

---

Electronic Theses and Dissertations, 2004-2019

---

2016

## Learning in the 21st Century: A Study Addressing Educational Trends and Implications

Rodney Harshbarger  
*University of Central Florida*

 Part of the [Education Commons](#)

Find similar works at: <https://stars.library.ucf.edu/etd>

University of Central Florida Libraries <http://library.ucf.edu>

This Doctoral Dissertation (Open Access) is brought to you for free and open access by STARS. It has been accepted for inclusion in Electronic Theses and Dissertations, 2004-2019 by an authorized administrator of STARS. For more information, please contact [STARS@ucf.edu](mailto:STARS@ucf.edu).

---

### STARS Citation

Harshbarger, Rodney, "Learning in the 21st Century: A Study Addressing Educational Trends and Implications" (2016). *Electronic Theses and Dissertations, 2004-2019*. 5043.

<https://stars.library.ucf.edu/etd/5043>

LEARNING IN THE 21ST CENTURY: A STUDY ADDRESSING EDUCATIONAL  
TRENDS AND IMPLICATIONS

by

DENISE HARSHBARGER  
B.S. Erskine College, 1999  
M.S. Florida State University, 2008

and

RODNEY HARSHBARGER  
B.A. University of Southwestern Louisiana, 1995  
M.A. University of Florida, 1998

A dissertation in practice submitted in partial fulfillment of the requirements  
for the degree of Doctor of Education  
in the College of Education and Human Performance  
at the University of Central Florida  
Orlando, Florida

Summer Term  
2016

Major Professor: Carolyn Walker Hopp

© 2016 Denise Harshbarger and Rodney Harshbarger

## ABSTRACT

The 21st century workforce is very different from the workforce of our predecessors. With the rise in automation and technology there are new demands that are being placed on employers to produce goods that are faster, more personalized, and more accessible. In order to meet these demands, this generation of employees must have a skillset that complements these demands. This skillset includes communication, collaboration, critical thinking, and creativity (4C) skills. The problem of practice addressed in this dissertation is the lack of 4C skills among students currently in the K-12 education system, and the lack of opportunities students have to develop these 4C qualities.

This problem was examined through a pilot study that was conducted in the context of a fifth grade setting in a small and rural school district in northeastern Florida. Teachers volunteered to provide a two-week unit of instruction to their students that focused on the development of communication, collaboration, critical thinking, and creativity (4C) skills within the context of state mandated curricular content. Curriculum also promoted the development of students' non-cognitive factors (academic behaviors, academic mindset, learning strategies, social skills, and perseverance) as stepping-stones to refining students' 4C skills. Over the course of the two-week unit, teachers tracked the development of their students' 4C skills, noting their perceived progress of students through teacher focus group sessions and through individual teacher's written reflections.

The results revealed that teachers perceived their students 4C skills to improve over the course of the unit of study, especially after the first four days of instruction. One significant finding of the pilot was that teachers who subscribe to a more student-centered philosophy of

teaching were more successful with implementing a 4C rich curriculum than teachers who preferred a teacher-centered classroom. Student-centered teachers also perceived more growth in their students' 4C abilities than teachers who were teacher-centered.

The framework developed from this study is intended to assist educators who are interested in improving students' 4C abilities. The framework was created and refined to reflect the results of the pilot study. Each of the non-cognitive factors that supported the development of the 4C skills were aligned in a visual and described in a rubric that can be used by educators to guide their students' progression toward proficiency in 4C skills. In this pilot, learning strategies, academic behaviors, and academic mindset were the non-cognitive factors that supported the development of all 4Cs, while social skills were critical to the development of communication and collaboration, and academic perseverance was essential to the development of critical thinking and creativity.

Recommendations for further studies include repeating the pilot study with a larger sample size and across multiple grade levels, as well as providing more lengthy and in-depth training for teachers who are interested in promoting 4C skills in their classrooms.

This work is dedicated to our parents, Dennis and Joy Migliaro, who earned their doctorates in child supervision while we earned ours in education.

## ACKNOWLEDGMENTS

We want to acknowledge all of the professors we have had the privilege of learning from through the EdD program at the University of Central Florida. Your willingness to push our thinking and continue to believe in our abilities, even when we did not believe in ourselves, is something we will always appreciate. In particular, we want to thank our committee members, Dr. Walter Doherty, Dr. Harold Border, and Dr. Thomas Vitale. We appreciate your unwavering support and advice. We are especially grateful for our chair, Dr. Carolyn Walker Hopp. You are the epitome of a true teacher. Your nurturing, positive feedback, and calming presence in our journey has not been overlooked. Thank you for your guidance, strategic questioning, and continuous support. This journey would not have been possible without you as our guide.

## TABLE OF CONTENTS

LIST OF FIGURES .....	x
LIST OF TABLES .....	xi
CHAPTER 1 BACKGROUND .....	1
Problem of Practice .....	1
Problem Statement .....	1
Significance .....	7
Research Questions .....	9
Organizational Context .....	10
Positionality .....	15
History and Conceptualization of Education .....	16
Historical Context .....	19
National .....	19
Local .....	20
Factors that Impact the Problem .....	22
Data .....	22
Potential Causes of the Problem .....	22
Proposed Framework .....	23
Curriculum .....	23
Non-Cognitive Factors .....	24
Leadership .....	29
Pilot .....	32
Data .....	34
Methods .....	34
CHAPTER 2 PILOT STUDY: THE SCIENCE OF SOUND .....	36
Pilot Rationale .....	38
Goals of the Pilot .....	39
Expected Outcomes of the Pilot .....	39
Positionality .....	41
Methods .....	43
Pilot Participants .....	45
Implementation of the Pilot .....	46
Professional Learning .....	47
Results .....	51
Focus Groups: Days 1–3 .....	52
Focus Groups: Days 4–7 .....	53
Focus Groups: Days 8–10 .....	54
Anecdotal Reflections .....	55
Discussion .....	62



CHAPTER 3 PILOT ANALYSIS .....	64
Overview .....	64
Outcomes .....	65
Researcher Positionality.....	66
Teacher Positionality .....	67
Student Progression .....	68
Content.....	68
Teacher Support for Implementation .....	69
Focus Groups .....	70
Modeling.....	71
Administrative Positionality .....	71
Instructional Methods and Teacher Practice.....	72
Development of Students’ 4C Skills.....	74
Development of Students’ Content Knowledge .....	76
Framework .....	77
Intended Audience .....	77
Intended Use .....	78
CHAPTER 4 INCREASING STUDENTS’ COMMUNICATION, COLLABORATION, CRITICAL THINKING, AND CREATIVE THINKING SKILLS .....	80
Overview.....	80
Outcomes .....	81
Framework .....	81
Intended Audience .....	82
Intended Use .....	82
Visual for Developing Students Communication, Collaboration, Critical Thinking, and Creative Thinking Skills.....	83
The Role of Social Skills in the Development of Communication and Collaboration.....	90
Communication.....	90
Collaboration.....	92
The Role of Academic Perseverance in the Development of Critical Thinking and Creative Thinking.....	94
Critical Thinking.....	94
Creativity.....	97
Conclusion .....	98
CHAPTER 5 IMPLICATIONS AND RECOMMENDATIONS.....	100
Program Coursework .....	104
Implications.....	105
Recommendations for Future Study .....	106
Conclusion .....	108

APPENDIX A	SCIENCE OF SOUND .....	110
APPENDIX B	PERMISSION TO CONDUCT STUDY: FLAGLER COUNTY.....	115
APPENDIX C	INSTITUTIONAL REVIEW BOARD APPROVAL .....	117
APPENDIX D	PERMISSION TO CONDUCT STUDY: OLD KING’S ELEMENTARY SCHOOL .....	119
REFERENCES	.....	121

## LIST OF FIGURES

Figure 1. Framework for 21st century success.. ..	7
Figure 2. 4C and non-cognitive alignment chart. ....	29
Figure 3. Expanded visual for developing students’ communication, collaboration, critical thinking, and creative thinking skills. ....	84
Figure 4. Condensed visual for developing students’ communication, collaboration, critical thinking, and creative thinking skills. ....	85

## LIST OF TABLES

Table 1	4C and Non-Cognitive Alignment.....	28
Table 2	Pilot Summary .....	35
Table 3	Participant Experiences in Education .....	46
Table 4	Teacher Perceptions of Student 4C Skill Improvement During Unit Instruction.....	56
Table 5	Rubric for Refining Students’ Communication, Collaboration, Critical Thinking, and Creative Thinking Skills .....	87

## CHAPTER 1 BACKGROUND

### Problem of Practice

The current public education system has been structured in a way that does not meet the needs of contemporary students, with curriculum originally structured to meet demands that are no longer relevant (Tucker, 2011); these irrelevant demands include shaping future workers for a labor market comprised of jobs in manufacturing and other labor-intensive industries that no longer exist (Fullan, 2012). With automation replacing workers in manufacturing, the demand for a higher-skilled, better-educated workforce increased. As a result of these changes in the labor market, 21st century students need academic opportunities that challenge them to solve complex problems, make rational decisions, and present compelling arguments for their solutions to the problems (Pink, 2006). In most contemporary public education settings, the main focus of the curriculum involves ensuring that students can demonstrate proficiency on annual assessments (Goertz & McDuffy, 2001; Reeves, 2006, Stiggins, 2005). Unfortunately, this focus on annual assessments has resulted in an educational system of compliance, assessment, mediocrity, and stagnation. Sadly, students exhibit limited drive to engage their natural curiosity about the world around them, and often display little interest in a curriculum that equally bores their teachers (Fullan, 2012; Pink, 2006).

### Problem Statement

In this study, the researchers have identified the following problem of practice: because current curriculum provides students with few opportunities to develop and refine their skills in

collaboration with other students, to engage in creative thinking, to practice effective communication, and to think critically (the 4Cs), this dissertation in practice addressed curriculum and strategies (connected to Florida Standards) that teachers can use to engage students in developing these skills.

The National Educator's Association (NEA) was established in 1857 and since that time has been committed to providing high quality publications and educational materials to educators (NEA, 2015). In 2002, the NEA published a 21st century framework that was designed to assist educators in making the transition from what was once considered a high quality education to what is now required for students to be successful (NEA, 2010). This initial framework was complex and not easily applied in the classroom. The NEA recognized this gap between framework and practice and resolved to streamline the framework through research in partnership with eight other national organizations dedicated to excellence in education. These groups worked collectively to interview leaders from every segment of the workforce over the course of several years. Data from interviews were analyzed and generated a pattern of four distinct skills required for 21st century students (NEA, 2010). These four skills became known as the 4Cs of 21st century education: (a) critical thinking, (b) communication, (c) collaboration, and (d) creativity (NEA, 2010).

Critical thinking can be defined as the ability to problem solve, reason effectively, or make proper judgments and correct decisions by applying systems thinking (NEA, 2010; Partnership For 21st Century Learning, 2015). Critical thinking constitutes an essential skill for the 21st century because of the need for solving important problems with either small pieces of information or overwhelmingly large pieces of information (NEA, 2010; Wyer, 2014). Also,

technology has increased access to information but has, at the same time, significantly eroded the patience of the average human for problem solving (Heckman, 2007; Stromquist, 2002,).

Finally, the 21st century workforce must be able to distinguish credible information from opinion and commercialism, to engage in critical thinking in order to create superior products, and satisfy the ever-growing demands of 21st century customers (AMA, 2010; NEA 2010).

In addition to critical thinking skills, communication skills are required to be successful in the 21st century workforce. Communication skills include both understanding what is being communicated and effectively expressing an idea or concept (Partnership for 21st Century Learning, 2015). Communication is an essential 21st century skill because workers must be able to relate to both customers and co-workers through empathy, explanation, and negotiation (NEA, 2010). While communication is a hallmark of the traditional education system, workforce studies cite deficits in this essential skill as major area of concern for more than 70% of employers interviewed (Conference Board, 2006; Wyer, 2014). Specifically, technology has also enabled this generation to feel connected with others without having to be physically near them or having to engage them in meaningful conversation (Kraut et al., 1998).

Collaboration is defined as working flexibly, effectively, and equitably with others in order to accomplish a shared task (NEA, 2010; Partnership for 21st Century Learning, 2015). The rise of technology and the subsequent internationalization of companies—geographically and culturally—requires the 21st century workforce to engage in collaborative work, which often includes team members from other countries (NEA, 2010, Wyer, 2014). The ability to work with a culturally diverse team is more firmly underscored by the rise in personalization of products. As personalization and convenience of consumers rise, so does the

need for multiple perspectives and approaches to problem solving. This creates the demand for effective collaboration skills of the 21st century workforce (NEA, 2010; Partnership for 21st Century Learning, 2015; Wyer, 2014).

Finally, creative thinking is defined as the ability to create a novel object or concept, or to refine an existing product to be more desirable (NEA, 2010; Partnership for 21st Century Learning, 2015). The ability to think creatively is a of the 21st century skill that cannot be ignored. With the rise in automation and outsourcing of jobs, creativity is one leverage point that all humans can rely on for job security (NEA, 2010; Partnership for 21st Century Learning, 2015; Pink, 2006; Wyer, 2014).

The brunt of the paucity of 4C development falls on students, as it is their individual futures that are at stake. An inadequate education can ultimately lead to a lifetime of poverty, which tends to perpetuate itself in a multi-generational cycle of underserved or under-achieving students (Payne, DeVol, & Smith, 2001).

Limited success in students' mastery the 4Cs also impacts teachers within the profession. Teacher turnover is significant; research shows that one in three teachers will leave the profession within the first two years of their careers, while up to 50% of teachers leave within their first five years of service (Borman & Dowling, 2008; Henry et al., 2011; Ingersoll & Strong, 2011; Look, 2015). Among other factors, teacher attrition is often attributed to environmental factors within the school (Borman & Dowling, 2008). In addition to environmental factors, students' ability to exhibit non-cognitive skills (academic mindsets, academic behaviors, social skills, learning strategies, and academic perseverance) and school climate and culture play significant roles in whether or not teachers decide to remain in their



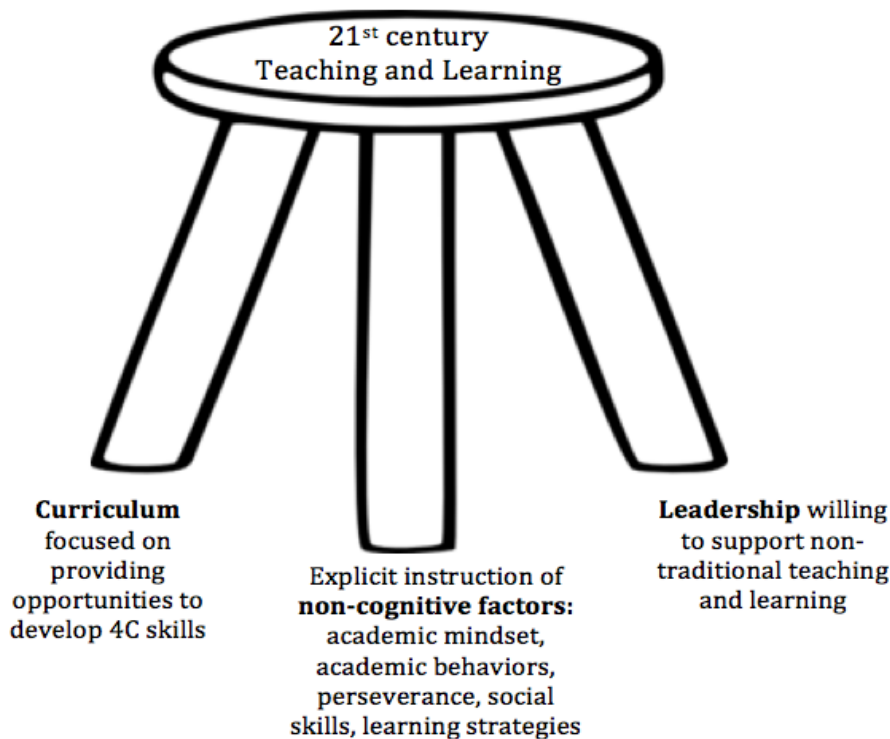
current positions (Grayson & Alvarez, 2008; Gu & Day, 2007; Ingersoll, 2001; Scafidi et al., 2007; Weiss, 1999).

The problems that result from the lack of an engaging and challenging curriculum for students begin with motivation. Research indicates that student motivation primarily hinges on student–teacher relationships and perceived relevancy of curriculum (Baker et al., 2008; Mouton et al., 1996; Pintrich & DeGroot, 1990; Ryan & Deci, 2000; Ryan et al., 1998; Ryan & Pintrich, 1998). The environment in which students learn is another contributing factor that can serve as a catalyst for intrinsic motivation. The lack of a stimulating and supportive environment undermines student motivation, ultimately leading to limited academic success (Pintrich, 2003). While important, motivation alone does not always correlate with achievement (Hardre, 2012), underscoring the need for positive and supporting environments and relationships among all stakeholders within a school (Mega et al., 2014; Wang & Eccles, 2013).

The culture within any public school is riddled with unremitting punitive academic checkpoints for teachers and students alike. These checkpoints create a stressful environment that prevents both teachers and students from performing at their highest level (Ryan & Deci, 2000). In addition, the teaching environment is a significant variable that influences whether or not a teacher will remain in the profession (Borman & Dowling, 2008). The current focus of assessment and accountability does not support opportunities for teachers to be supported and nurtured in their formative years of teaching and learning.

This problem of practice is critical because it reveals a significant deficiency in the education system’s ability to adequately prepare students to assume their future roles in college, in their future careers, and as responsible citizens capable of making good decisions in a

globalized economy (Millican, 2003; Stromquist, 2002). Even many of the highest achieving K-12 students find themselves at a disadvantage in the global marketplace because they have not had adequate practice in the 4Cs during their formal schooling years. This dissertation in practice proposes that the problem is not worthy of preservation, as the ultimate impact it has on both individuals and the nation, as a whole, prevents the advancement of the country as competitive in the world marketplace and able to sustain development and progress within the United States (Eicher, 1996; Friedman, 2005; Partnership for 21st Century Skills, 2007). Providing students with an academic foundation that includes effective 4C skills can be accomplished by implementing a framework for curriculum within K-12 education that is more closely aligned with the needs of individuals living in a global society, which includes structured and supported opportunities for students to engage in a curriculum rich in collaboration, creativity, communication, and critical thinking. One should note, however, that this curriculum can not stand alone as a palliative to the current problem. In order for teachers to develop these skills in students, school leaders must be willing and able to support teachers in delivering instruction that not only provides opportunities to engage in work that requires students to develop 4C skills, but also provides them with adequate non-cognitive skills (Figure 1).



*Figure 1.* Framework for 21st century success. Copyright 2016 by D. Harshbarger and R. Harshbarger.

The application of this framework will serve the purpose of preparing students to make educated decisions as citizens and to overcome the challenges that await them when they enter the workforce or a post-secondary institution (Baron & Markman, 2000; Matthews, 2006; Parker, 2003; Wilson & Berenthal, 2005).

### Significance

The lack of opportunities within the K-12 curriculum for students to engage in problem solving is a significant issue because the mission of public schools is to provide a foundational experience for students that will adequately prepare them for college or a career. The needs of

the 21st century workforce include abilities and skills that place a heavy emphasis on higher order problem-solving abilities and the ability of individuals to solve these problems collaboratively (Pink, 2006). However, in spite of this knowledge, the current public education system remains focused on assessments and accountability which creates an authoritarian environment in which teachers and students have become compliant subjects instead of excited and motivated learners (Herman & Baker, 2005; Booher-Jennings, 2006; Bridgeland, Dilulio, & Morison, 2006). In order to examine this problem as a whole, this dissertation in practice will examine the problem from multiple perspectives within the context of the organization, including: (a) curriculum, (b) non-cognitive factors, and (c) leadership.

Examination of curriculum currently pervasive in schools reflects the decentralized nature of education in the United States. However, the majority of academic programs (pre-K to 12th grade) within the individual states are composed of curricula that include instruction in reading and language arts, mathematics, science, social studies and or civics, as well as a multitude of non-core elective courses (Department of Education, 2008). While there has been a recent surge in consideration of elements of educational psychology, non-cognitive factors are elements of the instructional equation that are rarely considered beyond the basic introduction of students to their classrooms at the outset of the year or in isolation of academic coursework (Garcia, 2014; Nagaoka, 2013,). Another promising solution to the problem is the use of Project Based Learning curriculum, which is based in skills that align with the 4Cs of 21st century learning (Harada, Kirio, & Yamamoto, 2008; Thomas, 2000). While this curriculum shows promise of aligning with the needs of workforce, its implementation is not common in the

majority of public schools (Bridgeland, et al., 2006; Booher-Jennings, 2006; Herman & Baker, 2005; Thomas, 2000).

The lack of 4C skills among students is tremendous because our nation's future is at stake; the U.S. system of public education is not a front-runner in the global competition to mold a new generation of well-rounded, high-achieving students (Tucker, 2011). With automation on the rise, the development of critical thinking skills is imperative for students who will enter a 21st century workforce that requires skills beyond what a computer or robot can provide (Pink, 2006; Tucker, 2011). Without these 21st century skills, the young adults entering the workforce will qualify for less-demanding, low-paying positions that lead to a lifetime of poverty. In order for the US to remain competitive, and for its children to maintain a high quality of life for themselves and for their children, the current educational system must improve. In this dissertation in practice, the researchers propose that the paucity of 21st century skills in K-12 students exists because it has been viewed as individual components instead of as a whole. Specifically, the system of education must be viewed from the supporting components of a 4C-rich curriculum, non-cognitive factors, and leadership.

### Research Questions

1. Do students exhibit collaboration, creative thinking, effective communication, and critical thinking skills (4Cs) when the curriculum provides opportunity to engage the students in work where they can demonstrate the 4Cs?

2. How can explicitly teaching students non-cognitive factors (academic mindset, academic behaviors, perseverance, social skills, learning strategies) influence their ability to effectively demonstrate 4C skills?

### Organizational Context

The education system within the US is divided into two branches: (a) the pre-kindergarten through 12th grade system and (b) the post-secondary education system of institutes of higher education. These two branches of the educational system offer both public (non-profit schools that are free to the general public) and private options. This study focused on the public realm pre-K through 12th grade system, which is designed to prepare students for a career or postsecondary studies. The pre-K through 12th grade system of governance consists of multiple, decentralized layers (USDOE, 2008), limiting the role of the Federal Department of Education to establishing policies, providing financial and other forms of aid in conjunction with other Federal agencies, and collecting data (USDOE, 2008). This system imparts the governance of schools to the individual states in which the schools reside. All states have established a Department of Education that works under the direction of the state legislature. The Department of Education within each state sets policies, establishes curriculum, and provides resources to schools that function within its boundaries. Each state is further organized into individual districts called a local education agency (LEA); it is the responsibility of each LEA to establish an elected school board that oversees the governance of the local school system. Local education agencies vary in their approach in selecting a superintendent of schools, who oversees the general function of the school system. Some LEAs appoint superintendents through a school board vote but the

majority of LEAs elect superintendents through a general election held every four years. The role of the superintendent is to oversee the implementation of teaching and learning within the LEA, to ensure that state policies and mandates are being met, and that students within their LEA receive an appropriate education. Local education agencies that are exceptionally large may allow superintendents to appoint area superintendents to oversee specific areas of the district to ensure that the standards for education are met.

The LEA associated with this study is a small and rural district located in northeast Florida. In the early 1900s, a plot of land was donated to the small and rural district that became the site of a one-room schoolhouse for Grades 1-8. Eventually, that schoolhouse was traded in favor of a larger plot of land, which eventually housed a larger school. The school was the only district public school available until the mid-1970s, when new schools were built. The district now educates approximately 13,000 students who are spread among five public elementary schools, two public middle schools, and two public high schools. All five public elementary schools are pre-K through sixth grade and have between 1,100 and 1,400 students. Each elementary school contains a leadership staff consisting of a principal, two assistant principals, and two academic coaches. Middle schools house only seventh and eighth grade students, with an approximate enrollment of 1,000 students at each school. Leadership at these schools includes a principal, two assistant principals, and at least two academic coaches. Both high schools consist of ninth through 12th grades and have a leadership staff that includes a principal, at least three assistant principals, and at least two academic coaches. One high school has an average enrollment of 2,400 students while the other averages approximately 1,500.

Although the district is small and rural, the population is diverse. The district demographics breakdown is as follows: (a) 64% white, (b) 16% black, (c) 11% Hispanic, and (d) 9% multi-racial or other (Accreditation Report Flagler County School District, 2013, p. 4). Students within the district come from similarly diverse economic backgrounds, including students from affluent communities, traditional suburban middle class communities, government subsidized housing projects, and even homeless students. Eight out of the 11 public schools have more than 50% of their student population participating in free and reduced lunch programs and five schools receive Title I funds (Accreditation Report Flagler County School District, 2013, p. 3).

Regardless of the challenges that a particular LEA may face, school districts are responsible for the success of each student. It is the job of the superintendent of the school district to oversee the implementation of curriculum within schools, which are led by principals (USDOE, 2008). Principals are the ground level of leadership because they have the most contact with teachers who are responsible for educating the students (Marzano, 2008). The learning environment, the culture of the school, the quality of the teachers, and the ultimate outcomes for students fall under the direct supervision of individual school principals (Marzano, 2008).

The current superintendent of the small and rural district associated with this study has been in office since February 2014. Before serving as superintendent, he held the position of deputy superintendent and served as the acting superintendent for a transitional year after the former superintendent suffered a debilitating health crisis. The current superintendent has a reputation for his transformational vision for education and has initiated several large-scale



projects focused on improving teaching and learning in unconventional ways. One of this superintendent's first official acts was to modify the district vision statement to include verbiage about being creative and innovative in the way we educate students. The mission of the district also includes language that underscores the importance of innovative thinking, safe learning environments, and the empowerment of students to reach their full potential as responsible, ethical, and productive citizens in a diverse and changing world (Flagler Schools, 2015).

This small and rural district follows the typical national student progression plan, meaning students progress through the education system according to age. While many states offer voluntary pre-kindergarten for four year olds, mandatory school attendance is not required until the age of five and begins with kindergarten (USDOE, 2008). Students who are progressing according to the state prescribed volume of proficiency of standards per year progress one grade per year through a system of 13 grades (kindergarten, then grades 1-12) and graduate around the age of 18. State educational standards are regulated by the state's Department of Education. However, the curriculum that is used to implement the instruction of those standards is a local decision made by the superintendent and implemented by the principals at the schools. States vary in their systems of accountability for standards implementation but most use some system of student assessment to determine the degree to which standards are properly implemented. All states must assess students in reading and math annually (Grades 3-8) to determine whether students have achieved mastery of the state-prescribed standards for each grade level (USDOE, 2008). Each state sets its own cut scores that indicate a passing score on the end of the year assessment that measures student progress and governs options for how

LEAs remediate students who do not demonstrate proficiency. The state also offers curricular and other designation options for students who show promise for acceleration, but the ultimate decisions for how to remediate or accelerate students is in the hands of the superintendent of the district who often delegates immediate decisions of student eligibility to principals of the schools.

In addition to normal pupil progression, the district of focus also offers a third–12th grade gifted education program to students who qualify as gifted (per IQ test); gifted services in the district include honors, advanced placement (AP), International Baccalaureate (IB), and college dual-enrollment programs (Flagler Schools, 2015). The district also hosts a division of New Tech Network of Schools, as a school within a school.

The school district maintains high standards of accountability for all programs and services and was reaccredited in 2013 by the AdvancED Accreditation Commission. Formed in 2006, AdvancED consists of the following institutions:

- North Central Association Commission on Accreditation and School Improvement (NCA CASI),
- Southern Association of Colleges and Schools Council on Accreditation School Improvement (SACS CASI),
- National Study of School Evaluation (NSSE), and
- Northwest Accreditation Commission (AdvancED, 2015).

Accreditation is an additional, voluntary process that schools may pursue in order to promote the quality of education offered within the school. Only a few select institutions conduct organizational accreditations, which are recognized at the state and national level. The

accreditation process impacts all levels of educational institutions and is known for its ability to guide student performance.

### Positionality

This dissertation in practice is rooted in the process of action research, which is a means by which an individual or team studies a phenomenon occurring within an organization, with the intention to improve outcomes for the organization (Herr & Anderson, 2015).

Both of the authors of this study maintain employment within the small, rural district described above. One author is a fine arts teacher while the second is an administrator. Working collaboratively from these individual perspectives, this generated a more robust understanding of the problem of practice, examining implications of the results from the perspectives of both the teacher practitioner and the administrator practitioner.

Over the course of this study, the teacher-practitioner engaged with four colleagues who were part of the pilot study. The teacher-practitioner and colleagues employed a curriculum that focuses on teaching Florida Standards while implementing a 4C-rich curriculum that is supported by explicit instruction of non-cognitive factors. The teacher-practitioner and colleagues tracked student progress throughout implementation of the pilot and recorded anecdotal accounts of students' abilities to exhibit collaboration, communication, creativity, and critical thinking (4C behaviors).

The administrator-practitioner focused on building a tool to assist teachers in implementing curriculum rich in opportunities for developing collaboration, communication, creativity, and critical thinking (4Cs) in students. The tool contained indicators that exemplify

implementation in each of the 4C areas and provides examples of implementation for multiple areas of the curriculum.

Together, the teacher and administrator-practitioners approached this dissertation in practice from the standpoint of what Herr and Anderson (2015) refer to as two organizational “insiders,” collaborating to gather information that will inform the teaching practices happening within the organization. As insiders in the organization, both practitioners were acutely aware that this positionality requires reflection on, and careful consideration of, epistemology and methodology (Herr & Anderson, 2015). Specific mechanisms for dealing with bias were employed by using the guidelines for validity criteria proposed by Herr and Anderson (2015) as well as triangulation of data, member validation (Lincoln & Guba, 1985), and validation meetings (Bone, 1996).

### History and Conceptualization of Education

The earliest documentation of the existence of North American public schools appears in the early 1600s, with the intention of educating children concerning the principles of religion, civility of life, and humane learning at no cost to participants (Dexter, 1919; Reese, 2005). Historical records reflect the importance with which the early settlers regarded education. Settlers were willing to endure a variety of physical hardships, but they were not willing to compromise on educating their children in religion and literature (Dexter, 1919; Reese, 2005). The mid-1600s brought about a more organized, elementary-focused public school in the Boston area, establishing the concept of using tax dollars to support education and the foundation of colleges and universities. The establishment of the first school board to oversee educational

policy, along with the first mandate to provide education to children of families within communities, was also first documented in the mid-1600s. Initially, many students still did not receive an education because the penalty, in dollars, for not providing a school to these families was considerably cheaper than maintaining a school. Over time, the cost of the penalty increased and more communities moved into compliance. Schools did not exist in the states south of Virginia until the 18th century, a time when the United States saw a significant growth in elementary schools, usually with a religious focus. Later, in the 18th century, the “Land Ordinance of 1785” dictated that the western territories should be divided up into townships, which would dedicate one section of townships to the maintenance of public education. The end of the 18th century brought about the signing of the Bill of Rights, which contains no mention of education. For this reason, control of education is still a function of the individual states, not the federal government.

In 1821, the first public high school opened its doors in Boston, Massachusetts. In 1837, the first state Board of Education was formed under the direction of Horace Mann. Horace Mann believed in free (public) school for all and worked relentlessly to secure stable funding for public education. The mid-1800s marked the period of the Civil War, which stalled progress in education until 1867, when the Department of Education was founded in an effort to help states create effective school systems.

The 1900s brought about many rapid changes that had significant impacts on education. This began with World War I when the military did not have any method in place for measuring the intellectual ability of its recruits. A team of psychologists under the direction of Robert Yerkes created the Army Alpha and Beta test, establishing the groundwork for future

standardized assessments. In 1954, the United States Supreme Court ruled in the famous *Brown vs. the Board of Education* that separate but equal educational facilities for people of different races was inherently unequal. This ruling forced states to abandon segregation practices. Russia launched Sputnik in 1957 which spawned the National Defense Education Act (NDEA), increasing funding for science, math, and foreign language education (Bankston & Caldas, 2009). In 1965, the Elementary and Secondary Education Act (ESEA) was passed, along with Head Start. Both the ESEA and Head Start constituted part of President Johnson's "War on Poverty" initiative and the beginnings of educational efforts to ensure that students from low socioeconomic backgrounds receive opportunities to learn (Bankston & Caldas, 2009).

In the 1980s, the quality of education became the focus of educational reformers. In 1983, The National Commission on Excellence in Education issued a report titled "A Nation at Risk," which alerted the nation that we were no longer leading the way in education when compared with our international peers, and called for immediate action to raise the bar in public education (Reese, 2005). Subsequent mandates have been focused pointedly on the same goal: raising the standard for education. Examples of these mandates include:

- Goals 2000: Educate America Act, provided resources to school districts to achieve higher academic standards;
- No Child Left Behind (NCLB), mandated a standardized test to track student achievement and ensure that all students reach proficiency by 2014 (Bankston & Caldas, 2009); and

- American Recovery and Reinvestment Act (Race to the Top) of 2009, designed to drive reform in the K-12 public education sector (U.S. Department of Education, 2015).

The Race to the Top expenditure was designed to reward states that reformed their education systems in the following areas: (a) adopting standards and assessments that prepare students to succeed in both college and the workplace, (b) building data systems that measure student growth and success to be used toward improving instruction, (c) retaining and rewarding effective teachers and principals, and (d) turning around their lowest performing schools (U.S. Department of Education, 2015).

### Historical Context

#### National

Concerns about the United States remaining the frontrunner in education are not new. With the launch of *Sputnik* in the 1950s, the United States began a campaign to increase the aptitude of American students in an effort to prevent other countries from emerging as world leaders in the race to space (Bybee, 1997). Further concerns emerged in the 1980s when the National Commission on Excellence in Education first published *A Nation at Risk*, the report that first exposed the shortcomings of the education system in America in comparison to other countries (Gardner, 1983). These two historical events were critical points in education in the United States because they reflected the need for improvement in both practical, tangible achievement (*Sputnik*) and in theoretical, data based achievement (*A Nation at Risk*). Two

additional noteworthy efforts toward reform occurred in the early 21st century. The *No Child Left Behind* legislation, as well as *Goals 2000* were attempts to address the gradual decline of the educational standing of the United States by improving achievement among all students (Jorgensen & Hoffman, 2003). Another recent reform effort occurred in 2010, with the Common Core movement. Many states initially opted to adopt the more rigorous, application-based standards in hopes of propelling student achievement to the top of the international comparison assessments (Mathis, 2010). However, many of the states initially poised to adopt and implement the standards have modified or withdrawn their support for the standards (Kober & Rentner, 2012).

In spite of all of the reform efforts that have been enacted in the US, the problem of an undereducated and underprepared workforce still remains. In a 2013 Phi Delta Kappa/ Gallup poll, 7 out of every 10 participants who completed the survey indicated that they did not feel that students who graduate high school are ready for college or labor force entry. Furthermore, a cumulative look at scores on international assessments (e.g., NAEP, TIMSS, PIRLS, PISA) show that, while the United States has made some slight improvements in scores over the years, those improvements have been mediocre when compared with the progress of other countries (Hanushek, Peterson, & Woessmann, 2012).

#### Local

Although the performance of the United States, as a whole, in education is middling when compared to other nations, there are some states that have had success in improving their performance over time. From 1992-2011, Florida was one of four states that showed significant



growth on international assessments. The growth over this time period is equivalent to approximately two years of academic learning (Hanushek et al., 2012). However, that success was short lived, as announced in *Education Week's 2015 Quality Counts* report, which compares state assessment outcomes, chances for student success, and education finance, ranked Florida as 28th in the United States. Florida student achievement ranking, in this report, remained seventh in the nation (Education Week, 2015). Graduation rates have also been touted as remarkable, as Florida's on-time high school graduation rate has risen to 76% (NCES, 2013).

The setting of this study—a small, rural district—had been one of the three fastest growing counties in the nation prior to the recession of 2006. The influx of new residents was predominantly driven by the housing construction industry. The median age of the state is 39.4, while the district has a median age of 51.4 and an unemployment rate of just over 6% (Economic Research, 2015). The median household income in the district is just over \$47,000, exceeding slightly the state average of just under \$47,000. Despite a median household income that places it in the top half of all Florida counties, 16.6% of Hurricane County residents live below the poverty level, which is slightly above the state average of 16.3% (United States Census Bureau, 2015).

The most current data available reported a 0.9% school dropout rate for the district; the state average was 1.9% (Florida Department of Education, 2015). In the 2013-2104 school year, administrators issued 844 out-of-school suspensions, 811 in-school suspensions for the 2013-2014 school year, and zero expulsions (Florida Department of Education, 2015). The district also posted a 77.8% graduation rate for the 2013-2014 academic year, which is above the state rate of 76.1%.

## Factors that Impact the Problem

### Data

The United States spends more money on education than most other nations (Hanushek et al., 2012); the return on this considerable investment has been disappointing. For example, in a 2010 Achieve report comparing international educational outcomes, only 6% of all students tested performed above average in mathematics (Hanushek et al., 2010), ranking the US behind 30 other nations in mathematics. A similar study conducted in 2011 showed that only 32% of eighth grade students in the US performed at grade level in mathematics, placing Americans behind 31 other nations (Peterson et al., 2011). This study focused on programs that operate within the US that are achieving, or are close to achieving, on grade level results while satisfying the requirements of the US Department of Education.

### Potential Causes of the Problem

Within the US, matters of public concern, such as education, often are brought to light within the legislative branch of government. Typically, issues emerge as legislative platforms. The appropriate level of legislature (federal or state) hears the concerns of the public and often enacts laws that address the matter. Despite their lack of canonical knowledge of education, legislators serve as a source of education-related reform efforts (McDonnell, 2005). With increasing accountability in education arising from legislatures around the country, the focus of instruction consists of preparing students to demonstrate proficiency on state-mandated assessments. While research shows that using formative assessments, and sharing subsequent

feedback with students, can have a significant increase in student achievement (Larsen, Butler, & Roediger, 2009; Roediger & Karpicke, 2006; Turner, 2014; William, Lee, Harrision, & Black, 2004), literature suggests that the current focus on assessment is not well-aligned with the needs of the workforce or postsecondary institutions (Achieve, 2013, 2015; Herman, 2007). The focus on assessment outcomes rather than quality curriculum is further evidenced by data showing the high occurrence of postsecondary failure and dropout rates among students who were considered high achieving in high school (Honken & Ralsten, 2013).

### Proposed Framework

In order to produce a more prepared group of students who are ready to take on the challenges of the 21<sup>st</sup> century workforce this study proposes that a three-pronged framework should be employed in schools. The framework consists of three interdependent components: (a) curriculum that equally promotes the 4Cs of 21st century learning, (b) explicit instruction in non-cognitive factors, and (c) transformational leadership that supports teachers, processes, and structures. In short, this framework supports the instruction of teachers in curriculum and teaching strategies that will, in turn, engage students in work that addresses the 4Cs as well as the development of non-cognitive factors (academic behaviors, academic mindset, perseverance, social skills, and learning strategies).

### Curriculum

Providing relevant curriculum rich in opportunities to engage in critical thinking can only be accomplished through a drastic shift in pedagogy (Fullan, 2012, Pink, 2006). Under the

current tyranny of assessment and accountability, schools focus on compliance, not creativity (Pink, 2006). In addition, the framework proposed in this study makes possible the fulfillment of the requirements for a rigorous curriculum while still maintaining interest in the work. A curriculum rich in authentic problem solving, opportunities to use technology, and prospects for meaningful collaborations are the hallmarks of 21st century learning skills; proficiency in these skills will help students to be successful in today's world (Boyer & Crippen, 2014; Donovan, Green & Mason, 2014, Fullan, 2012).

Both students and teachers need to be engaged in, and motivated by, the curriculum in order for optimal learning to occur (Hattie, 2013, Pintrich, 2003). Allowing students to engage in collaborative problem-solving that is rigorous, authentic, and integrated with technology creates opportunities for teachers to move from a classroom with teacher-centered focus to a student centered focus, shifting ownership of learning to students (Rodel Foundation, 2014). The faithful implementation of this type of learning also creates the impetus for personalization of learning, instruction that allows students to engage in instruction that is specific to their academic needs and personal interests (Boyer & Crippen, 2014, Fullan, 2012; Rodel Foundation, 2014).

### Non-Cognitive Factors

A curriculum rich in opportunities for students to engage in the 4Cs (collaboration, creativity, critical thinking, and communication) constitutes an excellent step toward preparing students for the global workforce that awaits them. However, students of today are significantly different from students in past educational settings. With advances in technology and the

globalization of society, students have access to information instantly (Heckman, 2007, Kraut et al., 1998, Stromquist, 2002). As a result, students lack skills in perseverance and are reluctant to engage in any activity that is not personalized and tailored to their own interests (Babcock & Marks, 2010; Freedman, 2007; Kolikant, 2010; Raizen, 1997).

In order to successfully launch and maintain a curriculum that requires students to communicate, think critically and creatively, and effectively collaborate with others, students must first learn how to engage in this kind of work. We propose that non-cognitive factors are prerequisite skills that can ensure a successful implementation of 4C-rich curriculum. Literature identifies five categories of non-cognitive factors: (a) academic behaviors, (b) academic perseverance, (c) academic mindsets, (d) learning strategies, and (e) social skills (Farrington et al., 2014).

Typically, successful students demonstrate academic behaviors that qualify as “conscientious” and “hardworking”; these behaviors include regular class attendance, participation in class activities, studying, and attending to homework in a timely manner. Research indicates that increasing the frequency of these behaviors in a particular class is not only possible (Deci & Ryan, 1985; Skinner, 1953; Staats, 1963) but also typically improves the student’s academic outcomes (Farrington et al., 2014).

Academic perseverance is the ability of an individual to continue to work on a problem or task that is not immediately solved. The hallmark of academic perseverance is the ability to maintain the motivation to see the task to completion, even when unexpected challenges arise during the process (Farrington et al., 2014). Academic perseverance is often associated with the concept of grit, or the ability to maintain focus on one task for a long period of time (Duckworth,

Peterson, Matthews, & Kelly, 2007). Studies have shown that individuals who exhibit grit tend to be highly successful and experts in their fields (Duckworth, 2009). While grit, itself, has been identified as a possibly innate and somewhat fixed personality trait (Srivastava, John, Gosling, & Potter, 2003), research indicates that it is possible to teach perseverant behaviors even when they are not innate to an individual (McCrae & Costa, 1994; Roberts & DelVecchio, 2000). More specifically, studies related to academic perseverance have shown a moderate relationship between perseverance and student performance outcomes (Farrington et al., 2014). However, a closer examination of the limited research shows that student perseverance is highly influenced by the classroom and school environment and tends to mimic the conditions in which the student is placed (Dweck, Walton, & Cohen, 2011).

Carol Dweck, in her 2006 bestselling book *Mindset: The New Psychology of Success*, has popularized the idea of the malleability of academic mindsets. Mindsets can be fixed or open to growth (Dweck, 2006). While there are a multitude of academic mindsets, there are four that have been shown to contribute positively to student academic outcomes (Farrington et al., 2014). The four academic mindsets include the following:

- Belonging to an academic community (Furrer & Skinner, 2003; Ryan & Deci, 2000; Wentzel & Asher, 1995; Wentzel & Caldwell, 1997),
- The growth of ability with effort (Cury, Elliott, DaFonseca, & Moller, 2006; Dweck & Leggett, 1998),
- Belief in the likelihood of success (Bandura, 1986; Bandura & Schunk, 1981; Bouffard-Bouchard, 1990; Pajares, 1996), and

- Belief in the work as valuable to the student immediately or in the future (Atkinson, 1957; Eccles et al., 1983; Wigfield, 1994; Wigfield & Eccles, 1992).

In order for non-cognitive factors to affect academic performance outcomes, instructors must engage the cognitive processes of their students (Farrington et al., 2014); this is done through the implementation of learning strategies such as metacognition, goal setting, and time management (Crede & Kuncel, 2008; Flavell, 1979; Hacker, Dunlosky, & Graesser, 2009; Zimmerman, 2001; Zimmerman & Schunk, 1989). The use of these strategies allows students to track their progress towards a goal or academic outcome and provides the motivation necessary to feed academic perseverance and maintain a growth mindset (Paris, Lipson, & Wixon, 1983; Pintrich & DeGroot, 1990; Pokay & Blumenfeld, 1990).

The final non-cognitive factor shown to improve academic outcomes is social skills. The term social skill refers to the ability of an individual to work collaboratively in a way that is viewed by peers as socially acceptable (Gresham & Elliott, 1990). Social skills must be considered a vital non-cognitive factor because these skills play a pivotal role in the effectiveness of the other non-cognitive factors (Teo, Carlson, Mathieu, Egeland, & Sroufe, 1996).

In this framework, the researchers propose that the development of students' non-cognitive factors is a critical component to ensure the successful implementation of a 4C (creativity, collaboration, communication, and critical thinking) rich curriculum. Table 1 shows the alignment of each of the 4C skills with prerequisite skills that students need to exhibit before they can successfully engage in the 4C skill, as well as the supporting non-cognitive factors that develop the prerequisite skills (Figure 2).

Table 1

*4C and Non-Cognitive Alignment*

21st Century Skills	Description	Prerequisite skill	Supporting Non-Cognitive Factors
Communication	Students articulate their learning through both oral and written communication	Adequate self-efficacy and self confidence	Academic Mindset Academic Behaviors Learning Strategies
		Willingness to share perspectives and accept opposing views	
Collaboration	Students work with other students to accomplish an academic task, regardless of their similarities or differences	Ability to make thinking audible or written	Social Skills Academic Mindset Learning Strategies
		Active listening skills	
		Openness to opposing perspectives	
Creativity	Students generate alternate pathways to solutions, students think about how problems can be looked at from different perspectives	Ability to compromise to enhance work products	Academic Mindset Learning Strategies
		Willing to take risks by thinking differently about problems and solutions to problems	
		Willing to learn from failure	
Critical Thinking	Students solve problems that are complex, have multiple variables, or require more than one step to a viable solution	Academic	Perseverance Learning Strategies
		Willing to engage with a challenging problem	
		Willing to persist in efforts to solve problems over long periods of time	
		Willing to learn from failure	



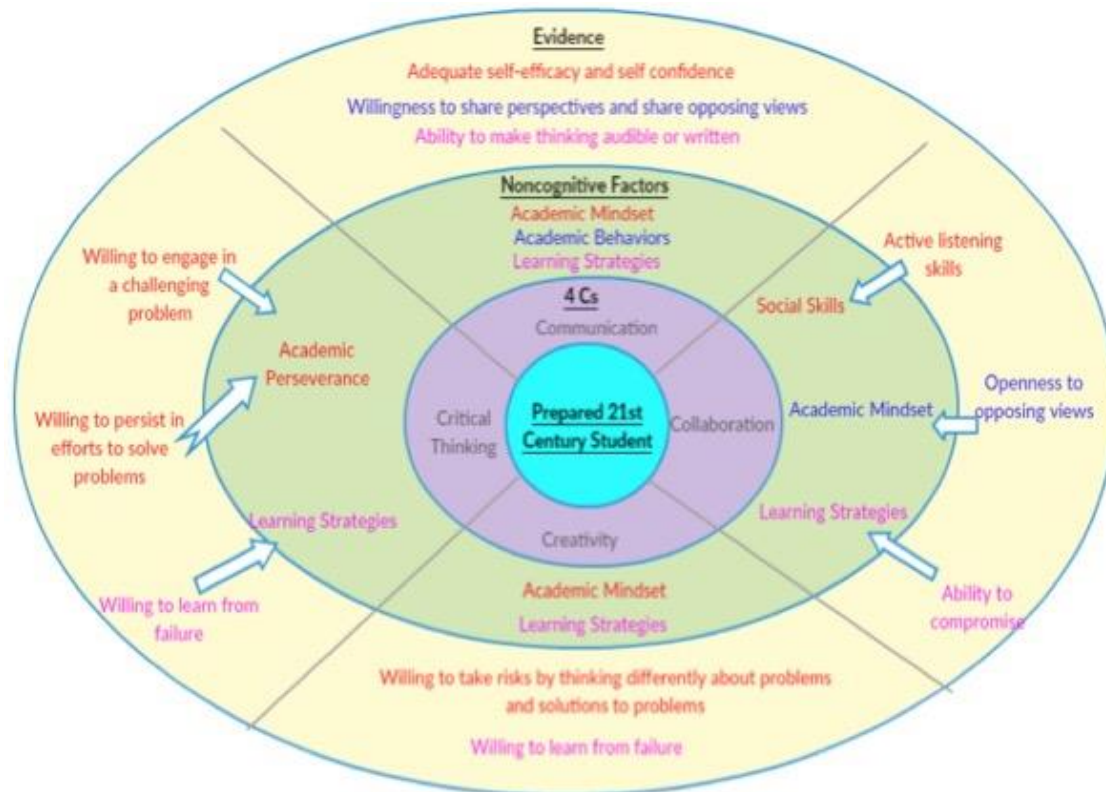


Figure 2. 4C and non-cognitive alignment chart.

### Leadership

The guidance of a highly qualified authority is necessary within this proposed model. Research indicates that, while high academic standards, encouragement, and a positive school culture are variables that significantly increase the probability of student and teacher success, the absence of a competent authority figure has the capacity to neutralize the impacts of these variable on student success (Bass, 1985; Bennis & Nanus, 2004; Hindt, 2012; Mega et al., 2014; Waters, Marzano & McNulty, 2003).

The inspiration to make the change from traditional approaches to teaching and learning (teacher-centered) to a new student-centered model requires stakeholder buy in. Creative tension

is one way to effectively inspire stakeholders; articulating a vision for an organization and contrasting that vision with the current reality of the organization induces this creative tension (Senge, 1990). In the case of this pilot, the current reality involves the struggle to implement new Florida Standards that are significantly more rigorous than previous standards (FLDOE, 2015) and the continuous assessment of this instruction through mandated testing that can occupy up to 5% of the time a student is in school (Florida Statute, 1008.22). In this current environment, many teachers struggle with implementation and develop a tunnel vision that focuses on the preparation of students for assessment instead of mastery of content and application of the content (Boud, 2000; Shepherd, 2000; Tomlinson, 2000). One of the first tasks a leader must complete in order to implement this framework consists of weaving the current reality into an opportunity to achieve new and better outcomes with students. Generating and maintaining this creative tension empowers stakeholders by generating a sense of shared vision and sustains inspirational motivation to achieve that vision (Bass, 1985; Bass & Riggio, 2010; Burns, 1978). The leader in this new educational environment must articulate—and re-articulate—this vision of the organization in a shared language (Jackson, 2000) and engage in regular honest self-reflection (Schein, 2004). Implementing these strategies will also support the positive culture that is needed to meet the demands of a rigorous curriculum.

In addition to communicating a vision and maintaining creative tension, the leader must engage in everyday communication with all stakeholders that is transparent and honest (Scott, 2004). Involvement in all levels of the organization and maintaining constant communication with all stakeholders are two important ways to ensure that transparency is maintained within an

organization (Scott, 2004). In this model, the school leader maintains regular points of contact with the students, teachers, parents, and community members.

In this time of turbulence in education, any leader in the field would be remiss to not consider motivation as an imperative piece of the equation that leads to positive student and teacher outcomes (Ryan & Deci, 2000). In order to support continuous improvement, the leaders of this model school must spend significant time, effort, and energy creating a positive learning culture within their organizations (Schein, 2004). The culture created by maintaining a positive and collaborative environment can set the tone for the growth of the organization and can motivate all stakeholders to continually strive to reach their optimal potential (Schein, 2004, Wang & Eccles, 2013). In an ideal framework, teachers enjoy plentiful opportunities to collaborate and engage in critical conversations with one another. Lesson studies, instructional rounds, and professional learning communities (PLC) are all opportunities to facilitate conversation, provide non-cognitive support for one another, and foster continuous improvement among all teachers and leaders within the school. This culture of support nurtures a regard for teachers as professionals who have choices and opportunities to improve their craft (Rodel Foundation, 2014). Positive school culture offering these non-cognitive environmental, behavioral, and emotional supports, coupled with cognitive supports, positively impacts both student and teacher performance (Wang & Eccles, 2013). Students and teachers who feel challenged by rigorous and relevant curriculum but, at the same time, supported by consideration of non-cognitive factors are more likely to take the academic risks necessary to be successful in their learning journey (Pintrich, 2003). These risks lead to positive experiences that nurture greater self-efficacy in both students and teachers (Pintrich, 2003).

While there are many other aspects of the problem of students' weak critical thinking abilities, the researchers' proposed framework focused on curriculum, non-cognitive factors, and leadership begins to break the trend of monotony that has existed in education for many years. This model, emerging from research, has a high probability of transforming teaching and learning for stakeholders by creating new opportunities for cognitive and behavioral engagement in relevant and rigorous curriculum.

### Pilot

The intention of the pilot study is to explore the problem further by identifying, on a small scale, whether implementing supports based on strong theory will address the problem of students' lack of 4C skills. Because current curriculum provides students few opportunities to develop and refine their skills in collaboration, creative thinking, effective communication, and critical thinking (the 4Cs), this dissertation in practice will address curriculum and strategies (connected to Florida Standards) that teachers can use to engage students in developing these skills. The small and rural district in northeast Florida, where the pilot was conducted, supports this project by allowing the pilot to be conducted on site at the target school. The superintendent of the school district was not only aware of the pilot but has asked to be informed of the findings, as he is interested the results of the implementation of a curriculum that strengthens the requisite 21st century skills among students in his district.

The pilot has been designed to address the research questions that inform the problem:

1. Do students exhibit collaboration, creative thinking, communication, and critical thinking skills (4Cs) when the curriculum provides opportunity to engage the students in work where they can demonstrate the 4Cs?
2. Does explicitly teaching students non-cognitive factors (academic mindset, academic behaviors, perseverance, social skills, learning strategies) influence their ability to effectively demonstrate 4C skills?

The pilot for this dissertation in practice was conducted in a K-6 elementary school located within the small and rural district described in the organizational context. Participants included science teachers in selected fifth grade classrooms. Teachers measured student achievement based on instruction that includes a 4C rich curriculum that was supported by explicit instruction of non-cognitive factors rooted in Florida Standards. Teachers described qualitatively their students' progress through anecdotal accounts and tracked student progress quantitatively through formative and summative assessments. The work of the teachers informed what elements should be included in the framework.

The goal of the pilot was to demonstrate whether students were capable of showing proficiency in the 4Cs when they were provided with opportunities to engage in work that included content that addressed the 4Cs as well as non-cognitive academic support. The effectiveness of the pilot was measured by whether the teachers' anecdotal accounts included reports of students showing growth in their ability to exhibit 4C skills, as well as the growth of students in their understanding of the content, as measured by formative and summative assessments. Pilot implementation began in January of 2016 and concluded in February of 2016.

## Data

Teachers involved in the pilot provided information through both surveys and reflections. Surveys revealed teacher perceptions of students' abilities in the 4C (creativity, critical thinking, communication, and collaboration) areas, teacher knowledge of non-cognitive factors, teacher implementation of 4C-rich curriculum, and teacher implementation of explicit instruction of non-cognitive factors. Through the implementation of the pilot, teachers tracked student results on formative and summative assessments (quantitative reports) as well as students' abilities to exhibit 4C behaviors (qualitative reports). This data was analyzed following protocols for maintaining confidentiality of participants. Results of the analysis were provided to stakeholders of interest including teachers, administrators of the pilot schools, and the superintendent of the school district in which the pilot took place.

## Methods

Science teachers from fifth grade classrooms in the pilot school were formally invited to participate in the pilot through an email invitation. Teachers chose to participate or decline the offer for participation. Teachers who responded positively to the initial email invitation were invited to a 30-minute overview of the study that included a review of the unit to be implemented with students. All teachers who attended the overview were formally invited, via email, to participate in the study. Teachers who indicated their willingness to participate were provided with a confidentiality agreement, as well as a pre-survey to assess their perceptions of their students' abilities to exemplify the 4Cs (creativity, critical thinking, communication, and

collaboration) and non-cognitive factors (academic behaviors, perseverance, academic mindset, learning strategies, social skills).

Teachers were asked to implement a science-of-sound 4C unit in their classrooms, along with the specific activities that provided explicit instruction in non-cognitive factors. During implementation, teachers provided reflections that addressed their students’ progress in exhibiting 4C skills (creativity, critical thinking, communication, and collaboration) and their challenges implementing the 4C rich curriculum in their classrooms. In their reflections, teachers will include reflections on results of students’ formative and summative assessments on the content addressed by the 4C rich unit. Finally, teachers completed a post survey to show changes in their perceptions of students’ abilities to exhibit 4C skills (creativity, critical thinking, communication, and collaboration) and non-cognitive factors (academic behaviors, perseverance, academic mindset, learning strategies, and social skills; Table 2).

Table 2

*Pilot Summary*

Outcome	Participants	Methods	Stakeholders	Timeline
Evidence to inform the problem by showing whether students’ abilities to exhibit 4C skills can be enhanced with a 4C rich curriculum that is supported by non-cognitive factor instruction.	5th and 6th grade teachers in the pilot school in a small and rural district in Northeast Florida	Mixed-methods. Qualitative - anecdotal reflections to include students’ ability to exhibit 4C skills and response to non-cognitive instruction.  Quantitative - student growth and proficiency on assessments, teacher survey results to reflect perceptions and knowledge of 4C rich curriculum.	Teachers Students Parents Administrators Superintendent Community and District-based businesses	January 2016 - February 2016

## CHAPTER 2 PILOT STUDY: THE SCIENCE OF SOUND

The complex problem of practice that drives this study emerged because current curriculum provides students few opportunities to develop and refine skills so necessary in the 21st century workplace: (a) collaboration, (b) creative thinking, (c) effective communication, and (d) critical thinking (the 4Cs). This dissertation in practice examined curriculum and strategies (connected to Florida Standards) that teachers can use to engage students in developing these 21st century skills.

The researchers designed a pilot study to determine how providing students with the opportunity to engage in curriculum may impact their development of 4C skills (critical thinking, creative thinking, collaboration, and communication). This type of instruction is not commonplace in the school district that was used for this study, nor is it commonplace in most classrooms across the United States (International Youth Foundation, 2012; OECD, 2009; Peterson, Fennema, Carpenter, & Loef, 1989; Saavedra, 2012). The result of this paucity of instruction has led to workforce concerns and prospective employers' support for developing "soft skills" among the nation's youth (Binkley et al., 2010); Saavedra, 2012).

While current legislative mandates demand a strong focus on assessment and accountability (Cawthon, 2004; Crowder & Konle, 2015; Kohn, 2001), there are curriculum programs that do emphasize the development of 4C skills in conjunction with course content. These curricula often fall into the category of project-based learning (PBL) and show promise in developing students' 4C skills; teachers receive extended opportunities for professional learning and students' progress is followed over significant periods of time (Finklestein, Hanson, Huang,



Hirschman, & Huang, 2010; Hixson, Ravitz, & Whisman, 2012; Mergendoller, Maxwell, & Bellismo, 2006).

Boss, Larmer, and Mergendoller (2013) of the Buck Institute for Education (BIE) cited 4C skills as one of the eight competencies that students must develop in order to engage effectively in PBL. The other seven competencies include: (a) significant content, (b) inquiry, (c) driving questions, (d) the need to know an answer to the question, (e) voice and choice, (f) revision and reflection, and (g) opportunities to present information to a public audience (Boss et al., 2013; Larmer et al., & 2015). While a variety of definitions of PBL exist, all mandate some form of the 4C skills.

Despite research that confirms the positive outcomes associated with curriculum that embeds development of students' 4C skills, K-12 curriculum provides inadequate opportunities for students to exhibit these skills (Silver, Mesa, Morris, Star, & Benken, 2009; Tyack, 1995). This gap between research and practice is especially evident in the district where this pilot was being conducted. The teachers involved in this study cited several reasons why they do not typically use curriculum that develops students' 4C skills: (a) time for planning, (b) time for implementation, (c) students inability to perform tasks requiring higher thinking, and (d) difficulty of planning activities for student learning. The reasons cited by teachers in this pilot echo the scholarly literature (Schleicher, 2012).

Research has shown that non-cognitive factors are significant predictors of success in college and in the workforce (Lleras, 2008; Tracey & Sedlacek, 1982; University of Chicago, 2011). Despite this strong link, researchers postulated that teachers often feel frustrated and overwhelmed with implementation of curriculum embedded with 4C skills; many students today

have few opportunities to develop their non-cognitive skills, exacerbating teachers' frustrations. In order to attend to these deficiencies and provide a more productive implementation of curriculum that develops 4C skills, the pilot unit of study was designed to embed the development of non-cognitive factors (academic mindset, academic behaviors, perseverance, social skills, learning strategies) as a scaffold for students to achieve success in executing 4C skills.

### Pilot Rationale

The pilot was conducted at a school in a small and rural district in northeast Florida. The school has a total population of approximately 1000 students in pre-kindergarten through sixth grade. Students who attend the school reside in the district's beachside community, which includes residences that include government funded Section 8 housing projects as well as beach homes valued at over a million dollars ("Flagler Beach," 2016). The student population is fairly even split between males and females, the majority of whom are white (75%), with the remaining 25% relatively evenly split among Black, Asian, and multiracial students. All teachers at Oceanside Elementary are classified as "Highly Qualified" by the state of Florida, which means that the school holds qualifications that meet the state requirements for teaching the grade levels they have been assigned to teach (FLDOE, 2016). Teachers in fifth grade were recruited to participate in the pilot study because the content standards of the pilot's unit of study aligned best with the 5th grade Florida Standards curriculum.

The pilot was designed to answer two exploratory questions:

- Do students exhibit collaboration, creative thinking, effective communication, and critical thinking skills (4Cs) when the curriculum provides opportunity to engage the students in work where they can demonstrate 4Cs?
- How does explicitly teaching students non-cognitive factors (academic mindset, academic behaviors, perseverance, social skills, learning strategies) influence students' abilities to effectively demonstrate 4C skills?

### Goals of the Pilot

The researchers developed two goals for the pilot:

- Teachers will deliver a 10 day unit of instruction that is rich in opportunities for students to collaborate, think critically, think creatively, and communicate effectively while providing scaffolding by embedding direct instruction in non-cognitive factors (academic mindset, academic behaviors, perseverance, social skills, and learning strategies).
- Teachers will reflect on their students' growth in exhibiting collaboration, critical thinking, creative thinking, and communication skills, as well as mastery of the content.

### Expected Outcomes of the Pilot

There were two expected outcomes from this pilot:

- Teachers will perceive growth in students' abilities to collaborate, think critically, think creatively, and communicate effectively when teachers deliver a lesson that requires students to practice these skills.

- Teachers will perceive growth in students' ability to show mastery of the content associated with the pilot's unit of instruction.

These outcomes were based on studies that have focused on PBL as a means of developing students' 4C (collaboration, creative thinking, effective communication, and critical thinking) skills. In order to provide scaffolding for students in their abilities to exhibit 4C skills, this pilot implemented the unique approach of using instruction in non-cognitive factors (academic mindset, academic behaviors, perseverance, social skills, and learning strategies) as a scaffold to move students toward proficiency.

There is a gap in research linking non-cognitive factors and 4C skills, so the researchers examined the scholarly literature focused on the development of 4C skills and non-cognitive factors, each in isolation from the other. This dissertation in practice offers a framework for using non-cognitive factors as prerequisite skills that can move students toward proficiency in their 4C skills.

The limited research provides accounts of PBL implementation in elementary grades through medical school and shows positive long-term learning outcomes when specific measurements are employed (Ravitz, 2009; Strobel & van Barneveld, 2009; Vernon & Blake, 1993; Walker & Leary, 2009). Interestingly, the results of PBL studies are not consistently associated with raising students' standardized achievement scores (Hattie, 2009; Ravitz, 2009; Walker & Leary, 2009) but do show promise in promoting more in-depth understanding of concepts and development of 4C skills (Barron & Darling-Hammond, 2008; Kivunja, 2014; Trilling & Fadel, 2009). To date, research on the impacts of PBL curriculum identifies significant deficits in measures that can effectively assess the outcomes of implementation

(Albanese & Mitchell, 1993; Belland, French, & Ertner, 2009; Bransford & Schwartz, 1999; Ravitz, 2009). In addition, the scholarly literature suggests several appropriate outcome measures: (a) deep content learning and problem solving ability, (b) development of 4C skills, (c) increased student engagement, and (d) improved long-term academic outcomes (Association of American Colleges and Universities, 2002; Barron & Darling-Hammond, 2008; Fredricks, Blumenfield, Friedel, & Paris, 2004; Newmann & Associates, 1996; Partnership for 21st Century Skills, 2007; Ravitz, 2009; Silva, 2008).

To date, work that has been done to improve students' non-cognitive factors (academic mindset, academic behaviors, perseverance, social skills, and learning strategies) has focused mainly on content-based academic outcomes and on the interplay of factors involved in improving academic outcomes (Conrad, 2006; Duckworth & Seligman, 2005; Dweck, 2011; University of Chicago, 2011). Building students' skills in each of the non-cognitive factors (academic mindset, academic behaviors, perseverance, social skills, and learning strategies) requires the teacher to address each skill explicitly; the teacher must also embed opportunities for students to engage in metacognitive activity that reinforces the progress they are making toward successfully mastering these skills (University of Chicago, 2011).

### Positionality

Both of the authors of this study maintain employment within the small and rural district where the pilot school was located. One author is a fine arts teacher, while the second is an administrator. Working collaboratively while bringing these individual perspectives, the research process generated a robust understanding of the problem of practice because the study

ultimately is informed by the insights of both a teacher-practitioner and an administrator-practitioner.

Together, these two teacher and administrator practitioners have approached this dissertation in practice from what Herr and Anderson (2015) call organizational “insiders,” collaborating to gather information to inform the teaching practices occurring within the organization. In more traditional dissertations, conducting research in one’s own setting may undermine the validity of the results because of the natural biases the researchers bring to the work (Glesne & Peshkin, 1992). However, as insiders in the organization, both practitioners were able to approach the problem within the organizational context, and, as a result, ensure that conclusions and solutions were appropriate, ethical, and pragmatic for the organization. The teacher-researcher was a participant in the pilot, noting the struggles and successes that came with implementation of the 4C-focused unit of instruction. The administrator-researcher did not participate directly in the pilot but did analyze the participants’ reflections and the detailed notes from the focus groups. Together, the researchers collaborated to build a framework by which teachers can move toward implementing curriculum that will also develop students’ 4C skills. The researchers monitored bias by maintaining active reflective practices along with careful considerations of epistemology and methodology (Herr & Anderson, 2015). Specifically, the researchers employed mechanisms for dealing with possible biases by using the guidelines for validity criteria proposed by Herr and Anderson (2015) as well as triangulation of data, member validation (Lincoln & Guba, 1985), and validation meetings with our advisor and other doctoral candidates in our cohort (Bone, 1996).

## Methods

This dissertation in practice addressed the lack of students' abilities to exhibit 4C skills because of a lack of opportunity to learn those skills. This work was rooted in the process of action research, defined as a means by which an individual, or individuals, study a phenomenon occurring within an organization, with the intention to improve outcomes for the organization (Herr & Anderson, 2015). Specifically, this dissertation in practice involves the researchers actually participating in the research. This approach is called participatory action research and was developed in the 1970s by Paulo Freire. Freire advocated for the concept of knowing by being part of something and not just by talking about something. These ideas precipitated the development of participatory action research projects throughout many developing countries (Herr & Anderson, 2015). In addition, Kemmis and McTaggart (2005) underscored the importance of research involving practitioners who are immersed in the context of the problem, invested in the problem, and are participants in the research process. While formally considered participatory action research, this work also parallels the transformative worldview tradition because it is latticed within the politics of current educational reform legislation and involves the researchers participating in the action meant to bring about change (Creswell, 2014).

While statistical analysis and quantitative analysis are often very useful in determining outcomes of work involving mass production of goods, issues pertaining to the education of children do not always lend themselves to a productive use of this type of method of research (Cuban, 2004, as cited in Anderson & Herr, 2015). For this reason, the researchers chose qualitative methods of data collection for this study.

Following Creswell's (2014) indicators of qualitative research, data were collected in the workplace of the participants, rendering the setting naturalistic. Multiple data sources supported the triangulation of information. These sources of information included the following:

- Participating teachers' pre-implementation lesson plans,
- Participating teachers' anecdotal accounts of their experiences during the pilot,
- Conversations during focus group sessions,
- Photos of student products from the pilot unit of study, and
- Participating teachers' reflections on student outcomes.

Finally, both researchers explicitly and reflexively identified biases and background experiences that could have shaped interpretations of the pilot study or resulting data. Data analysis was conducted through the duration of the pilot study and beyond. The researchers examined documents, anecdotal accounts, and narratives from focus groups to aggregate data into themes that were used to further inform the problem, provide insight into conclusions, and initiate more pragmatic solutions to the problem of practice.

The 10-day unit of instruction used in this pilot study, *The Science of Sound* (Appendix A), is a PBL-driven unit of instruction and meets the standards of the Buck Institute for Education (Larmer et al., 2015). This instructional unit contains embedded direct instruction in non-cognitive factors as well as opportunities for students to reflect on the development of their non-cognitive factors (Farrington et al., 2012).

Both the superintendent of the district and the principal of the school where the pilot was conducted provided letters of approval and support for the study. The IRB process was followed accordingly, and the study was determined to be "exempt." Qualitative data were collected



throughout the pilot process in order to determine whether teachers perceived improvement in students' capacity to exhibit 4C skills. Improvement in students' 4C skills was measured by teachers' perceptions of success; these included teachers' citing specific improvements in students' abilities or noting the perceived improvement of students' willingness to participate in activities related to 4C skills. The researchers selected these measures based on the participatory action research traditions of collaborative data analysis. Anderson and Herr (2015) noted the participatory nature of action research expressed in its multiple phases. Since one of the researchers is a participant in the study, both researchers felt it necessary to include the other participants in the discussion of student progress. By involving the participants in the collection of data and the analysis of student progress, the researchers built in a natural bias checkpoint which helped to maintain the integrity of the study.

### Pilot Participants

The researchers invited all fifth grade teachers at the Oceanside Elementary to participate in the study ( $n= 8$ ). After reviewing pilot requirements, five teachers decided to participate, all of whom had been teaching for more than 10 years and were considered "Highly Qualified" by the state of Florida to teach 5th grade. Two of the participating teachers were National Board Certified, three have master's degrees or higher, and one teacher is a former Teacher of the Year for the district. Furthermore, three of the five teachers reported having a basic understanding of 4C skills, and two reported having attempted implementation of PBL in the past.

All of the participating teachers reported and demonstrated (through conversation) a clear understanding of the five non-cognitive factors: (a) social skills, (b) academic mindsets, (c)

perseverance, (d) academic behaviors, and (e) learning strategies. However, four of the five teachers reported that they were unsure of how to apply these theories in practice, to support classroom instruction (Table 3).

Table 3

*Participant Experiences in Education*

Teacher	Experience (Years)	Certification	Highest Degree Earned	4C Knowledge	Non- Cognitive Knowledge
A	17	Highly Qualified	Bachelor	No	Yes
B	15	Highly Qualified	Bachelor	No	Yes
C	20	Highly Qualified, National Board	Specialist	Yes, with previous implementation of PBL	Yes, with knowledge of implementation
D	11	Highly Qualified, National Board	Masters	Yes	Yes
E	13	Highly Qualified	Masters	Yes, with previous implementation of PBL	Yes

Implementation of the Pilot

All fifth grade teachers ( $n=8$ ) at Oceanside Elementary were invited, via email, to participate in the pilot. The researchers invited those teachers willing to participate in the study to a preliminary meeting, where the researchers provided them with a 30-minute overview of the project and a copy of the pilot’s unit of study. The potential participants who attended the overview were then contacted, via email, with an invitation to participate in the study; this email included the purpose and significance of the study. Candidates who responded affirmatively were invited to an after-school professional learning experience. Candidates who did not reply

after one week or who responded “no” were eliminated from the list. The total number of teachers who participated in the pilot was five.

### Professional Learning

Participating teachers received training about using PBL to teach the 4Cs; this instruction was coupled with an emphasis on the processes for explicitly teaching non-cognitive factors to students and monitoring student progress through reflection. The researchers provided professional learning to participants in order to ensure that the lesson was delivered as effectively as possible. Some of the participants indicated that they had no knowledge of any curriculum designed to develop students’ 4C skills or how to practically develop students’ non-cognitive factors. Reuda and Pink (2011) noted that lack of knowledge leads to lack of self-efficacy, which can contribute to a lower level of motivation arising from an inability to attain mastery. Professional learning was provided in an effort to preserve the integrity of the lesson, while simultaneously preventing teacher frustration.

During professional learning, participants were asked whether or not their students demonstrated proficiency in 4C skills based on the following criteria developed using the Partnership for 21st Century Learning (2007).

- Communication: all students are not only able to effectively communicate their ideas in an articulate way, but can also exhibit exemplary listening skills, including summarizing peers ideas, and responding appropriately to those ideas.
- Collaboration: all students have the ability to work productively with their peers to accomplish a task. Each student participates equally and fully without needing

the teacher to facilitate the interactions of the group. Students find value in working with their peers.

- Critical thinking: all students use learning strategies to work toward mastery of the concept. Students embrace the process of struggling with a problem and persist in their efforts to solve problems or complete tasks.
- Creative thinking: all students have the ability to think about a task from multiple perspectives. Students are willing to think about problems in multiple ways with little or no direction from the teacher.

All of the participants noted that their students were not proficient in their ability to exhibit communication, collaboration, creative thinking, and critical thinking (4C) skills and reported that the only one of the 4C skills that their students had an opportunity to implement in their regular instruction is critical thinking. Participants were instructed that these standards (4C skills) would be the standards for student proficiency included in this pilot.

The researchers made a conscientious effort to design professional learning that actively involved the pilot participants. Guskey (2003) stated that effective professional learning requires the collaboration of all stakeholders throughout the learning experience(s). For this reason, the participants participated in the development of the professional learning and provided specific feedback regarding topics they would like the researchers to address during the professional learning experience. Participants also set goals for their professional learning during the pilot study. In their feedback, all of the participants asked for practical application of concepts; specifically, they requested advice on pacing, time management, and effective delivery of content within a student-centered classroom. Each of these issues was addressed in the

professional learning experience. Scholarly literature on professional learning outcomes shows that interactive professional learning increases the participants' ability to see the value in the learning and recreating the experience for other learners (Shulman & Hutchings, 2004; Wolf, 2004). The idea of recreating the experience of the learners as a means of delivering professional learning to teachers aligned with the desire of the participants who requested practical guidance for implementation. For these reasons, the researchers created an interactive professional learning experience that mirrored the unit of instruction that the teachers would deliver to students during the pilot study.

According to the scholarly literature, evaluating the effectiveness of professional learning experiences requires a multi-step approach (Guskey, 2000; Kirkpatrick, 1998; Killion, 2008), requiring the measurement and assessment of the following: (a) reaction, (b) learning, (c) change, (d) application of learning, (e) student learning, and (d) calculating return on investment (Guskey, 2000; Kirkpatrick, 1998; Phillips, 1997, as reported in Killion, 2008). Throughout the duration of this pilot project, teachers were supported through their implementation of the pilot's unit of instruction, with changes in their understanding of how to deliver effective 4C rich curriculum documented in their anecdotal accounts and in transcripts from focus group meetings. However, true changes in teachers' perceptions and skills can only be seen through direct observation of implementation over longer periods of time (Guskey, 2000; Kirkpatrick, 1998; Killion, 2008). Following these teachers and their use of other project based learning units (or other types of instruction that promote 4C skills) would be an ideal next step to determine whether prolonged professional learning and support for teachers would improve outcomes of students who receive PBL instruction.

During professional learning, participants completed activities from the two-week unit of instruction they would provide to their students as part of the pilot unit of instruction. Teachers engaged in the activities as students and received instruction from the researchers. Following the completion of these activities, teachers received a two week, standards-aligned unit called “The Science of Sound” (Appendix A) to implement in their classrooms. This unit of study aligns with the Buck Institute’s standards for PBL and meets specific 5th grade Florida Standards in both science and music (Boss et al., 2013; FLDOE, 2016). The researchers also embedded explicit instruction in non-cognitive factors, along with daily opportunities for students to reflect on their progress in those areas; research indicates that improvement in student non-cognitive factors improves when explicit instruction is coupled with regular opportunities for personal reflection (Farrington et al., 2012).

As they implemented the unit, participating teachers met daily, in focus groups, to share their progress on the unit, submitting a total of four anecdotal accounts through a medium of their choice (electronic or paper-based). Anecdotal data was collected for two purposes: (a) to gauge teachers’ perceptions of students’ 4C abilities throughout the unit of study and (b) to track teachers’ perceptions of students’ mastery of standards. The researchers removed all identifiable teacher and student information from logs and replaced it with pseudonyms. The researchers secured the matching document, containing names and aliases, in an electronically and physically secure, password-protected database.

## Results

The researchers reviewed anecdotal feedback from each of the participating teachers and sorted anecdotes based on characteristics of the writing. Three themes quickly emerged from participants' reflections: (a) frustration and difficulty, (b) signs of progress, and (c) signs of success and ease of implementation. These three themes corresponded with Days 1-3, Days 4-7, and Days 8-10. As expected, the three themes correlated with the number of days of implementation the teacher had completed when the reflection was written, with the reflections describing difficulties happening in the first three days (group 1) and the reflections citing successes taking place in the last three days (group 3).

### Focus Groups

The researchers conducted small informal focus groups every day during the pilot study. These focus groups served two purposes: (a) to provide researchers with a check on the progress of implementation and a venue for gathering feedback from teachers and (b) to provide teachers with support for implementing the pilot's curriculum. Each focus group session focused on two questions:

- What progress have you seen in your students' abilities to exhibit 4C skills?
- What support(s) do you still need to move forward with implementation?

The researchers kept notes on the types of questions and topics explored during the focus group meetings and analyzed these notes to determine themes of conversation.

Focus group conversations were transcribed and coded using an emergent coding system (Creswell, 2014). Codes were then collapsed into major themes. Conversational themes are the main questions the participants had about how to better facilitate the instructional processes in

their classrooms and improve students' non-cognitive skills or 4C skills. Researchers considered a topic a theme if more than one teacher asked for specific assistance in improving instruction to build the skill in question. Each teacher's response to whether students were showing improvements in their 4C skills were noted daily. During the first three days of instruction, none of the teachers reported improvements. On Days 4 – 7, teachers began noting improvements in one or more of the 4C skills. On Days 8 – 10 days, multiple teachers noted significant overall improvement in one or more 4C skills. The term “no improvement” was used to indicate that students still needed significant teacher support to exhibit the skill or students were not exhibiting the skill at all. The term “some improvement” was used to indicate that students were exhibiting the skill with intermittent teacher support, and “significant improvement” was used to indicate that students were exhibiting the skill with little or no teacher support.

### Focus Groups: Days 1–3

The initial days of the participants' focus group focused on developing better social skills, communication, and collaboration skills among students. In general, days 1-3 of the focus group meetings generated themes associated with the teachers' frustrations. While other topics emerged during the focus group, the main areas of concern for participants were social skills, communication, and collaboration. During the focus group meeting on day 2, Teacher A noted:

These kids are just struggling to work together. I feel like there are lots of individual ideas flowing, but there isn't much togetherness. They won't listen to each other long enough to realize they agree and can help one another out.



On day 3 of instruction, an interesting “breakthrough” moment occurred when Teacher C shared his experience with a student in his last period class:

It was last period when I figured it out, so I’m anxious to get back into it tomorrow, but I get it now- you have to model it for them. If you don’t, they won’t do it. You have to be aware of whether or not you are following the norms the class made. If you don’t, they won’t. It’s just that simple. You can redirect to the anchor charts all you want, but they are looking for you to model and set the standard.

Teacher C also shared that he was completing a task at his desk when a student came to ask a question. He was going to address the student’s question while still completing his task, but the student said, “Do we need to follow the class norms when we talk to you or is that just for when we do this project?” This story resonated with all of the participants and drove the longest focus group session of the pilot. The result seemed to be a renewed determination to model non-cognitive factors and 4C skills appropriately for students and maintain the speaking and listening norms at all times. On every subsequent day of implementation, teachers began noting improvements in collaboration and communication skills.

#### Focus Groups: Days 4–7

Focus group conversations in the middle portion of pilot instruction (days 4-7) focused mainly on developing perseverance, critical thinking, and creative thinking in students. Days 4-6 focused heavily on developing perseverance in students. Teachers discussed a variety of strategies by which students could be encouraged to continue to try to work through their assigned challenges. One of the researchers shared research linking the support of academic

mindsets and context specific learning strategies with improvements in perseverance (Dweck et al., 2011) and suggested the importance of supporting academic mindsets within the classroom.

During Day 7 of focus group, Teacher E noted the following:

You know, they can do it. I know they can, and they know they can. It's just a matter of them trying hard enough for long enough. I'm not sure if it's a perseverance thing or if it's a learning strategy thing. Maybe they want to keep on trying but they aren't sure what to do next?

Teachers had more comments about specific learning strategies and how to support the use of multiple approaches to problem solving in their classrooms.

#### Focus Groups: Days 8–10

The final days of instruction (Days 8-10) were characterized by more intense focus group conversations relating to supporting students in the implementation of different learning strategies in order to enhance their abilities to think critically and creatively. Teachers no longer mentioned perseverance as an issue of concern.

The researchers noticed one interesting trend: teachers' evolving topics of conversations in the focus groups. In the early focus group meetings (Days 1-3), conversations primarily focused on what the students could not accomplish. Conversations were characterized by statement such as "they just don't" or "My kids can't." After Day 4 of the instructional unit, statements emerged that highlighted teachers' responsiveness to students needs, "Maybe we need to" or "what if we changed our approach." By the end of instruction, topics discussed during focus group meetings focused on how teachers might provide more support for students

by modeling academic mindsets and providing students with access to additional learning strategies. This evolving nature of topics in the focus group indicated a significant shift from conversations early in instruction where the onus was placed on students and their inabilities (Table 4).

### Anecdotal Reflections

All participants, including the teacher researcher, submitted a total of four reflections during the pilot. The researchers provided participants with a set of five questions to drive their reflections. These questions included the following:

1. How have students progressed in their ability to exhibit collaboration, communication, creative thinking, and critical thinking (4C) skills?
2. Are there particular parts of the instruction that have been problematic for students? For you? Explain.
3. Has your approach to instruction changed with this unit? How?
4. Do you find this type of instruction to be more or less effective than your traditional format? Explain.
5. What else have you experienced or noticed about your students' during this unit of instruction? What have you noticed about your role as the teacher?

Table 4

*Teacher Perceptions of Student 4C Skill Improvement During Unit Instruction*

Day of Instruction	Teachers Perceptions of Overall 4C Improvement	Specific 4C Improvements Perceived by Teachers
1-3	No Improvement ( $n= 5$ )	None
4	Some Improvement ( $n= 3$ ) No Improvement ( $n= 2$ )	Teachers C, D, E: Collaboration and Communication
5	Some Improvement ( $n= 4$ ) No Improvement ( $n= 1$ )	Teachers A, C, D, E: Collaboration and Communication
6	Some Improvement ( $n= 4$ ) *1 teacher had a substitute	Teachers B, C, D, E: Collaboration and Communication Teachers C, E: Creativity
7	Some Improvement ( $n= 5$ )	Teachers A, B, C, D, E: Collaboration and Communication Teachers C, E: Creativity Teachers A, C, D, E: Critical Thinking
8	Significant Improvement ( $n= 3$ ) Some Improvement ( $n=2$ )	Teachers A, B, C, D, E: Collaboration and Communication Teachers C, E: Creativity Teachers A, C, D, E: Critical Thinking
9	Significant Improvement ( $n= 4$ ) Some Improvement ( $n=1$ )	Teachers A, B, C, D, E: Collaboration and Communication Teachers C, E: Creativity Teachers A, C, D, E: Critical Thinking
10	Significant Improvement ( $n= 4$ ) Some Improvement ( $n=1$ )	Teachers A, B, C, D, E: Collaboration and Communication Teachers C, E: Creativity Teachers A, B, C, D, E: Critical Thinking

Participating teachers submitted reflections on Days 2, 5, 7, and 10. Anecdotal reflections followed the same pattern that was observed in focus group feedback, with reflections becoming more positive over time.

The first set of reflections, submitted on Day 2 of instruction, focused heavily on the students' inabilities to communicate and collaborate effectively. For example, Teacher D noted the following:

I feel like it is the first day of school all over again. It's like they don't know any of the rules and I am having to start all over. I have no idea why it is such a problem. I do a lot of "turn and talk to your partner" during my instruction. I thought this would not be much different, but they are struggling to work together to complete the task.

Teacher A added to these sentiments, observing that "they [students] are excited, but having a difficult time organizing themselves." It should be noted that teachers offered this feedback before the focus group discussion that emphasized how they, the teachers, were modeling their expectations for their classes.

Reflections submitted on Day 5 mostly mirrored the focus group topics but with greater emphasis on enhancing the students' critical thinking and persevering abilities. For example, Teacher A wrote:

They are comfortable sharing ideas and listening to others. So, now, I can walk around and just steer their ideas and I'm not getting them to just answer me, I'm getting them to demonstrate. It's impressive to hear them question each other. Sometimes it's better than what I would ask. They are close to finding solutions, but they aren't used to working this hard for this long.

In addition, Teacher D noted the following observation:

They are working together. It's good collaboration- you can see it happening and it's good. I am holding the expectations all day, too, which has helped them to know it's not just isolated to when we do science. I notice that since I have done that, things have smoothed out with behaviors and their questions have been much more specific and pointed. I am struggling to keep myself out of the process, though. It seems like it would be easier for me to just show them how to adjust their pitch, but I know they may not learn it if I jump in. Now that the procedures are under control, my biggest challenge is keeping myself from giving away the punchline!"

Based on their comments, Teachers A and D readily embraced the role of teacher as facilitator, a role associated with PBL standards. This shift in role—from teacher to facilitator—seemed to be more problematic for some teachers than others but was critical to successful implementation.

Teacher B, still struggling with communication and collaboration at this point in the instruction, reported:

The students are having a hard time finding success. I had to do a lot of redirecting to help them focus on the learning outcome. The graphic organizer was helpful because that is something we use a lot when I am teaching, so I have leaned a lot on that activity, and we have worked on it a lot together, but they are still really having a hard time working as a team.

This reflection by Teacher B represented the outlier in the group submissions for Day 5. The researchers noted, in particular, the difference in the approach to implementing the instruction taken by Teacher B. Instead of extending the standards for collaboration throughout the day, as

the other participants did (giving students more practice), Teacher B restricted the collaboration time and modified the graphic organizer activity to be more of a direct instruction activity. This shifted the control of the learning from student-controlled to teacher-controlled (Marzano, 2005). The concept of locus of classroom control was not something that was addressed in the professional learning provided to the participants but, in this pilot study, seemed to be a significant variable for successful implementation.

Teachers' anecdotal accounts from Day 7 were positive and focused on how the students' and teachers' perceptions of their respective roles had changed. Most reflections highlighted the improvements in collaboration and communication and focused on the need to improve a growth mindset. Teacher A said:

Totally different today. Students are working together better and are now sharing their approaches. At first they just embraced that challenge but now they are completely embracing the collaboration because they see it as a way for them to learn from each other and make progress toward their goals. I'm out of the re-direction business because I don't have to do it anymore. They are doing it themselves. Now I can just ask the questions when they get stuck. We are still fighting against the 'right answer' concept. It is difficult for them to understand that I'm not just looking for one right answer.

Teacher C reported similar changes, making the following observation:

The students are working independently, for the most part. I am facilitating the collaboration and communication in places where the students struggle, but it has dwindled to become a rare occasion. The expectations are set and the students are following them. I find it really neat to see how students are learning through 'trial and

error’ and are beginning to see that ‘error’ is just as useful, if not more useful, than success. This is still a point of struggle for them, though, as I am having to continuously reinforce that part of learning is finding some positive outcome from failures. I am especially enjoying seeing them work through conflicts by referring to the anchor chart of norms that they developed. I see this as evidence that they have taken ownership of the collaborative learning process.

Teacher E reported an increase in students demonstrating creative approaches to problem solving, along with collaboration and communication abilities. For example, Teacher E stated:

I am very impressed with the progress that we have made in the willingness of the students to take risks. My kids are definitely more willing to try something new or listen when a group member has an idea that seems impossible. I don’t know if it is the reinforcement of the growth mindset, the groups working together or maybe all of that combined, but there is definitely something that has changed the tone of the learning that is happening here. It is exciting to see them excited to learn.

Teacher B’s reflection was again, the outlier in the group, noting some improvements in collaboration and communication, but also expressing concern about the progress of students’ critical thinking abilities.

They are getting better with working together, but things become very ‘out of control’ quickly if I am not constantly monitoring. It is very difficult for me to teach this way because it is overwhelming at points. I see the potential because I know they need to learn things by being hands on, but I am much more comfortable with a gradual release or guided instruction approach. I have stuck with it, mainly, because the kids are very



excited about doing the work. I'm afraid they would be disappointed if I took this project from them. I am having them work steadily on their graphic organizers and using that as the main way the group tries out new ideas for their instruments. They do not like to think critically so it is difficult for them to problem solve, and I feel that the graphic organizer is a good way to help them through the process in an organized way. We are nearing the end of the unit, and I am not certain that all of my groups will have their songs and instruments ready to demonstrate for the class.

Both researchers of this study noted the concern Teacher B expressed about the students displaying "out of control" behavior. When asked by the researchers to elaborate what was meant by "out of control" in this context, Teacher B responded:

By 'out of control' I meant that they were all doing different things and are at different points and going about the project in a different way. Plus, they get loud and have a tendency to jump from one thing to another.

What stood out in this teacher's response was the problem of having students approach solutions in different ways. Teacher B's preference was to maintain more control in the classroom and have students approach a problem in a uniform and systematic way; this type of learning is not synonymous with PBL and reveals an important consideration for both teachers and administrators. Specifically, in order for a PBL unit of instruction to be implemented successfully, the teacher must be willing to allow multiple approaches to solving problems. By limiting the means by which students can solve a problem, the teacher has inadvertently limited the students' ability to exhibit creative thinking skills.

Final anecdotal accounts were submitted on Day 10 and focused predominantly on students' performance on the summative assessment as well as their overall performance in exhibiting 4C skills during the unit of study. Four of the five teachers praised the implementation of this pilot unit of instruction and saw significant improvements in their students' overall abilities to exhibit communication, collaboration, creative thinking, and critical thinking skills. Several participating teachers also noted dramatic improvement in their students' content knowledge from the initial formative assessment to summative assessment. Teacher D reported that the "class average went from a 43% to a 92%. It's impressive. I had a feeling it would be good, but I didn't expect this." Teacher E similarly observed the following: "one of my struggling students earned a 30% on the initial formative and an 81% on the summative. I can see how this type of learning could be a game changer for my kids who struggle." Teacher B remained hesitant about the process and made the following observation:

This took a lot of time, and yes, they can communicate and collaborate better, and they enjoyed the work, but those are not standards that they will need to have mastered in order to well on the FSA . . . I am pleased that they did well on the summative assessment, but I am not convinced that they would not have done just as well if we had done a lecture with notes and a graphic organizer.

### Discussion

Based upon the results of this pilot study, the researchers concluded that there is much to be considered when implementing curriculum that supports the development of collaboration, communication, creative thinking, and critical thinking (4C) skills. While there must be

opportunities for students to practice these skills, the role of the teacher as a facilitator of learning (as opposed to the keeper of knowledge) is critical.

The framework developed by the researchers has been significantly informed by this study and includes a rubric that teachers and administrators can use to support students in developing their 4C skills and a visual that shows how non-cognitive skills can be used as a means of supporting students as they work to develop their 4C skills.

## CHAPTER 3 PILOT ANALYSIS

### Overview

This study's complex problem of practice emerges from the current curriculum that provides students few opportunities to develop and refine their skills in collaboration, creative thinking, effective communication, and critical thinking (4Cs). This dissertation in practice examined curriculum and strategies (connected to Florida Standards) that teachers can use to engage students in developing these essential skills (4Cs). Application of these strategies will prepare students to meet the expectations of a 21st century workforce.

The intention of this pilot study was to determine the impact of providing students with the opportunity to engage in curriculum that will develop their 4C skills (critical thinking, creative thinking, collaboration, and communication). This focus on the 4Cs is not commonplace in the school district that was used for this study, nor is it commonplace in most classrooms across the United States (IYF, 2012; OECD, 2009; Peterson et al., 1989; Saavedra, 2012). This gap in instruction has led to workforce concerns and an interest in developing "soft skills" among the nation's youth (Binkley et al., 2010; Saavedra, 2012.).

This pilot study was conducted at a school in a small, rural district in northeast Florida; this school has a total population of approximately 1000 students in grades pre-kindergarten through sixth grade. Students who attend the school reside in the district's beachside community, which includes residences that range from government funded Section 8 housing projects to homes located on the beach itself, valued at over one million dollars ("Flagler Beach," 2016). The student population is a fairly even split between males and females, the

majority of whom are White (75%), with the remaining 25% relatively evenly split among Black, Asian, and multiracial. All teachers at Old Kings Elementary are classified as “Highly Qualified” by the State of Florida, which means that they hold qualifications that meet the state requirements for teaching the grade levels they have been assigned to teach (FLDOE, 2016). Teachers in fifth grade were recruited to participate in the pilot study because the content standards of the unit of study aligned best with the fifth grade Florida Standards curriculum.

The pilot study answered two research questions:

- Do students exhibit collaboration, creative thinking, effective communication, and critical thinking skills (4Cs) when the curriculum provides opportunity to engage the students in work where they can demonstrate the 4Cs?
- How can explicitly teaching students non-cognitive factors (academic mindset, academic behaviors, perseverance, social skills, learning strategies) influence their ability to effectively demonstrate 4C skills?

### Outcomes

This pilot study explored teachers’ perceptions of students’ abilities to exhibit effective communication, collaboration, creativity, and critical thinking (4C) skills and whether these skills were increased with the implementation of a unit of instruction that was rich in 4C opportunities and supported with explicit instruction in non-cognitive factors. The pilot also provided evidence that teachers perceived instruction and modeling non-cognitive factors to be integral to the development of strong communication, collaboration, creative thinking, and critical thinking (4C) skills. The data collected from the pilot informed the framework from the

positionality of the teacher practitioner and administrative practitioner. This data clarified the following outcomes:

- The need for a specific tool to guide administrators and practitioners in the implementation of curriculum rich with opportunities for students to develop their communication, collaboration, creative thinking, and critical thinking (4C) skills and
- Teachers and administrators understanding the link between development of academic mindset, learning strategies, academic behaviors, social skills, and academic perseverance (non cognitive factors) and communication, collaboration, creative thinking, and critical thinking (4C) skills.

During the first three days of instruction, none of the teachers reported improvements. From Days 4–7, teachers began noting improvements in one or more of the 4C skills. During Days 8–10 multiple teachers noted significant overall improvement in one or more 4C skills.

### Researcher Positionality

Together, the teacher and administrator practitioners approached this dissertation in practice from what Herr and Anderson (2015) called organizational “insiders,” collaborating to gather information to inform the teaching practices within the organization. In a more traditional dissertation, conducting research in one’s own setting may be frowned upon because of the natural biases the researchers bring to the work (Glesne & Peshkin, 1992). However, as insiders in the organization, both practitioners were able to approach the problem within the organizational context and to ensure that conclusions and solutions generated were appropriate,

ethical, and pragmatic for the organization. The teacher-researcher was a participant in the pilot, noting the struggles and successes that came with implementation of the collaboration, communication, creative thinking, and critical thinking (4C) focused unit of instruction. The administrator-researcher did not participate directly in the pilot but analyzed the participants' reflections and the detailed notes from the focus groups. Together, the researchers collaborated to build the framework by which teachers can implement curriculum that will develop students' collaboration, communication, creative thinking, and critical thinking (4C) skills. The researchers monitored bias by maintaining active reflective practices and considering carefully epistemology and methodology (Herr & Anderson, 2015). Similarly, the researchers addressed the threat of biases by using the guidelines for validity criteria proposed by Herr and Anderson (2015), as well as triangulation of data, member validation (Lincoln & Guba, 1985), and regular validation meetings with the advisor for this study as well as other doctoral candidates in the same cohort (Bone, 1996).

### Teacher Positionality

From the perspective of the teacher researcher, the data from the pilot were examined from two vantage points: (a) student progression in their ability to exhibit collaboration, communication, creative thinking, and critical thinking (4C) skills, and (b) teacher supports for implementation of the collaboration, communication, creative thinking, and critical thinking (4C) rich curriculum.

### Student Progression

From the teachers' perspectives, student progression proved somewhat difficult to track because of the absence of established benchmarks of progress in each of the 4Cs. A rubric is one product of this dissertation in practice that will be useful for both teachers and students as a tool to measure progress of students' proficiency in communication, collaboration, creative thinking, and critical thinking (4Cs). In the absence of a specific benchmark measure, teachers relied on their own observations, noting specific aspects of communication, collaboration, creative thinking and critical thinking (4Cs) that improved (as per the standard presented in the professional learning experience) over the course of the unit of instruction.

Teachers reported progress that was progressive and began with improvements in communication and collaboration during the initial portion of the unit. However, the structure of the unit heavily emphasized communication and collaboration at the outset of instruction. Significantly, students' progress in developing communication, collaboration, creative thinking, and critical thinking (4C) skills, in this pilot, was dependent on the frequency with which the students engaged in the particular 4C skill. Teachers perceived that students' responses to the demands of project-based learning were varied but tended to improve with time.

### Content

Students who participated in the study found the content of the instructional unit challenging, but the challenge was overshadowed by student engagement and enthusiasm, which carried them through the unit successfully and was an added incentive for participants. All teacher-participants reported increased student enthusiasm, including the teacher who struggled



with implementation, who noted that she continued through the unit because her students would be disappointed if she did not. Teacher observations served as the measure of student engagement and enthusiasm as well as daily student reflections produced over the course of the instructional unit. Also notable: teachers reported little to no major student behavioral issues during the two-week unit of instruction, a contrast to the typical one major behavioral issue per teacher per week.

Outcomes related to content were significant, with all students demonstrating growth between the formative to summative assessments. Teachers noted that nearly all students showed significant growth in their understanding of the content as measured by their summative assessment scores. In particular, teachers recognized students' abilities to elaborate on answers they provided when asked content related questions. For example, when asked to explain the concept of pitch, Teacher D reported:

I was impressed with the answers I was getting. I asked about pitch and I not only got an explanation about how pitch is the same as frequency, but the showed me their string instrument and showed me how to change the pitch by adjusting the strings. Normally, they don't give me that level of detail, or if they do, I have to dig for it!

### Teacher Support for Implementation

As an insider conducting research, my positionality allowed me to simultaneously track the progress of the participating teachers in the learning process as well as that of the students who were receiving the new form of instruction. Ironically, the progress of the focus group (teachers) in exhibiting communication, collaboration, critical thinking, and creative thinking

(4C skills) mirrored somewhat the progress of the students' 4C skills. In the first few days of the focus group, participants struggled with how to structure the learning environment as well as how to communicate why implementation was difficult. Once the focus group learned to communicate more effectively, the group began to collaborate more naturally. As the group became more collaborative, the researchers were able to examine problems critically and produce creative solutions to support students' progress in developing their 4Cs skills. This process toward true collaboration and problem solving was typical of small group productivity and mirrored the process of becoming a productive team reported by Tuckman (1965) and Bonebright (2010).

### Focus Groups

The focus groups, while originally designed to answer participants' questions and collect data from participants, became an integral support system for participants throughout the process of implementing the instructional unit. While professional learning was provided to participants at the beginning of the unit, daily communication among participants during implementation emerged as the most beneficial aspect of professional learning because it was an immediate, embedded opportunity to compare thinking with other participants. Participants perceived the support of this focus group as integral to implementation of the instructional unit. One participant observed, "The focus group process is what kept me moving my kids forward. Just knowing that I had colleagues that I could work with to solve challenges was comforting. I feel like my teaching improved because of this experience."

## Modeling

In this pilot study, students demonstrated the most progress when teachers modeled 4C skills for their students and acted as participants in the learning process. This shift in the teachers' role was significant for many of the participants. Both researchers agreed that the portion of the professional learning that focused on the role of the teacher during instruction should have been much more explicit and detailed. In this pilot, those teachers who embraced the change from teacher-centered instruction to student-centered instruction were the teachers who reported the most perceived improvement in students' collaboration, communication, creative thinking, and critical thinking (4C) skills. Teacher participants' reflections were explicit in describing the shift in their positionality from teaching information to students to facilitating the learning of the students. This shift, in many respects, resonated with Anderson and Herr's (2015) description of the positionality of individuals in the process of completing a dissertation in practice. The typical teacher positionality is that of an outsider who performs action research "on" a particular topic, subject, or organization. However, teachers who embraced the idea of themselves as insiders, who were actively participating (with students) in the process of learning, perceived improvements in student progress.

## Administrative Positionality

From the administrative perspective, the data from the pilot were viewed through three distinct lenses: (a) instructional methods and teacher practice, (b) development of students' collaboration, communication, creative thinking, and critical thinking (4C) skills, and (c) development of students' content knowledge.

### Instructional Methods and Teacher Practice

One of the most notable results of the pilot was the evolution of teachers' perceptions of their students' progress. Initially (days 1-3), teachers' conversations focused primarily on what the students could not accomplish. Teachers' reflections included phrases such as "they just don't . . ." or "my kids can't . . ." and were heavily focused on the students' inability to communicate and collaborate effectively. Day three was a turning point for all of the participants when Teacher C shared his insight into the importance of modeling the behaviors in the classroom and becoming an actual participant in the learning process. Teacher C observed:

I get it now—you have to model it for them. If you don't, they won't do it. You have to be aware of whether or not you are following the norms the class made. If you don't, they won't. It's just that simple. You can redirect to the anchor charts all you want, but they are looking for you to model and set the standard.

These words carried significant weight with all of the participants and seemed to precipitate a shift in the behavior of most of the participants. This shift in behavior required teachers to embrace the role of facilitator as indicated by project based learning standards (Albanese & Mitchell, 1993; Barron & Darling-Hammond, 2008; Boss et al., 2013). Making this shift, more difficult for some teachers than others, was critical to successful implementation of the instructional unit. Research supports the concept of student-centered classrooms as a means of improving student engagement and, ultimately, conceptual understanding; research also recognizes the difficulty that many teachers experience when initially implementing this type of instruction (Cubukcu, 2012; Tillapaugh & Haber-Curran, 2013).

Once they began thinking of themselves as facilitators and active participants in the

learning process, teachers' reflections began to focus more on what the teachers needed to do to support students through the process. Evidence emerged in teachers' reflections and focus group conversations with statements such as "maybe we need to . . ." and "what if we changed our approach . . ." Instead of focusing on behaviors, teachers began to concern themselves more with how to enhance the students' critical thinking and persevering abilities. On Day 7, one participant noted the link between perseverance and learning strategies, stating, "I'm not sure if it's a perseverance thing or if it's a learning strategy thing. Maybe they want to keep on trying but they aren't sure what to do next." The researchers saw this statement as another turning point in participants' transformation because teachers could see their role in the development of students' understanding and perseverance. These statements also demonstrated that teachers were looking for ways to support students in the development of 4C skills instead of simply noting the deficiencies that students have in these areas. This thinking was further observed in conversation and written reflections teachers submitted during the instructional unit. Communications from the majority of teacher-participants focused on how the students' and teachers' perceptions of their respective roles had changed and noted a need for improving growth mindsets by modeling for students.

One participant struggled with the transition to "teacher as facilitator" and described portions of the instruction as "out of control." When asked to elaborate on what "out of control" meant in this context, the teacher shared the following response:

By 'out of control', I meant that they were all doing different things and are at different points and going about the project in a different way. Plus, they get loud and have a tendency to jump from one thing to another.

This teacher highlighted the problem of students' generating solutions in different ways, ultimately preferring to maintain a high level of control in the classroom and have students approach a problem in a uniform and systematic way. By structuring students' approach to problem solving, the teacher has also inadvertently limited the students' ability to exhibit creative thinking skills. This type of learning is not synonymous with project-based learning (Barron & Darling-Hammond, 2008; Partnership for 21st Century Skills, 2007). In order to implement a project based-learning unit of study, the teacher must allow multiple approaches to solving problems; teachers must possess, then, a firm understanding of the difference between teacher-centered and student-centered classrooms. Teachers whose belief systems do not align with student-centered teaching may struggle to implement curriculum rich with collaboration, communication, creative thinking, and critical thinking (4C) opportunities and will need significant support. Administrators who are interested in implementing a 4C rich curriculum should be prepared to provide significant support to teachers who struggle to consistently maintain a student-centered classroom environment.

By the end of this pilot study, focus group conversations and the majority of the participants' reflections focused on the ways teachers could provide more support for students by modeling academic mindsets and providing students with access to more learning strategies. These conversations demonstrated a significant shift from conversations early in instruction where the onus was placed on students and their inabilities.

#### Development of Students' 4C Skills

While the researchers recognize that all data collected from this pilot were funneled

through the filter of the teacher-participants, evidence suggests that this pilot did improve students' abilities to exhibit collaboration, communication, critical thinking, and creative thinking (4C) skills. These outcomes correspond with outcomes in the literature, suggesting that project-based learning methods typically do facilitate deep content learning and deep problem solving, development of 4C skills, improve levels of engagement, and enhance long-term academic outcomes (Association of American Colleges and Universities, 2002; Barron & Darling-Hammond, 2008; Fredricks et al., 2004; Newmann & Associates, 1996; Partnership for 21st Century Skills, 2007; Ravitz, 2009; Silva, 2008).

Both teacher reflections and focus group conversations indicated that students' skills improved over the duration of the unit. Moreover, all participants noted the same sequence of events associated with student improvement. Teachers first noted improvement in their students' communication and collaboration skills. Focus group conversations and written reflections from the teachers coupled these two skills, communication and collaboration, almost exclusively. Only one teacher mentioned the development of communication skills in isolation of collaboration skills. Interestingly, teacher-participants noted that their students' focus on "speaking and listening skills" was essential in order for the group to collaborate effectively.

Critical and creative thinking were discussed both independently and in conjunction with each other. Participants initially indicated their concerns about developing their students' 4C skills (implying that students either had these skills or did not have these skills) but, in later conversations, participants began to discuss ways to support students' development of these same skills. In addition, participants indicated that their students' reflections showed the same pattern. Initially, students wrote, "I'm not creative" or "I am not a creative person" but, later in

the unit of instruction, the same students reported that they were “proud of my creation and glad I had time to change it and make it better and better”.

While the development of students’ communication, collaboration, critical thinking, and creative thinking (4C) skills is evident in this data, there is an important academic mindset at work. While initially both researchers found an academic mindset to be an important non-cognitive factor for students to develop 4C skills, data from this pilot revealed the importance of the teacher’s academic mindset and ability to model this attribute for students at all times. This relationship aligns with recent research, which indicates that academic mindsets cannot be taught in the absence of teachers whose belief systems align with a growth mindset (Dweck, 2006).

#### Development of Students’ Content Knowledge

Proficiency in the standards associated with this unit of instruction was examined from an administrative perspective. In the school where the pilot was conducted, scoring 70% or above on the final unit assessment qualified as proficiency. The final unit assessment is typically a common assessment that is teacher-created and aligns with the Florida Standards for the particular subject matter being assessed. The majority of the students participating in the study not only showed proficiency in the standards, but showed mastery of these standards (scoring 90% or above) as measured by the Florida Standards aligned common summative assessment. This outcome aligns with evidence found in some project-based learning literature, which has shown that students who learn by these methods outscore their peers who receive traditional instruction (Barron & Darling-Hammond, 2008; Kivunja, 2014; Trilling & Fadel, 2009). Teachers who participated in the pilot noted the significant improvement in the number of



students scoring in the proficient and mastery ranges for this unit of instruction as compared to scores from previous years. One teacher noted that, for the first time, more than five or six students scored in the mastery range on a common summative assessment. Participants were particularly intrigued with these results and expressed interest in determining whether this finding would align with findings in other project-based learning studies (Ravitz, 2009; Strobel & van Barneveld, 2009; Vernon & Blake, 1993; Walker & Leary, 2009).

### Framework

By collaboratively analyzing the outcomes of the pilot study from both the teacher and administrative perspectives, the researchers developed a framework to address the problem of practice: the lack of consistent opportunities for students to learn through curriculum that is rich in opportunities to develop collaboration, communication, critical thinking, and creative thinking (4C) skills.

### Intended Audience

It is the intention of the researchers to develop a framework and accompanying rubric to be used by educators who are interested in implementing a collaboration, communication, creative thinking, and critical thinking (4C) rich curriculum. Outcomes from this pilot study show that educators who have demonstrated belief systems aligned with teacher-centered classrooms will need more support during implementation of the framework than teachers whose belief systems are more student-centered.

### Intended Use

The framework developed as a result of this pilot study was developed to inform teachers, administrators, and students thinking about the development of 4C skills by showing the link between the development of non-cognitive factors and communication, collaboration, critical thinking and creative thinking (4C) skills. The researchers developed the visual to show how academic mindset, learning strategies, academic behaviors, social skills, and academic perseverance (non-cognitive factors) function as prerequisite skills for collaboration, communication, creative thinking, and critical thinking (4C) skills. This link between the development of non-cognitive factors and 4C skills was one that teachers discovered through the implementation of the pilot study and would have liked to have had support from the outset of implementation. The framework can be used by teacher and administrators as a diagnostic tool for assisting students in the development of specific 4C skills or as a means of determining whether a classroom is providing a firm foundation for 21st century skills by providing a collaboration, communication, creative thinking, and critical thinking (4C) rich curriculum.

The descriptions included in the rubric will also provide recommendations based on the work of Farrington et al. (2012) for moving from one level of implementation to the next. The recommendations are intended for use in conjunction with the rubric as a means of providing concrete understanding for how to explicitly teach, embed reflective practices to further develop skills, and model academic mindset, learning strategies, academic behaviors, social skills, and academic perseverance (non cognitive skills) for students. This tool will provide a means of scaffolding the development of 4C skills.

The use of this framework and rubric offers a means by which educators can directly address the lack of 21st century skill development that is common in classrooms across the United States (IYF, 2012; OECD, 2009; Peterson et al., 1989; Saavedra, 2012) and respond to the demands for a more prepared 21st century workforce (Binkley et al., 2010; Saavedra, 2012). Employing this framework serves the purpose of preparing students to make educated decisions as citizens and to overcome the challenges that await them when they enter the workforce or a post-secondary institution (Baron & Markman, 2000; Matthews, 2006; Parker, 2003; Wilson & Berenthal, 2005).

## CHAPTER 4 INCREASING STUDENTS' COMMUNICATION, COLLABORATION, CRITICAL THINKING, AND CREATIVE THINKING SKILLS

### Overview

This dissertation's complex problem of practice emerges because current curriculum provides students few opportunities to develop and refine their skills in collaboration, creative thinking, effective communication, and critical thinking (the 4Cs). This study examined curriculum and strategies (connected to Florida Standards) that teachers can use to engage students in developing these essential skills. This will prepare students to engage in and meet the expectations of a 21st century workforce.

The pilot study was conducted to determine the impact of providing students with the opportunity to engage in curriculum that will develop their 4C skills (critical thinking, creative thinking, collaboration, and communication). This type of instruction is not commonplace in the school district that was used for this study, nor is it commonplace in most classrooms across the United States (IYF, 2012; OECD, 2009; Peterson et al., 1989; Saavedra, 2012). The result of the lack of instruction has led to workforce concerns and an interest in developing “soft skills” among the nation's youth (Binkley et al., 2010; Saavedra, 2012.). The pilot study was conducted to answer two research questions:

1. Do students exhibit 4Cs when the curriculum provides opportunity to engage the students in work where they can demonstrate them?
2. How can explicitly teaching students non-cognitive factors (academic mindset, academic behaviors, perseverance, social skills, learning strategies) influence their ability to effectively demonstrate 4C skills?

### Outcomes

The pilot study was significant because it revealed teacher perceptions that students' abilities to exhibit 4C skills were increased with the implementation of a unit of instruction that was rich in 4C opportunities and supported with explicit instruction in non-cognitive factors. The pilot also provided evidence that teachers perceived both instruction and modeling of non-cognitive factors to be integral to the development of strong (4C) skills. The data collected from the pilot informed the framework from the positionality of the teacher practitioner and administrative practitioner. This data informed the researchers about the need for a specific tool to guide administrators and practitioners in the implementation of curriculum rich with opportunities for students to develop (4C) skills. Moreover, this framework will provide a means by which teachers and administrators can understand the link between development of academic mindset, learning strategies, academic behaviors, social skills, and academic perseverance (non-cognitive factors) and (4C) skills.

### Framework

By collaboratively analyzing the outcomes of the pilot from both the teacher and administrative perspectives, the researchers developed a framework to address the problem of practice: the lack of consistent opportunity for students to learn through curriculum that is rich in opportunities to develop collaboration, communication, critical thinking, and creative thinking (4C) skills.

### Intended Audience

While it is the intention of the researchers for this framework and accompanying rubric to be used by any educators who are interested in implementing a (4C) rich curriculum, it should be noted that the outcomes from this pilot have shown that educators who have demonstrated belief systems aligned with teacher-centered classrooms will need more support for implementation than teachers whose belief systems are more student-centered.

### Intended Use

The framework developed as a result of this pilot study is intended to inform teachers, administrators, and students by showing the link between the development of non-cognitive factors and (4C) skills. The visual was developed by the researchers to show how academic mindset, learning strategies; academic behaviors, social skills, and academic perseverance (non-cognitive factors) function as prerequisite skills for (4C) skills. This link was one that teachers discovered through the implementation of the pilot study, and would have liked to have had support for from the outset of implementation. Teachers and administrators can use the framework as a diagnostic tool for assisting students in the development of specific 4C skills or as a means of determining whether a classroom is providing a firm foundation for 21st century skills by providing a (4C) rich curriculum.

The descriptions included in the rubric will also provide recommendations based on the work of Farrington et al. (2012) for moving from one level of implementation to the next. The recommendations are intended for use in conjunction with the rubric as a means of providing concrete understanding for how to explicitly teach embed reflective practices to further develop

skills and model academic mindset, learning strategies, academic behaviors, social skills, and academic perseverance (non cognitive skills) for students. This tool will provide a means of scaffolding the development of (4C) skills.

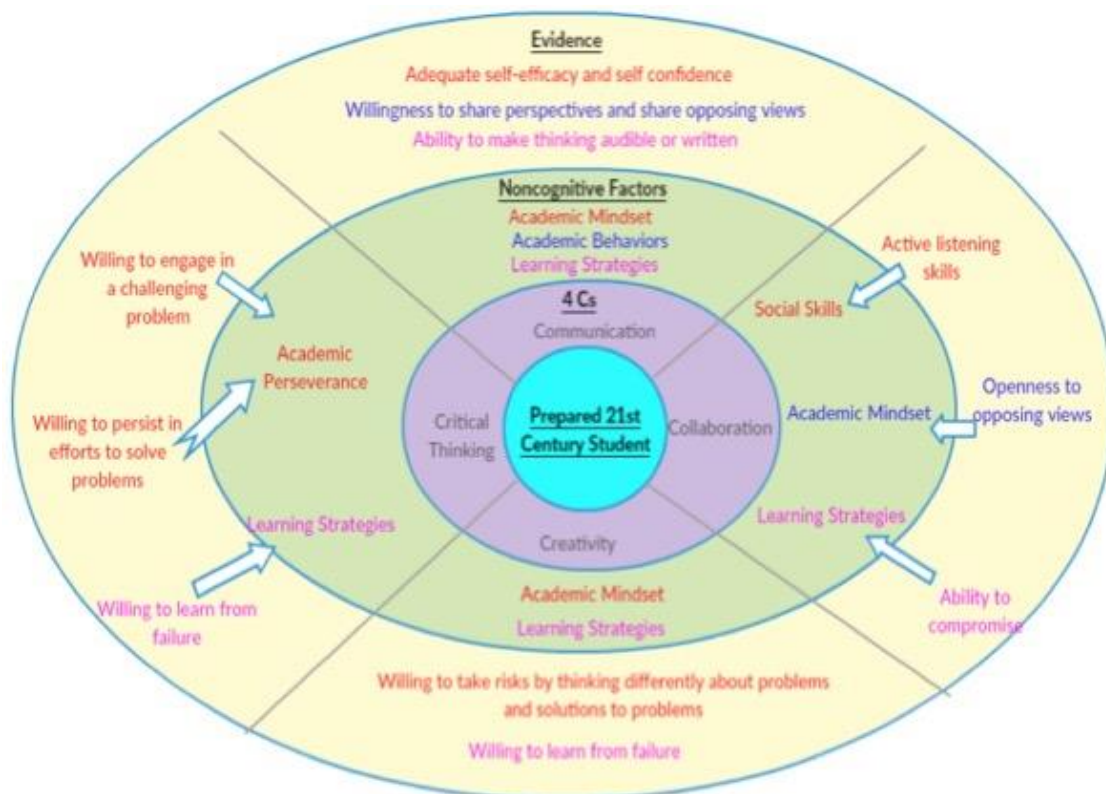
The use of this framework and rubric will begin to offer a means by which educators can directly address the lack of 21st century skill development that is common in classrooms across the United States (IYF, 2012; OECD, 2009; Peterson et al., 1989; Saavedra, 2012) and begin to answer the demands expressed for a more prepared 21<sup>st</sup> century workforce (Binkley et al., 2010; Saavedra, 2012). Employing this framework will serve the purpose of preparing students to make educated decisions as citizens, and to overcome the challenges that await them when they arrive in the workforce or in a post-secondary institution (Baron & Markman, 2000; Matthews; 2006; Parker, 2003; Wilson & Berenthal, 2005).

### Visual for Developing Students Communication, Collaboration, Critical Thinking, and Creative

#### Thinking Skills

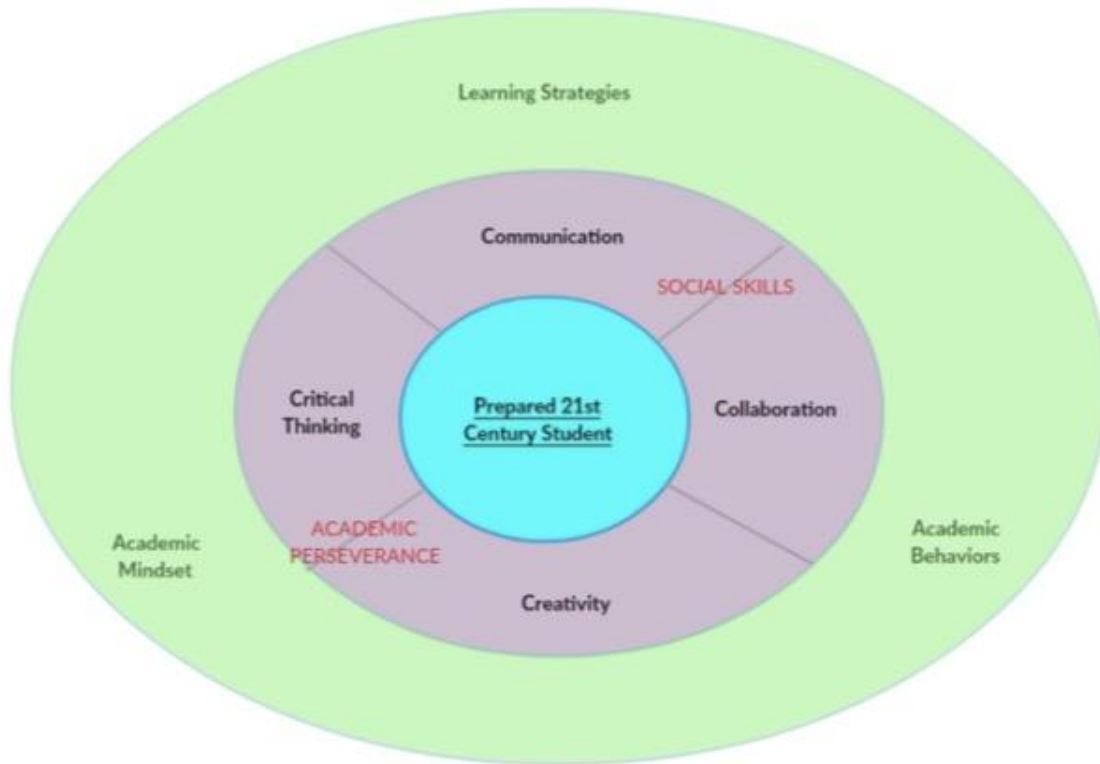
In this study, the researchers were able to synthesize specific relationships among non-cognitive factors and 4C skills. Specifically, this study reflected the importance of the development of students' proficiency in applying learning strategies, academic behaviors, and academic mindsets in order to support the development of their 4C skills. These particular non-cognitive factors were equally applicable to the development of all of the 4Cs and were integral to students' progress through the unit of instruction. In contrast, the non-cognitive factor of social skills seemed to be of extreme importance in supporting the development of students' communication and collaboration skills, while academic perseverance was critical in supporting

the development of students' critical thinking and creativity skills. Figure 3 shows the expanded form of the visual, which includes specific evidence that builds non-cognitive factors, which support the development of 4C skills. This visual can be viewed more succinctly (Figure 4) when accompanied by the rubric that has been developed to assist with the progression of 4C implementation.



*Figure 3.* Expanded visual for developing students' communication, collaboration, critical thinking, and creative thinking skills.





*Figure 4.* Condensed visual for developing students’ communication, collaboration, critical thinking, and creative thinking skills.

This visual, coupled with the rubric is intended to assist educators who have a desire to implement or to further refine implementation of a curriculum that is rich with opportunities for students to develop their (4C) skills (Table 5). Below each of the 4C sections of the rubric are discussed with specific recommendations for how to progress across the continuum.

Recommendations are based on literature, as well as the findings of this pilot, which has linked instruction in non-cognitive factors with the development of (4C) skills.

Academic behaviors are characteristics exemplified by students who are typically labeled as “conscientious” and “hardworking” by stakeholders in students’ educational experiences. The behaviors include regular class attendance, participating in class activities, studying, and

attending to homework in a timely manner. Research has shown that increasing the frequency of these behaviors in a particular class is not only possible (Deci & Ryan, 1985; Skinner, 1953; Staats, 1963), but also typically improves the student's academic outcomes (Farrington et al., 2014).

Carol Dweck, in her 2006 bestselling book, *Mindset the New Psychology of Success*, popularized the idea of the malleability of academic mindsets. Mindsets can be fixed or open to growth. While there are a multitude of academic mindsets, there are four that have been shown to contribute positively to student academic outcomes (Farrington et al., 2014). They are: belonging to an academic community (Furrer & Skinner, 2003; Ryan & Deci, 2000; Wentzel & Asher, 1995; Wentzel & Caldwell, 1997), the growth of ability with effort (Cury et al., 2006; Dweck & Leggett, 1998), a belief in the likelihood of success (Bandura, 1986; Bandura & Schunk, 1981; Bouffard-Bouchard, 1990; Pajares, 1996) and the belief in the work as valuable to the student immediately or in the future (Atkinson, 1957; Eccles et al., 1983; Wigfield, 1994; Wigfield & Eccles, 1992).

Table 5

*Rubric for Refining Students' Communication, Collaboration, Critical Thinking, and Creative Thinking Skills*

4Cs	Basic	Developing	Proficient	Refined
Communication	Students have limited opportunities to share ideas and only a small number of students speak when prompted. Only some students are engaged in the conversation and able to summarize the thoughts of their peers.	Students have weekly opportunities to share ideas. Most students embrace the opportunity to communicate, though not all will participate in conversation with peers.	Students have daily opportunities to share ideas. All students embrace the opportunity to communicate with others, and most show excellent skills in summarizing the ideas of others and responding to those ideas appropriately.	All students are not only able to effectively communicate their ideas in an articulate way, but can also exhibit exemplary listening skills, including summarizing peers ideas and responding to those ideas. The teacher ensures that curriculum requires students to communicate with each other, as well as other authentic audiences who may have an interest in the work at hand. Students are involved in identifying audiences.
Collaboration	There are limited opportunities for students to work together to complete a task. Student collaboration is only evident among some students. All students do not participate equally in the collaborative process and most learning tasks are designed so that collaboration is not necessary.	Students are provided with regular opportunities to collaborate. Tasks are designed to require all students to collaborate in order to be successful. Many students engage in the collaborative effort, but not all students are fully invested or see the value of collaborating with peers.	Collaboration is an expected part of the classroom experience. Students embrace the opportunity to collaborate with peers with the teacher acting as the facilitator.	All students have the ability to work productively with their peers to accomplish a task. Each student participates equally, and fully without needing the teacher to facilitate the interactions of the group. Students find value in working with their peers.  The teacher designs curriculum that requires students to work together to complete tasks. The learning environment promotes a sense of community and collaboration.

4Cs	Basic	Developing	Proficient	Refined
Critical Thinking	There are limited opportunities for students to struggle with a concept or idea. Much of the students' work is designed at a cognitive level that does not challenge students. When challenging work is presented to students, some students embrace the challenge, while others avoid the task.	Students are provided with regular opportunities to think critically. The teacher effectively scaffolds the process by providing students with direct instruction in learning strategies that will assist them to complete the work. The work is designed to be student centered, but the teacher must provide significant interventions in order for the students to be successful.	Reasonably challenging curriculum is an expectation in the classroom. Students have command of a sufficient repertoire of learning strategies, which assist them in making progress with the work and persevering. The teacher facilitates student progress and encourages curiosity among students.	All students use learning strategies to work toward mastery of the work. Students embrace the process of struggling with a problem and persist in their efforts to solve problems or complete tasks. The teacher designs curriculum that moves students outside of their comfort zone of thinking. Students are continually challenged to engage in work that is authentic. The teacher requires students to solve problems. Curiosity is valued and encouraged.
Creative Thinking	Students have limited opportunities to make their own choices about how to demonstrate mastery of the standards. When students are presented with these opportunities, only some students are willing to think about the problem in a different way.	Students have regular opportunities to use a variety of methods to show their mastery of standards. Some students embrace the opportunity to think about problems in different ways, while other students resist the opportunity and crave more structured, teacher directed tasks. The teacher assists students who struggle by providing them with scaffolded activities to nurture their creativity.	Students have daily opportunities to solve problems in a variety of ways. Students are also given opportunities to show their mastery of standards in ways they choose. All students embrace these opportunities and are willing to take intellectual risks in order to explore diverse ways to complete a task.	All students have the ability to think about a task from multiple perspectives. Students are willing to think about problems in multiple ways or elaborate on solutions with little or no direction from the teacher. The teacher designs work that requires students to think about problems from multiple perspectives.

In order for non-cognitive factors to affect academic performance outcomes, it is necessary to engage cognitive processes (Farrington et al., 2014). This is done through the implementation of learning strategies such as metacognition, goal setting, and time management (Flavell, 1979; Hacker et al., 2009, Crede & Kuncel, 2008; Zimmerman, 2001; Zimmerman & Schunk, 1989). Using these strategies allows students to track their progress toward a goal or academic outcome and provides the motivation necessary to feed academic perseverance and maintain a growth mindset (Paris et al., 1983; Pintrich & DeGroot, 1990; Pokay & Blumenfeld, 1990). In the pilot study, students were expected to use learning strategies to solve a complex problem and were required to write about their progress toward the goal of creating musical instruments that could produce the necessary sounds to create a famous song. Pilot participants noted that students used learning strategies as a means of developing communication skills (written communication skills, specifically), collaboration (expressing ideas more fully and thoughtfully), critical thinking (employing learning strategies to solve complex problems), and creative thinking (choosing different strategies for solving problems).

In this pilot, these three non-cognitive factors: academic behaviors, academic mindset, and learning strategies were integral prerequisites for developing all four of the 21st century skills: collaboration, communication, critical thinking, creative thinking. The remaining two non-cognitive factors: social skills and academic perseverance were more intimately connected with specific 4C skills. Social skills were instrumental in developing communication and collaboration, while academic perseverance was related to the development of critical thinking and creative thinking skills.

## The Role of Social Skills in the Development of Communication and Collaboration

The term social skill refers to the ability of individuals to work collaboratively in a way that is viewed by peers as socially acceptable (Gresham & Elliott, 1990). Social skills must be considered as a variable in the equation of non-cognitive factors that influence student academic performance because they play a pivotal role in the effectiveness of the other non-cognitive factors (Teo et al., 1996). Although research on social skills has been completed in the presence of other non-cognitive factors, results suggesting that the development of strong social skills support students' ability to learn collaboratively, which increases their overall ability to learn and retain information (Bandura, 1997; Collaborative for Academic, Social, and Emotional Learning, 2003; Greenberg et al., 2003; Vygotsy, 1978).

### Communication

Refining students' communication abilities requires attention to two critical skills: the ability to effectively communicate one's own perspective and the ability to actively listen and respond appropriately to another individual's perspective (Farrington et al., 2014; Partnership for 21st Century, 2007). These skills are essential in the 21st century workforce because they are the primary means by which humans can set themselves apart from automated production (Achieve, 2015; Baron & Markman, 2000). In addition to simply being able to effectively communicate, there is also evidence in the literature dating back to both Vigotsky (1978) and Bandura (1997) that peer communication, facilitated as social constructivism, is an effective means of promoting understanding of content (Durlak, Weissberg, Dymnicki, Taylor, & Shellnger, 2011; Greenberg et al., 2003).

In order to begin to scaffold students in their communication abilities, teachers must first create a classroom climate where communication is both necessary and valued. This can be accomplished by providing curriculum that is completed in small groups and requires all students to participate. As was evident in the pilot study, while some students readily embrace the opportunity to communicate, others feel uneasy and need practice in specific non-cognitive skills in order to scaffold their knowledge.

A teacher interested in developing his or her students' abilities in communication should initially establish the need for effective communication. This can be accomplished through a game or other activity that illustrates the importance of effective speaking and listening skills. Several social skills promote the development of communication. These include waiting until someone finishes a thought before speaking, asking questions when you are uncertain of meaning, and looking individuals in the eye when engaging in conversation (Malecki & Elliott, 2002). Providing direct instruction in these skills, followed by learning strategies that refine communication abilities will give students the tools they need to communicate effectively. In addition to instruction, students should be provided with time to practice conversing and encouraged to reflect on the effects the social skills and specific learning strategies have had on the conversation. In order for the climate of the classroom to positively influence students' progress, the teacher must also employ both social skills and learning strategies provided to students (Phillippo & Stone, 2013). This was underscored in the pilot when the student pointed out the teacher's "multitasking" and asked for his full attention.

Providing students with the social skills and learning strategies that facilitate effective communication allows the students to move toward mastery of academic behaviors that support

communication (Goodwin, 1999; Farrington et al., 2014). Social skills often act as prerequisites for academic behaviors, which improve academic outcomes (Collaborative for Academic, Social, and Emotional Learning, 2003; Greenberg et al., 2003; Malecki & Elliott, 2002; Wentzel, 1991, 1993). Participation and cognitive engagement are the two academic behaviors that drive a student's ability to improve his or her communication skills (Farrington et al., 2014). In order to enhance these academic behaviors beyond the initial surge created by the proficiency in social skills and learning strategies, teachers should be explicit in their instruction, monitor students understanding of learning strategies, and provide timely and specific actionable feedback to students (Lee & Shute, 2010; Marzano, Pickering, & Pollack, 2001).

### Collaboration

Collaboration is a critical 21<sup>st</sup> century workforce skill because it is the means by which many successful companies plan to accomplish high volumes of work (Pink, 2011; Saavedra & Opfer, 2012; Trilling & Fadel, 2009). The ability to create a product that is inclusive of multiple perspectives is paramount in the future, and as a result, workforce has cited the ability to collaborate with others as a skill that is ideal in new hires (Pink, 2011; Trilling & Fadel, 2009).

The development of effective social skills is critical to the development of collaborative behaviors (Goodwin, 1999; Johnson, Johnson, & Holubec, 1993). Literature indicates that social skills are best developed by systematically teaching appropriate skills and allowing students opportunities to deliberately practice these skills until they become second nature (Durlack et al., 2011; Ladd & Mize, 1983; Weissberg, Caplan, & Sivo, 1989). In the pilot, this was accomplished when students worked with the teacher to develop norms for collaborative



work. Students also tracked their progress in maintaining norms through their daily reflections. One of the more important elements of implementation, in this pilot, was the opportunity for students to see desired behaviors modeled by not only peers, but also the teacher. This outcome resonates with research, which has shown that teacher practices and expectations have significant influence over the process of improvements in students' social skills (Catalano, Berglund, Ryan, Lonczak, & Hawkins, 2002).

A teacher interested in developing collaboration among students should start by establishing norms with students. These should be heavily focused on social skills (looking individuals in the eye, maintaining appropriate conversational tone, actively listening to the speaker) and should be monitored and positively reinforced by both teacher and students even as they become part of the daily routine (Blum, Libbey, Bishop, & Bishop, 2004; Hamre & Pianta, 2005; Jennings & Greenberg, 2009). Once norms are established, the teacher should provide opportunities for the students to work collaboratively, in a variety of situations, so students are able to refine their collaborative skills (Bond & Hauf, 2004; Durlak et al., 2011). During this time, the teacher should continue to reinforce and model the norms for collaboration (Durlak et al., 2011). Over time, and with consistent reinforcement, the teacher will no longer have to facilitate student interactions, and collaboration will become more strongly rooted into students' expectation for the classroom experience. As the students become more proficient, teachers should shift the focus of students monitoring from proficiency in collaborative skills to the outcomes of collaboration. This will assist students in developing an understanding of the power of collaboration.

## The Role of Academic Perseverance in the Development of Critical Thinking and Creative Thinking

Academic perseverance is the ability of an individual to continue to work on a problem or task that is not immediately solved. The hallmark of academic perseverance is the ability to maintain the motivation to see the task to completion, even when unexpected challenges arise during the process (Farrington et al., 2014). Academic perseverance is often associated with the concept of grit, or the ability to maintain focus on one task for a long period of time (Duckworth et al., 2007). Studies have shown that individuals who exhibit grit tend to be highly successful and experts in their fields (Duckworth, 2009). While grit, itself, has been potentially identified as an innate and somewhat fixed personality trait (Srivastava et al., 2003), research has shown that it is possible to teach perseverant behaviors even when they are not innate to an individual (McCrae & Costa, 1994; Roberts & DelVecchio, 2000). Studies related to academic perseverance have shown a moderate relationship between perseverance and student performance outcomes (Farrington et al., 2014). However, a closer examination of the limited research shows that student perseverance is highly influenced by the classroom and school environment and tends to mimic the conditions in which the student is placed (Dweck et al., 2011).

### Critical Thinking

Critical thinking is viewed as an essential skill in the 21st century because of the vast amounts of information that are readily available for consumption (Conference Board, 2006). Complex problem solving is a requirement for higher paying opportunities in the 21st

century world because of the rise in automation and the trend toward outsourcing routine, low-cognitive demand jobs to countries where labor is less expensive (Pink, 2011; Saavedra & Opfer, 2012; Trilling & Fadel, 2009).

A teacher interested in promoting critical thinking in the classroom would first need to commit to allowing students to engage in productive struggle. This can be difficult for teachers who do not subscribe to a constructivist mindset, as it is counterintuitive to traditional teacher-centered classroom frameworks (Cubukcu, 2012; Tillapaugh & Haber-Curran, 2013). However, with practice, teachers can learn to push their students to solve complex problems that are beyond students' comfort zones. Beginning this process requires the teacher to provide an environment rich with sufficient supports for student perseverance (Duckworth, 2009; Tough, 2011). Literature indicates that this can best be done by providing instruction that is authentic (and valued by students), and structuring feedback so that it promotes a growth mindset among students (Boss et al., 2013; Dweck et al., 201; Farrington et al., 2012). When students feel they are valued as part of a community, they are more likely to feel they are capable of success. The prospect of success, coupled with willingness to take academic risks and the value that authentic work provides, develops the intrinsic motivation required for students to persevere in difficult academic situations (Duckworth et al., 2007; Dweck, et al., 2011).

In addition to modeling and teaching strategies for perseverance, students should also be provided with an adequate repertoire of learning strategies. In this pilot, when teachers began to transition their classrooms to student centered work spaces, they wondered if the students were frustrated because they lacked perseverance or if they lacked a sufficient volume of learning strategies that would see them to the completion of the task (Farrington et al., 2012). Learning

strategies are ways by which students focus on their academic goal, metacognitively monitor their progress toward their goals, and select specific strategies that assist them in progressing toward their goal (Farrington et al., 2012; Zimmerman, 2001).

While literature does not provide specific models for how to teach learning strategies (Farrington et al., 2012), it does provide significant evidence that there are several critical components that can be used as a means of developing students' proficiency in application of learning strategies during instruction. Students must develop effective means by which they employ metacognitive strategies (Hacker et al., 2009; Flavell, 1979; Isaacson & Fujita, 2006), monitor their learning and adjust behaviors when they are not being successful (Pintrich & DeGroot, 1990; Zimmerman, 2001), and self - regulate learning by applying cognitive strategies like rehearsal, elaboration, manipulation of information, and organizing information (Farrington et al., 2012; Paris & Winograd, 1990; Weinstein, Mayer, & Wittrock, 1986; Zimmerman, 1990).

Literature supports the idea that learning strategies can be developed in students over time, with results showing that students show the most promising results when they are explicitly taught learning strategies within the context of the cognitive content they are learning (Farrington et al., Graham & Harris, 1994; Hattie et al., 1996; Ritchhart et al., 2009). In this study, teachers provided students with opportunities to track their own progress toward proficiency, while they manipulated and organized information they acquired during the unit. Teaching these learning strategies within the context of the unit provided students with the ability to develop a sense of pride in their work, which motivated them to continue to persevere with the work, even though it was challenging (Bembenutty & Karbenick, 1998). Teachers

perceived that students' critical thinking skills improved in the last few days of the pilot. This was the time period when students had developed a sense of success and were beginning to see the results of their labor and were comfortable taking academic risks in order to learn more about the problem they were solving. This mirrors what literature says about developing critical thinking skills as they are predicted to improve with regularly occurring and structured opportunities to practice (Boss et al., 2013; Case, 2005; Duckworth et al., 2011).

### Creativity

The 21st century demands the ability of the workforce to continually adapt to fast paced innovation by continuously improving services, processes, and products (Trilling & Fadel, 2012). Innovative skills cannot be developed in the absence of opportunities to employ creative thinking skills nestled within authentic problems (Boss et al., 2013; Partnership for 21st century skills, 2007; Saavedra & Opfer, 2012; Trilling & Fadel, 2012).

Teachers who wish to develop creativity among their students should start by providing opportunities for students to think about problems from multiple perspectives or elaborate on solutions that other students provide to problems (Boss et al., 2013; Saavedra & Opfer, 2012). However, students who are just beginning to explore their creative abilities may be hesitant to engage in creative processes because of the common American misconception that creativity is a fixed trait that cannot be developed over time (Azzam, 2009; Niu & Sternberg, 2002; Saavedra & Opfer, 2012). The first step to combatting this misconception is underscoring the malleability of creativity with students by facilitating an environment where students have a growth mindset about their creative potential (Dweck, 2006; Saavedra & Opfer, 2012).

Once students have a firm foundation of willingness to take intellectual risks in order to develop their creativity, teachers can introduce learning strategies like brainstorming, elaboration exercises, and concept mapping, which have been shown to assist students in developing their creativity (Azzam, 2009; Boss et al., 2013; Trilling & Fadel, 2012). These processes will serve as a scaffold for students and allow them to begin to be more confident in their creative abilities. In this study, one of the key elements for developing reluctant students' creativity was the ability of those students to persevere when faced with a creative task. This was evident when students had to continue to revise their thinking about how to create and tune their musical instruments so that they could produce the final product, the song they were assigned. While the students found the work challenging, they continued to engage in the creative process with the support of their teachers. This resonates with literature, which indicates that teachers can enhance students' abilities to persevere in developing their creative abilities by providing encouragement and feedback that highlights effort, success, and progress (Dweck, 2009; Sternberg, 2006; Saavedra & Opfer, 2012).

### Conclusion

While the work of connecting non-cognitive factors (learning strategies, social skills, perseverance, mindset, and academic behaviors) with critical thinking, creativity, communication, and collaboration (4C skills) is in its infancy, this pilot study provided a foundation from which the rubric and visual has been devised to aid educators who have a desire to move their classrooms to a more 21st century skill focused environment. Using these tools will help educators, in both teaching and administrative roles, to more thoroughly understand

how to develop critical thinking, creativity, communication, and collaboration (4C skills) in students. While specific connections among non-cognitive factors and critical thinking, creativity, communication, and collaboration (4C skills) were made from this pilot study, it is evident that there are many places where these skills overlap and provide effective means for developing skills in students that will prepare them for their experiences in the workforce.

## CHAPTER 5 IMPLICATIONS AND RECOMMENDATIONS

The dissertation's Complex Problem of Practice emerges because current curriculum provides students few opportunities to develop and refine their skills in collaboration, creative thinking, effective communication, and critical thinking (the 4Cs). This dissertation in practice examined curriculum and strategies (connected to Florida Standards) that teachers can use to engage students in developing these essential skills. This will prepare students to engage in and meet the expectations of a 21st century workforce.

The intention of the pilot study was to determine the impact of providing students with the opportunity to engage in curriculum that will develop their 4C skills (critical thinking, creative thinking, collaboration, and communication). This type of instruction is not commonplace in the school district that was used for this study, nor is it commonplace in most classrooms across the United States (IYF, 2012; OECD, 2009; Peterson et al., 1989; Saavedra, 2012). The result of the lack of instruction has led to workforce concerns and an interest in developing “soft skills” among the nation's youth (Binkley et al., 2010); Saavedra, 2012.).

The Pilot study was conducted to answer two research questions:

1. Do students exhibit collaboration, creative thinking, effective communication, and critical thinking skills (4Cs) when the curriculum provides opportunity to engage the students in work where they can demonstrate the 4Cs?
2. How can explicitly teaching students non-cognitive factors (academic mindset, academic behaviors, perseverance, social skills, learning strategies) influence their ability to effectively demonstrate 4C skills?



While current legislative mandates require focus on assessment and accountability (Cawthon, 2004; Crowder & Konle, 2015; Kohn, 2001), there are curriculum programs that do emphasize the development of 4C skills (critical thinking, creative thinking, collaboration, and communication) alongside of content. These curricula are often described as Project Based Learning and show promise in developing students' 4C skills (critical thinking, creative thinking, collaboration, and communication) when teachers are provided with extended opportunities for professional learning and student progressions are followed over significant periods of time (Finklestein et al., 2010; Hixson et al., 2012; Mergendoller et al., 2006).

Together, the teacher and administrator practitioners have approached this dissertation in practice from what Herr and Anderson (2015) called organizational "insiders" collaborating to gather information to inform the teaching practices happening within the organization. In more traditional dissertations, conducting research in one's own setting can be frowned upon because of the natural biases the researchers bring to the work (Glesne & Peshkin, 1992). However, as insiders in the organization, both practitioners were able to approach the problem within the organizational context, and ensure that conclusions and solutions rendered were appropriate, ethical, and pragmatic for the organization. The teacher researcher was a participant in the pilot, noting the struggles and successes that came with implementation of the collaboration, communication, creative thinking, and critical thinking (4C) focused unit of instruction. The administrator researcher did not participate directly in the pilot, but analyzed the participants' reflections and the detailed notes from the focus groups. Together, the researchers collaborated to build the framework by which teachers can move toward implementing curriculum that will also develop students' collaboration, communication, creative thinking, and critical thinking

(4C) skills. The researchers monitored bias by maintaining active reflective practices and careful considerations of epistemology and methodology (Herr & Anderson, 2015). The researchers applied specific mechanisms for addressing biases, using the guidelines for validity criteria proposed by Herr and Anderson (2015) as well as triangulation of data, member validation (Lincoln & Guba, 1985), and validation meetings with our advisor and other doctoral candidates in our cohort (Bone, 1996).

Qualitative data were collected throughout the pilot process in order to determine whether teachers perceived students' improving their abilities to exhibit 4C (collaboration, communication, creative thinking, critical thinking) skills. Improvement was measured based on teachers' perceptions of success. These included teachers citing specific improvements in students' abilities, or noting the perceived improvement of students' willingness to participate in activities related to 4C (collaboration, communication, creative thinking, critical thinking) skills. These measures were chosen based on the participatory action research traditions of collaborative data analysis. Anderson and Herr (2015) noted that participatory action research can be participatory in multiple phases of research. Since one of the researchers is a participant in the study, both researchers felt it was necessary to include the other participants in the discussion of student progress. By involving the participants in the collection of data and the analysis of students' progress, the researchers built in a natural bias check-point, which helped to maintain the integrity of the study.

The pilot study was significant because it revealed teacher perceptions that students abilities to exhibit effective communication, collaboration, creativity, and critical thinking (4C) skills were increased with the implementation of a unit of instruction that was rich in 4C

opportunities and supported with explicit instruction in non-cognitive factors. The pilot also provided evidence that teachers perceived instruction and modeling non-cognitive factors to be integral to the development of strong communication, collaboration, creative thinking, and critical thinking (4C) skills. The data collected from the pilot informed the framework from the positionality of the teacher practitioner and administrative practitioner. This data informed the researchers about the need for a specific tool to guide administrators and practitioners in the implementation of curriculum rich with opportunities for students to develop their communication, collaboration, creative thinking, and critical thinking (4C) skills and a means by which teachers and administrators can understand the link between development of academic mindset, learning strategies, academic behaviors, social skills, and academic perseverance (non-cognitive factors) and communication, collaboration, creative thinking, and critical thinking (4C) skills. During the first three days of instruction, none of the teachers reported improvements. From Days 4-7 teachers began noting improvements in one or more of the 4C skills. During Days 8-10, multiple teachers noted significant overall improvement in one or more 4C skills.

By collaboratively analyzing the outcomes of the pilot from both the teacher and administrative perspectives, the researchers developed a framework to address the problem of practice: the lack of consistent opportunity for students to learn through curriculum that is rich in opportunities to develop collaboration, communication, critical thinking, and creative thinking (4C) skills.

### Program Coursework

Many factors shaped the direction of this dissertation, but none more than the EdD coursework coupled with the relationships and personal face-to-face conversations with faculty members. Notable courses included Facilitating Learning—Development & Motivation, Organizational Theory in Education, and Identifying Complex Problems of Practice. These course served as a platform for developing understanding of how to use theory and research in learning, development, and motivation to identify, analyze, and solve both learning and motivational problems in a variety of educational settings. Notable texts included Rueda's (2011) *The 3 Dimensions of Improving Student Performance*, Bolman and Deal (2011), and Mayer's (2010) *Applying the Science of Learning*. These texts served as foundational reading materials, which challenged and expanded our thinking and lead to the ability to successfully complete a gap analysis to diagnose an educational performance problem and solve it with research-based interventions. Ultimately, these materials, courses, and experiences were scaffolds that assisted in shaping the pilot study. The coursework experiences culminated with proposing and implementing data driven decisions, which brought the idea of a dissertation in practice to life and set a clear, concise path for moving forward to the completion of this work.

In addition to the coursework for the EdD program, both practitioners completed the requirements to become certified in educational leadership. These courses were instrumental in the development of the positionality of the administrator practitioner, and also provided significant perspective to the teacher practitioner. In particular, curriculum development and building school culture were discussed in great depth, and were beneficial for both the

development and progress of the pilot and dissertation process, but also the day-to-day job requirements of both practitioners.

While the coursework was significant in developing the understanding and perspectives of both practitioners, nothing was more impactful than the face-to-face dialogue with faculty, committee members, and, especially, our committee chair.

### Implications

The framework developed as a result of this pilot study is intended to inform teachers, administrators, and students by showing the link between the development of non-cognitive factors and communication, collaboration, critical thinking and creative thinking (4C) skills. The visual aid was developed by the researchers to show how academic mindset, learning strategies, academic behaviors, social skills, and academic perseverance (non-cognitive factors) function as prerequisite skills for collaboration, communication, creative thinking, and critical thinking (4C) skills. This link was one that teachers discovered through the implementation of the pilot study; teachers later indicated that they would have liked this support at the outset of implementation. The framework can be used by teacher and administrators as a diagnostic tool for assisting students in the development of specific 4C skills or as a means of determining whether a classroom is providing a firm foundation for 21st century skills by providing a collaboration, communication, creative thinking, and critical thinking (4C) rich curriculum.

The descriptions included in the rubric also provided recommendations based on the work of Farrington et al. (2012) for moving from one level of implementation to the next. The recommendations are intended for use in conjunction with the rubric as a means of providing

concrete guidance concerning how to embed reflective practices to help students develop skills and how to model for students an academic mindset, learning strategies, academic behaviors, social skills, and academic perseverance (non cognitive skills). This tool provides a means of scaffolding the development of collaboration, communication, creative thinking, and critical thinking (4C) skills.

The use of this framework and rubric offers a means by which educators can directly address the lack of 21st century skill development that is common in classrooms across the United States (International Youth Foundation, 2012; OECD, 2009; Peterson et al., 1989; Saavedra, 2012) and begins to respond to the demands expressed by employers for a more prepared 21st century workforce (Binkley et al., 2010; Saavedra, 2012). Employing this framework will serve the purpose of preparing students to make educated decisions as citizens, and to overcome the challenges that await them when they arrive in the workforce or in a post-secondary institution (Baron & Markman, 2000; Matthews, 2006; Parker, 2003; Wilson & Berenthal, 2005).

#### Recommendations for Future Study

The findings in this study indicate that teachers perceived students' communication, collaboration, critical thinking, and creativity (4C) skills were increased when they followed a unit plan that incorporated opportunities for students to practice these skills and were supported by the explicit instruction and monitoring of non cognitive factors (social skills, perseverance, academic mindset, academic behaviors, and learning strategies). While this study showed positive results, there were several limitations that should be noted. These limitations include the

context of the pilot, small sample size, and duration of the study. The success of this pilot generates the recommendations for future research that could serve to provide practitioners with more information about how to effectively develop communication, collaboration, critical thinking, and creativity (4C) skills in students.

The pilot for this study involved various fifth grade classes from a traditional elementary school. Elementary school students generally see one or two teachers throughout the school day. Along with this, the students are with the same group of peers throughout the school day, and school year. Because of its nature, the students have at least some knowledge of all of the personalities of the various students in their classrooms. This fact may (or may not) influence the development of students' communication and collaboration skills, and should be noted by practitioners. In contrast, secondary school settings provide students with more expansive opportunities to work with others, which more closely mirrors the workforce. Expanding the study to include more students across multiple grade levels would be an ideal way to determine whether the incorporation of opportunities to practice communication, collaboration, critical thinking, and creativity (4C) skills and the explicit teaching and monitoring of non-cognitive skills does enhance students' abilities to exhibit those particular qualities, even when students do not have familiarity with one another.

As previously noted, this study revealed the importance of the willingness of teachers to embrace a student centered classroom in order for students to make significant progress in the development of their communication, collaboration, critical thinking, and creativity (4C) skills. This pilot happened over the course of a two-week period of time. This was not a significant amount of time for teachers to assimilate to new, student centered teaching

strategies. Literature shows that teachers often need significant time and support to refine new instructional strategies (Guskey, 2000; Killion, 2008; Kirkpatrick, 1998). While results from this study showed improvements in teachers' perceptions of students abilities to exhibit 4C skills, further study is need to see if results are more dramatic when teachers have been provided with extensive professional learning and feedback to refine their abilities to teach in a way that promotes the development of these skills.

Finally, a more accurate means of measuring students' progress toward mastery of communication, collaboration, critical thinking, and creativity (4C) skills would be to measure those skills directly in students. This would require the development of a tool, aligned to Partnership for 21st Century Learning framework of 21st century ready skills (Partnership for 21st Century Skills, 2007) that could measure student proficiency in each of the 4C areas. Used as an assessment, this tool would be an ideal way to more accurately describe student strengths and progress toward 21st century proficiency, and could ultimately be an additional means by which students could market themselves to universities or businesses.

### Conclusion

This Dissertation in Practice addresses the problem of students lacking communication, collaboration, critical thinking and creativity (4C) skills as they enter the workforce. This problem is critical because it reveals a significant deficiency in our education system's ability to adequately prepare students to assimilate into their future roles in college, a career, or as a responsible citizen capable of making good decisions in a global economy (Millican, 2003; Stromquist, 2002). Neglecting this problem prevents the advancement of the country as



competitive in the world marketplace and able to sustain development and progress within the United States (Eicher, 1996; Friedman, 2005; Partnership for 21st Century Skills, 2004). The authors of this dissertation in practice have proposed implementing a framework for curriculum within education that is closely aligned with the needs of individuals living in a global society, including structured and supported opportunities for students to engage in curriculum rich in collaboration, creativity, communication, and critical thinking supported by explicit instruction on how to develop the non-cognitive skills necessary to be successful in solving problems. In order for teachers to develop these skills in students, school leaders must be willing and able to support teachers in delivering instruction that not only provides opportunities to engage in work that requires students to develop 4C skills, but also provides them with adequate non-cognitive supports.

APPENDIX A  
SCIENCE OF SOUND

**The Science of Sound: Unit Plan focused on Developing 4Cs and Non-Cognitive Factors through Standards Aligned Instruction**

**Standards Addressed:**

**MU.5.S.1.2:** Compose short vocal or instrumental pieces using a variety of sound sources.

**SC.5.N.1.1:** Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

**SC.5.N.2.2:** Recognize and explain that when scientific investigations are carried out, the evidence produced by those investigations should be replicable by others.

**SC5.P.10.1:** Investigate and describe some basic forms of energy, including light, heat, sound, electrical, chemical, and mechanical.

<b>Day</b>	<b>Activities</b>	<b>Assessments</b>	<b>Reflection for students</b>
1	<p>The teacher will introduce the students to the unit as a new type of instruction and ask for students to be candid in their opportunities to reflect on their learning throughout the unit.</p> <p>Students will complete a formative assessment targeting the focus standards.</p> <p>Students will be introduced to the learning scale for the unit and asked to write a reflection citing specific evidence to support their claim for where they perceive their level of knowledge.</p> <p>The teacher will explain that the students will be working in collaborative groups. Students will work as a class to develop norms for collaboration, including how partners will work together, what happens when there is a disagreement, and how to address a group</p>	<p>Students will complete the formative assessment focused on above standards. Teacher will assess the student work and create groups of three or four based on assessment scores (low scoring with mid scoring, mid scoring with high scoring).</p>	<p>Students will write their initial wonderings or concerns about the new way of work for this unit of study and will explain where they perceive themselves on the learning scale and will cite specific evidence to support their claim.</p>

	<p>member who is not performing to expectations. The teacher will record these norms and post them in a prominent place in the room so that students can refer to them throughout the duration of the lesson.</p> <p>The teacher will explain that students will receive continuous feedback throughout the learning journey. Feedback will not be in the form of grades. It will be one of three items: Mastery, Proficient (with comments on how to improve to mastery), and Not Yet (with specific comments on how to improve). The teacher will explain that system of feedback promotes a growth mindset, where learning is valued.</p>		
2	<p>Students will be presented with the challenge for the unit. They will be tasked with creating 3 different musical instruments with their group and playing their assigned song with the instruments they create. The teacher will assign students to groups and will review the norms the class developed. Each student will be provided with one card that contains a portion of a definition for a vocabulary word (Energy, pitch, frequency, wavelength, medium, tone, vibration, sound, strings, percussion, woodwinds, brass).</p> <p>Students will practice communicating with their team by explaining (not reading) their card to their teammates. The teammates will be asked to listen attentively using eye contact and positive body language (facing the person, only focused on what they are saying). Students will take turns providing each other with their piece of information. The group will collaborate to provide a complete definition of</p>	<p>The teacher will model how graphic organizers can be used as a way to organize thinking and enhance understanding of how words are related.</p> <p>Groups will be challenged to create a graphic organizer to show how they think the vocabulary words are inter-related. Groups will post their graphic organizer and will be able to adjust the graphic through the unit to reflect any changes in their thinking. The teacher will underscore the importance of the graphic organizer as a learning tool that will serve the purpose of facilitating learning, not just serving as a “grade”.</p>	<p>Students will reflect on how effectively their group was able to maintain group norms and rate their proficiency at communicating effectively with one another and will cite specific examples from their group work to support their claims.</p>

	their assigned vocabulary word.		
3	<p>Students will be provided with their challenge activity: work collaboratively to create at least 3 different musical instruments using materials provided and learn to play the song the group has been assigned (Mary had a Little Lamb, Ode to Joy, Twinkle Twinkle Little Star). Assigned songs for groups will be based on group dynamics and needs. Higher achieving groups may be assigned multiple songs or songs that require more notes to play.</p> <p>Students will be provided with materials and will begin to discuss what instruments they will create and how they will be created. Groups will interact with their materials and work collaboratively to create sounds.</p>	<p>The class will work collaboratively to create a rubric that will be used to assess their instrument creations. The rubric will be posted in a prominent place in the classroom so that all groups can refer to it through the duration of the unit.</p> <p>Students will revisit their graphic organizer of vocabulary words and will rearrange the word relationships, if they feel it is necessary. The teacher will provide specific feedback and ask questions to enhance student understanding.</p>	<p>Students will record their initial successes and failures in creating sound and will describe how their group is working through the vocabulary graphic organizer and the creation of instruments.</p>
4	<p>Groups will be offered the opportunity to generate questions they have about how musical instruments produce sound. Groups will be able to observe and interact with actual music instruments in order to find answers to their questions about how the instruments produce different sounds.</p>	<p>Groups will work with the teacher to refine their questions about musical instruments and later answer their questions about how the instruments create different sounds.</p> <p>Groups will continue to work on their graphic organizer to show how vocabulary words are related.</p> <p>The teacher will facilitate learning by asking probing questions and offering specific feedback to students.</p>	<p>Students will reflect on how well their group is communicating and working collaboratively, how they are progressing in their learning (scale assessment), and their progress on their graphic organizer.</p>
5	<p>Students will share their progress and points of frustrations with another group and will offer suggestions to each other on how to improve their outcomes.</p> <p>Groups will consider the advice of their peers and will continue to work on construction of their instruments. The teacher will continue to facilitate learning by offering specific feedback to students.</p>	<p>Groups will continue to work on their graphic organizer to show how vocabulary words are related.</p> <p>The teacher will facilitate learning by asking probing questions and offering specific feedback to students.</p>	<p>Students will reflect on how well their group is communicating and working collaboratively, how they are progressing in their learning (scale assessment), and their progress on their graphic organizer.</p>

6-7	Groups will continue to work on construction of their instruments and the ability to play their assigned song. The teacher will continue to facilitate learning by offering specific feedback to students.	Groups will continue to work on their graphic organizer to show how vocabulary words are related.  The teacher will facilitate learning by asking probing questions and offering specific feedback to students.	Students will reflect on how well their group is communicating and working collaboratively, how they are progressing in their learning (scale assessment), and their progress on their graphic organizer.
8-9	Students will use the rubric they created to (individually) provide specific, actionable peer feedback to groups regarding the mastery of their assigned task.	Each group of students will perform their assigned musical selection for the class and will explain their instruments and how they work using grade appropriate vocabulary words.  Students will individually write an explanation of what instruments their group created, and how those instruments were modified to create the desired sounds to play the song the group was assigned.  Groups will finalize their vocabulary graphic organizers and submit them for assessment.	Students will reflect on their road to mastery of the standards and will cite specific evidence that shows how their thinking aligns with the learning scale presented at the beginning of the unit. Students will also reflect on how and why their vocabulary graphic organizer changed as they progressed through the unit.  Students will also reflect on the structure of the unit and their perceptions of how this structure influenced their learning.

### Resources:

### Learning Scale

<b>4</b>	In addition to being able to provide an extensive explanation for how the instruments work, the student can teach others how to create musical instruments, tune musical instruments, and can infer how other instruments work based on the student's own interactions with instruments and their sounds.
<b>3</b>	The student can adequately explain (using appropriate science and music vocabulary words) how each of the different types of instruments produces sound and can explain how to modify the instrument to change the pitch of the sound that is created. The student understands and can explain the science of how energy is related to sound.
<b>2</b>	The student has an emerging understanding of how sound and energy are related, but has a limited understanding of how to produce sound through instrument modification.
<b>1</b>	The student has only a very preliminary framework for how sound is produced. There is limited evidence to support the student's understanding of how objects can create sounds and what role energy plays in the process.

APPENDIX B  
PERMISSION TO CONDUCT STUDY: FLAGLER COUNTY



P. O. Box 755 ■ 1769 E. Moody Blvd. ■ Bldg. 2 ■ Bunnell, FL 32110  
Phone (386) 437-7526 ■ Fax (386) 437-7577  
[www.flaglerschools.com](http://www.flaglerschools.com)

**BOARD OF EDUCATION**

Colleen Conklin  
Chairman  
District 3

Trevor Tucker  
Vice Chairman  
District 4

Sue Dickinson  
Board Member  
District 5

Andy Dance  
Board Member  
District 1

Janet McDonald  
Board Member  
District 2

Student School Board Member  
Montgomery Russell  
Flagler Palm Coast H.S.

Student School Board Member  
Lauren Emery  
Matanzas H.S.

Teacher of the Year  
Kimberly Weeks  
Old Kings Elementary School

Employee of the Year  
Deandre Harris  
Indian Trails Middle School

Jacob Oliva  
Superintendent

January 27, 2016

To Whom It May Concern,

Rodney Harshbarger and his wife, Denise Harshbarger, have approached me about conducting the pilot for their Dissertation in Practice within one of the schools in my district.

I understand that the pilot will involve 4 classes of students who will be exposed to Florida Standards aligned curriculum that is based in the 4Cs of 21<sup>st</sup> Century Learning (collaboration, critical thinking, creative thinking, and communication). I am also aware that, in addition to the 4C curriculum, the students will be taught non-cognitive factors (academic behaviors, perseverance, social skills, learning strategies, and academic mindset), in order to help them to meet the rigorous demands of a 4C curriculum aligned with Florida Standards.

The teachers that will be participating in this survey understand that this is voluntary. There will be no student names or student identifying information disclosed in this study. I understand that qualitative data will be collected from teachers as they implement this study, and that this information will be used as part of the Harshbargers' Dissertation in Practice, which is being completed through the University of Central Florida's Ed.D Education Program.

I am willing for this pilot study to be conducted in my district and am eager to see the outcomes of the instruction.

Sincerely,

Jacob Oliva  
Superintendent

"An Equal Opportunity Employer"



APPENDIX C  
INSTITUTIONAL REVIEW BOARD APPROVAL



University of Central Florida Institutional Review Board  
Office of Research & Commercialization  
12201 Research Parkway, Suite 501  
Orlando, Florida 32826-3246  
Telephone: 407-823-2901 or 407-882-2276  
[www.research.ucf.edu/compliance/irb.html](http://www.research.ucf.edu/compliance/irb.html)

### Approval of Exempt Human Research

**From:** UCF Institutional Review Board #1  
FWA00000351, IRB00001138

**To:** Denise Harshbarger and Co-PI: Rodney Harshbarger

**Date:** December 22, 2015

Dear Researcher:

On 12/22/2015, the IRB approved the following activity as human participant research that is exempt from regulation:

Type of Review: Exempt Determination  
Project Title: Learning in the 21st Century: Current Trends and Implications  
Investigator: Denise Harshbarger  
IRB Number: SBE-15-11836  
Funding Agency:  
Grant Title:  
Research ID: n/a

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the [Investigator Manual](#).

On behalf of Sophia Dziegielewski, Ph.D., L.C.S.W., UCF IRB Chair, this letter is signed by:

A handwritten signature in black ink that reads "Joanne Muratori".

Signature applied by Joanne Muratori on 12/22/2015 09:02:44 AM EST

IRB Manager

APPENDIX D  
PERMISSION TO CONDUCT STUDY: OLD KING'S ELEMENTARY SCHOOL



## OLD KINGS ELEMENTARY SCHOOL

301 Old Kings Rd. Flagler Beach, FL 32136

Phone: 386-517-2060 Fax: 386-517-2074

**Benjamin Osypian**  
Assistant Principal

**Kirianne Suriano**  
Assistant Principal

**Nick Schell**

**Principal**

11/18/15

To Whom it May Concern,

I am the Principal of Old Kings Elementary School in Flagler County, Florida. One of my teachers, Mr. Rodney Harshbarger and his wife, Denise Harshbarger, have approached me about conducting the pilot for their Dissertation in Practice within my school. I understand that the pilot will involve 4 classes of students who will be exposed to Florida Standards aligned curriculum that is based in the 4Cs of 21<sup>st</sup> century learning (collaboration, critical thinking, creative thinking, and communication). I am also aware that, in addition to the 4C curriculum, the students will be taught non-cognitive factors (academic behaviors, perseverance, social skills, learning strategies, and academic mindset) in order to help them to meet the rigorous demands of a 4C curriculum aligned with Florida Standards. I understand that qualitative data will be collected from teachers as they implement this study, and that this information will be used as part of the Harshbargers' Dissertation in Practice being completed through the University of Central Florida's EdD Education Program. I am willing for this pilot study to be conducted in my school and am eager to see the outcomes of the instruction.

Thank you,

Benjamin Osypian  
Principal

## REFERENCES

- Achieve. (2013). *Closing the expectations gap 2013. 50-state progress report on the alignment of state K-12 policies and practice with the demands of college and careers*. Retrieved from <http://www.achieve.org/files/2013ClosingtheExpectationsGapReport.pdf>
- Achieve. (2015). *Closing the expectations gap: 2014 annual report on the alignment of state K-12 policies and practice with the demands of college and careers*. Retrieved from <http://www.achieve.org/publications/closing-expectations-gap-2014>
- Albanese, M., & Mitchell, S. (1993). Problem-based learning: A review of literature on its outcomes and implementation issues. *Academic Medicine*, 68, 52-81.
- American Management Association. (2010). *Critical skills survey: Executive summary*. Retrieved from <http://www.amanet.org/news/AMA-2010-critical-skills-survey.aspx>
- Association of American Colleges and Universities. (2002). *Greater expectations: A new vision for learning as a nation goes to college*. Retrieved from <https://www.aacu.org/publications/greater-expectations>
- Atkinson, J. W. (1957). Motivational determinants of risk-taking behavior. *Psychological Review*, 64(6), 359.
- Azzam, A. M. (2009). Why creativity now? A conversation with Sir Ken Robinson. *Educational Leadership*, 67(1), 22-26.
- Babcock, P., & Marks, M. (2010). Leisure college, USA: The decline in student study time. *American Enterprise Institute for Public Policy Research*, 7, 1-7.

- Baker, A. M., Kanan, H. M., & Al-Misnad, S. A. (2008). Factors that discriminate best between students identified as motivated or not-motivated to achieve academically. *Educational Research and Reviews, 3*(4), 128.
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Upper Saddle River, NJ: Prentice-Hall.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: W.H. Freeman.
- Bandura, A., & Schunk, D. H. (1981). Cultivating competence, self-efficacy, and intrinsic interest through proximal self-motivation. *Journal of personality and social psychology, 41*(3), 586.
- Baron, R. A., & Markman, G. D. (2000). Beyond social capital: How social skills can enhance entrepreneurs' success. *The Academy of Management Executive, 14*(1), 106-116.
- Barron, B., & Darling-Hammond, L. (2008). *Powerful learning: Studies show deep understanding derives from collaborative methods*. Retrieved from <http://www.edutopia.org/inquiry-project-learning-research>
- Barron, B., & Darling-Hammond, L. (2008). *Excerpt: Teaching for meaningful learning: A review of research on inquiry-based and cooperative learning (teaching for meaningful learning)*. Retrieved from <http://www.edutopia.org/resource/wildwood-edutopia-teaching-for-meaningful-learning>
- Beane, J. A. (2013). A common core of a different sort: Putting democracy at the center of the curriculum. *Middle School Journal, 44*(3), 6-14.

- Belland, B., French, B., & Ertner, P. (2009). Validity and problem-based learning research: A review of instruments used to assess intended learning outcomes. *Interdisciplinary Journal of Problem-based Learning*, 3(1), 59-89.
- Bembenuddy, H., & Karabenick, S. A. (1998). Academic delay of gratification. *Learning and Individual Differences*, 10(4), 329-346.
- Binkley, M., Erstad, O., Herman, J., Raizen, S., Ripley, M., & Rumble, M. (2010). *Draft white paper 1: Defining 21st century skills*. Retrieved from <http://cms.education.gov.il/NR/rdonlyres/19B97225-84B1-4259-B423-4698E1E8171A/115804/defining21stcenturyskills.pdf>
- Blum, R. W., Libbey, H. P., Bishop, J. H., & Bishop, M. (2004). School connectedness—strengthening health and education outcomes for teenagers. *Journal of School Health*, 74(7), 231-235.
- Bond, L. A., & Hauf, A. M. C. (2004). Taking stock and putting stock in primary prevention: Characteristics of effective programs. *Journal of Primary Prevention*, 24(3), 199-221.
- Bonebright, D. A. (2010). 40 years of storming: A historical review of Tuckman's model of small group development. *Human Resource Development International*, 13(1), 111-120.
- Borman, G. D., & Dowling, N. M. (2008). Teacher attrition and retention: A meta-analytic and narrative review of the research. *Review of Educational Research*, 78(3), 367-409.
- Boss, S., Larmer, J., & Mergendoller, J. R. (2013). PBL for 21st century success: Teaching critical thinking, collaboration, communication, and creativity. Novato, CA: Buck Institute for Education.

- Boud, D. (2000). Sustainable assessment: Rethinking assessment for the learning society. *Studies in continuing education*, 22(2), 151-167.
- Bouffard-Bouchard, T. (1990). Influence of self-efficacy on performance in a cognitive task. *The Journal of Social Psychology*, 130(3), 353-363.
- Bransford, J., & Schwartz, D. (1999). Rethinking transfer: A simple proposal with multiple implications. *Review of Research in Education*, 24(1), 61-100.
- Bridgeland, J. M., Dilulio, J. J., & Morison, K. B. (2006). The silent epidemic: Perspectives of high school dropouts. Retrieved from ERIC database. (ED513444)
- Brooks, J.G., & Brooks, M.G. (1993). In search of understanding: The case for constructivist classrooms. Alexandria, VA: ASCD.
- Burghardt, M. D., Lauckhardt, J., Kennedy, M., Hecht, D., & McHugh, L. (2015). The effects of a mathematics infusion curriculum on middle school student mathematics achievement. *School Science & Mathematics*, 115(5), 204-215. doi:10.1111/ssm.12123
- Bybee, R. W. (1997, October). *The Sputnik era: Why is this educational reform different from all other reforms*. Paper presented at the Prepared for the Symposium Reflecting on Sputnik: Linking the Past, Present, and Future of Educational Reform Washington, DC.
- Carnegie Mellon. (2014). *Research in teaching and learning*. Retrieved from <https://www.cmu.edu/teaching/resources/Research/cognitive/index.html>
- Case, R. (2005). Moving critical thinking to the main stage. *Education Canada* 45(2), 45-49.
- Catalano, R. F., Berglund, M. L., Ryan, J. A., Lonczak, H. S., & Hawkins, J. D. (2002). Positive youth development in the United States: Research findings on evaluations of positive youth development programs. *Prevention & Treatment*, 5(1), 15a.



- Cawthon, S. (2004). How will No Child Left Behind improve student achievement? The necessity of classroom-based research in accountability reform. *Essays in Education*, 11(11).
- Chavkin, N. F. (Ed.). (1993). *Families and schools in a pluralistic society*. Albany, NY: State University of New York Press.
- Chen, D., Wang, L., & Neo, W. (2015). School-based curriculum development towards a culture of learning: Nonlinearity in practice. *British Journal of Educational Studies*, 63(2), 213-229. doi:10.1080/00071005.2015.1034236
- Collaborative for Academic, Social, and Emotional Learning. (2003). *Safe and sound: An educational leader's guide to evidence based social and emotional learning (SEL) programs*. Retrieved from <http://static1.squarespace.com/static/513f79f9e4b05ce7b70e9673/t/5331c141e4b0fba62007694a/1395769665836/safe-and-sound-il-edition.pdf>
- Conference Board. (2006). Are they really ready to work? *Employers' perspectives on the basic knowledge and applied skills of new entrants to the 21st century workforce*. Retrieved from [http://www.Partnership for 21st Century Learning.org/storage/documents/FINAL\\_REPORT\\_PDF09-29-06.pdf](http://www.Partnership for 21st Century Learning.org/storage/documents/FINAL_REPORT_PDF09-29-06.pdf)
- Credé, M., & Kuncel, N. R. (2008). Study habits, skills, and attitudes: The third pillar supporting collegiate academic performance. *Perspectives on Psychological Science*, 3(6), 425-453.
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Los Angeles, CA: Sage.

- Crowder, Z., & Konle, S. (2015). Gumbo ya-ya or, what Pearson can't hear: Opt-out, standardized testing, and student surveillance. *The High School Journal*, 98(4), 285-289.
- Cubukcu, Z. (2012). Teachers' evaluation of student-centered learning environments. *Education*, 133(1), 49-66.
- Cury, F., Elliot, A. J., Da Fonseca, D., & Moller, A. C. (2006). The social-cognitive model of achievement motivation and the 2×2 achievement goal framework. *Journal of Personality and Social Psychology*, 90(4), 666.
- Daley, F. (2010). Why college students drop out and what we do about it. *College Quarterly*, 13(3). Retrieved from <http://www.senecacollege.ca/quarterly/2010-vol13-num03-summer/daley.html>
- Darling-Hammond, L. (2008). Teacher learning that supports student learning. *Teaching for intelligence*, 2, 91-100.
- Darling-Hammond, L., Wei, R. C., Andree, A., Richardson, N., & Orphanos, S. (2009). *Professional learning in the learning profession*. Washington, DC: National Staff Development Council.
- Deci, E. L., & Ryan, R. M. (1985). The general causality orientations scale: Self-determination in personality. *Journal of Research in Personality*, 19(2), 109-134.
- Donavan, L., Green, T. D., & Mason, C. (2014). Examining the 21st century classroom: Developing an innovation configuration map. *Journal of Educational Computing Research*, 50(2), 161-178.
- Duckworth, A. (2009). True grit: Can perseverance be taught [Video file]. Retrieved from: <http://tedxtalks.ted.com/video/TEDxBlue-Angela-Lee-Duckworth-P>

- Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: Perseverance and passion for long-term goals. *Journal of Personality and Social Psychology*, 92(6), 1087.
- Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). The impact of enhancing students' social and emotional learning: A meta-analysis of school-based universal interventions. *Child development*, 82(1), 405-432.
- Dweck, C., & Leggett, E. (1998). A social-cognitive approach to motivation and personality. *Psychological Review*, 95, 256-273.
- Dweck, C. (2006). *Mindset: The new psychology of success*. New York, NY: Ballantine Books.
- Dweck, C., Walton, G. M., & Cohen, G. L. (2011). *Academic tenacity: Mindsets and skills that promote long-term learning*. Seattle, WA: Bill & Melinda Gates Foundation
- Eccles, J., Adler, T. E., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J., & Midgley, C. (1983). Expectancies, values, and academic behaviors. In J. T. Spence (Ed.), *Achievement and achievement motives* (pp. 75-146). San Francisco, CA: W.H. Freeman and Company.
- Education Commission of the States. (2011, December). Pre-K-12 literacy: State of the nation, 12(6). Retrieved from EbscoHost database.
- Eicher, T. S. (1996). Interaction between endogenous human capital and technological change. *The Review of Economic Studies*, 63(1), 127-144.
- Farrington, C., Roderick, M., Allensworth, E., Nagaoka, J., Keyes, T., Johnson, D. & Beechum, N. (2012). *Teaching adolescents to become learners: The role of noncognitive factors in shaping school performance: A critical literature review*. Chicago, IL: University of Chicago Consortium on Chicago School Research.

- Finkelstein, N., Hanson, T., Huang, C., Hirschman, B., & Huang, M. (2010). *Effects of problem based economics on high school economics instruction* (NCEE 2010-4002). Washington, DC: Institute of Education Sciences, US Department of Education.
- Flagler Beach, FL*. (n.d.). Retrieved from [http://www.realtor.com/realestateandhomes-search/Flagler-Beach\\_FL/price-900000-na](http://www.realtor.com/realestateandhomes-search/Flagler-Beach_FL/price-900000-na)
- Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist*, *34*(10), 906.
- Fredricks, J., Blumenfeld, P., Friedel, J., & Paris, A. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, *74*(1), 59-109.
- Freedman, S. (2007, November 7). New class(room) war: Teacher vs. technology. *The New York Times*. Retrieved from <http://www.nytimes.com/2007/11/07/education/07education.html>&gt;
- Freire, P. (1970). *Pedagogy of the oppressed*. New York, NY: Herder & Herder.
- Fullan, M. (2012). *Stratosphere: Integrating technology, pedagogy, and change knowledge*. Toronto, Canada: Pearson.
- Furrer, C., & Skinner, E. (2003). Sense of relatedness as a factor in children's academic engagement and performance. *Journal of Educational Psychology*, *95*, 148-162.
- Gallagher, S., & Gallagher, J. J. (2013). Using problem-based learning to explore unseen academic potential. *Interdisciplinary Journal of Problem-Based Learning*, *7*(1), 110-131. doi:10.7771/1541-5015.1322
- Gardner, D. P. (1983). *A nation at risk: The imperative for educational reform*. Washington, DC: US Department of Education.

- Glesne, S., & Peshkin, A. (1992). *Becoming qualitative researchers: An introduction*. White Plains, NY: Longman.
- Goertz, M. E., & Duffy, M. C. (2001). *Assessment and accountability systems in the 50 states: 1999-2000*. Retrieved from [http://repository.upenn.edu/cpre\\_researchreports/13](http://repository.upenn.edu/cpre_researchreports/13)
- Grayson, J. L., & Alvarez, H. K. (2008). School climate factors relating to teacher burnout: A mediator model. *Teaching and Teacher Education, 24*(5), 1349-1363.
- Greenberg, M., Weissberg, R., O'Brien, M., Zins, J., Fredericks, L., Resnik, H., and Elias, M. (2003). Enhancing school based prevention and youth development through coordinated social, emotional, and academic learning. *American Psychologist, 58*(6-7), 466-474.
- Greene, J. P. (2001). *High school graduation rates in the United States*. Retrieved from <http://www.manhattan-institute.org/html/high-school-graduation-rates-united-states-5799.html>
- Gresham, F. M., & Elliott, S. N. (1990). *Social skills rating system: Manual*. Los Angeles, CA: American Guidance Service.
- Gu, Q., & Day, C. (2007). Teacher's resilience: A necessary condition for effectiveness. *Teaching and Teacher Education, 23*(8), 1302-1316.
- Guskey, T. R. (2002). Does it make a difference? Evaluating professional development. *Educational Leadership, 59*(6), 45-51.
- Guskey, T. R. (2003). What makes professional development effective? *Phi Delta Kappan, 84*(10), 748.

- Guskey, T. R. (2005). Taking a second look at accountability: Strong evidence reflecting the benefits of professional development is more important than ever before. *Journal of Staff Development, 26*(1), 10-18.
- Hacker, D., Dunlosky, J., & Graesser, A. (2009). *Handbook of metacognition in education*. New York, NY: Routledge.
- Hamre, B., & Pianta, R. (2005). Can instructional and emotional support in the first grade classroom make a difference for children at risk of school failure? *Child Development, 76*, 949-967.
- Hanushek, E. A., Peterson, P. E., & Woessmann, L. (2012). *Achievement growth: International and U.S. state trends in student performance*. Retrieved from [https://www.hks.harvard.edu/pepg/PDF/Papers/PEPG12-03\\_CatchingUp.pdf](https://www.hks.harvard.edu/pepg/PDF/Papers/PEPG12-03_CatchingUp.pdf)
- Hardré, P. L. (2012). Standing in the gap: Research that informs strategies for motivating and retaining rural high school students. *Rural Educator, 34*(1), 1.
- Harada, V. H., Kirio, C., & Yamamoto, S. (2008). Project-based learning: Rigor and relevance in high schools. *Library Media Connection, 26*(6), 14-16.
- Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. New York, NY: Routledge.
- Hattie, J., Biggs, J., & Purdie, N. (1996). Effects of learning skills interventions on student learning: A meta-analysis. *Review of Educational Research, 66*(2), 99-136.
- Henry, G. T., Bastian, K. C., & Fortner, C. K. (2011). Stayers and leavers early-career teacher effectiveness and attrition. *Educational Researcher, 40*(6), 271-280.

- Herman, J. L. (2007). *Accountability and assessment: Is public interest in K-12 education being served?* Los Angeles, CA: National Center for Research on Evaluation, Standards, and Student Testing.
- Herr, K., & Anderson, G. (2015). *The action research dissertation: A guide for students and faculty*. Los Angeles, CA: Sage.
- Hixson, N., Ravitz, J., & Whisman, A. (2012). *Extended professional development in project-based learning: Impacts on 21st century teaching and student achievement*. Charleston, WV: West Virginia Department of Education, Division of Teaching and Learning, Office of Research.
- Honken, N. B., & Ralston, P. A. S. (2013). High-achieving high school students and not so high-achieving college students: A look at lack of self-control, academic ability, and performance in college. *Journal of Advanced Academics*, 24(2), 108-124.
- Hung, C.M., Hwang, G.J., & Huang, I. (2012). A project-based digital storytelling approach for improving students' learning motivation, problem-solving competence and learning achievement. *Journal of Educational Technology & Society*, 15(4), 368-379.
- Ingersoll, R. M. (2001). Teacher turnover and teacher shortages: An organizational analysis. *American Educational Research Journal*, 38(3), 499-534.
- Ingersoll, R. M., & Strong, M. (2011). The impact of induction and mentoring programs for beginning teachers a critical review of the research. *Review of Educational Research*, 81(2), 201-233.

- International Youth Foundation. (2012 March). *Opportunity for action: Preparing youth for 21st century livelihoods*. Retrieved from [http://www.iyfnet.org/sites/default/files/Opportunity\\_for\\_Action.pdf](http://www.iyfnet.org/sites/default/files/Opportunity_for_Action.pdf).
- Isaacson, R. M., & Fujita, F. (2006). Metacognitive knowledge monitoring and self-regulated learning: Academic success and reflections on learning. *Journal of Scholarship of Teaching and Learning*, 6(1), 39-55.
- Jennings, P. A., & Greenberg, M. T. (2009). The prosocial classroom: Teacher social and emotional competence in relation to student and classroom outcomes. *Review of Educational Research*, 79(1), 491-525.
- Johnson, D. W., & Johnson, R. T. (2009). An educational psychology success story: Social interdependence theory and cooperative learning. *Educational Researcher*, 38(5), 354-379.
- Jordan, A. (2014). Houston, we have a problem: Math and science education lags in the United States, but CASIS is working to reverse the trend. *IEEE Pulse*, 5(4), 46.
- Jorgensen, M. A., & Hoffmann, J. (2003). *History of the no child left behind act of 2001 (NCLB)*. Retrieved from [http://images.pearsonassessments.com/images/tmrs/tmrs\\_rg/HistoryofNCLB.pdf?WT.mc\\_id=TMRS\\_History\\_of\\_the\\_No\\_Child\\_Left\\_Behind](http://images.pearsonassessments.com/images/tmrs/tmrs_rg/HistoryofNCLB.pdf?WT.mc_id=TMRS_History_of_the_No_Child_Left_Behind)
- Karaçalli, S., & Korur, F. (2014). The effects of project-based learning on students' academic achievement, attitude, and retention of knowledge: The subject of 'electricity in our lives'. *School Science & Mathematics*, 114(5), 224-235. doi:10.1111/ssm.12071
- Katz, J. S., & Martin, B. R. (1997). What is research collaboration? *Research policy*, 26(1), 1-18.



- Kemmis, S., & McTaggart, R. (2005). Participatory action research: Communicative action and the public sphere. In K. Herr & G. Anderson (Eds.), *The action research dissertation: A guide for students and faculty*. Los Angeles, CA: Sage.
- Killian, J. (2010). *Assessing impact: Evaluating staff development*. Oxford, OH: National Staff Development Council.
- Kirkpatrick, D. L. (2006). Seven keys to unlock the four levels of evaluation. *Performance Improvement, 45*(7), 5-8.
- Kivunja, C. (2014). Teaching students to learn and to work well with 21st century skills: Unpacking the career and life skills domain of the new learning paradigm. *International Journal of Higher Education, 4*(1), 1-11.
- Kober, N., & Rentner, D. S. (2012). *Year two of implementing the common core state standards: States' progress and challenges*. Retrieved from  
file:///C:/Users/D99012032/Downloads/KoberRentner\_Report\_CommonCore\_1.25.12.pdf
- Kohn, A. (2001). Fighting the tests: A practical guide to rescuing our schools. *Phi Delta Kappan, 82*(5), 348-357.
- Kolikant, Y. (2010). Digital natives, better learners? Students' beliefs about how the Internet influenced their ability to learn. *Computers in Human Behavior, 26*(6), 1384-1391.
- Komaraju, M., Ramsey, A., & Rinella, V. (2013). Cognitive and non-cognitive predictors of college readiness and performance: Role of academic discipline. *Learning & Individual Differences, 24*, 103-109. doi:10.1016/j.lindif.2012.12.007

- Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukophadhyay, T., & Scherlis, W. (1998). Internet paradox: A social technology that reduces social involvement and psychological well-being? *American Psychologist*, *53*(9), 1017.
- Ladd, G. W., & Mize, J. (1983). A cognitive–social learning model of social-skill training. *Psychological Review*, *90*(2), 127.
- Larmer, J., Mergendoller, J., & Boss, S. (2015). *Setting the Standard for Project Based Learning*. Alexandria, VA: ASCD.
- Larsen, D. P., Butler, A. C., & Roediger, H. L. (2009). Repeated testing improves long-term retention relative to repeated study: A randomized controlled trial. *Medical Education*, *43*(12), 1174-1181.
- Lee, J., & Shute, V. J. (2010). Personal and social-contextual factors in K–12 academic performance: An integrative perspective on student learning. *Educational Psychologist*, *45*(3), 185-202.
- Lleras, C. (2008). Do skills and behaviors in high school matter? The contribution of non-cognitive factors in explaining differences in educational attainment and earnings. *Social Science Research*, *37*(3), 888-902.
- Malecki, C. K., & Elliot, S. N. (2002). Children's social behaviors as predictors of academic achievement: A longitudinal analysis. *School Psychology Quarterly*, *17*(1), 1.
- Marzano, R. J., Pickering, D., & Pollock, J. E. (2001). *Classroom instruction that works: Research-based strategies for increasing student achievement*. Alexandria, VA: ASCD.

- Mathis, W. J. (2010). *The "Common core" standards initiative: An effective reform tool*. Retrieved from [http://www.greatlakescenter.org/docs/Policy\\_Briefs/Mathis\\_NationalStandards.pdf](http://www.greatlakescenter.org/docs/Policy_Briefs/Mathis_NationalStandards.pdf)
- Mayer, R. E. (2011). *Applying the science of learning*. Boston, MA: Pearson/Allyn & Bacon.
- McCrae, R. R., & Costa, P. T. (1994). The stability of personality: Observations and evaluations. *Current Directions in Psychological Science*, 3(6), 173-175.
- McDonnell, L. M. (2005). No child left behind and the federal role in education: Evolution or revolution? *Peabody Journal of Education*, 80(2), 19-38.
- Mega, C., Ronconi, L., & De Beni, R. (2014). What makes a good student? How emotions, self-regulated learning, and motivation contribute to academic achievement. *Journal of Educational Psychology*, 106(1), 121-131. doi:10.1037/a0033546
- Mergendoller, J., Maxwell, N., & Bellismo, Y. (2006). The effectiveness of problem-based instruction: A comparative study of instructional methods and student characteristics. *Interdisciplinary Journal of Problem-based Learning*, 1(2), 49-69.
- Millikan, R. (2003). Globalisation and education: Critical perspectives. *Journal of Research in International Education*, 2(3), 352-353.
- Mouton, S. G., Hawkins, J., McPherson, R. H., & Copley, J. (1996). School attachment: Perspectives of low-attached high school students. *Educational Psychology*, 16(3), 297-304.
- Mueller, C. M., & Dweck, C. S. (1998). Praise for intelligence can undermine children's motivation and performance. *Journal of Personality and Social Psychology*, 75(1), 33.

- National Education Association. (2010). *Preparing 21st century students for a global society: An educator's guide to the "Four Cs"*. Retrieved from <http://www.nea.org/assets/docs/A-Guide-to-Four-Cs.pdf>
- Newman, M. (2003). *A pilot systematic review and meta-analysis on the effectiveness of problem based learning*. Retrieved from [https://www.heacademy.ac.uk/sites/default/files/sr2\\_effectiveness\\_of\\_pbl\\_0.pdf](https://www.heacademy.ac.uk/sites/default/files/sr2_effectiveness_of_pbl_0.pdf)
- Newmann, F. (1996). *Authentic achievement: Restructuring schools for intellectual quality*. San Francisco, CA: Josey Bass.
- Niu, W., & Sternberg, R. (2002). Contemporary studies on the concept of creativity: The East and the West. *Journal of Creative Behavior*, 36(4), 269-288.
- Organization of Economic Co-Operation and Development. (2009). *Creating effective teaching and learning environments: First results from TALIS*. Retrieved from <http://www.oecd.org/edu/school/43023606.pdf>.
- The Partnership for 21st Century Learning. (2015). *Partnership for 21st century learning framework definitions*. Retrieved from [http://www.Partnership for 21st century Learning.org/storage/documents/docs/PARTNERSHIP FPR 21ST CENTURY LEARNING\\_Framework\\_Definitions\\_New\\_Logo\\_2015.pdf](http://www.Partnership%20for%2021st%20century%20learning.org/storage/documents/docs/PARTNERSHIP%20FPR%2021ST%20CENTURY%20LEARNING_Framework_Definitions_New_Logo_2015.pdf)
- Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research*, 66(4), 543-578.
- Paris, S. G., & Winograd, P. (1990). How metacognition can promote academic learning and instruction. *Dimensions of Thinking and Cognitive Instruction*, 1, 15-51.

- Paris, S. G., Lipson, M. Y., & Wixson, K. K. (1983). Becoming a strategic reader. *Contemporary Educational Psychology*, 8(3), 293-316.
- Partnership for 21st Century Skills. (2007). *Partnership for 21st century skills framework*. Retrieved from [http://www.Partnership for 21st Century Learning.org/storage/documents/1.\\_\\_Partnership for 21st Century Learning\\_framework\\_2-pager.pdf](http://www.Partnership for 21st Century Learning.org/storage/documents/1.__Partnership for 21st Century Learning_framework_2-pager.pdf)
- Payne, R. K., DeVol, P., & Smith, T. D. (2001). *Bridges out of poverty: Strategies for professionals and communities*. New York, NY: Aha.
- Peterson, P, Fennema, E., Carpenter, T., & Loef, M. (1989). Teacher's pedagogical content beliefs in mathematics. *Cognition and Instruction*, 6(1), 1-40.
- Peterson, P. E., Woessmann, L., Hanushek, E. A., & Lastra-Anadón, C. X. (2011). *Globally challenged: Are US students ready to compete? The latest on each state's international standing in math and reading*. Retrieved from <http://files.eric.ed.gov/fulltext/ED526954.pdf>
- Pink, D. H. (2006). *A whole new mind: Why right-brainers will rule the future*. New York, NY: Riverhead Books.
- Pink, D. H. (2011). *Drive: The surprising truth about what motivates us*. New York, NY: Riverhead Books.
- Pintrich, P. R. (2003). A motivational science perspective on the role of student motivation in learning and teaching contexts. *Journal of Educational Psychology*, 95(4), 667-686.  
doi:10.1037/0022-0663.95.4.667

- Pintrich, P. R., & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology*, 82(1), 33.
- Pokay, P., & Blumenfeld, P. C. (1990). Predicting achievement early and late in the semester: The role of motivation and use of learning strategies. *Journal of Educational Psychology*, 82(1), 41.
- Raizen, S. (1997). Making way for technology education. *Journal of Science Education and Technology*, 6(1), 59-77.
- Ravitz, J. (2009). Introduction: Summarizing findings and looking ahead to a new generation of PBL research. *Interdisciplinary Journal of Problem-Based Learning*, 3(1), 3-11.
- Reeves, D. B. (2006). *The learning leader: How to focus school improvement for better results*. Alexandria, VA: ASCD.
- Ritchhart, R., Turner, T., & Hadar, L. (2009). Uncovering students' thinking about thinking using concept maps. *Metacognition and Learning*, 4(2), 145-159.
- Roberts, B. W., & Del Vecchio, W. F. (2000). The rank-order consistency of personality traits from childhood to old age: a quantitative review of longitudinal studies. *Psychological Bulletin*, 126(1), 3.
- Rotherham, A. J., & Willingham, D. T. (2010). 21st-century skills. *American Educator*, 17-20.
- Rueda, R. (2011). *The 3 dimensions of improving student performance: Finding the right solutions to the right problems*. New York, NY: Teachers College Press.

- Ryan, A. M., Gheen, M. H., & Midgley, C. (1998). Why do some students avoid asking for help? An examination of the interplay among students' academic efficacy, teachers' social-emotional role, and the classroom goal structure. *Journal of educational psychology*, 90(3), 528.
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68-78. doi:10.1037/0003-066X.55.1.68
- Saavedra, A. R., & Opfer, V. D. (2012). Learning 21st-century skills requires 21st-century teaching. *Phi Delta Kappan*, 94(2), 8-13.
- Scafidi, B., Sjoquist, D. L., & Stinebrickner, T. R. (2007). Race, poverty, and teacher mobility. *Economics of Education Review*, 26(2), 145-159.
- Schleicher, A. (Ed.). (2012). *Preparing teachers and developing school leaders for the 21st century: Lessons from around the world*. Retrieved from <https://www.oecd.org/site/eduistp2012/49850576.pdf>
- Shepard, L. A. (2000). The role of assessment in a learning culture. *Educational Researcher*, 29(7), 4-14.
- Shulman, L. S., & Hutchings, P. (2004). *The wisdom of practice: Essays on teaching, learning, and learning to teach*. San Francisco, CA: Jossey-Bass.
- Silva, E. (2008). *Measuring skills for the 21st century*. Retrieved from <http://educationpolicy.air.org/sites/default/files/publications/MeasuringSkills.pdf>

- Silver, E., Mesa, V., Morris, K., Star, J., & Benken, B. (2009). Teaching mathematics for understanding: An analysis of lessons submitted by teachers seeking NBPTS certification. *American Educational Research Journal*, 46(2), 501-531.
- Skinner, B. (1953). *Science and human behavior*. New York, NY: Free Press.
- Srivastava, S., John, O. P., Gosling, S. D., & Potter, J. (2003). Development of personality in early and middle adulthood: Set like plaster or persistent change? *Journal of Personality and Social Psychology*, 84(5), 1041.
- Staats, A. (1963). *Complex human behavior*. New York, NY: Holt, Rinehart and Winston.
- Sternberg, R. J. (2006). The nature of creativity. *Creativity Research Journal*, 18(1), 87-98.
- Stiggins, R. (2005). From formative assessment to assessment for learning: A path to success in standards-based schools. *Phi Delta Kappan*, 324-328.
- Stromquist, N. P. (2002). *Education in a globalized world: The connectivity of economic power, technology, and knowledge*. Lanham, MD: Rowman & Littlefield.
- Taylor, M. W. (2013). Replacing the ‘teacher-proof’ curriculum with the ‘curriculum-proof’ teacher: Toward more effective interactions with mathematics textbooks. *Journal of Curriculum Studies*, 45(3), 295-321. doi:10.1080/00220272.2012.710253
- TED. (2009, October 18). Angela Duckworth: True grit: Can perseverance be taught? [Video file]. Retrieved from <https://www.youtube.com/watch?v=qaeFnxSfSC4>
- Teo, A., Carlson, E., Mathieu, P. J., Egeland, B., & Sroufe, L. A. (1996). A prospective longitudinal study of psychosocial predictors of achievement. *Journal of School Psychology*, 34(3), 285-306.



- Thoman, E., & Jolls, T. (2004). Media literacy—A national priority for a changing world. *American Behavioral Scientist*, 48(1), 18-29.
- Tillapaugh, D., & Haber-Curran, P. (2013). At the intersection of leadership and learning: a self-study of using student-centered pedagogies in the classroom. *Educational Action Research*, 21(4), 519-531. doi:10.1080/09650792.2013.832345
- Tomlinson, C. A. (2000). Reconcilable differences: Standards-based teaching and differentiation. *Educational Leadership*, 58(1), 6-13.
- Tough, P. (2011). What if the secret to success is failure. *The New York Times Magazine*. Retrieved from [http://www.nytimes.com/2011/09/18/magazine/what-if-the-secret-to-success-is-failure.html?\\_r=0](http://www.nytimes.com/2011/09/18/magazine/what-if-the-secret-to-success-is-failure.html?_r=0)
- Tracey, T. J., & Sedlacek, W. E. (1982). *Non-cognitive variables in predicting academic success by race*. Retrieved from <http://files.eric.ed.gov/fulltext/ED219012.pdf> .
- Trilling, B., & Fadel, C. (2009). *21st century skills: Learning for life in our times*. San Francisco, CA: John Wiley & Sons.
- Tucker, M. S. (2011a). Standing on the Shoulders of Giants: An American Agenda for Education Reform. *National Center on Education and the Economy (NJ3)*.
- Tucker, M. S. (Ed.). (2011b). *Surpassing Shanghai: An agenda for American education built on the world's leading systems*. Cambridge, MA: Harvard Education Press.
- Tuckman, B. W. (1965). Developmental sequence in small groups. *Psychological Bulletin*, 63(6), 384.

- Turner, S. L. (2014). Creating an assessment-centered classroom: Five essential assessment strategies to support middle grades student learning and achievement. *Middle School Journal, 45*(5), 3-16.
- Tyack, D. (1995). *Tinkering toward utopia: A century of public school reform*. Cambridge, MA: Harvard University Press.
- United States Government Accountability Office. (2012). *K-12 education: Selected states and school districts cited numerous federal requirements as burdensome, while recognizing some benefits*. Retrieved from <http://www.gao.gov/assets/600/591930.pdf>
- VanTassel-Baska, J., Bracken, B., Feng, A., & Brown, E. (2009). A longitudinal study of enhancing critical thinking and reading comprehension in title I classrooms. *Journal for the Education of the Gifted, 33*(1), 7-37.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher mental process*. Cambridge, MA: President and Fellows of Harvard College.
- Wang, M., & Eccles, J. (2013). School context, achievement motivation, and academic engagement: A longitudinal study of school engagement using a multidimensional perspective. *Learning & Instruction, 28*, 12-23.
- Waters, T., Marzano, R. J., & McNulty, B. (2003). *Balanced leadership: What 30 years of research tells us about the effect of leadership on student achievement*. Retrieved from <http://www.educationallleaders.govt.nz/Pedagogy-and-assessment/Pedagogical-leadership/Balanced-leadership-what-30-years-of-research-tells-us-about-the-effect-of-leadership-on-student-achievement>

- Weinstein, C. E., Mayer, R. E., & Wittrock, M. C. (1986). *Handbook of research on teaching*. New York, NY: MacMillan.
- Weiss, E. M. (1999). Perceived workplace conditions and first-year teachers' morale, career choice commitment, and planned retention: A secondary analysis. *Teaching and Teacher Education, 15*(8), 861-879.
- Weissberg, R. P., Caplan, M. Z., & Sivo, P. J. (1989). A new conceptual framework for establishing school-based social competence promotion programs. In L. A. Bond & B. E. Compas (Eds.), *Primary prevention and promotion in the schools* (pp. 255-296). Newbury Park, CA: Sage.
- Wentzel, K. R. (1991). Relations between social competence and academic achievement in early adolescence. *Child Development, 62*(5), 1066-1078.
- Wentzel, K. R. (1993). Does being good make the grade? Social behavior and academic competence in middle school. *Journal of Educational Psychology, 85*(2), 357.
- Wentzel, K. R., & Asher, S. R. (1995). The academic lives of neglected, rejected, popular, and controversial children. *Child Development, 66*(3), 754-763.
- Wentzel, K. R., & Caldwell, K. (1997). Friendships, peer acceptance, and group membership: Relations to academic achievement in middle school. *Child Development, 68*(6), 1198-1209.
- Wigfield, A. (1994). Expectancy-value theory of achievement motivation: A developmental perspective. *Educational Psychology Review, 6*(1), 49-78.
- Wigfield, A., & Eccles, J. S. (1992). The development of achievement task values: A theoretical analysis. *Developmental Review, 12*(3), 265-310.

- William, D., Lee, C., Harrison, C., & Black, P. J. (2004). Teachers developing assessment for learning: Impact on student achievement. *Assessment in Education: Principles, Policy, and Practice*, 11(1), 49-65.
- Wolf, M. A. (2004). Professional development for professional developers. *THE Journal*, 31(12), 30.
- Wraga, W. G. 1. (2011). What's the problem with a 'rigorous academic curriculum'? Setting new terms for students' school experiences. *Clearing House*, 84(2), 59-64.  
doi:10.1080/00098655.2010.511307
- Wyers, A. (2014). *Website top 10 online colleges visualizes valuable future work skills*. Retrieved from <http://www.trendhunter.com/trends/future-work-skills>
- Yang, C. K. (2011). *How do students' problem solving strategies and preferences in learning environments relate to their mathematical performance? A comparative study between South Korea and the United States*. Retrieved from <http://files.eric.ed.gov/fulltext/ED528918.pdf>
- Zimmerman, B. (2001). Self-regulated learning. *International Encyclopedia of the Social and Behavioral Sciences* (pp.13855-13859). New York, NY: Elsevier.
- Zimmerman, B., & Schunk, D. (Eds.). (1989). *Self-regulated learning and academic achievement: Theory, research, and practice*. New York, NY: Routledge.