to face interview should take approximately 20 to 30 minutes of your time. Shortly after the interview, I will transcribe the interview using a recording device and it will be sent to you for your review.

6. Confidentiality
The only persons that will have access to my study will be me, my advisor, and my dissertation committee. All materials pertaining to the study will be locked in a cabinet in my home office. Upon compilation of the study, or any reports pertaining to the study, pseudonyms will be used for all school districts or individuals participating in the study such as Teacher A, District B, etc. You will be able to review all transcripts prior to the printing of any of your information.
Additional communication, such as phone or email, will be treated in the same manner with regard to confidentiality. In compliance with federal regulations, your informed consent document and all research data will be retained for a minimum of three years. All such materials will be locked in a cabinet in my home office.

7. To find out more information about the project:
Please contact either me (gegnor@comcast.net or (412) 719-1171) or Dr. Joseph Marcoline (j.f.marcoline@iup.edu or (724) 357-2419) for additional details pertaining to this study.

8. Voluntary Participation
Participation in this study is voluntary and you may withdraw at any time by notifying me at the provided contact information. You may refuse to answer any interview questions. If you are in agreement with the terms stated above, and willing to participate in this study, please sigh the consent form enclosed and either mail it to me or give it to me a the interview. A second copy is provided that you may keep for your records.

VOLUNTARY CONSENT FORM

I have read and understand the information on the form and I consent to volunteer to be a subject in this study. I understand that my responses are completely confidential and that I have the right to withdraw at any time through personal conversation, written communication, phone call, or email. I have received an unsigned copy of this Informed Consent Form to keep in my possession.

Name (PLEASE PRINT) _____

Signature _____

Date _____

Phone number or location where you can be reached_____

Best days and times to reach you_____

I certify that I have explained to the above individual the nature and purpose, the potential benefits, and possible risks associated with participating in this research study, have answered any questions that have been raised, and have witnessed the above signature.

_____ _____

Date **Investigator's Signature**

APPENDIX E

Demographic data survey

Thank you for agreeing to participate in my study. Please complete this survey prior to our scheduled interview. There are five questions and should take just a few minutes to complete. The data collected will be added to the data collected in our interview.

1. Please complete the following information

Name: _____

School District: _____

School: _____

2. What position do you currently serve in?

- ☐ Department Chair
- ☐ Grade Level Leader
- ☐ Principal
- ☐ Curriculum Coordinator

3. How many years have you served in THIS position?

4. How many years have you worked in education?

5. How many students are in your school district?

- ☐ 0-1000
- ☐ 1000-2000
- ☐ 2000-3000
- ☐ 3000+

APPENDIX F

21st CENTURY SKILLS BACKGROUND INFORMATION

For the purposes of this study, the "four C's" will define 21st century skills. Outcomes that focus on *critical thinking, communication, collaboration and creativity* are essential to prepare students for the future (Partnership for 21st century skills, 2011). The following organizer illustrates these skills. For additional information regarding my concept of 21st century skills as it relates to this study, you are invited to review the following short video http://www.youtube.com/watch?v=0AvZ5ulVyLc&feature=related

The Four "C's"

CRTICIAL THINKING	***COMMUNICATION***
▪ Reason Effectively ▪ Use Systems Thinking ▪ Make Judgments and Decisions ▪ Solve Problems	▪ Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills ▪ Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions ▪ Use communication to inform, instruct, motivate and persuade ▪ Utilize multiple media and technologies ▪ Communicate effectively in diverse environments (including multi-lingual)
CREATIVITY	***COLLABORATION***
▪ Use a wide range of idea creation techniques ▪ Create new and worthwhile ideas ▪ Elaborate, refine, analyze and evaluate ideas ▪ Demonstrate originality and inventiveness in work ▪ View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes	▪ Demonstrate ability to work effectively and respectfully with diverse teams ▪ Exercise flexibility and willingness in making necessary compromises to accomplish a common goal ▪ Assume shared responsibility for collaborative work, and value the individual contributions made by each team member

APPENDIX G

Interview instrument

Interview questions for elementary school leaders of highly achieving elementary schools. Each participant will be asked the same interview questions with potential follow-up questions listed below.

1. How would you describe student's ability to engage in process or inquiry at your school?
    - Are there standards for students to demonstrate 21st century skills in your school or district?
    - How do teachers in this school perceive these efforts?
    - Does your school have a vision for identifying 21st century skills?
2. How would you describe the 21st century skills your school purposely utilizes?
    - What were the factors that influenced your facilitation of 21st century skills?
    - What obstacles exist with the implementation of 21st century skills in your program?
    - What are your perceptions of 21st century skills?
3. What are the most commonly used instructional practices in your school?
    - Describe your school's most common assessment practices.
    - Describe your school's efforts to refine assessment practices.
4. What methods do you consider to have the most valuable impact on the PSSA?

- What data does your school review when making instructional decisions?
- Describe your school's use of inquiry based or project based learning.
- What effect do you believe inquiry based or project based learning has on PSSA achievement?

5. How would you describe your school's efforts to facilitate 21st century skills that have a positive impact on the PSSA?
   - How are these practices integrated by teachers?
   - Describe how 21st century skills are purposefully integrated into your curriculum.
6. How would you describe your school's approach to improvement around 21st century skills?
   - Describe the professional development opportunities your school offers.
   - How would you describe the availability of professional development regarding 21st century skills?
   - How active are administrators and teacher leaders around 21st century skills?

APPENDIX H

Approval documentation from the Partnership for 21st Century Skills

From: Requests, P21 [requests@p21.org]
Sent: Wednesday, November 16, 2011 12:28 PM
To: Gregory Egnor
Subject: Re: Dissertation Study

Thank you very much for your request. P21's Framework for 21st Century Learning and other materials are free and available to use for educational purposes. We would be very glad to have you include our materials as part of your work. Please do cite Partnership for 21st Century Skills, and see our website for the latest in 21st Century Skills-related resources. We would of course love to see how our materials are utilized, so if there is anything you could share with us as far as final product, publication or web links, we'd greatly appreciate it. We also encourage you to share with us feedback on the use of our materials and Framework. Please let us know more about your ongoing efforts and stay in touch.
All the best,

Partnership for 21st Century Skills
1 Massachusetts Avenue NW
Suite 700
Washington, DC 20001
www.P21.org

On Mon, Nov 7, 2011 at 9:40 PM, Gregory Egnor <gegnor@comcast.net> wrote:
Hello,

My name is Greg Egnor and I am a doctoral student at the Indiana University of Pennsylvania. I am studying the presence of 21st century skills in high achieving elementary schools in southwest Pennsylvania. Influenced from the work of Friedman and Wagner, I plan to conduct a case study through interviews.
I am writing to ask permission to base my definition of 21st century skills off of the partnership's "framework for 21st century learning". I will mostly focus on the 4 "C's" of *Communication, Collaboration, Critical Thinking, and Creativity.* I am also asking to base some of my interview questions from your free online MILE guide assessment. Appropriate reference will be made stating that the content was "reprinted with permission"
Your approval will be most helpful as it will provide a credible and well known source as the definition for the backbone of my study. I appreciate your consideration of this request. I can be reached at:
gegnor@comcast.net
412-719-1171

Thank you,
Gregory Egnor