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Effects of Teacher Grit on Student Grit and Reading Achievement: A Mixed-Methods Study

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EFFECTS OF TEACHER GRIT ON STUDENT GRIT AND READING ACHIEVEMENT: A MIXED-METHODS STUDY

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Grit is a two-factored, non-cognitive skill including perseverance and passion. Grit is quantified through the grit-S survey, which measures an individual's degree of grit. Higher degrees of grit have a positive influence on life success. Teachers have an influence on student achievement. The current mixed-methods study explored the influence of teacher grit on student grit and student achievement by utizing the grit-S survey, classroom observations and teacher interviews. Although this current study revealed no statistically significant connection between teacher grit and student grit, there was a statistically significant negative correlation between the scores within the factor of perseverance. Implications, recommendations for professional practice and suggested research studies to further the extension of this research.

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"At times our own light goes out and is rekindled by a spark from another person. Each of us has cause to think with deep gratitude of those who have lighted the flame within us." -Albert Schweitzer

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CHAPTER I

INTRODUCTION

Achievement involves more than academic skills; however, education, which is often the gateway to a successful life, is being measured primarily through academic, standardized tests. Achievement is often quantified through academic, standardized outcome-based tests, but this practice ignores a large part of the equation. Both cognitive and non-cognitive measures of student growth should be included to ensure effective instruction that can yield positive student reading achievement (Duckworth, 2009; Kallick & Zmuda, 2017; Sackett, Borneman, & Connelly, 2008). Recently, a non-cognitive skill defined as grit has shown some promise in life success. The two-factors included in the non-cognitive skill of grit are perseverance and passion in a topic. Individuals with higher degrees of grit may have an increased potential for life success.

Although cognitive skills are well-known and important in measuring reading achievement, developing an effective measure of non-cognitive, non-academic skills has been more challenging to attain (Kaufman & Agars, 2009). In a meta-analysis by Hattie (2012), non- cognitive skills revealed high effects sizes on student achievement, with motivation (d = .48), goals (d = .50), and self-concept (d = .47) ranking as some of the highest student influences on academic achievement. Life achievement involves more than academic skills and requires individuals to have other non-cognitive, non-academic skills (Duckworth, 2009; Duckworth, 2016; Hoerr, 2017; Kaufman & Agars, 2009; Kuncel & Hezlett, 2007; Sackett, Borneman, & Connelly, 2008).

The studies reviewing high-stakes testing revealed that there is a parallel between the degree of reading achievement on high-stakes tests and life achievement (Duckworth,

2009; Kuncel & Hezlett, 2007). A meta-analysis of the impact of standardized tests showed a positive correlation with student reading achievement in higher education (Kuncel & Hezlett, 2007). This meta-analysis brought a plethora of rebuttals, some of which called for discussion of other potential causal links that are just as essential but not assessed on standardized tests. Rather than disagreeing with the criticism of their meta-analysis, Kuncel and Hazlett agreed with the critics. Kuncel and Hazelett further contended that the meta-analysis information should not be used in isolation and that certain individual characteristics beneficial in determining achievement are poorly measured (Lerdau, Avery, Brown, Sherley, Kuncel, & Hezlett, 2007).

Another meta-analysis by Sackett, Borneman, and Connelly (2008) reviewed research on high-stakes testing and attempted to negate the concerns about the value placed on high-stakes testing. According to Sackett et al., high-stakes testing is valid and fair, but even this analysis revealed a concern about what individuals are expecting from these tests. Sackett et al. suggests:

> There is no reason to expect such tests to be predictive of criteria such as whether a student will or will not be satisfied with the social environment at college or whether an employee will or will not go out of his or her way to be helpful to coworkers. (p. 219)

Since high-stakes tests are quantifiable and have shown a positive correlation to life achievement, they can be valuable in predicting student reading achievement (Kuncel & Hezlett, 2007; Sackett et al., 2008). Additionally, there is current research that can connect previous achievement to future successes on future assessments and in life (Hattie, 2012; SASEVAAS, 2016). Furthermore, investigating both cognitive and non-

cognitive skill development may more effectively measure long-term achievement.

Cognitive skills define what individuals can do; whereas, non-academic, non-cognitive skills define what individuals decide to do. Since there are some measures of the academic component, and even with these measures, the interventions that have been attempted yielded little to no improvement, an exploration of the non-academic, non-cognitive traits in addition to the academic, cognitive traits might prove beneficial. "It seems that in exploring the vast mixed-methods territory of individual differences not captured by high-stakes tests, cross-disciplinary collaboration may be the most promising way forward" (Duckworth, 2009, p. 280).

In the future, complex situations will be everywhere. The need for focus on students' ability to devise real-world problem-solving skills is necessary for today's students. Classrooms need to provide opportunities for students to think critically, reason, analyze, interpret, and synthesize information. Additionally, classrooms need to include opportunities for students to grapple with new learnings in an environment that is engaging and fosters resiliency. Achievement requires more that academic success; it requires students to develop and teachers to foster the non-cognitive skills that impact achievement. Grit is a non-cognitive skill that has promise to support achievement. Grit can be defined as "tenacity, perseverance, hanging in, and not ever giving up" (Hoerr, 2017, p. 111).

This mixed-methods study was an exploration of the possible connection between teachers' grit and students' grit and the possible connection between teacher grit and student reading achievement on an outcome-based standardized assessment. This research study utilized beginning-of-the-year (B-O-Y) and end-of-the-year (E-O-Y)

survey data, teacher interviews, and classroom observations. This chapter will include a more thorough explanation of the non-cognitive, non-academic trait of grit, the importance of grit in 21st century learning, the difficulty of measuring non-academic skills, and current research on the topic of grit. Additionally, a statement of the problem and the research questions are included.

Statement of the Problem

Technology integration and development are integral features of 21st century skills; however, 21st century skills are much more than knowing how to navigate a computer. According to the U. S. Department of Education, Office of Educational Technology (USDOET), in order for students to be successful in the future, they need to have core content knowledge, life skills, and the ability to identify and create innovative ideas and tools for the rapidly changing society (Shechtman, DeBarger, Dornsife, et al., 2013). The ability to identify and create innovative ideas and tools are important skills for solving problems and navigating not only the 21st century society, but also the workforce. Lack of problem-solving skills can have an astoundingly negative impact on employment (Casner-Lotto & Barrington, 2006; Shechtman, et al., 2013). Between 65% and 80% of employers reported the five most important 21st century skills as teamwork, leadership, written and oral communication, initiative, and problem-solving skills (Job Outlook, 2016). When reviewing this list, it is evident that academic and non-academic skills are critical for life success.

Most student reading achievement assessments measure only academic skills and do not account for the non-academic skills needed in today's society. Considering that some of the 21st century skills include teamwork, professionalism, ethics and moral

responsibility and are the very same skills that employers express are lacking in graduates entering the workforce, there needs to be a more comprehensive way to measure and determine student achievement (Casner-Lotto & Barrington, 2006; Shechtman, et al. , 2013). This study explored a new measure of the non-academic, non-cognitive skill called grit, to identify any possible connection between the degree of teacher grit, the degree of student grit, and student reading achievement and success.

The ambiguity of non-academic skills has made measuring them a challenge. These traits are not easy to reveal through test scores alone; however, a tool called the Short Grit Scale (Grit-S) has shown to be a valid and reliable measure of the non-academic, non-cognitive skill of grit (Duckworth & Quinn, 2009). Individuals with high levels of grit exhibit "effort and interest over years despite failure, adversity, and plateaus in progress" (Duckworth, Peterson, Matthews, & Kelly, 2007, p. 1088). Most assessments of success are measuring what individuals *can* do rather than what individuals *choose* to do. The Grit-S measures an individual's "consistency of interest" and "perseverance of effort."

Interest and perseverance are choice-based rather than ability-based. Passion and perseverance for long-term goals, as defined in the trait of grit, has "predicted achievement in challenging domains over and beyond measures of talent" (Duckworth & Quinn, 2009, p. 3). All individuals that meet with success appear to have many different attributes, but one thing in common which are the factored involved in grit (Duckworth, 2016; Hoerr, 2017).

Non-cognitive and non-academic traits such as grit are beneficial for overall life achievement (Duckworth, 2016; Hoerr, 2017; Kallick & Zmuda, 2017). There is some

evidence that reveals teachers with certain non-academic traits may provide students with a more successful educational experience (Bain, 2004; Hattie, 2009). Research regarding teacher effectiveness revealed that two positive traits, grit and life satisfaction, have a significantly positive effect on teacher performance (Duckworth, Quinn, & Seligman, 2009; Henderson & Milstein, 2003). Studies revealed that these traits are the same traits that facilitate student reading achievement; thereby meaning that if students have these traits, they are more apt to be successful in life (Duckworth, 2016; Tough, 2012). If effective teachers tend to exhibit strong non-academic, non-cognitive skills, and those particular skills are also indicative of achievement in life, would it not be beneficial to explore the possible connection between teachers' degree of grit and students' degree of grit? Additionally, would it be prudent to explore the potential connection between the degree of teacher grit and student reading achievement on high-stakes tests?

The National Assessment of Educational Progress (NAEP) has assessed students across the country in 4^{th}, 8^{th}, and 12^{th} grades since 1992. These tests measure academic skills in content areas such as science, math, and literacy. In spite of the emphasis placed on academic instruction and the focus on high-stakes testing, students in the United States continue to make no improvement or lose ground in all academic areas based upon grade level and content area (Snyder & Dillow, 2016). More research should be focused on discovering additional options for improving student reading achievement, including the possible benefits and opportunities to cultivate non-academic, non-cognitive skills such as grit (Casner-Lotto & Barrington, 2006; Duckwork, et al., 2009; Dweck, 2012; Shechtman, et al., 2013; Snyder & Dillow, 2016).

Purpose of the Study

The purpose of this mixed-methods study was to expand the research on the impact of grit on student reading achievement, as well as the possibility of grit being cultivated through working with a teacher with high levels of grit. The trait known as grit encompasses two components: consistency of interest and perseverance of effort (Duckworth & Quinn, 2009). Dr. Angela Duckworth of the University of Pennsylvania began, and continues, to research the non-cognitive, non-academic trait of grit. This research has included the creation and validation of a scale to measure grit called the Grit-S (Duckworth & Quinn, 2009). The Grit-S is an 8-item test that measures an individual's degree of grit through self-reporting using Likert items.

Since the trait of grit is a relatively new expansion based on the theory of positive psychology, much of the research has been to develop the foundation of the trait and determine a reliable and valid measure of grit. There is little research exploring the relationship between high levels of teacher grit on student grit levels. Research implies that grit is a greater indicator of achievement than talent and comparable to the effects of comprehensive school reform (Duckworth et al., 2007; Duckworth, et al., 2009; Tough, 2012).

Research also suggested that the level of teacher grit is a predictor of teacher performance and teachers who scored one standard deviation higher in grit were 31% more likely to outperform their peers with less grit (Duckworth et al., 2009). A research study on twins in the United Kingdom concluded that the heritability of the traits of perseverance and passion are 37% and 20%, respectively (Rimfeld, 2016). This research provided two different impressions. The first impression concluded that this limited

heritability suggests that grit has no impact on student achievement, whereas the second impression concluded that since grit is not a strongly inherited trait, then environment would play a larger role in its development (Duckworth, 2016; Rimfeld, 2016).

There have not been studies reviewing the impact of teacher grit on student grit, but there has been increased interest in the study and importance of grit in the classroom. The reason for this direction was the realization that there is disconnect between talent and success. Students can have the talent, but not the perseverance, to overcome obstacles to be successful. When researching students who were successful in school regardless of the obstacles within their lives, the difference between students meeting with success or not succeeding was attributed to grit rather than talent (Duckworth, 2016). "Many educators recognize that it is not enough to teach students content; we must also teach them to hang on when times are tough" (Hoerr, 2017, p. 120). There is also belief that the non-cognitive trait of grit is improved with support; however, there is much more research needed to determine the most effective way to provide this support.

Although some consider grit a panacea, others have their concerns; specifically, the purpose of measuring grit and the importance of limit its use as an indicator of success (Credé, Tynan, & Harms, 2016; Duckworth, 2016; Hoerr, 2017). Due to the contradictory research, it is beneficial to continue to fine-tune and research the possible implications of grit as a success measure and a transferrable trait. To add to the discussion, the first purpose of this study is to review possible connections between student grit and teacher grit.

The second component of this research involved the connection between teacher grit and student success on outcome-based assessments. The *Every Student Succeeds Act*

*(*ESSA *)* signed into office on December 10, 2015, has legislative changes regarding how to monitor student achievement (Every Student Succeeds, 2015). States are required to develop plans that will take place in the 2017-2018 school year to have additional ways to measure student success that can include non-cognitive components.

In Pennsylvania, there have been several initiatives to improve high-stakes test results, with the focus on academic, cognitive skill development. The Pennsylvania Department of Education (PDE) has embraced School Climate, Multi-Tiered Systems of Support (MTSS), Pennsylvania Value-Added System (PVAAS) and Teacher Effectiveness as possible additional indicators of student success (www.pdedsas.org). Additionally, Pennsylvania has developed an open-source portal entitled the Standards-Aligned System (SAS) that provides educators the opportunity to improve their craft, share lesson plans, and review modeled lessons (additional information is available at www.pdesas.org). PDE is still developing the modifications that are required for ESSA compliance.

In spite of these initiatives and focus on development of cognitive, academic skills, NAEP scores continued to show dismal results. Reading scores across the nation continued to be flat in 4th grade reading and have decreased in 8th grade (Snyder & Dillow, 2016). The reading scores on the PSSA in Pennsylvania are uneven from grade to grade (Data Recognition Corporation, 2015). Because of regulation changes, lack of gains on the *NAEP* or the PSSA, there was a need to explore other options to improve student achievement.

In it's publication, *Promoting Grit, Tenacity and Perseverance: Critical Factors for Success in the 21st Century,* the USDOET acknowledged the over-emphasis on

cognitive, academic skills and the need to increase knowledge about non-cognitive, non-academic skills such as grit (Shechtman, et al., 2013). “The test score accountability movement and conventional educational approaches tend to focus on intellectual aspects of achievement, such as content knowledge; however, this is not sufficient” (Shechtman, et al., 2013, p.8).

There was limited research on the value of grit as a predictor of teacher effectiveness and student achievement and the relationship that exists between teacher grit and student grit. Furthermore, with the sense of urgency regarding student achievement and the relatively flat growth of NAEP scores across all contents, it was critical to explore the relationship between the degree of grit a teacher exhibits and student reading achievement scores. Conclusions and recommendations from the USDOET (2013) research revealed the importance of more research regarding the possible transference of the non-academic, non-cognitive skills of tenacity, perseverance, and grit. The current study extended the discussion of the possible connection between teacher grit, student grit, and student reading achievement.

Cognitive and non-cognitive skills are the foundation to life achievement. Studies that explore only one or the other are missing part of the equation. Fortunately, grit is a non-academic, non-cognitive skill that takes into account the importance of interest and perseverance in reaching attainable goals. The current study explored the possible connection between teacher grit and student scores on high-stakes tests through investigating historical high-stakes testing data of teachers involved in the research. In addition, the current study analyzed the grit scores of students at the B-O-Y and E-O-Y, specifically in classrooms of teachers exhibiting high degrees of grit.

Research Questions

The purpose of this mixed-methods research study was to describe and explore the possible influence of teachers' grit on students' grit levels from the B-O-Y to the E-O-Y. In addition, this study examined the possible impact teachers' degrees of grit had on students' *Pennsylvania System of School Assessment* (PSSA) results through reviewing historical reading achievement scores on the PSSA of teachers' cohorts of students. The focus was on the data of the teacher each year; it was not a comparison of the same group of students from one year to the next. This mixed-methods study sought to explore and elaborate on the connections among student grit, teacher grit, and teacher grit and student reading achievement. The following research questions guided this study:

1. Using the Grit-S scale, what is the relationship between a teacher's level of grit and a student's level of grit?
2. Since grit is defined as a two-factored structure, perseverance and interest:
    a. What is the relationship between the grit factor of perseverance between teacher and student, as evidenced in the beginning-of-year (B-O-Y) to end-of-year (E-O-Y) student grit scores?
    b. What is the relationship between the grit factor of interest between teacher and student, as evidenced in B-O-Y and E-O-Y student grit scores?
3. Does the degree of teacher grit relate to student reading achievement of a cohort of students, as measured by up to three years of historical PSSA test scores?
4. How do teachers explain the connection, if any, between their levels of grit and up to three years of cohort student reading achievement test scores as assessed with the outcome-based PSSA?

Theoretical Perspective

There are three theoretical constructs framing this research study. One of the foundations of the non-cognitive, non-academic trait of grit relies on the theory positive psychology. Positive psychology looks to resiliency factors that impact achievement, such as engagement, self-discipline, and recovery from failure and adversity (Seligman, 2011). The theory of positive psychology considers the positive non-academic traits, including grit, as critical to life achievement.

Secondly, in order to explore the possible connection between degrees of teacher grit and student grit, the theory of growth mindset vs. fixed mindset was critical. This theory connects the belief that intelligence is not fixed, but can be malleable based upon environmental factors (Dweck, 2016). Growth mindset theory also supports that achievement is connected to an individual's understanding that he or she can be successful and that life achievement is not based on "fixed" criteria. A foundation of this study was the theory that intelligence can be modified if an individual has a growth mindset and the growth mindset was a feasible concept as evidenced by recent research regarding hereditary versus environmental factors (Duckworth, 2016).

This research study explored the possible connection between teacher grit and student reading achievement and the possible connection between student degree of grit and teacher degree of grit. A teacher's understanding of growth mindset, the belief that one's skills and qualities could be cultivated through effort and perseverance, would impact the basic premise of this research; therefore, one of the theoretical constructs was based on the belief that intelligence and non-cognitive traits can be modified based upon environmental experiences (Duckworth, 2016; Dweck, 2016; Kallick & Zmuda, 2017).

If an individual has a growth mindset, he or she believes that life achievement is something that is controlled. Additionally, individuals with a growth mindset believe that their lives are not preplanned; rather, they are able to make choices and they can make those choices based upon their passions (Dweck, 2016; Hattie, 2009; Hoerr, 2017; Pink, 2009). There is more to reading achievement than intelligence and an additional part of the puzzle is the belief that in the face of difficulties, one can still succeed (Duckworth, 2016; Dweck, 2016; Gladwell, 2008; Pink, 2009). The concept of succeeding in spite of failing; the perseverance to "shake it off" and start over again, requires a growth mindset and the belief that one can achieve based on decisions that continue the opportunity to grow.

Flow Theory is the belief that happiness and achievement are grounded in "optimal experiences" (Csikszentmihalyi, 1990). Optimal experiences occur when interest, goal setting, and opportunity connect with perseverance and talent. Flow is "the state in which people are involved in an activity that nothing else seems to matter; the experience itself is so enjoyable that people will do it even at great cost, for the sheer sake of doing it" (Csikszentmihalyi, 1990, p. 4). Flow occurs when activities are often practiced and yet still enjoyable and necessary. Csikszentmihalyi explains this experience in this way, "Even when learning is hard, it is not bitter when you feel it is worth having, that you can master it, that practicing what you learned will express who you are and help you achieve what you desire" (as cited in Duckworth, 2016, p 129).

Research on achievement reveals that there are specific components that are similar to most successful individuals. Individuals with the growth mindset believe that they can be successful in their life goals (Dweck, 2016). Successful individuals focus on

their passions and interests grounded in influencing the lives of many (Csikszentmihalyi, 1990, Gladwell, 2008; Pink, 2009). Another quality is persevering to accomplish impassioned goals despite challenging obstacles (Csikszentmihalyi, 1990; Duckworth, Peterson, Matthews, & Kelly, 2007; Dweck, 2012). The Grit-S scale measures much of what is considered to make people happy and successful.

Significance of the Study

The USDOET published a draft report entitled *Promoting Grit, Tenacity and Perseverance: Critical Factors for Success in the 21st Century* that provided several conclusions and recommendations regarding 21st century achievement (Shechtman, et al., 2013). Many of these conclusions and recommendations revealed the sense of urgency in researching non-cognitive, non-academic skills. Specifically, the report suggested that educators, parents, community members, and administrators investigate and research possibilities to promote and improve grit, perseverance and tenacity (Shechtman, et al., 2013).

The current research study added to the information and exploration of grit in education. The recommendations from the report, *Promoting Grit, Tenacity and Perseverance: Critical Factors for Success in the 21st Century* provided several conclusions in respect to education. These recommendations included the need for growing involvement and support by stakeholders, coherent methods to integrate practices to promote grit, tenacity and perseverance, increasing knowledge of these non-cognitive traits in education and models and strategies for developing these traits over time (Shechtman, et al., 2013).

Due to the increased accountability, measured in large part through high-stakes testing, taking educational time to foster non-cognitive, non-academic skills such as grit could potentially influence student reading achievement. This research study analyzed a possible relationship among PSSA reading performance test scores and student and teacher grit scores.

Research Design

This mixed-methods study involved the analysis of survey data, historical data from up to three years of PSSA reading scores per teacher, and classroom observational data. Additionally, some teachers and students were involved in interviews and classroom observations to develop further the study. In education research, it is most effective to use a mixed-methods design (Mertler & Charles, 2005).

A mixed-methods study was utilized for several reasons. First, data are more accurate and reliable when they are triangulated (Bernhardt, 2013; Foss & Ellefsen, 2002; Moss, n.d.). Utilizing quantitative and qualitative data provides a deeper understanding of the research. Quantitative data revealed what had occurred and the qualitative data provided possible reasons why the results occurred. When working with types of data, mixed-methods research provide more opportunities for deeper analysis with less possibility of bias.

Second, mixed-methods research was used because the research on grit is relatively new and conflicting. Mixed-methods research is utilized for relatively new topics with the intent to explore and add to current information (Foss & Ellefsen, 2002; Mertler & Charles, 2005). Mixed-methods research designs often begin with a qualitative observation that turns into a research study, which was the case with this research study.

Mixed-methods research design includes quantitative and qualitative data and this study included both quantitative and qualitative data.

Quantitatively, participating students were surveyed at the B-O-Y and E-O-Y using the Grit-S Scale developed by Duckworth and Quinn in 2009. Teachers completed the Grit-S Scale at the B-O-Y as a baseline. Qualitatively, teachers with high grit scores (4.25 and above) and students of identified teachers were involved classroom observations and identified high grit teachers were involved in interviews. Additionally, past years' whole class scores were analyzed to explore possible connections between degrees of teacher grit and required high-stakes, outcome based test scores, such as those on the PSSA reading assessment.

Qualitatively, participating teachers were asked to provide the opportunity for classroom observations. The teachers were identified following the analysis of the survey data, specifically the degree of grit. At the E-O-Y, several teachers participated in interviews. Criteria for observations and interviews were based upon teachers' grit scores, students' grit scores, and PSSA cohort data. The tools used for teacher interviews and classroom observations are found in Appendices A and B of this study. There were several different possibilities for involvement in interviews and classroom observations to insure flexibility for teachers to participate. Teachers who reflected high degrees of grit and above average student reading achievement results on the PSSA were asked to participate in interviews. All teachers with grit scores at or above 4.35 participated in classroom observations.

Limitations

There were several possible limitations of the study. Since the districts involved included those in rural, central Pennsylvania, the results may not be generalizable to other districts that are in other states or districts not similar to this population. Additionally, the students and educators involved in the study included grades 5 through 8. Although there is some information to be utilized for future studies, it should be noted that the demographics of this population should be considered.

The Grit-S is a relatively new measure; and, although it was as psychometrically valid and reliable, it is in the infancy stage of development and continues to need to be researched using a variety of different populations (Duckworth & Quinn, 2009, Rimfeld, 2016). Much of the research using the Grit-S involves younger children and adults; there is limited research regarding the validity of this scale on middle school students. The research on adolescents revealed that grit is only slightly hereditary, which had implications on this research, but was not researching the same ideas. This research added to the information regarding the adolescent population, but the population was also a limitation of the study. Additionally, there is no definition of what would be considered an "average" grit score. An approximate average of American adults is 3.8 and this average is used as a foundation for this study.

Another possible limitation was that high-stakes tests are not necessarily motivating to teachers or students; rather, they are necessary to measure reading achievement. Teacher interviews involved questions regarding impressions of high-stakes testing and teachers' perceived influence on these tests. The purpose of this qualitative information explored this limitation.

Finally, the information available for research question four was limited to five educators. This limitation occurred as a result of the number of teachers who had the identified grit score of 4.25 and higher and historical reading achievement data on the PSSA. Some teachers within this population were not in a classroom in previous years in which students were required to be assessed using the PSSA. The results of the PSSA reading achievement historical data provides a snapshot of information to possibly guide further research on this research topic.

Definition of Terms

21st Century Skills: In their position paper, the National Science Teachers Association (NSTA) described 21st century skills as "collectively encompass[ing] core subject knowledge; learning and innovation skills; information, media, and technology skills; life and career skills; adaptability; complex communication/social skills; non-routine problem solving; self-management/self-development; and systems thinking" (2011, para. 2).

Cognitive Skills: "The set of trainable mental abilities and methods that are held to underpin successful learning and performance. The basic mental skills include concentration, goal-setting, imagery and mental rehearsal, relaxation and self-talk" (Dictionary of Sports Medicine, n.d.).

Every Student Succeeds Act: ESSA includes guidance that will help to ensure success for students and schools across the United States. (United States Department of Education (USDE), 2016)

Fixed Mindset: "Belief that your qualities are carved in stone…you only have a certain amount of intelligence, a certain personality, and a certain moral character"

(Dweck, 2016, p. 6).

Flow Theory: "The state in which people are so involved in an activity that nothing else seems to matter; the experience itself is so enjoyable that people will do it, even at great cost, for the sheer sake of doing it" (Csikszentmihalyi, 1990, p. 4).

Grit: Duckworth et al. (2007) defined grit as "perseverance and passion for long-term goals. Grit entails working strenuously toward challenges, maintaining effort and interest over years despite failure, adversity, and plateaus in progress" (p 1087).

Growth Mindset: Term coined by Carol Dweck, and defined as "the belief that your basic qualities are things that you can cultivate through your efforts" (Dweck, 2016, p. 7).

High-Stakes Testing: High-stakes testing means that one test is used to make important decisions about students, teachers, and schools (International Literacy Association).

Intelligence: "Intelligence can be defined as a general mental ability for reasoning, problem solving, and learning. Because of its general nature, intelligence integrates cognitive functions such as perception, attention, memory, language, or planning. On the basis of this definition, intelligence can be reliably measured by standardized tests with obtained scores predicting several broad social outcomes such as educational achievement, job performance, health, and longevity" (Colom, Karama, Jung, & Haier, 2010, p. 489).

National Assessment of Educational Progress (NAEP): "The National Assessment of Educational Progress (NAEP) is the largest nationally representative and continuing assessment of what America's students know and can do in various subject areas.

Assessments are conducted periodically in mathematics, reading, science, writing, the arts, civics, economics, geography, U.S. history, and beginning in 2014, in Technology and Engineering Literacy (TEL)" (NAEP, para. 1).

Non-Academic Skills: Tools, attitudes, and habits that empower individuals for success throughout life. (Nonacademic skills: The future of assessment, n.d.).

Non-Cognitive Skills: Non-cognitive skills are those skills that support cognitive skills, such as motivation, grit, empathy and responsibility. Non-cognitive skills are more nebulous with fewer valid and reliable measures; however, they are critical 21st century skills (Casner-Lotto & Barrington, 2006).

Outcome-Based Assessments: Outcome-based assessments occur after a significant set of learning experiences. They address what the student knows, can actually do with what has been learned, and the student's confidence and motivation in carrying out the asessment. (Outcome-Based Learning Project - About OBL, n.d.).

Paired Sample *t*-test: The paired *t*-test provides a hypothesis test of the difference between population means for a pair of random samples whose differences are approximately normally distributed. (Paired *t*-test, n.d.).

Pearson correlation coefficient: The Pearson correlation coefficient is a statistical formula that measures the strength between variables and relationships. (McAllister, 2003).

Pennsylvania System of School Assessment (PSSA): "measures how well students have achieved in reading, mathematics, science and writing according to Pennsylvania's world-class academic standards. By using these standards, educators,

parents and administrators can evaluate their students' strengths and weaknesses to increase students' achievement scores" (PDE, para. 1, 2003).

Pennsylvania Value-Added System (PVAAS): The term "value-added" refers to a statistical analysis used to measure the amount of academic progress students make from year to year with a district, school, or teacher. PVAAS is the measurement of growth of students in academic subjects from year to year. (PVAAS, n.d.).

Short Grit Scale (Grit-S): The Grit-S is 8-item tool that measures two different subscales: perseverance of effort and consistency of interest. The Grit-S is a valid and reliable measure of the non-cognitive skill of grit (Duckworth & Quinn, 2009).

SPSS: Software utilized to perform statistical analysis of data. (IBM Analytics, n.d.).

Summary

Grit is a non-cognitive, non-academic skill, which is critical for long-term goal setting and consists of having passion (consistency of interest) and perseverance in accomplishing a goal (Duckworth et al., 2007). The non-cognitive skill of grit does not work in isolation. There are other non-cognitive traits, such as self-regulation and self-efficacy, both playing a role in the development of grit. Grit-S is a new relatively new scale to measure an individual's degree of grit and has been determined to be valid and reliable in numerous studies. It is one of only two non-cognitive measures with validity and reliability. The development of this scale has provided an opportunity to explore the impact of grit on student reading achievement.

To date, there has not been a study exploring the possible connection between the degree of teacher grit and student grit. This research study provided some of the first

steps to investigating these relationships, as well as possible connections between teacher grit, and the PSSA scores of students within those classrooms. Since this study is a mixed-methods study, the information was not only quantitative, but also qualitative in nature, providing the opportunity for valuable discussion.

CHAPTER II

LITERATURE REVIEW

This chapter investigated the previous research on the importance of perseverance and interest in student reading achievement. The chapter began with the importance of 21st century skills in the workforce and the historical theories and hypotheses on what makes intelligence. Following the academic, cognitive views on intelligence was an exploration of non-cognitive, non-academic traits and their role in student reading achievement. Research regarding the concepts of positive psychology, grit, growth mindset and flow were addressed. The final section included the connections between teacher, task and student in connection with student reading achievement.

Introduction

The standards of reading achievement have evolved over time and the new millennium has brought the need for more adaptations. Adaptations have occurred as a result of changes in the social and physical environment in which we live. From prehistory to the modern era, needs of human beings have changed at a rapid pace. As the needs changed, human beings developed communication skills, invented fire, agriculture, automobiles, computers, and other technologies. Research from Dr. James Flynn revealed that in regard to intelligence, early ancestors had lower intelligence quotients that their counterparts, due primarily to changes in cultural requirements and the need for adaptations (Flynn, 2013). The need to develop 21st century skills emerged because of changes in technology and research on what is required to support overall success.

Literacy is not what it used to be. “It is important to note that no 21st century skills implementation can be successful without developing core academic subject

knowledge and understanding among all students. Students who can think critically and communicate effectively must build on a base of core academic subject knowledge" ("Partnerships for," n.d.). 21st century skills is a broad term, referring to knowledge, skills, work habits and character traits needed to succeed in life. Classrooms need to provide students engaging materials that incorporate all of these skills in a meaningful way. In addition to development of core academic subject knowledge, such as reading, The Partnership for 21st Century Learning identified the 4Cs as critical for student success: Communication, Collaboration, Creativity and Critical Thinking ("Partnerships for," n.d.).

Communication, collaboration, creativity and critical thinking are critical 21st century skills. The 4Cs are enhanced through opportunities to develop grit factors, which are perseverance and passion about a goal. In order for students to develop these skills, they must be in a classroom that supports these skills. Classrooms that provide this environment afford opportunities for students to take calculated risks, multiple opportunities to talk, listen, read, and write. The 4Cs provide students the possibility to develop the initiative to solve complex problems. Education professionals must continue to revise the definitions of reading achievement to compete and support students as they navigate the ever-changing society.

The PSSA has changed in line with the changing expectations of society. In 2015, students in grades 4-8 were required to complete a text-dependent analysis question that was worth 19% of their overall score. Text Dependent Analysis Questions require students to synthesize answers based on specific evidence within a reading passage and demonstrate their ability to analyze the meaning behind the evidence they selected. This

requirement aligns with the expectations of 21st century learning, including written communication and critical thinking. The results of the text dependent analysis questions were very low and as a result, the cut scores were modified. Although this modifying the cut scores did not solve the problem of these results, it allowed an opportunity for educators to develop the skills necessary for students to be more successful on this new criteria in coming years.

Often 21st century skills have often been considered only technology-based. Technology is a component of what students need to learn, but there are other non-academic, non-cognitive skills that need to be fostered (Casner-Lotto & Barrington, 2006; Shechtman, et al., 2013; Tough, 2012). It is not the type of technology that needs to be taught, but the skills required to think critically about tasks and choices. Individuals require problem-solving skills to determine best tools, steps, and strategies to complete the job effectively. For example, if a student wants to become an author, what skills are required? Even though knowing how to use a computer, navigate the Internet, and dissect necessary research are critical skills for this student, becoming an author requires much more.

The 21st century skills needed beyond technology proficiency are non-cognitive, non-academic traits, such as grit, self-regulation, perseverance, and tenacity. The U.S. Department of Education, Office of Educational Technology researched 50 programs that revealed promise to develop these non-academic, non-cognitive skills within an educational environment (Shechtman, et al., 2013). These environments showed five conceptual common clusters, including interventions that address mindsets, learning strategies, and resilience. The conclusions within this study did not only uncover the

importance of these skills, but also contended that investing time and resources into developing non-cognitive, non-academic skills can result in positive gains in student achievement and overall life achievement (Shechtman, et al., 2013).

Students can be proficient at many of the academic skills that support reading achievement and still struggle at being successful. There is more to achievement than academic prowess (Duckworth, et al., 2010; Dweck, 2016; Henderson, 2013; Tough,2012). One non-cognitive, non-academic skill that has promise in supporting 21st century development is grit. Grit is best defined as an individual's "consistency of interest" and "perseverance of effort." Passion and perseverance for long-term goals as defined in the trait "grit," have "predicted achievement in challenging domains over and beyond measures of talent" (Duckworth & Quinn, 2009, p. 3). Grit is a non-cognitive, non-academic skill developed through the convergence of several theories. These theories were addressed in isolation and then combined through the concept of Flow Theory (Csikszentmihalyi, 1990).

Flow theory is the "state in which people are so involved in an activity that nothing seems to matter; the experience itself is so enjoyable that people will do it even at great cost, for the sheer sake of doing it" (Csikszentmihalyi, 1990, p. 4). It is an individual's belief that achievement is attainable, having the perseverance to attain that goal, and interest in the task that puts an individual in a "state of flow." Research on combinations of passion and perseverance has revealed a positive relationship with achievement (Costa & Kallick, 2008; Csikszentmihalyi, 1990; Duckworth, 2016, Duckworth & Quinn, 2009; Henderson & Milstein, 2003). Prior to the turn of the century, most psychologists, educators, and nonprofessionals believed that these non-cognitive,

non-academic skills were irrelevant, and that is was the "fixed" trait of intelligence that provided opportunities for achievement (Dweck, 2012; Dweck 2016).

The next section of this chapter made the connection between the evolution of intelligence and the process made it possible to delve more deeply into the educational implications of non-cognitive, non-academic skills, including grit. To discuss the possibilities of non-cognitive, non-academic skills, there must be an overall belief that intelligence has to be malleable. The history of intelligence debate is addressed to frame the current research.

Achievement and Intelligence

Theories of student achievement and intelligence have evolved throughout the centuries. As with other life quandaries, there is a question of whether intelligence and achievement are a result of "nature" or "nurture." This "Nature vs. Nurture" debate regarding achievement and intelligence began in 1883 with Sir Francis Galton. Galton (1892) believed intelligence was considered a completely hereditary trait. Galton's belief was similar to today's concept of grit, as his definition of what he defied as "outliers demonstrated 'ability' in combination with exceptional 'zeal' and the 'capacity for hard labor" (as cited in Duckworth, 2016, p 21). Galton's theory began with the work of his cousin, Charles Darwin; however, it was Galton's theory of Eugenics that was embraced by many individuals of the time (Galton, 1904).

Eugenics is the science proposing that all influences that improve life are the inborn qualities of a race (Galton, 1904). In 1904, Galton wrote in the famous journal, *Popular Science:*

> We are ceasing as a nation to breed intelligence as we did fifty to a hundred years ago. The mentally better stock of the nation is not reproducing itself at the same rate as it did of old; the less able, and the less energetic are more fertile than the better stocks. No scheme of wider or more thorough education will bring up, in the scale of intelligence, hereditary weakness to the level of hereditary strength. The only remedy, if one possible, is to alter the relative fertility of the good and the bad stocks in the community. (Galton, 1904, p. 168)

Galton was not alone in his misinformed beliefs and had the support of famous individuals such as H. G. Wells, Charles Darwin, Lady Welby, and G. Bernard Shaw (Galton, 1904).

"A considerable list of qualities can easily be compiled that nearly everyone except *"cranks"* would take into account when picking out the best specimens of his class. It would include health, energy, ability, manliness, and courteous disposition" (Galton, 1904, p. 2). In other words, Galton and many others believed that intelligence was inherited, and could not be changed. Eugenics, literally meaning "good genes," and was a popular belief until it took a turn that questioned the moral integrity of eugenics and the definition of "fixed" intelligence.

The original intention of Eugenics was the eradication of "evils" of world-poverty, mental retardation, and other qualities that at the time were considered the downfall of civilization (Galton, 1907). Although Hitler was identified as the individual that perpetuated the popularity of Eugenics, the practices of "eugenicide" were prevalent in the United States, from California to New York (Black, 2003). Bloodlines were

destroyed through sterilization. Hitler took applied eugenics to another level, through mass extermination and euthanizing of individuals not considered to be of the appropriate race. The theory of eugenics exacerbated the discussion of intelligence being "fixed" and inherited. It should be noted that Galton's theory of intelligence including ability, zeal and perseverance appears to have merit even though he and his cohorts, having a fixed mindset believed that these traits could only be replicated through heredity. As a result, the methods of increasing these traits were eradication of races based-upon limited information. Similar misguided responses occurred with the work of Alfred Binet.

In 1905, Alfred Binet's work was designed into an intelligence test. Binet was asked to develop an intelligence test to determine best instruction for struggling students in France; however, it has been used for more than identification of effective instructional practices. Binet's life work was based on the belief that there were a variety of interpretations of intelligence and he referred to qualitative differences being more important to explore than quantitative differences (Siegler, 2014). Since the intelligence test reduced intelligence down to numbers, it reinforced the belief that intelligence was a fixed trait since it could be quantified. Since intelligence test were able to determine an individual's intelligence, and the work of Galton expressed the importance of intelligence to ensure that the human race was preserved. It was the combination of these two factors reinforced the notion of fixed intelligence.

Around this same time, William James developed another intelligence theory, which was slightly different from Galton's theory of Eugenics. According to the philosopher James, nurture, or more specifically, the amount of experiences that one had, could determine individual achievement and success in specific areas (1890). In James's

book, *Energies of Men*, he described the need to "warm up" to a task and then get a "second wind" to continue a task to completion. According to James, the "warm up" phase was when individuals became comfortable with the task and often abandoned the task, believing it was complete. It was the "second wind," James contended in his work, that individuals were most successful because the individual had mastered the basics of the task and could work through fatigue to a deeper goal and better understanding (James, 1890). This concept was very similar to the current definition of perseverance, which explores the connection of quality and quantity of time on task to reach a goal (Duckworth, 2016).

The definition of accomplishment developed by James implied that achievement and success required more than intelligence and nature. Whereas Galton believed that intelligence was fixed, James contended that there was more to intelligence than that with which we were born. Additionally, he expressed the importance of a non-cognitive, non-academic traits being involved in success and achievement (1907). James described this second wind as being different for each individual and based on a specific task. Each individual had a particular amount of energy expenditure and human beings only used part of the energy available, and the use of that energy was based on desire. Desire can also be considered interest or passion in a topic or motivation to accomplish a task.

In 1904, James's discussion of energy expenditure was a result of the state of the economy of the times. James contended that human beings only used a small part of their physical and mental capabilities and that if the economy were to grow it would be a result of men reaching their fullest energy potential. He stated, "as a rule men habitually use only a small part of the powers which they actually possess and which they might use

under appropriate conditions" (p. 14). This phenomenon perplexed and intrigued James. In a time where it was thought that individuals were either smart or not, James grappled with information even less tangible than intelligence. He stated, "either some unusual stimulus fills them with emotional excitement, or some unusual idea of necessity induces them to make an extra effort of will" (1907, p. 16).

It has been over a century since this statement from James regarding the potential value of non-academic, non-cognitive skills, yet the process of supporting these skills continues to elude educators and psychologists. These non-academic, non-cognitive skills are intangible and have been difficult to measure in any reliable and valid way (Duckworth, et al., 2009; Duckworth, & Quinn, 2009; Duckworth, Tsukayama, & May, 2010; Mischel, Shoda & Rodriguez, 1989; Shechtman, et al., 2013). Achievement scores and IQ measures provide an indicator of achievement in life, but not the complete picture. Even Galton, in 1907, shared that "it appears that the men distinguished in science have usually been born in small towns, and educated by imperfect teachers, who made the boys think for themselves. Nothing is brought out more clearly in the work than that the first desideratum in scientific education is to stimulate curiosity and the observation of real things…" (p. 70). The research to explore and connect intelligence and non-cognitive, non-academic traits has taken over a century to develop.

In 1963, psychologist Raymond Cantell developed a theory of intelligence that involved two types of intelligence, which were responsible for different intelligences and held in two separate places in the brain. The first type of intelligence, called fluid intelligence is the ability to identify patterns and relationships to problem-solve issues. Fluid intelligence is utilized when there is limited knowledge of the situation, but some

sort of action needs to be taken. Although fluid intelligence, controlled by anterior cingulate cortex, dorsolateral prefrontal cortex, and other regions that affect short-term memory and attention, is logic-based it also requires creativity. On the other hand, crystallized intelligence, controlled by the hippocampus and other areas supporting long-term memory, is the ability to utilize information, skills, knowledge, and experience in a way that is measurable on a standardized test. Crystallized intelligence represents long-term memory knowledge and increases with age and experience.

The theory of crystallized and fluid intelligence is still considered a reasonable concept of intelligence. Although fluid intelligence is said to decline with age, crystallized intelligence increases (Bergland, 2013; Cantell, 1963). Additional research from MIT raises concerns about the impact of standardized tests on fluid intelligence, suggesting that these types of tests require students to develop skills and knowledge at the expense of developing problem-solving strategies (Bidwell, 2013). The discussion about intelligence continues with work of Carol Dweck and her research on the perception of intelligence.

In 2006, Carol Dweck constructed a theory that connected the thoughts of Galton and James' nature vs. nurture debates on intelligence and achievement as well as a two-concept type of intelligence as was developed by Cattell. Dweck, in 2006, contended that all human beings have the potential to have either a fixed mindset of intelligence or a growth mindset of intelligence. Individuals with a fixed mindset believed that intelligence is "fixed" at birth and inherent; whereas, those with the growth mindset believed that intelligence can be cultivated (Dweck, 2016; Gottlieb, 1998). The concept of mindset is often misinterpreted as a single choice; whereas, individuals may have fixed mindset in

some respects and growth mindset in others. Additionally, research suggested that a growth mindset can be cultivated with the appropriate supports (Costa, & Kallick, 2008; Dweck, 2016; Tough, 2012).

It is possible and probably more practical, to point out that most individuals will have at times, both perceptions of mindset, depending upon the circumstance (Gross-Loh, 2016). An individual's belief about mindset often determines how people approach challenges. An individual tackling a challenge with a fixed mindset is of the belief that the outcome is controlled by heredity; whereas an individual tackling a challenge with a growth mindset believes that skills and qualities could be cultivated through effort and perseverance. Recently, some educators have developed what Dweck calls a "false growth mindset," which supports the opposite of what Dweck intended (Gross-Loh, 2016).

In a 2016 interview with Gross-Loh, Dweck explained that the misunderstanding often occurs when teachers and parents are providing praise. In this instance, it is necessary for teachers and parents to be very specific about feedback on the process, rather than trying to boost self-esteem through misleading open praise. Students know that this type of praise is an attempt to make them feel better, but it negates the foundation of growth mindset, which is that students can truly be successful with effort and perseverance (Gross-Loh, 2016).

Non-Cognitive Components to Reading Achievement

The pendulum continued to swing from placing the blame on the individual to blaming society for the lack of academic reading achievement (Duckworth & Seligman, 2005; Stein, 2004). The Elementary and Secondary Education Act (ESEA) was

established in 1965. Although the name changed throughout the changes in government, the purpose stayed the same, to improve education for the most struggling students (Stein, 2004).

On December 10, 2015, President Obama signed into legislation a new variation of ESEA , entitle the Every Student Succeeds Act (ESSA). ESSA provides the states with more local control; however, still requires high-stakes testing for students in grades three through eight and in reading, math and science in high school. Additionally, states are required to provide another measure to quantify student success that is not a high-stakes test. The states are allowed to choose this measure, which can be related to school climate, college and career readiness, and other measures that would elude to the growth of the non-cognitive skills that are required for success. The provisions of this bill are still in process due to the recent change in administration; however, since the launch of the ESEA, there has been relatively little change overall in student gains.

In spite of the inception and continuation of the ESEA under a variety of names, student achievement continues to remain stagnant (Snyder & Dillow, 2016; Stein, 2004) and there is often a propensity to fix the blame, rather than fix the problem on either the teachers and the education system or the students. “Attention is most often paid to the characteristics of individuals rather than the structures of society that contribute to unequal and inequitable life circumstances” (Stein, 2004, p. 7). Title I School Reform attempted to support individuals living in poverty; however, many of the politicians creating the policies did not have a firmly held belief that students would be successful if given the opportunity.

In addition to the lack of belief of politicians, there have also been concerns that

many teachers may lack high expectations of their students. Additionally, teacher attrition rate is high, leading to teacher turnover and systemic challenges. The education system as a whole is constantly fluctuating with administration including mandates like the Common Core and the variety of changes in the ESEA throughout the decades. ESEA was entitled No Child Left Behind (NCLB) in 2001 until 2015 when ESSA was signed into law. NCLB held promise to hold the education systems accountable for student achievement (Klein, 2017). It is starting to become evident that the changes made throughout the decades with the modifications of ESEA has yielded minimal effects at best.

Results from the test known at the NAEP (Snyder & Dillow, 2016) revealed that since 1992, the attempt to improve student reading achievement through state standardized testing and alignment to state standards has yielded little to no impact on student reading achievement. Due to increased accountability measures, teachers and administrators in Pennsylvania are now evaluated using Act 82.2, which was put into law with the modification of Chapter 4 ("Chapter 4," 2017). The new evaluations system, based in part on the on Danielson's Framework for Teaching, has increased the expectations and accountability of teachers and administrators through including student achievement results in the evaluation procedure ("Teacher Effectiveness," n.d.). In spite of this increase in accountability measures in Pennsylvania, the scores on the PSSA have also remained relatively unchanged.

The other side of the pendulum blamed the individual for not reaching potential. "Certain styles of life [namely the cultural pattern of the lower class] set limits on what policy makers can accomplish" (Banfield, 1968, p. 46). Throwing money at the problem

and ongoing standardized testing had most often been the solution and the solution has yielded little positive results (Stein, 2004). "Underachievement among American youth is often blamed on inadequate teachers, boring textbooks, and large class sizes. We suggest another reason for students falling short of their intellectual potential: their failure to exercise self-discipline" (Duckworth & Seligman, 2005, p. 7). Within this current decade, there has been information to suggest that there is more to promoting reading achievement than merely teaching the content, in hopes that students will absorb the information (Costa & Kallick, 2008; Duckworth & Quinn, 2009; Dweck, 2016; Shechtman, et al., 2013; Tough, 2012).

The information regarding the importance of non-cognitive, non-academic skills is mounting. Learning environments that promote grit, tenacity, and perseverance have indicated increases in success and student achievement (Costa & Kallick, 2008; Duckworth & Quinn, 2009; Kallick & Zmuda, 2017; Shechtman, et al., 2013). Research supports that growth mindset instruction within the classroom increased the use those non-cognitive, non-academic skills, which in turn improved success and student achievement (Dweck, 2016; Kallick & Zmuda, 2017; Shechtman, et al., 2013; Tough, 2012). Studies regarding the importance of non-academic, non-cognitive silks such as grit and self-regulation, revealed the these traits have a stronger correlation with life achievement and satisfaction than standardized tests. Student reading achievement involved more than talent and intellect (Costa & Kallick, 2008; Duckworth & Quinn, 2009; Dweck, 2016; Shechtman, et al., 2013; Tough, 2012).

Since the late 1800s, there was an impression that success and achievement were more than just intelligence-based (James, 1914; Seigler, 1992). Flat scores on the NAEP,

even after money, time, and effort were offered to alleviate the problem suggested that there was still a missing component (Snyder & Dillow, 2012). Recent research indicated that there are additional components contributing to student achievement (Dweck, 2012; Dweck, 2016; Hoerr, 2017, Shechtman, et al., 2013; Tough, 2012). These components are often called non-academic or non-cognitive skills; however, more to the point, they are traits that individuals have or can develop that improve chances of achievement and success (Duckworth & Seligman, 2005; Shechtman, et al., 2013; Tough 2012). Research into the impact of these skills began to develop in the 1960s, with the non-academic, non-cognitive skills known as self-regulation.

The research from the "marshmallow experiment" in the 1960s studied the importance of a non-cognitive trait known self-regulation (Mischel, Shoda, & Rodriguez, 1998). Preschool children were asked to make a choice of either eating a marshmallow sitting in front of them right away, or waiting until the adult returned to the room. The children were told they would receive an additional marshmallow if they did not eat the marshmallow until the adult returned. The study supported that children have different degrees of self-regulation. Some children were able to wait for the reward of an extra marshmallow; whereas, other children ate the marshmallows almost immediately following the adult's exit. This study's information investigated new possibilities regarding the value of self-regulation and delay of gratification.

Dr. Martin Seligman, also known as the "father of positive psychology," is one researcher who has furthered the research of non-academic, non-cognitive skills. In addition to his work on self-discipline, also known as self-regulation and self-control, Dr. Seligman and his colleagues utilized the theory of positive psychology to study four areas. These areas were the components that promote success: "(1) positive emotions

(happiness, gratitude, fulfillment), (2) positive individual traits (optimism, resiliency, character strength), (3) positive relationships among groups, and (4) enabling institutions (schools, worksites) that foster positive outcomes" (Kobau, Seligman, Peterson, Diener, Zach, Chapman, & Thompson, 2011, p. e1). These non-academic traits were not just traits that individuals are "born with;" in fact, they could also be enhanced with effective support (Costa & Kallick, 2008; Henderson, 2013; Henderson & Milstein, 2003; Seligman, Ernst, Gillham, Reivich & Linkins, 2009; Tough, 2012).

This research was supported by the results of a longitudinal look at the Marshmallow Experiment (Clear, 2016; Mischel, n.d.). Forty years later, the children in the Marshmallow Experiment were revisited. As realized by the research of Seligman, the Marshmallow Experiment revealed that individuals with self-control were statistically more successful than their counterparts who did not exhibit self-control as preschoolers. Some individuals misinterpreted the results as meaning that self-control was an inherited trait and that if children did not have self-control as preschoolers, that they would never have self-control. Mischel explained this outcome in a different way: "From my point of view, the marshmallow studies over all these years have shown of course genes are important, of course the DNA is important, but what gets activated and what doesn't get activated in this library-like genome that we've got depends enormously on the environment" (Mischel, para. 3).

The information in this chapter thus far has provided a framework of intelligence, non-cognitive, non-academic traits such as grit, and the struggle to support student success and achievement which to date has yielded minimal gains, if any (Shechtman, et al., 2013; Snyder & Dillow, 2016). The first theoretical construct of this study relies on

positive psychology. Positive psychology looked to resiliency factors that impacted achievement, engagement, self-discipline, and recovery from failure and adversity (Seligman, 2011). The theory of positive psychology considered the positive non-academic traits, including grit, as critical to life achievement.

Positive Psychology is a branch of psychology, which focuses on positive assets, and attributes of human beings (Kobau et al., 2011). Research divulged that happiness was an indicator of life satisfaction and achievement (Csikszentmihalyi, 1990; Seligman et al., 2009). Positive emotions are defined as "typically brief and result from personal meaningful circumstances" and can reduce the impacts of negative and stressful situations (Kobau et al., 2011, p. 2). Positive emotions are associated with health and socioeconomic benefits, as well as overall well-being (Csikszentmihalyi, 1990; Gladwell, 2008; Kobau et al., 2011). The skills of well-being, such as resilience, persistence, engagement, and positive emotion can be fostered and taught through the educational environment (Costa & Kallick, 2008; Duckworth & Seligman, 2005; Duckworth, Tsukayama, & May, 2010; Henderson, 2013; Hoerr, 2017; Kallick & Zmuda, 2017; Seligman et al., 2009; Tough, 2011).

School systems integrating these traits into learning revealed an increase in student achievement (Costa & Kallick, 2008; Henderson, 2013; Tough, 2012). It was the work of one of Seligman's protégés, Angela Duckworth, who created and tested the reliability of a grit measure, called the Short Grit Scale (Grit-S). With the exception of self-regulation and now the Short Grit-S, there are no valid and reliable measures for non-cognitive capacity (Duckworth et al., 2007). Knowing for over 100 years that there was more to achievement than cognitive skills, using the non-cognitive achievement

measures available and the Short Grit-S may provide insight into how to support student achievement.

In 2007, Duckworth et al. defined grit as "perseverance and passion for long-term goals" and "working strenuously toward challenges and effort over the years despite failure, adversity and plateaus in progress" (p. 1087). New research by Duckworth in 2016, suggests that there is a certain progression in regard to how grit is acquired. It is noted that since there appears to be a sequence, that grit must to some degree be environmentally developed. Individuals develop the factor of "interest" prior to other components. Interest begins with determining what provides passion and is different for each individual. Next, the individual has to determine the capacity in which they can practice what is of interest.

This practice is what Ericsson defines as "deliberate practice" (2016). "Deliberate practice" requires that the practitioner set goals that push beyond the expected limit and meticulously work in reaching that point. Those individuals utilizing deliberate practice in an effective manner have a clearly defined stretch goal, believe in full effort and concentration, look for immediate and specific feedback and reflect an adjust based upon the feedback received. When the goal has be obtained, then a new goal that is even more challenging is determined. It would be difficult for individuals to spend the time on deliberate practice prior to developing an interest, due to the intensity of the work. The third step of developing grit is the conviction that the work has purpose to the individual and a larger audience. Within the realm of grit, there is a lot of time and effort invested, so it would make sense that this effort includes interest, deliberate practice and passion to obtain goals.

In grit research, commitment towards a goal is simplified when the task is reasonable, positive thoughts about the future are present and there is an awareness of obstacles that may arise (Gollwitzer, Oettingen, Kirby, Duckworth & Mayer, 2011). Part of this commitment occurs because of feeling hopeful that this calling is relevant and beneficial in life. Hope is interwoven throughout the steps of developing grit (Duckworth, 2016). In research regarding non-cognitive, non-academic traits leading to achievement, the underpinnings of grit, perseverance, and interest often rose to the top (Costa & Kallick, 2008; Hattie, 2009; Shechtman, et al., 2013; Tough, 2012). Although research regarding non-cognitive, non-academic traits has increased, there has been little quantitative data to show the connection between these traits and achievement.

Qualitative research regarding the non-cognitive, non-academic traits that contribute to achievement began as early as 1892 with Sir Francis Galton, who concluded that successful individuals work hard and have passion about the work. Additional qualitative research for over a century has concluded similar findings (Costa & Kallick, 2008; Csikszentmihalyl, 1990; Duckworth, 2016; Gladwell, 2009; Gollwitzer et al., 2011; Seligman et al., 2009, Tough, 2012). Duckworth's research looked into the concept of long-term "stick-with-it-ness" that creates individuals who meet with achievement in spite of seemingly insurmountable odds and discovered that all of those individuals have some of the same qualities, which are those that are assessed on the Grit-S. Moreover, these qualities showed time and again to be a better indicator of achievement than IQ even though they were not defined in the trait now known as grit (Casner-Lotto & Barrington, 2006; Colom, Karama, & Haier, 2010; Csikszentmihalyl, 1990; Duckworth et al, 2007; Galton, 1907; Shechtman, et al., 2013; Tough, 2012). This research

resulted in the development and implementation of a valid a reliable measure called the Grit Scale (Duckworth et al., 2007).

Using the original Grit Scale, which was a 12-item scale to measure an individual's degree of grit, Duckworth et al. (2007) performed several research studies. These studies were to compare the accuracy of currently used measures with the accuracy of the Grit Scale. Although the original Grit Scale included a 12-item analysis, the Grit-S was able to show the same results with only eight items. Two sub-categories are measured in Grit Scales: (1) Consistency of Interest and (2) Perseverance of Effort. Six studies were performed and then combined into one research paper. The research concluded in all six experiments, the Grit Scale was a better predictor of success and achievement, and that grit could under the right conditions; grow with age (Duckworth, 2016; Duckworth et al., 2007).

What are considered "the right conditions?" One condition is connected to a sense of urgency. If the goal is important and purposeful, then the incentive is higher. Flynn uses the concept of the sense of urgency of the goal to explain the reason for what is coined the "Flynn Effect" (Flynn, 2013). In a meta-analysis of IQ tests, Dr. Flynn discovered that people born a century ago would now be considered having and IQ of 70 (borderline mentally retarded) and if people born today took the IQ test of a century ago, they would be considered to have an IQ of 130. According to Flynn, this research does not imply that today's generation is more intelligent than previous generations rather that today's society requires more abstract, logical thinking than the society of a century ago. The urgent and purposeful goals and needs of early 20th century people were different than individuals in the 21st century.

When Duckworth conducted research regarding age and the degree of grit an individual had appeared to increase based upon the generations. The rationale behind this generational

increase can be interpreted in two different ways. The first possibility is that an individual in an older generation has had different cultural experiences and as a result of those experiences, developed more grit out of necessity of higher need for perseverance and interest. Duckworth used the term the "reverse Flynn effect" to explain this possibility (2016). The second possibility is that individuals become grittier with age due to life experiences and opportunities to develop. In either case, the one piece that becomes more certain is that grit is not just a trait that one is born with and it can be cultivated and nurtured.

Cognitive and non-cognitive skills are the foundation to life achievement (Costa & Kallick, 2008; Csikszentmihalyl, 1990; Gladwell, 2009; Gollwitzer et al., 2011; Kobau, et al., 2011; Seligman et al., 2009; Tough, 2012). It has also been revealed that these non-cognitive traits are critical in the 21st century in order for individuals to be successful in today's society (Casner-Lotto & Barrington, 2006; "Partnerships for", n.d.; Shechtman, et al., 2013). Studies that explored only academic, cognitive skills or non-academic, non-cognitive skills were missing part of the equation.

Studies discussed by Tough (2012) revealed that academic achievement does not necessarily translate into life achievement, and that achievement must be coupled with certain character traits, such as grit. Some non-academic skills have been researched with promising results. Grit is a non-academic, non-cognitive skill that takes into account not only the importance of interest and perseverance, but also the role of talent in making attainable goals. Data recently collected by Duckworth revealed that grit changes with age as well as cultural changes are evidence that grit is not fixed and can possibly be nurtured (Duckworth, 2016; Tough, 2016).

The Connection of Intelligence and Non-Cognitive Skills

In 1968, Horn and Cantell shared a nuanced theory of intelligence: crystallized intelligence and fluid intelligence. Horn and Cantell (1968) questioned the belief that intelligence is most effectively identified by intelligence tests, as these test were missing key components of intelligence (1968). The two types of intelligence were identified as fluid intelligence and crystallized intelligence. Since this time, the concepts of intelligence and achievement have developed even further. Much like the information of Horn and Cantell, Dweck considered that intelligence could be crystalized or fluid; however, how intelligence developed is based in large part, on the belief system of the individual (2016). Does the individual believe that he/she can learn (growth mindset), or does he/she believe that intelligence is pre-determined (fixed)? It was the groundbreaking work of Carol S. Dweck on the growth mindset, which connected the necessity of having both skill and perseverance in order to be successful in life. If mindset is not fixed, then an individual can develop, change and grow based on the belief that it is possible.

The concept of the growth mindset is tied together with the importance of effort, stamina, and talent in acquiring success. Furthermore, Dweck (2016) contended individuals can change their mindset to reach available, yet underutilized potential for achievement. Dweck provided the avenue to explore the possibilities of increasing the benefits those non-academic skills with the growth mindset. Dweck (2006) explained that this mindset is "allowing people to love what they're doing—and continue to love it in the face of difficulties" (p. 48). Having a growth mindset provides individuals with the belief that they can achieve and they are in control of that achievement.

In order to explore the possible connection between degrees of teacher grit and

student grit, the theory of growth mindset vs. fixed mindset is critical. This theory connected the belief that intelligence is not fixed, but can be malleable based upon environmental factors (Duckworth, 2016; Dweck, 2016; Hoerr, 2017). Individuals with a growth mindset see failure as a positive and a learning experience. “Even with the growth mindset, failure can be a painful experience. But it doesn’t define you. It’s a problem to be faced, dealt with, and learned from” (Dweck, 2006, p. 33). Individuals with the growth mindset were not only successful because they have a growth mindset. When individuals have the growth mindset they will work on developing additional skills and techniques in their areas of interest. Individuals with a growth mindset are always working in or slightly beyond their Zone of Proximal Development (ZPD) in order to be successful (Vygotsky, 1978). The ZPD is the optimal zone for learning to occur; the optimal time for an individual to learn which is the place between what a learner can and cannot do.

According to Vygotsky’s work from 1978, individuals learned best through learning within their individual ZPD. It is the combination of one’s belief in achievement, interest in a topic, and working within one’s ZPD that provides a large part of an individual’s degree of grit, including resiliency and perseverance (Duckworth & Quinn, 2009; Dweck, 2016; Henderson, 2013; Tough, 2012). Thus far, the connection has been made among perseverance, interest, the growth mindset and grit. Research regarding achievement revealed that perseverance and interest outweighed individual intelligence (Costa & Kallick, 2008; Duckworth et al., 2007; Duckworth & Quinn, 2009; Dweck, 2006; Henderson, 2013; Tough, 2012).

One of the underpinnings of the trait of grit is that individuals with high degrees of grit work through times of frustration, and much like the growth mindset theory, are

always working at the edge of their breaking point to increase their knowledge, work within their ZPD (Costa & Kallick, 2008; Dweck, 2006; Tough, 2012). Paul Tough (2011) shared an experience that he had in which an individual from KIPP public charter schools explained the reason that students are sometimes not developing grit: "The idea of building grit and building self-control is that you get that through failure, and in most highly academic environments in the United States, no one fails anything" (p. 177). This inability to allow students the opportunity to failure can have negative consequences to developing the non-cognitive traits of grit.

In order to develop passion and perseverance, one has to have the challenge of overcoming obstacles. These obstacles are considered as challenges to be overcome rather than avoided. Duckworth (2013) explored individuals entering college, who had been exposed difficulties that made it challenging to continue with their goals. She discovered that their degree of grit had a significant impact on their ability to overcome the trauma and continue to persevere. Hoerr (2017) also expressed that "the concept of grit fed my concern that focusing on standardized tests and limiting ourselves to traditional academics, we fall short of preparing students with the skills and attitudes they will need after they graduate" (p.118). For individuals to develop grit, opportunities to fail in a situation that they wish to succeed is an effective way to build perseverance. In our society, failure is considered a negative rather than a growth opportunity. Positive psychology, growth mindset and flow theory are based upon things that make people happy, but not without having to overcome hurdles.

Go with the Flow

Flow Theory is the belief that happiness and achievement are grounded in "optimal experiences" (Csikszentmihalyi, 1990). Optimal experiences occur when interest, goal setting, and opportunity connect with perseverance and talent. Flow is "the state in which people are involved in an activity that nothing else seems to matter; the experience itself is so enjoyable that people will do it even at great cost, for the sheer sake of doing it" (Csikszentmihalyi, 1990, p. 4). Achievement occurs not only as a result of perseverance and interest, but also with what comes naturally.

This naturalness of a task should not be confused with easy. In the theory of flow, it is often the challenge, failure, and recovery that cause the most happiness in one's life (Csikszentmihalyi, 1990). The Grit-S scale measures much of what is considered to make people happy and successful according to flow theory. Grit is defined as "perseverance and passion for long term goals entails working strenuously toward challenges, maintaining efforts and interest over years despite failure, adversity, and plateaus in progress" (Duckworth et al., 2007, pp. 1087-1088).

High degrees of grit require individuals to believe that they can be successful which is acquired through having a growth mindset (Dweck, 2016). In addition to growth mindset, individuals must work diligently at a skill within their zones of proximal development, in order to become accomplished within their talent which requires individuals to choose a talent that is so interesting to them, that they are not just willing, but driven to work toward achievement within that goal. Lastly, the theory of flow, choosing a goal that comes naturally must also be considered.

Putting the Components Together

The research in this chapter combined the theories of flow, growth mindset, and intelligence with the importance of perseverance, relevance, and interest in a goal. The final section of this chapter connected these components within a classroom setting, using a triangulation of task, teacher, and student. Triangulation is a method in which to review data and determine if the data is valuable when looking at all of the components.

The Task

Task achievement is based on several components: attainability, interest, and motivation to reach the reading goal. Attainability, interest, and motivation are student and teacher dependent. For example, if the task is within the student's ZPD is considered interesting, achievement is more definite (Csikszentmihalyi, 1990; Duckworth et. al. 2007; Dweck, 2016; Mischel, Shoda & Rodriguez, 1989; Nakamura & Csikszentmihalyi, 2009). Additionally, students must believe that achievement can occur on the reading task; in other words, students must have a growth mindset which is the belief that they can be successful with hard work and perseverance.

The research supported that goal-setting, a task in itself, is facilitated with the reading goal or task is achievable and desirable (Gollwitzer, Oettingen, Kirby, Duckworth & Mayer, 2011). The reading task also must involve some motivation from the student to be successful and do the work required to attain the needed outcome. A student can be intrinsically motivated to be successful on the task or it may be the teacher that provides the relevance and support the student in realizing the value of the reading task. For the teacher to support the student in reading achievement, or the task of reading, the teacher must find the task valuable and necessary, believe that the student is able to

be successful on the task, and have the knowledge needed to support the student in succeeding.

The Teacher

The teacher has the biggest impact on student acheivement (Hattie, 2009; Hattie, 2012; O'Connor, 2009). A teacher supports student reading achievement through having knowledge of the taught content, modeling working collaboratively with others, having high but realistic expectations, and developing effective relationships with students (Blankstein, 2004; Elmore, 2004; Hattie, 2012; O'Connor, 2009; Seligman et al., 2009). These relationships are even more critical in the 21st century. Technology has allowed for students to reduce the amount of face to face interactions and increase the opportunity to being less mindful in responses that don't require conversation, as those found in platforms such as Twitter, Facebook and Snapchat. Teachers have an obligation to developing effective communication and to provide students experiences that promote collaboration and articulation of ideas.

Research on the most effective schools revealed one outstanding feature: all of the educators in these schools described a community of learners (Blankstein, 2004; DuFour & Eaker, 1998, Hargreaves & Fullan, 1998). Educators can attest to the benefit of developing a community of learners. In this community, children feel safe to take risks in their learning, depend on others for support, and help others. (Henderson, 2013; Tough, 2012). It appears, from the available research, teachers must have that same sense of community. For decades, researchers have validated the value of professional learning communities in the school setting (Blankstein, 2004; DuFour & Eaker, 1998; Elmore, 2004; Hargreaves & Fullan, 1998; Hoerr, 2017; Murphy & Meyers, 2008). Even with a

school setting that provides opportunity to reflect with peers, it is also critical for teachers to have certain qualities.

There is not one "type" of teacher that best supports student reading achievement; however, there are certain qualities that increase the odds. Teacher qualities that have the most impact on student achievement include challenging students, having high expectations, formative assessment, commitment to student learning, and reflection on practice (Bain, 2004; DuFour & Eaker, 1998, Hattie, 2009; Pollack, 2007; Wiliam, 2011). Additionally, teachers must believe that achievement can occur on the reading task; in other words, teachers must also have a growth mindset (Dweck, 2016; Tough, 2012).

Student-teacher relationships have an effects size of .72 (Hattie, 2009). Student-teacher relationships are developed through understanding specific student needs and taking those needs into account through instruction (Costa & Kallick, 2008; Henderson, 2013, Tough, 2012). The impact of the teacher, through qualities or relationships, is strongly correlated with positive student achievement. Hattie's (2012) research described five components of highly effective classroom teachers. Teachers who meet with student achievement are experts in their subject and know how to impart that knowledge, are proficient in creating an optimal learning environment, monitor and provide feedback, have a growth mindset, and influence student outcomes.

Novice teachers with high degrees of grit and satisfied with life are predicted to be more effective educators (Duckworth, et al., 2009). The research regarding grit and teacher effectiveness has not been measured in veteran teachers, nor is there clear research on the possible impact of teacher grit on student grit. This current research

explored the possible impact of teacher grit on student grit, by analyzing the B-O-Y to E-O-Y student grit scores. Novice and veteran teachers were included in this research.

The Student

The student enters a classroom with a certain belief system and set expectations. It is the belief system more than the student's IQ, which sets the stage for achievement (Duckworth & Seligman, 2005; Dweck, 2006; Dweck, 2012; Hoerr, 2017; Tough, 2012). This belief system is not fixed when a student enters the classroom; rather, this mindset can change through personal experiences (Dweck, 2016; Henderson, 2013; Hoerr, 2017). An individual with a growth mindset believes that failures are obstacles to overcome rather than something to be avoided. Students with a growth mindset tend to have high, but realistic goals, tenacity, and perseverance to achieve these goals and the self-regulation needed to work through short-term obstacles (Csikszentmihalyi, 1990; Duckworth, 2013; Duckworth, Tsukayama & May, 2010; Henderson, 2013; Tough, 2013).

Students come to the classroom with different degrees of grit. Individuals with high degrees of grit set long-term objectives and do not deviate from those objectives, even if others do not provide positive feedback (Duckworth et al., 2007). Other students have less degrees of grit and need more teacher support to acquire the desired outcome. Some students will enter the classroom with a variety of interests. Other students may come with limited experiences or minimal opportunities to discover their passion. Students needs to have the opportunity to fail in a safe way. If students have not had that opportunity, they need that experience to develop perseverance.

What the students, teachers, and task bring to the classroom indicate the potential success of developing non-cognitive skills such as grit. This is not to say that all three components cannot be changed based upon experiences. Setting goals, determining outcomes, and developing a plan to achieve that goal can be the beginning.

Conclusion

The research on intelligence, non-cognitive, nonacademic skills, and achievement has continued to morph as more is discovered about them. The purpose of this mixed-methods research study is to investigate the possible relationship between teacher grit and the possible influence on students' grit levels from the B-O-Y to the E-O-Y. This research considered the current theories of the growth mindset and flow theory on the impact of student reading achievement. There is much information regarding intelligence and non-cognitive, non-academic traits. This research study focused on the impact of teacher grit on student reading achievement and the impact of teacher grit on student grit.

Individuals with the growth mindset believe that they are able to influence their intelligence and success. Flow Theory describes the setting required to ensure optimal experiences in which individuals achieve. Positive Psychology is built on the understanding that positive experiences promote success. These three theories are grounded in the understanding that non-academic, non-cognitive skills such as grit have an impact on achievement. The next chapter will review the methodology used to explore the relationships among teacher grit, student grit and student achievement.

All three theories, as well as the research from Duckworth, share two important common themes. The first theme is the importance of failure. In these theoretical constructs, failure and the ability to overcome failure and obstacles are important to the

development of positive psychology, growth mindset and flow (Csikszentmihalyi, 1990; Duckworth, 2013; Dweck, 2016; Hoerr, 2017; Seligman, 2011; Tough, 2012). The second critical theme is the desire to extend beyond one's zone of proximal development. These theoretical constructs, in combination with research on grit, have determined the willingness to extend beyond expectations as a component of acquiring life success (Csikszentmihalyi, 1990; Duckworth, 2016; Dweck, 2012; Seligman, 2011).

This chapter provided a framework with which to ground the research and address the importance of grit. Grit, defined as a two-factored concept of perseverance and passion or interest, is a non-academic, non-cognitive skill that can support 21st century skills needed for success. Individuals with high degrees of grit will work tirelessly and problem-solve ways to overcome obstacles in the way of their goals. Problem solving is necessary to prepare students for careers that have not been created. The Growth Mindset, Flow Theory, and Positive Psychology theoretical constructs create the backdrop to discuss the potential value of the non-cognitive, non-academic trait known as grit in relationship to student reading achievement, as well as the potential impact of teacher grit on student grit.

CHAPTER III

METHODOLOGY

The purpose of this mixed-methods research study was to describe and explore the possible relationship between teacher grit and the influence on students' grit levels from B-O-Y to E-O-Y. In addition, this study examined the impact of teachers with high levels of grit on high-stakes tests through reviewing reading PSSA scores of teacher cohorts over a three-year period. This mixed-methods study sought to explore and elaborate on the connection between student grit, teacher grit, and student reading achievement as assessed on the outcome-based PSSA.

This chapter provides an outline of the study, including the design, participants, sites, instruments, protocols, and methodologies of analysis. This mixed-methods study investigated the possible relationship between teacher grit and student grit, specifically the potential influence of teacher grit on students' grit from the beginning (B-O-Y) to the end (E-O-Y) of the year. In addition, this study examined the possible connection between teachers with high levels of grit and student results on high-stakes tests, through reviewing PSSA scores historically over a three-year period. The following research questions directed this study:

1. Using the Grit-S scale, what is the relationship between a teacher's level of grit and a student's level of grit?
2. Since grit is defined as a two-factored structure, perseverance and interest:
    a. What is the relationship between the grit factor of perseverance between teacher and student, as evidenced in the beginning-of-year (B-O-Y) to end-of-year (E-O-Y) student grit scores?

b. What is the relationship between the grit factor of interest between teacher and student, as evidenced in B-O-Y and E-O-Y student grit scores?

3. Does the degree of teacher grit relate to student reading achievement of a cohort of students, as measured by up to three years of historical PSSA test scores?
4. How do teachers explain the connection, if any, between their levels of grit and up to three years of cohort student reading achievement test scores as assessed with the outcome-based PSSA?

Research Design

This research began with an idea: the effectiveness of the teacher has the most impact on students. What makes a teacher effective? The current research regarding the non-cognitive, non-academic trait of grit provided some possible insight into what could be one aspect of teacher effectiveness (Bain, 2004; Csikszentmihalyi, 1990; Duckworth, Tsukayama & May, 2010; Henderson, 2013; Tough, 2012). Although the research is overwhelming that the teacher is the number one variable affecting student achievement (Hattie, 2009; Hattie, 2012; Hoerr, 2017; O'Connor, 2009; Tough, 2012), the evidence is still building in regard to the skills or traits that are required or preferred for teacher effectiveness. There is research that supports the value of grit on overall life success and satisfaction, which may be considered an important trait for teachers to possess and to cultivate in their students (Hoerr, 2017; Kallick & Zmuda, 2017; Tough, 2012).

This study was mixed-methods and involved a variety of quantitative and qualitative data. Quantitative data included teachers' and students' participation in the 8-item Grit-S survey (See Appendix A). The Grit-S survey was administered via paper and pencil or computer depending upon the discretion of the teacher. Text to speech

adaptations were available to students, when needed or requested. Only two students requested this adaptation. The participating teachers and the students answered the Grit-S survey at the B-O-Y. The students were reassessed with the survey at the end of the year to explore possible differences between B-O-Y and E-O-Y student grit scores. Qualitative data, through classroom observations and teacher interviews, provided a deeper understanding of the quantitative data. Having multiple ways of measuring results numerically and qualitatively that are valid and reliable, provides for multiple data points to triangulate the data and strengthen the understanding of the results (Bernhardt, 2013; Mertler & Charles, 2005).

Another piece of quantitative data included the reading PSSA results from three different cohorts of students from the previous three years. Using up to three years of historical reading PSSA scores for each teacher who had a grit score of 4.25 and above revealed possible trends within individual teacher's data. Historical PSSA reading scores reflected a group of students' reading achievement each year. These data were collected as a whole group score. Each cohort score revealed the percentage of students who reached proficient and advanced on the reading PSSA. The purpose for collecting and examining this data developed an impression of the relationship between the teacher's degree of grit on students' overall reading achievement as evidenced with the PSSA data. The data collected and reviewed explored the connection with the statewide average of students receiving proficient or advanced and the district average of students receiving proficient and advanced.

Qualitative data were also included in this study to look more deeply into the nuances of grit, a non-academic and non-cognitive trait. This mixed-methods study

involved the analysis of qualitative data in several forms. All teachers with a grit score of 4.25 and above participated in interviews and provided opportunities for classroom observations. Specific teachers were chosen based upon the results of the quantitative data to further investigate the results. Questions for interviews can be found in Appendix B and the format for classroom observations are available in Appendix C.

Although the research had begun with an idea of teacher effectiveness, the data provided the direction for the teacher interviews and classroom observations. These data revealed possible connections between teacher and student grit, and standardized assessments. The purpose of using mixed-methods design was to provide objective quantitative data, as well as more intricate qualitative data.

Description of the Study

This section provides a description of the participants, study sites, methods, assessment tools, and procedures for research. This section includes demographic information and implementation of the study.

Participants

There were two distinct populations of participants involved in this study: students and teachers, grades five through eight. Since the students involved in the study were in grades five through eight, the approximate student ages ranged from ten years-old to 15 years-old. This grade band was chosen because the statewide assessments in grades five through eight are a consistent measure called the Pennsylvania System of School Assessment (PSSA). Most teachers in these grades had historical data from PSSA reading scores for up to three years.

Participating students received instruction from the same teacher(s) during the duration of the study to be eligible to participate in the study. Incomplete surveys, surveys of students who entered the classroom later in the year, or students who left prior to the spring survey, were excluded. Students who did not return a permission to participate form were given and alternate activity during the implementation of the survey.

Fifth through eighth grade teachers in the study ranged in ages from 22 years of age to 60 years of age. Due to different building configurations, some teachers were in self-contained classrooms and others were teaching in teams. Teacher data were coded accordingly. All participating content-area teachers, grades five through eight, provided a voluntary informed consent form to be included in the study. Content-area teachers in grades five through eight who did not provide voluntary informed consent were excluded from the study.

Study Sites

Twelve public school districts and five charter school within Central Intermediate Unit 10 were invited to participate through an email and letter to the superintendents. Six district superintendents and one charter school CEO approved contact with their teachers. Teachers from one charter school and three traditional public schools volunteered to participate. Cyber schools were excluded from this study due to the variability of contact with students.

All of the participating districts were in Central Pennsylvania within the tip of Appalachia. The majority of districts were within Clearfield County. The districts were rural and small, with the maximum district size being approximately 3,000 children

kindergarten through grade 12. This county had a census poverty rate of 74% and was ranked the 8th lowest county in poverty in the state according to the annual reach and risk data (Pennsylvania Departments of Education and Public Welfare, 2017). Reach and risk data are published by the Pennsylvania Office of Child Development and Early Learning (OCDEL) and is a compilation of the state of educational risk for preschool children in the Commonwealth of Pennsylvania. This information is provided for and used by early childhood educators to make effective decisions based on their specific population, as well as districts in order to determine specific demographics.

Methods and Procedures

This section includes the methods and procedures containing the protocols and instruments used in the research study. Twelve public school districts and six charter school within Central Intermediate Unit 10 in Pennsylvania were contacted to participate. Schools containing grades five through eight were utilized for this study. Once the participation was agreed upon by the administrators of these schools, the teachers were emailed a cover letter of introduction along with the Grit-S survey instrument using Qualtrics® software. The questions included in the Grit-S survey can be found in Appendix A.

The letter explained the purpose of the research study and advised the potential participants of the voluntary nature of participation, affirming that there would be no negative consequences for the participant if he/she chose not to participate in the study. A link to the survey was included at the end of the introductory letter. The identity of survey participants were coded by the Qualtrics® program in order to assign student surveys to teacher surveys for data review and analysis. The survey included the

electronic version of the 8-Item Grit Scale and the 8-Item Grit Scale for Children, as well as some demographic data.

All participating teachers (N = 21) completed an informed consent form and were surveyed at the beginning of the study using the *8-Item Grit* scale and demographic data through the Qualtrics® survey tool provided through Indiana University of Pennsylvania (IUP). The teacher facilitated the administration of the survey. Directions for facilitation of the survey were provided for the participating teachers to ensure consistency.

Student surveys were collected from students in participating teacher classrooms at the B-O-Y and E-O-Y. It was preferred that these data be obtained through a computer-based survey, although paper and pencil versions were also made available upon request. The majority of participating teachers chose to utilize paper and pencil because of limited technology. The surveys were administered whole class and the proctors were given clear instructions about test administration. Students were given the opportunity to "opt out" of the survey confidentially, through choosing a survey that was related to school facts.

Students were excluded if they were not in a class taught by a teacher who provided a voluntary informed consent form or if the student did not complete a voluntary consent for with a parent or guardian's signature of approval. All of those individuals participating were given information regarding exclusion. This exclusion is necessary because the results included a comparison between the degree of teacher grit and change in student grit. If teacher scores were not available, then the data were considered incomplete.

Following the administration of the initial surveys, reviewed data were analyzed to determine initial degrees of teacher grit and student grit in the study. Five teachers with

grit scores of 4.25 and above provided opportunities for classroom observations. A specific format of "look-fors" to maintain classroom observation consistency was utilized (see Appendix C).

To compare the degree of teacher grit to student reading-achievement scores obtained historical PSSA reading scores for up to three years of student cohorts were analyzed. The cohorts were groups of students taught by identified teachers in 2011-2012, 2012-2013, and 2013-2014 school years if the data were available. In some cases, there were less than three years of historical PSSA reading data because the teacher had previously taught in a classroom that did not administer the PSSA.

These historical data were reading achievement PSSA scores of participating teachers and are not the students currently in the teachers' classrooms, as that information was not available at the time of this research. The purpose for analyzing these data was to review possible relationships between teachers' degrees of grit and student reading achievement. Since these data were collected as whole cohort scores (per teacher) and the student scores were anonymous, consents were not obtained for the students with historical scores.

The final components of the research were teacher interviews and classroom observations. At the end of the year, five teachers participated in interviews and possible connections between grit and reading achievement in the classroom environment were explored. Criteria for observations and interviews were based upon teachers' grit scores and historical PSSA reading cohort data. Requested interviews were based upon the results of the teacher grit scores to explore the results of the historical data from a different perspective. Teachers (n = 5) who reflected high degrees of grit according to the

beginning-of-the-year 8-item grit scale (Appendix A) and improved historical PSSA reading scores participated in for exit interviews. Interview questions and classroom observations were developed and utilized consistently for all of those participating. Classroom observations and teacher interviews enhanced the study and took place within the identified schools.

Interviews were administered in a comfortable and confidential environment within each school having participating teachers. Interviews were recorded and transcribed. The color-coded transcriptions were kept in a locked filing cabinet in the office of the primary researcher after analysis. The times chosen for classroom observations were at the discretion of the teacher. Data from the classroom observations were collected on the graphic organizer found in Appendix C. The results of the data were color-coded and analyzed. These data were also kept in a locked filing cabinet in the primary researcher's office.

Methods for Analysis

This section of the research contains the tools involved in the study and the validity and reliability of the measures for each tool. Some of these tools were already developed; whereas, the interview questions were created by the researcher. The interview questions were reviewed by other educators and modified to ensure clarity of questions and limitation of bias. The interview questions are in Appendix B.

Short Grit Scale for Adults and Short Grit Scale for Children (Grit-S)

Predictors of future reading achievement for middle grades students includes meeting the benchmark scores on non-cognitive assessments ("Predictors," 2013). One of these assessments is Grit-S scale, a self-assessment that measures student characteristics

predicting student ability to continue the pursuit of academic goals despite of obstacles, such as uncertainty, frustration, or negative thoughts of others. In the research, Duckworth and Quinn performed six different studies to determine the most effective version of the grit scale score. The final self-assessment of the Grit-S includes eight items to measure the two factors incorporated within grit. Grit is a non-cognitive, non-academic skill, which is critical for long-term goal setting and consists of having consistency of interest and perseverance.

The 8-item grit scale was developed after the reconfiguration of the original 12-item grit scale, which was comprised of two dimensions, interest and perseverance (Duckworth et al., 2007). The 8-item grit scale was validated as an efficient measure of grit, through five different research studies (Duckworth & Quinn, 2009). The Grit-S scale studies revealed evidence of validity (predictive and consensual) and test-retest reliability (Duckworth & Quinn, 2009). This scale was chosen because of the research supporting its validity and reliability in determining grit in adults and children. The impression of teacher and student degrees of grit was the foundation of the research. Perseverance and passion are also indicators of success (Hattie, 2012).

The result of their research revealed that the two factors measured on the Grit-S, consistency of interest and perseverance of effort have internal consistency and are strongly correlated, $r = 0.59$, $p < .001$ (Duckworth & Quinn, 2009). Test-retest reliability on the Grit-S was $r = 0.68$, self-report and informant report versions correlated $r = 0.45$, $p < .001$, and the Grit-S was also a significant indicator of educational attainment (Duckworth & Quinn, 2009). Effect sizes are utilized to determine the amount of effect a particular activity or concept with have on an outcome. For educational research, effect

sizes of r =0.2 is considered low, r = 0.4 is considered medium, and r =0.6 is considered high. Internal and external consistency were high effect sizes and informant reporting was a medium effect size, which was also a good result.

Pennsylvania School System of Assessment (PSSA)

"The Pennsylvania System of School Assessment (PSSA) is an annual assessment administered in commonwealth classrooms in grades 3 through 8, and in English Language Arts and Mathematics. Pennsylvania adopted more rigorous PA Core Standards in late 2013 and the 2015 PSSA marks the first time the assessment was fully-aligned to the standards" (Pennsylvania Department of Education, n.d., para. 1). These new, more rigorous standards aim to better prepare students for the 21st century workforce (Pennsylvania Department of Education, n.d.). For this research, reading PSSA scores were used. This research was built on grades five through eight assessments, as the students have had several years of experience with the assessment's format.

The PSSA technical report of 2015 revealed that the reliability of the assessment in reading, grades three through eight are .90 correlation or higher with a standard error of measure 3.1 or lower (PSSA Technical, 2015). This reliability has been consistent from year to year (PSSA Technical, 2015).

The PSSA Technical report revealed that all the internal structures indicate that related elements of each of the PSSA tests correlate in the intended manner; however, caution is indicated when using the strand scores to identify individual student's strengths and weaknesses (2015). Since the validity of the reading and writing assessments as a

whole are more valid than individual parts, the complete reading assessments were analyzed.

Teacher Interview Protocol and Classroom Observation Protocol

For the purpose of this research, this researcher created two protocols: the teacher interview and classroom observation. The teacher interview protocol and the classroom observation protocol were reviewed by five teachers to ensure clarity of questions and confirm that the questions used and observation protocols developed were targeting the appropriate concepts. Changes were made to the questions, as needed. None of the teachers involved in the review were included in the research study results. Copies of the teacher interview protocol and the classroom observation protocol are in Appendix B and C, respectively.

Ethical Considerations

Since minors were involved in this study, these considerations were addressed prior to the study by requiring consent forms. All participating teachers, parents, and students completed and returned consent forms before any survey administrations, classroom observations, or interviews. Throughout the research study, students and teachers were reminded of the opportunity to discontinue by request and their data were removed from the study. All data from this study were kept confidential and locked in a filing cabinet in the researcher's office.

Teacher surveys were confidential in nature. When teachers signed the consent form to participate, their names and district names were added to an excel spreadsheet and each teacher was provided a numeric identification code. All participating teacher surveys were collected through Qualtrics, which is a computer-based survey tool. Each

teacher had a number and this number was used when they participated in the survey. From that point forward, the teachers were identified by their numeric identification code only.

The surveys were administered as a whole class and students were identified as a number within each teacher's classroom. A number also identified the teachers. For example, student "2" in the classroom of teacher "3" was identified as "Student 3.2," to denote both the teacher and the student. All teachers opted to administer the test through traditional paper and pencil surveys. Teachers were provided the paper surveys with their research identification number and a number for students on the survey form. Teachers kept record of individual student numbers, so that the data from pre- and post-surveys were accurately associated.

Students were not identified during classroom observations and teachers were identified by their numeric code. Students involved in classroom observations were not identified in the schematics of the observation form by name. Classroom observations utilized color-coding for individual movement and verbal interaction throughout the classroom observation. The purpose of the classroom observation was to investigate teacher-interaction and explore classroom environment similarities and differences within classrooms of teachers with grit scores of 4.25 and higher.

The reading PSSA test scores were from the historical data of teachers identified by their respective numbers and collected as a cohort of students and individual student test scores were not acquired. Additionally, the scores obtained for the historical research were the scores from the teachers' previous cohorts of students, not the historical data of the current students. The teacher's research identification number, the year the testing

occurred, and the percentage of students scoring below basic, basic, proficient or advanced identified the historical data. Scores were not collected for individual students; therefore, there were no vulnerable subjects in this data collection.

Although there may have been teachers who were pregnant, had health issues, or socioeconomic issues, this researcher was not aware of these circumstances unless the teacher brought it to the researcher's attention. These vulnerabilities were not a focus of this study and are not addressed in this study. Due to family medical leave, two teachers requested removal from the study. Another teacher requested removal from the study shortly after consent forms were collected. All data from these individuals were removed from the study and destroyed.

All data, including the teacher's survey, student survey data, student reading achievement data, teacher interviews, and observational data were identified through a given numeric code. The spreadsheet containing the teachers' names were kept by the primary researcher on a password-protected site and surveys were kept in a locked filing cabinet in the researcher's office. All assurances were provided to ensure confidentiality during survey administration and collection, interviews, and classroom observations.

Data Analysis

For research questions one, two, and three, Pearson's correlation coefficient, descriptive statistics, and a paired *t*-test were used to describe the strength, direction, and significance of the relationship between two continuous variables. For this research, the continuous variables were teacher grit and student grit for question one. The data were collected and analyzed to explore the connection between teacher grit scores and student grits scores at B-O-Y and E-O-Y. Since grit is a two-factored trait, Pearson's correlation

coefficient descriptive statistics, and a paired *t*-test were also used for question two, which explored the relationships between teacher and student perseverance and teacher and student interest, respectively. These data were compiled and analyzed through the use of the Statistical Package for the Social Science (SPSS).

The historical data of PSSA reading scores were limited to the five teachers who scored a 4.25 or higher on the Grit-S. Data were compiled in an Excel spreadsheet to determine the relationship between teachers' degrees of grit and available historical data of reading PSSA scores of cohorts of students from the 2011-2012, 2012-2013, and 2013-2014 schools years. This relationship was based upon whole class results, not individual students within the class. The purpose of collecting these data was to explore the relationship between reading PSSA scores and teachers with grit scores at or above 4.25, through reviewing these scores in combination with overall district and state averages.

When analyzing the quantitative data, this researcher preliminarily reviewed the data through the use of a scatterplot to check for outliers, determined the direction of the relationship, and the distribution of respective data points. Secondarily, a Pearson coefficient correlation, descriptive statistics, and a paired sample *t*-test were used to determine the strength of the relationship and the significance of the relationship between student and teacher grit scores, student B-O-Y and E-O-Y grits scores, and the multiple connections between perseverance and passion or interest. To look deeply into the results of the quantitative data, question four was based on observational data and individual teacher interviews.

The qualitative data individual teacher interviews were transcribed and classroom observations were captured using the forms found in Appendices A and B, and results

were color-coded based upon recurring themes. All data were analyzed and collected into patterns. This portion of the research study provided a deeper look and different perspective of the research questions.

Summary

The purpose of this mixed-methods research study was to investigate the possible relationship between teacher grit and student grit, in addition to teacher grit and high-stakes testing. The mixed-methods design, using qualitative and quantitative data, was chosen to expand upon current research about the value of the non-academic, non-cognitive skill grit. Participants and school sites were located in central Pennsylvania. Students and teachers in grades five through 8 in Central Intermediate Unit 10 were provided the opportunity to participate with approval as per the districts' requirements. The research did not include students and teachers who chose not to participate at any time throughout the study.

Research included quantitative survey analyses through Grit-S surveys and historical PSSA results, as well as qualitative analysis through classroom observations and individual teacher interviews. Teachers and students were given the opportunity to discontinue involvement in the study. By the end of the study, three teachers requested removal from the research and as a result, all of their respective student data were removed from the research and destroyed.

The quantitative data were analyzed through the SPSS system to explore connections between teacher grit scores and student B-O-Y and E-O-Y grit scores. Teacher grit scores and historical PSSA reading scores were reviewed by utilizing *EXCEL* spreadsheets and graphs. Qualitative data were analyzed through color-coding of

the interviews and classroom observation protocols and analysis of the color-coding to reveal specific patterns.

Chapter IV will involve close analyses and findings of the qualitative and quantitative data collected with this research.

CHAPTER IV

ANALYSIS OF DATA

The main purposes of this study were to research the possible influence of teacher grit levels on student grit levels from the beginning of the year (B-O-Y) to the end of the year (E-O-Y) school year and to explore the connection between teacher grit and PSSA reading achievement scores. This mixed-methods study involved teacher and student survey questions, a review of historical PSSA reading achievement data for teachers with grit scores of 4.25 and above, classroom observations of teachers with grit scores of 4.25 and above, and individual teacher interviews with teachers with grit scores of 4.25 and above. The following research questions directed this study:

1. Using the Grit-S scale, what is the relationship between a teacher's level of grit and a student's level of grit?
2. Since grit is defined as a two-factored structure, perseverance and interest:
    a. What is the relationship between the grit factor of perseverance between teacher and student, as evidenced in the beginning-of-year (B-O-Y) to end-of-year (E-O-Y) student grit scores?
    b. What is the relationship between the grit factor of interest between teacher and student, as evidenced in B-O-Y and E-O-Y student grit scores?
3. Does the degree of teacher grit relate to student reading achievement of a cohort of students, as measured by up to three years of historical PSSA test scores?
4. How do teachers explain the connection, if any, between their levels of grit and up to three years of cohort student reading achievement test scores as assessed with the outcome-based PSSA?

Included in this chapter are an overview of the demographics of teachers and students involved in the study and a description of the utilized tools. A chart was created and utilized to share the research questions, data collection tools, and the data analysis tools. The data results were organized by research question and shown within the results section of this chapter.

Teacher and Student Demographics

Although 24 teachers began the research, the final number of participating teachers were a compilation of 21 teachers, ranging from those teaching grades three through eight. Of the three teachers who did not complete the research study, two began maternity leave in the middle of the school year; therefore, they did not have the whole year with their students and were unavailable to administer the E-O-Y survey or participate in the teacher interview. The third teacher requested to discontinue participation in the research study shortly after the collection of the consent forms.

The teachers' content areas ranged from self-contained classrooms in which teachers taught all content areas to content-specific classrooms. Teachers within the content-specific areas taught English, mathematics, music, physical education, or social studies. Content-specific teachers taught fifth through eighth grade and teachers in self-contained classrooms were fifth and sixth grade teachers. Two content-specific teachers requested to participate in the research with two different groups of students. A total of 364 students participated in the research study.

According to the Center for American Progress in 2015, Pennsylvania had 13.6% of families in poverty, with a total of 19% of children under the age of 18 living in poverty ("Pennsylvania 2015 Report," n.d.). In the Pennsylvanian county in which this

research study took place, the number of families living in poverty are slightly higher, with 16.5% of families living in poverty. Students receiving free and reduced lunch ranged from 51% to 82% within the participating buildings. Over 95% of individuals living in this area identified as White alone and 3% of the population identifies as black or African-American alone. The other 2% of the population are from a variety of races and origins. Slightly over 13% of the population reports having a bachelor degree or higher, which is more than 2 times below the state average of 28.1% ("Quick Facts Clearfield," n.d.).

In August 2014, twelve superintendents of public schools and five CEOs of charter schools within Central Intermediate Unit # 10 were provided a letter of intent and a copy of the Institutional Review Board (IRB) approval of the research study. Approval to email teachers was provided by the superintendents and CEOs of the participating districts following the request. All of the teachers of grades three through eight within the districts were sent an email with a letter of intent and expectations. At the end of the research study, there were 21 teachers and 361 students in participation.

Description of Research Tools Utilized

Teachers' grit scores were obtained using the Grit-S survey the Qualtrics survey platform. Students' grit scores of participating teachers were obtained using the Grit-S survey at the B-O-Y and at the E-O-Y. The *8-Item* Grit-S survey measures an individual's "consistency of interest" or "passion" and "perseverance of effort" in a topic to anticipate the likelihood of success in goals and life achievements at that specific point in time. The *8-Item* Grit-S scores were analyzed in several ways.

For question one, *Using the* Grit-S *scale, what is the relationship between a teacher's level of grit and a student's level of grit?* the scores were evaluated using the Pearson correlation coefficient and a paired sample *t*-test. First, using the Pearson correlation coefficient, all teacher scores were compared to all student scores in the pre- and post-assessments. The purpose of this overall comparison was to determine the possible relationship of teacher grit scores and student grit scores from the B-O-Y to E-O-Y regardless of specific teacher. Next using a paired sample *t*-test and descriptive statistics, students' B-O-Y score and E-O-Y score were compared to each other to analyze the change in individual student grit scores from the beginning to the end of the school year. Finally, using the Pearson correlation coefficient and descriptive statistics, the individual teacher scores were compared to the changes in their specific students' grit scores at the beginning and end of the school year..

For research question two, *Since grit is defined as a two-factored structure, perseverance and interest: a. What is the relationship between the grit factor of perseverance between teacher and student, as evidenced in beginning-of-the-year (*B-O-Y*) to end-of-the-year (*E-O-Y*) student grit scores? and b. What is the relationship between the grit factor of interest between teacher and student, as evidenced in* B-O-Y *and* E-O-Y *student grit scores?* The grit scores were divided into two definitive factors, "perseverance of effort" and "consistency of interest." For this research question, descriptive statistics, paired sample *t*-tests, and Pearson correlation coefficients were used to dissect the research more deeply into the two factors associated with grit.

Question three asked, *Does the degree of teacher grit relate to student reading achievement of a cohort of students, as measured by up to three years of historical* PSSA

test scores? To explore this question, historical PSSA reading data were collected to review information from teachers who exhibited high degrees of grit (4.25 or above) based upon self-reporting on the Grit-S Survey. The information used to research this question was up to three years of historical PSSA reading achievement data of students instructed by identified educators during the 2011-2012, 2012-2013, and 2013-2014 school years. This information was obtained upon teacher consent from the curriculum directors from their respective districts. An Excel spreadsheet and graphs utilizing basic addition and division formulas was developed to compile the data from identified teachers in identified years.

Finally, question four asked, *How do the teachers explain the connection, if any between their levels of grit and cohort student reading achievement according to the* PSSA *test scores*? This question is qualitative in nature and utilized ethnographic principles to guide the research. The anecdotal information acquired from the transcribed teacher interviews and the classroom observations were color-coded and analyzed for patterns.

This chapter describes the data, which were collected and analyzed to answer each question. A comprehensive explanation of the results is described below. Table 1 summarized the research questions at the foundation of the process and the type of statistical analysis used to determine their answers.

Table 1

Overview of Research Questions, Data Collection, and Analysis

Research Question	**Data Collection**	**Analysis**
Using the Grit-S scale, what is the relationship between a teacher's level of grit and a student's level of grit?	8-Item Grit-S Scale: Teacher: One administration at B-O-Y Students: Pretest at B-O-Y, Posttest at E-O-Y	Quantitative using the SPSS system: Pearson 2-tailed correlation coefficient Paired samples *t*-test
Since grit is defined as a two-factored structure, perseverance and interest: a. What is the relationship between the grit factor of perseverance between teacher and student, as evidenced in beginning-of-the-year to end-of-the-year student grit scores? and b. What is the relationship between the grit factor of interest between teacher and student, as evidenced in beginning-of-the-year (B-O-Y) to end-of-the-year (E-O-Y) student grit scores?	8-Item Grit-S Scale: Teacher: One administration at B-O-Y Students: Pretest at B-O-Y, Posttest at E-O-Y	Quantitative using the SPSS system: Pearson 2-tailed correlation coefficient Paired samples *t*-tests Descriptive statistics: Teacher Interest and Teacher Perseverance
Does the degree of teacher grit relate to student reading achievement of a cohort of students, as measured by three years of PSSA historical data?	PSSA Student Data for Educators receiving a 4.25 or higher on the Grit-S Scale Grit-S Scale of Teachers scoring a 4.25 or higher Semi-Structured	Quantitative Data using Excel spreadsheets
How do the teachers explain the connection, if any between their levels of grit and cohort student reading achievement according to the PSSA test scores	Teacher Interviews and Classroom Observations	Qualitative Teacher Interviews and Classroom Observations-

Results and Analysis

Research Question One

The researcher asked, *Using the* Grit-S *scale, what is the relationship between a teacher's level of grit and a student's level of grit?* At the beginning of the 2014-2015 school year, participating teachers were asked to take the Grit-S Survey. The results of the survey are shown below in Figure 1.

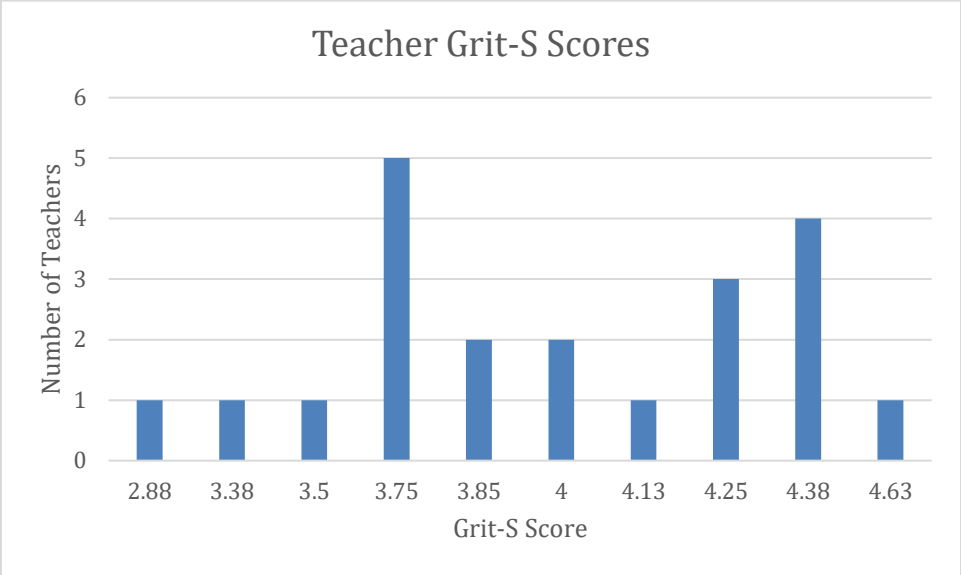

Figure 1. Participating Teachers Grit-S Scores.

The information in Figure 1 shows the results of each teacher's grit score, as obtained from the Grit-S survey. The minimum score on a Grit-S Survey is 1.00 and the maximum score is 5.00. A teacher with a higher grit score reveals that the teacher self-reports high degrees in consistency of interest and perseverance of effort, which are the components of grit. Teacher's scores ranged from 2.88 to 4.63. The lowest possible score is 1.00 and the highest score is 5.00, with the majority of teachers scoring at or above 3.75. Three of 21 teachers scored below 3.75. The teachers in this study were overall above average in degree of grit, although it should also be noted that there is not a specifically average grit score for the population at this time. In this research study,

average was compared to previous research studies on average grit of Americans, in which the 50th percentile was at 3.8 (Duckworth, 2016, p. 56).

Eleven teachers scored between 3.75 and 4.13, and eight teachers scored 4.25 and above. For the purpose of this study, above average was 4.25. Although many cognitive tests have an approximate average score, there is not guidance on a statistically documented average grit scores at this point.

Table 2 shows the statistically significant increase in student post-instruction grit survey scores compared to student pre-instruction grit survey scores using a paired sample *t*-test of 360 students. A two-tailed paired sample *t*-test reveals that the students' overall post grit scores were significantly higher than pre-grit scores (*post*=3.59, *pre*=3.52, $t(359)=2.07$, $p< .05$).

Table 2

Comparison of Student Pre-Instruction and Post-Instruction Grit Survey Scores

		M	*N*	*SD*	$\sigma_{\bar{x}}$
Pair 1	Posttest	3.5896	360	.63103	.03326
	Pretest	3.5198	360	.58467	.03081

Note. In this paired samples *t*-test, $p<.05$.

Additionally, with 95% confidence, overall post grit survey scores will show an increase in score of lowest at .003 and highest .14. This confidence means that if the Grit-S was to be utilized in a similar study, that there is a high assurance that those who were to take the survey would have similar score changes with little variance.

To explore the relationship between teacher grit scores and student grit scores,

students were asked to complete a B-O-Y grit survey and an E-O-Y grit survey. The Grit-S survey can be found in Appendix A (with permission) and at http://angeladuckworth.com/Grit-Scale/ (Duckworth, n.d.). In addition, teachers' Grit-S scores were correlated to their individual students' pre- and post-survey grit scores. The results of this analysis are shown in Table 3 below.

Table 3

Correlational Data Between Teacher Grit-S *Scores and Student Pre- and Post-*Grit-S *Scores*

		Teacher Grit Score	Total Student Pretest Grit Score	Total Student Posttest Grit Score
Teacher Grit Score	Pearson Correlation	1	-.030	-.095
	Sig. (2-tailed)		.568	.070
	N	364	361	363
Total Student Pretest Grit Score	Pearson Correlation	-.030	1	.449**
	Sig. (2-tailed)	.568		.000
	N	361	361	360
Total Student Posttest Grit Score	Pearson Correlation	-.095	.449**	1
	Sig. (2-tailed)	.070	.000	
	N	363	360	363

Note. **. Correlation is significant at the 0.01 level (2-tailed).

The results revealed a statistically significant increase in student grit from the B-O-Y, September 2014 to the E-O-Y, May 2015 ($r = .449$, $p < .05$). Although the students had a significantly positive increase in scores from pre to post, there was a

negative correlation between teacher grit and student grit *(r* = -0.030 and *r* = -0.095, respectively). This correlation was not statistically significant (*post* = 3.59, *pre* = 3.52, *t*(359) = 2.07, *p*< .05). The findings of this research question lead to the need for more in depth analysis. For example, even though the negative overall grit scores were not statistically significant it would be of value to dissect the grit scores into its two factors of perseverance and of interest (passion). The results of this segmentation of data are analyzed in the next research question.

Research Question Two

The researcher sought to answer, *since grit is defined as a two-factored structure, perseverance and interest: a.) What is the relationship between the grit factor of perseverance between teacher and student, as evidenced in the beginning-of-year (*B-O-Y*) to end-of-year (*E-O-Y*) student grit scores? and b.) What is the relationship between the grit factor of interest between teacher and student, as evidenced in* B-O-Y *and* E-O-Y *student grit scores?*

Two sub-categories are measured in Grit Scales: (1) Consistency of Interest and (2) Perseverance of Effort. Since grit is defined as "perseverance and passion for long term goals [and] entails working strenuously toward challenges, maintaining efforts and interest over years despite failure, adversity, and plateaus in progress" (Duckworth et. al., 2007, p. 1088), it is valuable to explore the relationship within each sub-category between teacher and student. The terms "passion" and "interest" have been used interchangeably by the creator of the Grit-S and are identified as the same factor in this research study.

The teachers' scores for the subcategories of perseverance and interest were determined

by using descriptive statistics. This information is provided in Tables 4 and 5 below.

Table 4

Mean Scores for Teacher Interest Factor

	N	min	max	*M*	*SD*
Teacher Interest	21	2.25	3.75	3.1786	.34589
Valid *N*	21				

Table 4 provides the mean scores of the interest factor for teachers. The minimum score was 2.25 and the maximum score was 3.75. The mean for the interest factor for this group of teachers was 3.75.The approximate average of overall grit scores of American adults is 3.8 (Duckworth, 2016, p56). There is not an approximate average of the individual factors of grit, passion and perseverance; however, it is noted that perseverance scores tend to be slightly higher than passion (interest) scores in most individuals.

The table below contains the minimum, maximum, and mean scores for teachers within the perseverance factor of the Grit-S.

Table 5

Mean Scores for Teacher Perseverance Factor

	N	min	Max	*M*	*SD*
Teacher Perseverance	21	3.00	5.00	4.2857	.50797
Valid *N*	21				

Table 4 provides the mean scores of the perseverance factor for teachers. The minimum score was 3.00 and the maximum score was 5.00. The mean for the perseverance factor for this group of teachers was 3.75. Review of the information in

Tables 4 and 5 revealed that the mean of teacher interest was M = 3.17; the mean of teacher perseverance was M = 4.29. The teachers in this study viewed themselves as having high degrees of perseverance, but less consistency of interest. This outcome is related to previous research that has shown that individuals tend to score higher in the perseverance factor than the interest factor.

In addition to analyzing the student data using the Pearson Correlation, the data connecting student pre- and post-survey perseverance and interest scores were also analyzed using the paired sample *t*-test. The results are provided below in Table 6.

Table 6

Paired Sample t-Test for Student Perseverance and Interest, Pre- and Post- Grit Surveys

					95% Confidence Interval of the Difference				
		M	*SD*	$\sigma_{\bar{x}}$	Lower	Upper	*T*	Df	Sig. (2-tailed)
Pair 1	Perseverance Pre/Post	.07964	.73861	.03887	.00319	.15609	2.049	360	.041
Pair 2	Interest Pre/Post	.05801	.87404	.04594	.03233	.14835	1.263	361	.207

Note: Pair one revealed the mean difference between pre and post scores for effort of perseverance. Pair two revealed the mean difference between pre and post scores consistency of interest. Df is defined as Degrees of Freedom.

The paired sample *t*-tests reveal that the mean of perseverance within the grit surveys of students increased by m = .07964, $t(360)$, $p<.05$. There was a 95% Interval of the Difference of Scores showing a lower limit of .00310 and an upper limit of .15609.

The confidence interval determines how high and low a score would be in a similar study, to show the possible range of mean score differences. Since the upper and lower intervals are both positive, there is strong confidence that if a similar survey were completed that the scores would be similar.

Concerning the pre- and post-test interest survey results, there was no significance between the mean scores. This information is represented in two different ways: 1.) the 95% Confidence Interval of the Difference revealed a negative number for the lower difference and a positive number for the upper difference and 2.) the significance was .207, which is quite a large margin with $p<0.05$. When the Interval of Difference displays a positive sign and a negative sign, there is not strong confidence that a similar study would reveal similar results.

Table 7

Comparison on Teacher Total Grit Score and Student Pre- and Post-test Interest and Perseverance Scores

	Teacher Total Grit Score	Student Pre-Score: Perseverance	Student Post-Score: Perseverance	Student Pre-Score: Interest	Student Post-Score: Interest
Teacher Total Grit Score	1	.015	-.129*	-.056	-.043
Sig. (2-tailed)		.773	.014	.286	.413
N	64	362	363	363	363
Student Pre-Score: Perseverance	.015	1	.346**	.322**	.225**
Sig. (2-tailed)	.773		.000	.000	.000
N	362		362 361	361	361
Student Post-Score: Perseverance Pearson Correlation	-.129*	.346**	1	.232**	.437**
Sig. (2-tailed)	.014	.000		.000	.000
N	363	361	363	362	363
Student Pre-Score:Interest	-.056	.322**	.232**	1	.419**
Sig. (2-tailed)	.286	.000	.000		.000
N	363	361	362	363	362
Student Post-Score: Interest Pearson Correlation	-.043	.225**	.437**	.419**	1
Sig. (2-tailed)	.413	.000	.000	.000	
N	363	361	363	362	363

* Correlation is significant at the 0.05 level (Correlation is significant at the 0.01 level (2-tailed).

Student pre- and post-perseverance grit scores and interest grit scores were analyzed using a 2-tailed Pearson correlation coefficient. Also, the correlation between the teacher Grit-S score and student Grit-S score in the perseverance sub-category on the pre- and post-surveys were reviewed and analyzed. Additionally, the correlation between the overall teacher Grit-S score and student Grit-S score in the interest sub-category on the pre- and post-tests were reviewed and analyzed.

Investigation of the sub-categories of interest and perseverance showed that student perseverance and interest increased significantly from the beginning of the 2014-2015 school year to the end of the 2014-2015 school year. Students' pre- to post-sub-category of interest revealed that a statistically significant increase between pre- and post-survey interest data ($r = .419$, $p < .05$). Students' pre- to post-sub-category of perseverance revealed that a statistically significant increase between pre- and post-survey perseverance data ($r = .346$, $p < .05$). Finally, there is a statistically significant positive relationship between post-survey student interest and perseverance ($r = .346$, $p < .01$), revealing that as interest (passion) increases so does perseverance.

This analysis revealed several findings in regard to overall teacher grit scores and student perseverance scores correlations. Prior to instruction, there was not a statistically significant negative relationship between the teacher overall grit scores and student perseverance scores ($r = .015$). After almost a year of instruction, it was determined by the results from the Grit-S survey that there was a significantly negative relationship between teacher overall grit scores and student post-test perseverance ($r = -.129$, $n(363)$, $p < .05$). Although the correlation between teacher overall grit scores and student perseverance scores was negative, it should be noted that student perseverance scores

increased significantly ($r = .346$, $p < .05$).

To explore the connection between teacher grit and student post-test grit scores further, the teacher reporting a grit score of less than three was removed from the results as a potential outlier. The purpose of removing these statistics was to determine if removing the teacher with a less than average grit score would change the correlations between teacher grit and student sub-category post-test grit scores. The outcome of this exploration can be found in Table 8, which is shown below.

Table 8

Comparison on Teacher Total Grit Score and Student Pre- Post-test Interest and Perseverance Scores After Removing the Teacher With an Overall Grit Score of Less than 3

	Teacher Total Grit Score	Student Pre-Score: Perseverance	Student Post-Score: Perseverance	Student Pre-Score: Interest	Student Post-Score: Interest
Teacher Total Grit Score Pearson Correlation	1	-.009	-.148**	-.048	-.013
Sig. (2-tailed)		.865	.005	.366	.810
N	357	355	356	356	356
Student Pre-Score: Perseverance Pearson Correlation	-.009	1	.346**	.318**	.225**
Sig. (2-tailed)	.865		.000	.000	.000
N	355	355	354	354	354
Student Post-Score: Perseverance Pearson Correlation	-.148**	.346**	1	.227**	.432**
Sig. (2-tailed)	.005	.000		.000	.000
N	356	354	356	355	356
Student Pre-Score: Interest Pearson Correlation	-.048	.318**	.227**	1	.412**
Sig. (2-tailed)	.366	.000	.000		.000
N	356	354	355	356	355
Student Post-Score: Interest Pearson Correlation	-.013	.225**	.432**	.412**	1
Sig. (2-tailed)	.810	.000	.000	.000	
N	356	354	356	355	356

**Correlation is significant at the 0.01 level (2-tailed).

Removing the teacher grit score of 2.88, revealed a statistically significant negative correlation that was slightly higher. Eliminating the teacher with a less than average grit score revealed an even larger negative correlation between the existing teachers and their respective students. Additionally, post-test 2-tailed Pearson correlation was significant at the 0.01 level, rather than the 0.05 level, suggesting that this connection has even less probability of error when this teacher's score was removed ($r = -.148$, $p < .01$).

To delve further into the data, the sub-category scores of teachers to the sub-category scores of students were compared to research the possible connection between teacher perseverance and student perseverance, and teacher interest and student interest. Tables 9 and 10 below show the data reviewed.

Table 9

Correlations between Teacher Perseverance and Student Perseverance.

		Teacher Perseverance Score	Student Pre-score Perseverance	Student Post-score Perseverance
Teacher Perseverance Score	Pearson Correlation	1	-.025	-.120*
	Sig. (2-tailed)		.642	.026
	N	344	343	343
Student Pre-score Perseverance	Pearson Correlation	-.025	1	.346**
	Sig. (2-tailed)	.642		.000
	N	343	362	361
Student Post-score Perseverance	Pearson Correlation	-.120*	.346**	1
	Sig. (2-tailed)	.026	.000	
	N	343	361	363

* Correlation is significant at the 0.05 level (2-tailed); ** Correlation is significant at the 0.01 level (2-tailed)

The data in Table 9 revealed a negative, but not significant, correlation between teacher perseverance scores and student pre-test perseverance scores, but a significantly negative correlation between teacher perseverance scores and student post-test scores for perseverance (r = -.120, p< .05).

Table 10

Correlations between Teacher Interest and Student Interest.

		Teacher Interest Score	Student Pre-score Interest	Student Post-score Interest
Teacher Interest Score	Pearson Correlation	1	-.008	-.034
	Sig. (2-tailed)		.887	.533
	N	344	343	343
Student Pre-score Interest	Pearson Correlation	-.008	1	.419**
	Sig. (2-tailed)	.887		.000
	N	343	363	362
Student Post-score Interest	Pearson Correlation	-.034	.419**	1
	Sig. (2-tailed)	.533	.000	
	N	343	362	363

**. Correlation is significant at the 0.01 level (2-tailed).

The data in Table 10 revealed no significant correlation between teacher interest and student pre- or post-test scores for interest. Although there is a negative correlation between teachers' interest scores and students' interest scores, it is insignificant.

Research Question Three

The researcher asked, *Does the degree of teacher grit relate to student reading achievement of a cohort of students, as measured by up to three years of historical* PSSA *test scores?*

To explore this question, up to three years of historical PSSA reading data were collected to review information from teachers who exhibited high degrees of grit based upon the self-reporting on the Grit-S Survey. Of the 21 teachers in the survey, eight teachers scored a 4.25 or above on the grit survey. Of those eight teachers, three of them did not have any historical PSSA reading achievement data that could be used for this research study. The historical data were based on the Pennsylvania School System of Assessment *(*PSSA*)*, which is administered to all students learning in a public school in Pennsylvania in grades three through eight. The information was collected within an Excel spreadsheet and is shared in graph form in Figure 2 below.

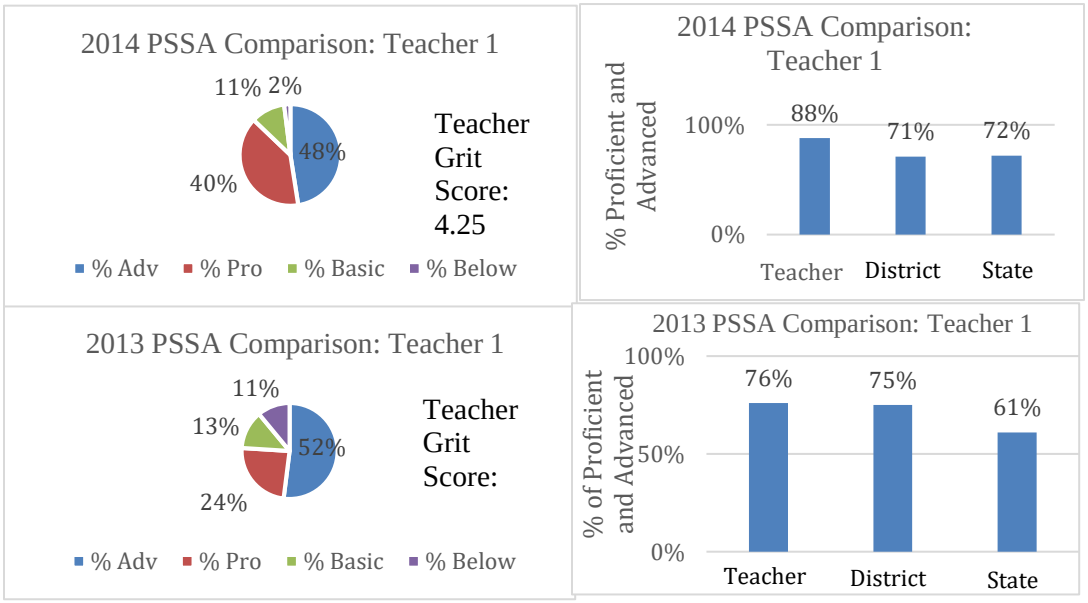

Figure 2. Two years of historical PSSA reading data and comparison to state and district reading data for Teacher 1.

The pie charts provide Teacher 1 student PSSA scores for two tested school years. Students are expected to perform proficient or advanced on this assessment. The bar graphs on the right depict the student scores attributed to the teacher in comparison to the district and state scores for the same year.In the data obtained and shown above, at least 15% more of Teacher 1 students performed at proficient or advanced than the state average. In 2013, 61% of students across the state performed proficient or advanced on the PSSA, and 72% of students in Teacher 1 scored proficient or advanced. In 2014, 88% of Teacher 1 students were proficient and advanced, compared to the state average of 72%. The teacher also scored above the district average in both years reviewed.

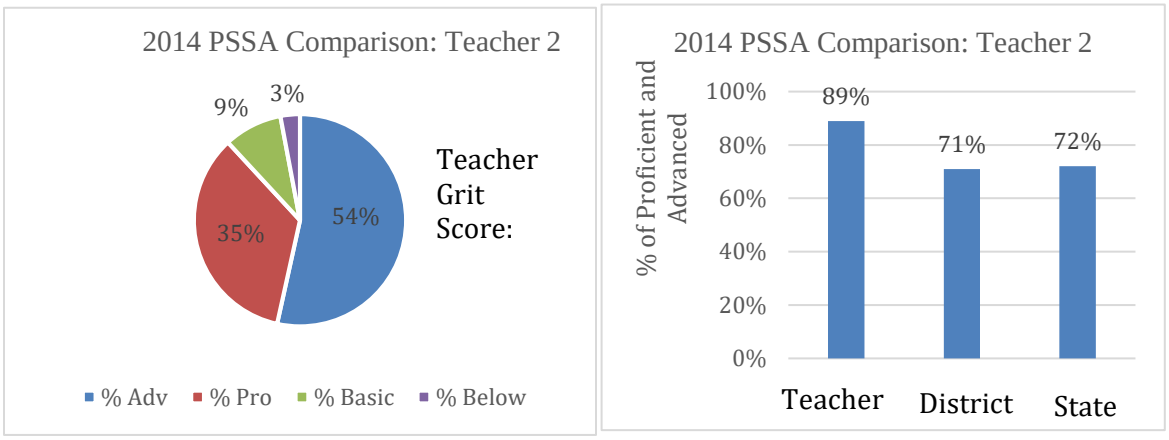

Figure 3. One year of historical PSSA data and comparison to state data for Teacher 2.

The pie charts provide Teacher 2 student PSSA scores for one tested school year. Students are expected to perform proficient or advanced on this assessment. The bar graphs on the right depict the student scores attributed to the teacher in comparison to the district and state scores for the same year. Teacher 2 students were 89% proficient or advanced. When reviewing the scores across the state, 72% of the students performed

proficient or advanced. Teacher 2 had 17% more students score proficient or advanced than the state average and 18% more students than the district average.

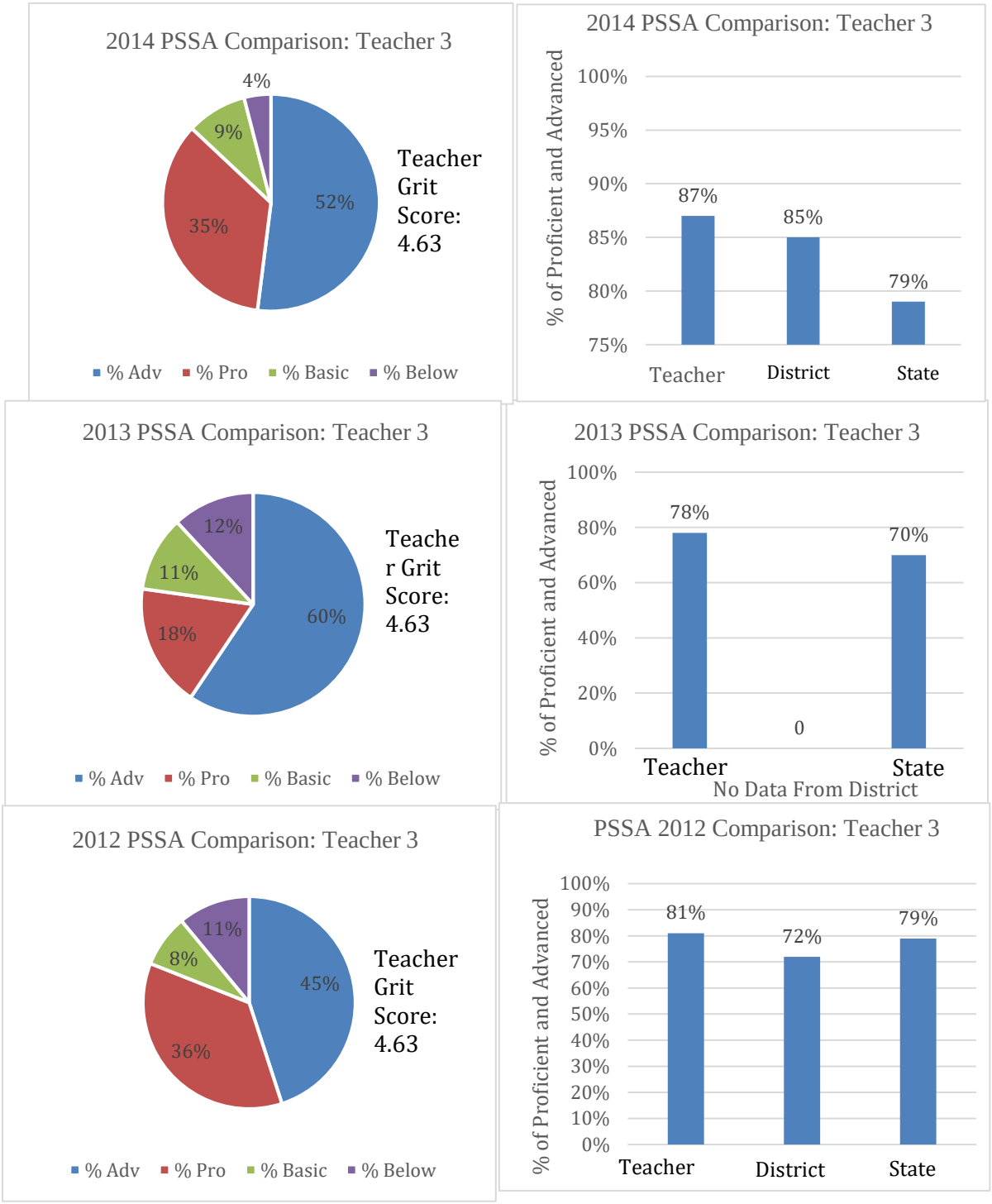

Figure 4. Three years of historical PSSA data and comparison to state data: Teacher 3.

The pie charts provide Teacher 3 student PSSA scores for three tested school years. Students are expected to perform proficient or advanced on this assessment. The bar graphs on the right depict the student scores attributed to the teacher in comparison to the district and state scores for the same year. For three consecutive years, Teacher 3 had a greater number of students meeting proficient or advanced than the state average on the PSSA reading assessment. Teacher 3 had scores of 8%, 8% and 2% higher than the state average in 2014, 2013, and 2012 respectively. The teacher also scored above the district average in both years reviewed. Data for 2013 PSSA reading achievement scores were unavailable.

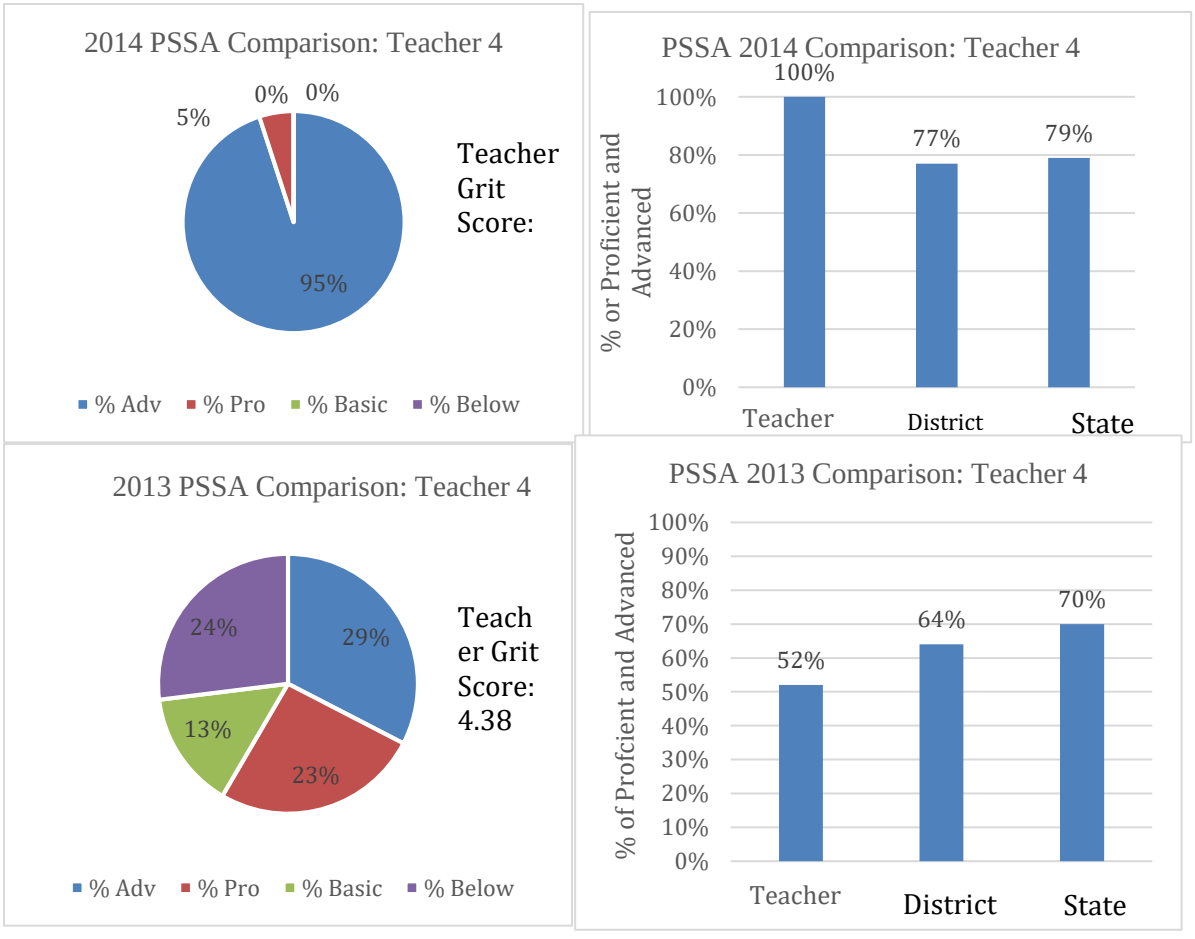

Figure 5. Two years of historical PSSA data and comparison to state data: Teacher 4.

The pie charts provide Teacher 4 student PSSA scores for two tested school years. Students are expected to perform proficient or advanced on this assessment. The bar graphs on the right depict the student scores attributed to the teacher, in comparison to the district and state scores for the same year. In 2013, Teacher 4 had 52% of students scoring proficient or advanced which was 18% below the state average of 70%. It should also be noted that 2013 was Teacher 4's first year teaching. In 2014, Teacher 4 had 100% of students score proficient or advanced on the PSSA reading assessment, which was 21% above the state average. Teacher 4 also had 12% less students scoring proficient or advanced in the PSSA reading achievement test than the district average in 2013, but 13% above the district average of PSSA reading scores in 2014.

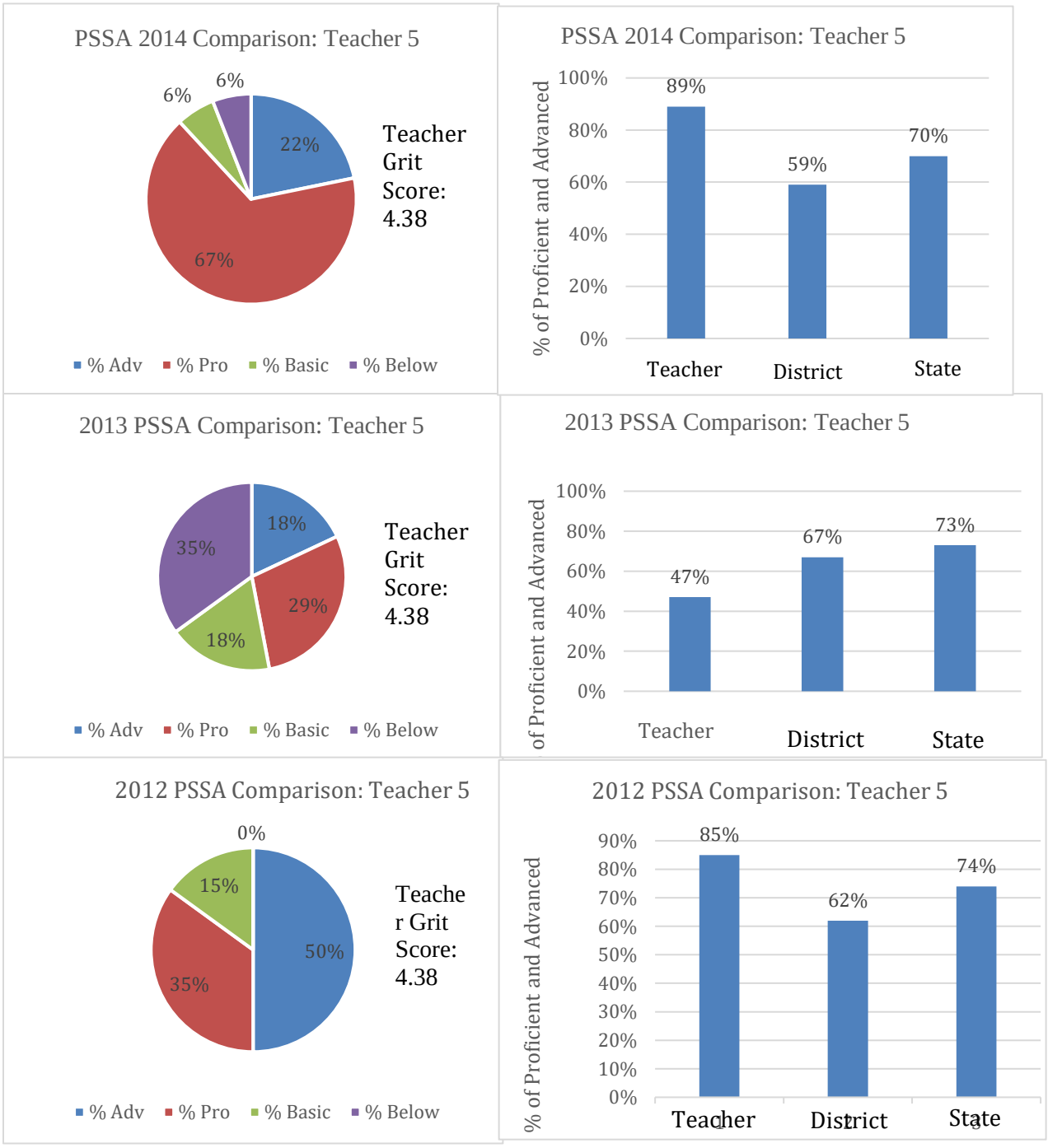

Figure 6. Three years of historical PSSA data and comparison to state: Teacher 5.

The pie charts provide Teacher 5 student PSSA scores for two tested school years. Students are expected to perform proficient or advanced on this assessment. The bar graphs on the right depict the student scores attributed to the teacher in comparison to the district and state scores for the same year. In 2014, Teacher 5 had 89% of students score proficient or advanced, compared to the state average of 70% and 85% of students scoring proficient or advanced in 2012, which was 11% above the state average. In 2013, Teacher 5 had 47% of students score proficient or advanced, which was 26% lower than the state average.

The graphs displayed above reflect student achievement results of five teachers with grit scores of 4.25 or higher. All five teachers showed a greater amount of students obtaining proficient or advanced than the state or district average during at least one reporting category. Three of the five teachers revealed a greater amount of students scoring proficient or advanced student reading achievement scores on the PSSA in every year reviewed.

Research Question Four

With this question, the researcher sought to answer, *How do teachers explain the connection, if any, between their levels of grit and up to three years of cohort student reading achievement test scores as assessed with the outcome-based* PSSA*?*

Fetterman (2010) explains ethnographic study as "the art and science of describing a group or culture" (p. 11). In this mixed methods study, survey data and historical data were utilized for research questions one through three. Ethnographic techniques were utilized for this research question. When using ethnographic techniques as described by Fetterman (2010), the researcher relies on “all senses, thoughts and

feelings to gather information" (p. 41). Ethnographic techniques provide a holistic approach to study groups of individuals or a culture. In this research, the researcher questioned the possible influence of high grit teacher scores with student reading achievement, in addition to the connection between teacher grit scores and student grit scores. This researcher was already part of the communities as a professional development consultant and was familiar with the language and "customs" in education due to having almost twenty years of educational experience. The current study involved classroom observations and semi-structured interviews of educators within the study with a recorded 4.25 or above on the Grit-S scale.

Classrooms were observed considering the following categories: space, objects, individual actors, social systemic context, behaviors (acts, activities, and events), language, expressive culture, patterns of interaction, and goals, motivations or agendas (Whitehead, 2005). During these observations, some consistent patterns emerged. Data were collected using the form found in Appendix C and then color-coded with emerging patterns. The results of these analyses are discussed below.

When observing in classrooms of the five teachers who obtained a grit score of 4.25 or above, certain patterns emerged. As these patterns emerged, they were color-coded and analyzed based on the frequency of observations. The most common themes were in the categories of space, language, and goals. For the purpose of this research study, space is defined as the area in which the students participate in instruction. Language refers to oral and written communication observed during the classroom visit. Goals refers to the presence of clear and consistent goals through written and oral conversation as well as teacher actions. Each of these themes are discussed more in depth

below.

In regard to space, all classrooms were highly organized. For example, all of the materials needed for the tasks at hand were readily available. Students were knowledgeable of the equipment locations and the space was kept in a neat and organized fashion. There was no specific manner in which the classrooms were organized with the exception that they were devoid of any areas that would appear to be confusing or out of place. One teacher used bins placed by groups of students that contained all of the tools necessary for completing the task. Another teacher had determined roles for students and they were responsible for ensuring that everything was available through getting the materials expected prior to the start of the class or activity.

All observed teachers had their students in groups for learning and expectations or goals for the day displayed within the classroom. Regardless of the classroom observed, students arrived and immediately began the expected task. Students did not ask what they were supposed to be doing, it appeared that they already had systems in place to know what to do when they arrived in class or when the activity started or completed in a self-contained classroom. In some classrooms, the task was a bell ringer, in other classrooms it was a homework check, but the procedure to begin the class upon arrival was established in all classrooms observed.

During the lesson itself, students participated in active lecture or small group instruction. Students were expected to stay on task and during my observations, between 80% and 90% of students were actively engaged 80% of the time. Engagement took the form of active listening, note-taking, collaborative work or independent work. There was not a specific format for instruction and it varied from teacher to teacher.

Language in the classroom was academically-based, and academic vocabulary was used contextually and often. When observing students within small group instruction, they also utilized the academic vocabulary within classroom instruction, regardless of teacher interaction during that time. Academic and content area vocabulary were taught, but also interwoven throughout classroom discussion.

In one classroom, students utilized a vocabulary graphic organizer to choose appropriate vocabulary, yet in another classroom, the students had already incorporated the vocabulary into everyday conversation. For example, one student noted, "I can see why this book would be hard for someone that didn't understand colloquialisms. If they thought that she really meant what she said, not that it was a figure of speech, then the book wouldn't make any sense."

Through classroom observation and lesson plan reviews, this researcher noted that four out of five classrooms provided the opportunity for small group and individual instruction at least three times per week. This type of instruction occurred following large group instruction. One of the classrooms involved whole class, lecture-style instruction four times out of the week, and small group instruction one time per week. Finally, all but one of the classrooms observed provided clear and defined goals, including expectations of daily classroom instruction and overall class or course objectives.

This information was provided to the students in several ways, including oral explanation in the beginning of class, overviews at the end of class, and written explanations on assignments. One teacher provided the daily activities on a YouTube channel, so the students could go back and review the lesson. In these classrooms, student were able to articulate the goal and its purpose. The final classroom only provided written

daily goals on the interactive white board at the beginning of the lesson and there was no evidence of long-term goal review. When interviewing the teacher, it was mentioned that goals are usually discussed more often, but the class was currently at a transition point between to lessons and as a result there is minimal discussion of specific goals until a little more content is divulged.

Teachers (n = 5) who exhibited a grit score of 4.25 and above were interviewed for this research question. The decision to interview only teachers with higher degrees of grit was due to the information uncovered in research question three. Since teachers with high degrees of grit appeared to have some success on the PSSA reading scores most of the time, it was logical to focus the planned interview questions on those teachers.

Each teacher was asked a series of five questions, as well as one demographic question. The questions were asked following classroom observations, to provide some background knowledge on the teacher's classroom prior to interviews. These semi-structured interviews were conducted May 11, 2015, to May 29, 2015. Semi-structured interviews are an ethnographic technique utilized to provide some structure to an interview, while allowing for the opportunity for deeper discussion (Fetterman, 2010). The teachers' numbers were utilized to record interview responses. Interviews were conducted within the teacher classrooms when the students were not in class. No pseudonyms were necessary in this format and all teachers were assured that the interviews were kept confidential.

The interview questions are provided in Figure 7. The five teachers interviewed had a Grit-S score of 4.25 and above. Interviewed teachers worked in education for a

range of 3 to 22 years. The answers to question six were synthesized into the other questions for clarity.

Teacher Interview Questions:

1. What grade(s) and content(s) do you teach?
2. How long have you been in education?
3. What do you hope students will have acquired after a year in your classroom?
4. What do you believe to be your role in student reading achievement?
5. What impact do you believe you have in student reading achievement on high-stakes tests?
6. Are there any additional comments you want to share that will be helpful in my research?

Figure 7. Teacher interview questions.

Teachers were asked four questions in addition to a demographic question regarding years in education. Question number three also included a follow-up question. The first question in the interview was, "*What do you believe to be your role in student reading achievement?"* The predominant theme in the answers to this question were teaching skills and providing engaging materials. One teacher responded in this way, "I am an English teacher. Having said that, if kids can't read, what are we doing? Literacy for my students is paramount." Although half of the teachers interviewed were not specifically reading teachers, they did express that they believe it is important to teach students how to read the textbooks and understand vocabulary that goes along with their content. The teachers that were in self-contained classrooms identified the importance of literacy in every aspect of the classroom.

The interviewed teachers expressed the importance of teaching to the standards of their specific grade levels and/or contents, but not teaching to the test. When questioned

further about this, teachers explained that knowing how to answer the questions on the test were important, so they did provide students with released PSSA passages. Released PSSA passages provide an example of what students will see on the test. Four of the teachers interviewed stated that they used the released passages as a pre-test and then instruct from the results.

The second interview question, "*What are the major challenges you experience in teaching reading in your content?*" revealed two common themes, specifically time and students who struggle with reading. All interviewees expressed that time is a factor to ensure reading instruction in their classroom. Specific concerns discussed were the lack of time for small group and individualized instruction for students that need the additional support. Teachers within self-contained classrooms revealed that some of their time constraints were not as challenging as one-content teachers because they could modify the schedule. "Changing the schedule around doesn't come without consequences," one teacher explained. "Sometimes I don't get to science or social studies as often as I want to because I have to spend time on reading to help the kids pass the PSSA."

Teachers in content-specific classrooms also shared concerns with motivation and relevance for students who have not met with success for many years prior to entering their classrooms. One teacher explained, "My challenge at times is to get them to believe that they can be successful." All interviewed teachers shared experiences with students who do not believe in themselves, or do not understand why education is important.

The third question in the semi-structured interview was, *"What strategies do you use to meet these challenges?"* The response provided from the participants did not

reveal a strongly common theme. One teacher shared the strategy of teaching more test-taking skills to the students. Another teacher expressed the benefit in participating in professional development to build capacity. Another teacher believed it best to limit instruction only to information that is assessed on the PSSA at the end of the year.

One of the most interesting responses came from a history teacher who expressed students not seeing the relevance of reading in history as the largest challenge. When asked about strategies to meet these challenges, this researcher was provided a history lesson, "The domino theory – everything in history is related to what happened before it in some way." When the researcher asked for further clarification, the teacher shared, "Meaning that, what happened before, or is happening now with a student's reading, will impact their future. Teaching them the relevance of reading enables students to overcome the challenge of understanding the relevance of reading in the future."

The final interview question was "*What impact do you believe you have in student reading achievement on high-stakes tests?*" Four out of five of the teachers interviewed believed they had an impact on the results of high stakes reading tests on a variety of levels. Some believed they had a big impact, whereas the mathematics teacher believed the reading impact was only made in teaching of academic vocabulary and affixes. The teacher who expressed that she did not have an impact explained it this way, "I'm deeply distressed that I feel I had little impact on their test scores this year. This has been maybe the toughest year of teaching for me." When questioned further, this teacher also explained that she believes she has had impact on student reading achievement in previous years.

Due to the size of the cohort for question 4, a word cloud was used to further identify themes within the populations. See figure 8.

Figure 8. Tagxedo including the information from teacher interviews and classroom observations of educators with a Grit-S score of 4.25 and above.

As expressed within Figure 8, some common patterns emerged among the educators during interviews and observations. The larger the word is depicted, the more often it was observed in the classroom, or discussed in an interview.The patterns are described in more detail in the information provided below.

The first pattern that emerged was goals. During classroom observations and teacher interviews, the importance of goal setting was expressed. The format of the goal setting was different from one educator to the next; however, the intention of the goals was focused on expectations of the standards, specifically those addressed in the PSSA.

As revealed in Figure 8, words such as “scores, test, stakes, and final” were some of the more prevalent explanations of the direction of learning in the classroom. Goal is not listed as a prevalent word in the Figure 8, due to the fact that teachers sometimes referred to them as “goals” and other times as “lessons.”

Classroom observations exposed a theme of the importance of reading achievement outcomes and expectations of reaching these outcomes. Teachers with high degrees of grit had classroom environments and conversations that focused on the goal of reading achievement or more specifically, reading the content of the class. When asked about her role in student reading achievement outcomes, one teacher explained, “My goal is to not only teach skills but to engage students in the enjoyment and satisfaction to be found in reading and writing.”

The second pattern dealt with instruction. Teachers within this category were teachers of self-contained classrooms, English, social studies, and mathematics; however, all interviewed teachers believed that they had a role in student success on the PSSA. Their responsibility was, in large part, on ensuring that students were provided the academic vocabulary and opportunity to read within specific content areas. Teachers stressed the importance of small group, whole group, and individualized instruction to increase vocabulary knowledge.

One teacher explained his direction through finding “engagement strategies, professional development classes, resources from outside the school, like professional reading and the internet, and the most interesting fiction and non-fiction I can find.” One teacher discussed, “Anytime I can use a method that serves dual purposes, I do. I have used exit tickets with a writing component. I also use word problems to teach history

concepts while incorporating reading skills such as marking the text." Another teacher shared, "One of my primary reading focuses is teaching meanings of prefixes and root words and demonstrate to students the similarities between words used in everyday English and words used in math."

Additionally, teachers were of the belief that they provided the students the necessary tools to accomplish outcomes, but it was in large part the responsibility of the students to use the tools in an effective manner. During one teacher interview, it was described, "My role is equal to the role of the students in the classroom. They have to be just as motivated to be successful, as I am in believing that they can be successful."

Another pervasive pattern was time. When observing the classrooms, teachers did not appear to have any bias in respect to gender or classroom performance. Four of the five classrooms had environments in which students were given equal opportunities to respond. There was a definite theme regarding the time challenges that educators currently face in the classroom including a perception that the largest challenges facing student achievement is the amount of time provided to support students in meeting with success through small group instruction or special education services.

During interviews, teachers described frustration with expectations imposed by state mandates. One teacher defined it this way, "There is just not enough time to devote to reading instruction, individualized or small group work and student practice time. What I think is good teaching and learning versus what it takes to do well on standardized tests has to be thought about. Do I teach using what I know to be best practices, or do I teach to the test? I usually find myself doing a little of both."

The final pattern focused on students. Several teachers explained the students' limited desire to be successful. One teacher shared, "The major challenges this year in teaching ELA has been student lack of buy-in to the relevance of reading and writing skills in their lives. I had mostly homogeneous classes of lower achievers." Another teacher explained "Poor readers have been struggling with reading for many years by the time they get to me. My challenge, at times, is to get them to believe that they can be successful." The majority of the teachers interviewed shared similar sentiments, often describing students as lacking motivation and not seeing the relevance of reading or the role of standards-based assessments such as the PSSA. There were indications that some students were not interested in participating, even with prompting.

Summary

This chapter provided the results of this mixed-methods study, which involved survey questions, a review of historical PSSA achievement data, classroom observations and individual teacher interviews. Research question one explored the relationship between a teacher's level of grit and student grit. The results of this question revealed that there was not a statistically significant correlation between teacher grit and student grit. Additionally, there was a positive statistically significant correlation between student pre- and post-survey results. In research question 2, it was revealed that there was a statistically significant negative relationship between the teacher and student perseverance factor. Conversely, the results of research question 3 describe a positive connection between teacher grit score and historical PSSA reading achievement data. Finally, research question 4 explored potential patterns of classrooms and behaviors of teachers with higher grit scores. Interviews and observations revealed patterns of goal-

driven instruction focused on academics. Teachers expressed concerns with time and student motivation.

Chapter V will share an analysis of these research findings, in addition to their significance, limitations and implication for educational practice, and recommendations for future research in this area.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

The definition of grit is the combination of perseverance and interest or passion in a topic. Although researchers have determined that having a higher level of grit can contribute to overall life success, this research explores the possible connection between teacher grit and student grit. Since grit is a two-factored trait, perseverance and interest, the research also involved separating the Grit-S scale into both factors to assess the possible relationship between teacher grit and end-of-year student grit. In addition, the research explored possible relationship between teacher grit and student achievement. This chapter will provide the major findings from the research, implications, and recommendations for future research.

Overview of the Study

This mixed-methods study was an exploration of the possible relationship between teachers' grit and students' grit and the possible connection between teacher grit and student reading achievement on standardized assessments, specifically the PSSA reading test scores. The non-cognitive, non-academic trait of grit is critical for 21st century life success. Some other the 21st century skills addressed within grit include problem-solving, agility, adaptability, and initiative. These skills are necessary to have perseverance, which is a factor of grit. An additional 21st century requirement is communication, oral and written. Written conversation is a component of the PSSA reading achievement.

As with most non-academic skills, grit is a challenging skill to measure. The ambiguity of non-academic skills has made measuring them difficult; however, a tool

called the Short Grit Scale (Grit-S) is a valid and reliable measure of the non-academic, non-cognitive skill of grit (Duckworth & Quinn, 2009). Most assessments of success are measuring what individuals *can* do rather than what individuals *choose* to do. Interest or passion and perseverance are choice-based rather than ability-based. The new Every Student Succeeds Act (ESSA) regulations recognizes that there is more involved to success than student achievement.

ESSA was signed in to law in December 2015 and State Education Agencies (SEAs) have until the 2017-2018 school year to implement required changes. Although ESSA provides more individual state and local control, it also includes an additional indicator of school quality or success, which could include student engagement or educator engagement. Some education leaders have suggested using measures of students' social-emotional and non-cognitive skills, like social awareness and growth mindset, as that "extra indicator." In Pennsylvania, there has been additional money set aside for districts to pilot tools to improve school climate. Districts may have to look more closely on traits such as grit, and their possible implications on student success.

Non-cognitive and non-academic traits such as grit are beneficial for overall life achievement and there is some evidence that reveals teachers with certain non-academic traits may provide students with a more successful educational experience (Bain, 2004; Kallick & Zmuda, 2017; Hattie, 2009; Hattie 2012; Hoerr, 2017). Research regarding teacher effectiveness revealed that two positive traits, grit and life satisfaction, have a significantly positive effect on teacher performance (Duckworth, et al., 2009; Henderson & Milstein, 2003; Hoerr, 2017; Tough, 2012). Studies revealed that these traits are the same traits that facilitate student reading achievement; thereby meaning that if students

have these traits, they are more apt to be successful in life (Dweck, 2012; Duckworth & Seligman, 2005; Henderson & Milstein, 2003; Tough, 2012).

This current study does reveal a possible connection between student reading achievement success and teacher grit; however, there is a significantly negative correlation between teacher grit and student grit in regard to perseverance. If effective teachers tend to exhibit strong non-academic, non-cognitive skills, and those particular skills are also indicative of achievement in life, would it not be beneficial to explore the possible connection between teachers' degree of grit and students' degree of grit? Additionally, would it be prudent to explore the potential connection between the degree of teacher grit and student reading achievement on high-stakes tests?

Major Findings

Below is a description of the major findings of this research. For clarity, each research question is presented with a summary and interpretation of the results from this research.

Research question one posed: *Using the* Grit-S *scale, what is the relationship between a teacher's level of grit and a student's level of grit?* The results of this research were unexpected, based upon the premise of theoretical constructs of this study. In respect to the construct of positive psychology and flow theory, both relate to positive experiences as those that will support success and achievement. Since grit is a non-cognitive trait that is a predictor of life success, and often life success comes from positive experiences, it is perplexing that the students of teachers with high grit scores did not develop higher grit scores themselves.

Grit is a two-factored trait, combining perseverance on a task in spite of obstacles and interest in a topic. The purpose of this research question was to discover the possible influence of teachers with high amounts of perseverance and interest on their students' perseverance and interest. In fact, there was negative, albeit not significant, correlation between teachers with high degrees of grit and student B-O-Y grit scores and a larger, but still not significant negative correlation between teacher scores and student E-O-Y results.

Although the grit scores between teachers and students did not significantly correlate, overall student scores significantly increased from the B-O-Y to the E-O-Y. Initial interpretation of this data would conclude that overall grit scores of one individual does not necessarily influence grit scores of another individual. None of the teachers involved in this study were "teaching" the concepts behind grit, nor were they providing time for students to discover a passion or overcome obstacles. The overall answer to research question one is that there is no solid relationship between student grit and teacher grit. One important piece of information to also note is that student's grit scores did show a statistically significant increase from the beginning to the end of the year.

In research question two, this researcher sought to discover: *Since grit is defined as a two-factored structure, perseverance and interest: a. What is the relationship between the grit factor of perseverance between teacher and student, as evidenced in beginning year to end of year student grit scores? b. What is the relationship between the grit factor of interest between teacher and student, as evidenced in beginning year to end of year student grit scores?* The data revealed that the participating teachers had an overall mean score of 3.17 in the area of interest and 4.29 in the area of perseverance.

Information about the approximate average of overall grit scores for American adults is 3.8 (Duckworth, 2016). There is no approximate average for the two individual factors; however, for this study, the overall average of 3.8 will be used for these averages as well. Thirteen of the 21 teachers involved in the study had an overall grit score of 3.85 or above and five additional teachers had overall grit scores of 3.75.

The highest achievable score for each of these factors was 5, suggesting that according approximate overall grit score average of 3.8, the teachers in this study generally had a high degree of perseverance and a slightly below average degree of keeping interest in a topic. Recent studies have revealed that overall, individuals tend to score themselves slightly higher in perseverance than passion and this is the case in this research study as well.

The results for students showed a slightly different picture. Students' scores showed statistically significant growth in their overall grit scores compared to their B-O-Y and E-O-Y survey results and a significant increase in both interest and perseverance factors. Although there was a significant increase in these scores, the confidence intervals were not as significant. It appeared that if the research was replicated, that the chances of the results being similar may not occur. Additionally, although the students showed an increase in their grit scores in relationship to their own pre- and post-surveys, the same cannot be said regarding the relationship to the teacher scores.

When analyzing the data collected between teacher grit surveys and student E-O-Y grit surveys, there were some unexpected anomalies. First, the differences in the relationship between student interest and teacher interest was negative in both the pre-

and post-tests, but not statistically significant. The difference was less negative in the interest factor, which would perhaps explain the results of the overall scores of students increasing from B-O-Y to E-O-Y results.

The information from the perseverance results showed a different story. Although the relationship between the teachers' scores and students' scores on the perseverance factor were not statistically significant for the B-O-Y survey, they were positive. This B-O-Y relationship reveals that students' and teachers' perseverance scores had a positive correlation with each other; however, the results from the E-O-Y showed a different connection. Not only were the E-O-Y perseverance correlations statistically significant, they were negative. This negative relationship would imply that the teachers with higher degrees of grit actually had students displaying a statistically significant decrease in the perseverance factor over the school year.

To elaborate on this finding, the statistics were recalculated to explore what the correlation would reveal if the teachers with grit scores lower than three were removed from the data. When the teacher with a lower grit score was removed, the statistically significant negative correlation increased in perseverance for E-O-Y results from $r = -.129$, $p < .05$ to $r = -.148$, $p < .01$. The overall answer to research question two is that there is not a correlation between teacher interest scores and student interest scores, but there is a statistically significant negative correlation between teacher perseverance scores and student perseverance scores.

There are some possible explanations for this negative correlation. It is possible that teachers with high degrees of perseverance, with the goal of student achievement on outcome-based measures are focused on the deliberate practice that increases success on

the PSSA. Unfortunately, providing students the opportunity for already created deliberate practice does not provide opportunities for students to grapple with developing their own strategies, which support perseverance.

In research question three, this researcher sought to discover: *Does the degree of teacher grit relate to student reading achievement of a cohort of students, as measured by up to three years of historical* PSSA *data?* To explore this question, it was necessary to obtain historical PSSA data for students that were instructed by teachers within the survey. Additionally, it was determined to obtain this data from teachers who received a grit score of 4.25 or above. Five teachers in the research study had historical PSSA data and a grit score of 4.25 or higher. Due to the small group of sampled educators, there was not enough information to determine statistical significance; however, there was some information that can be considered as a possible springboard for deeper exploration.

Although the results of research questions one and two revealed either little or statistically significant negative correlation between student grit and teacher grit, it appears that the reading results of students who have these teachers with high degrees of grit are scoring at or above the statewide average for student reading achievement. When reviewing the historical PSSA reading scores from the five selected teachers, there were eleven data points. These data points reveal that as a whole group the historical cohorts of students in the classrooms of the teachers with a grit score of 4.25 and higher scored higher than the state average on the PSSA in reading nine out of eleven times.

An additional point to note is that eight out of ten districts scored below the state average, revealing that the teachers within this study who recorded grit scores of 4.25 and higher also had PSSA state reading achievement scores higher than their districts scores.

The sample size of teachers who had higher grit scores and PSSA scores was limited in this study. The initial answer to research question three, is yes, there is the possibility that teachers with high degrees of grit have a positive impact on outcome-based assessments, but there is not enough information to quantify the results statistically.

The most interesting information occurs when comparing the results from research questions one and two with research question three. Even though the teachers with high grit scores have high scores on an outcome-based reading assessment, such as the PSSA, the students within those classrooms also exhibit a statistically significant negative correlation with the same teachers on the Grit-S survey. Perhaps it would be beneficial to reflect upon two of the theoretical constructs that connect with this research study, specifically positive psychology and flow theory.

Positive psychology theorists have grounded their research upon positive experiences and grit is grounded in positive psychology. The teachers who are part of this sub-group have high degrees of grit and as a result, students who have these teachers should have a positive experience. Most individuals with high degrees of grit have non-cognitive traits, such as goal driven passion, do not abandon tasks, and choose to overextend expectations, work with a purpose, and utilize deliberate practice. It would make sense that students learning from teachers with high degrees of grit would also increase their perseverance and desire to achieve goals, but according to the research in this study, students have not developed more perseverance as the result of this experience.

Csikszentmihalyi's 1990 research on flow explores the importance of "optimal experiences" in respect to success. It appears that teachers with high degrees of grit may

have an understanding of “optimal experiences” and a strong belief the students can be successful. Having experiences such as above average student achievement, could promote higher teacher grit scores, as they are going with the flow and meeting with success because of their optimal experiences with outcome-based assessments. It seems as though teacher perseverance does not improve student perseverance and may in fact have a negative connection.

When reflecting upon this research, it is revealed that students appear to be more successful with reading achievement according to the PSSA results and yet they have shown a significant decrease in the important factor of perseverance. Could it be possible that the results of outcome-based assessments such as the PSSA are due to deliberate practice and not students developing the grit required to persevere and overcome obstacles? To discover possible connections between high student achievement scores and lowered grit scores, teacher interviews were conducted. The results of these interviews are analyzed within the next research question.

For research question four, this researcher sought to discover: *How do teachers explain the connection, if any, between their levels of grit and cohort student reading achievement according to the* PSSA *test scores?* To explore research question three more in depth, question four was created. Although it appears that students who are within a classroom that has a teacher with a high grit score may be more successful on the PSSA, what are some possible reasons for this success? Information acquired through classroom observations and teacher interviews exposed some common themes, which were goal-oriented practice, instructional strategies and obstacles related to time and student motivation.

The most prevalent theme was the importance of goal setting based specifically on student achievement, in this case the results of the PSSA. The classrooms were highly organized; materials were readily available, goal-oriented, and contained a plethora of academically-based language. Many of the teachers utilized deliberate practice of skills suggesting that their success relied on this practice. Most of the teachers interviewed expressed the importance of teaching content and academic vocabulary that would be on the test. All of the teachers, regardless of content, believed that they had an impact on reading PSSA results because they embedded these practices into their everyday practice.

Interviewed teachers were goal-related; however, the goals appeared related to student achievement on the PSSA, not necessarily the students' abilities to persevere when confronted with tasks that may be challenging. In these cases, the teachers often provided more direct support to students in lieu of providing opportunities for students to struggle to make sense of the task. The goal of student achievement is a reasonable one, as students and teachers are held accountable for the results. If research supports that prior achievement has a very high effect size to overall success (Hattie, 2012), then teaching students to be successful on outcome-based assessments should yield positive results not only on the assessment, but also overall. Yet, it appears that this success may be more of an indicator of the teachers' successes rather than the students' successes.

Since the development of perseverance requires students grappling with concepts and competencies, could these students possibly need more gradual release of responsibility within their instruction so they can have deliberate practice with overcoming obstacles? Perhaps it may be ideal to consider the structure of the goal. The teachers interviewed have highly-structured, goal-oriented classrooms and multiple

opportunities for students to work collaboratively. A focus on developing some of the non-cognitive skills such as grit, that connect with the goal may be an effective way to meet the needs of both perseverance and student achievement.

The biggest obstacles shared were time constraints and individual student motivation. Teachers reported that it is a challenge to find the time to provided differentiated small group instruction to their students. Additionally, all teachers interviewed expressed concerns about student motivation and pushing students to be successful. It would be great if there was a way to provide more time, but without systemic educational changes, the obstacle of time is beyond the scope of this research.

It is interesting to consider that the teachers were very clear about their control over student outcomes through goal setting, but expressed limited control over student motivation. All of the teachers interviewed conveyed little or no control over individual student motivation, but research revealed positive outcomes in student achievement. A reflection in connection with the third theoretical construct of this research, growth mindset, may lend some guidance in regard to this disconnect. Growth mindset is the belief that intelligence is not fixed; rather that it is fluid and flexible based upon certain factors (Dweck, 2016).

It appears from this current research that the teachers believe in the growth mindset in regard to skills and content, but not necessarily in regard to non-cognitive skills such as motivation and perhaps grit. Growth mindset is not something that someone has or does not have. Just like grit, individuals can develop a better understanding of growth mindset and its implications in education. Teachers may believe that students have the capacity to be successful on assessments, but not necessarily believe that

students have the ability to become more motivated. Motivation is often connected with interest or passion about a goal. The challenge is to motivate students to become engaged and see the value in learning.

The teachers in this sub-group did exhibit goals directed toward student success on the outcome-based measures, such as the PSSA. Disconnect between the results on the PSSA and results from the negative correlation between teacher and student grit scores, does pose an interesting dilemma. Should we teach for mastery on outcome-based assessments and test-taking skills or be more focused on students developing non-cognitive skills, such as grit? Implications regarding these major findings are discussed below.

Implications

When considering student success, it is critical to consider student achievement and non-cognitive skills such as grit. This research explored the connection of teacher grit scores and student grit scores, as well as the connection between student achievement and teacher grit scores. Interestingly, in this small sample size, teachers with higher grit scores appeared to positively influence outcome-based student achievement; however, the increases in teacher grit scores negatively affected student grit scores. The negative impact was within the factor of perseverance, suggesting that students within a high-grit teacher's classroom may be successful on outcome-based assessments, but may lose some ground on overall perseverance. It would stand to reason that if achievement and non-cognitive skills, such as grit, should work in tandem, how can it be that the students' perseverance scores decreased in these classrooms, while their achievement increased?

The first implication of this research is that grit is not a transferrable skill. Although students in the research had teachers with various grit scores, the students' perseverance scores revealed an increased negative correlation with the teacher grit scores from the B-O-Y to E-O-Y. The students' overall grit scores increased significantly from the B-O-Y to the E-O-Y, with the increase occurring more significantly within the interest category. These results suggest that an increase in grit scores of students is not connected to a teacher's degree of grit; rather, it reveals that grit is a non-cognitive skill that develops over time.

A second implication of this research is the possibility that teachers with high degrees of grit are focusing on the goal of the outcome-based assessments, rather than overall success for students. This practice is understandable because students need to reach certain milestones in order to continue to be successful in school. Additionally, in Pennsylvania, students' scores directly affect the teacher's evaluation. It could be that the results of this research are revealing that outcome-based assessments may encourage teachers to work harder for students "pass the test," but it has potential and unintentional negative consequences on students' perseverance. This consequence leads to another possible implication of this research.

Dr. James Flynn discovered that as a human race, scores on IQ tests have dramatically increased from the early 20th century. He attributes this increase to expectations of more cognitively demanding tasks, such as using logic to discuss hypotheticals (Flynn, 2013). Conversely, grit appears to increase with age, with the grittiest participants in Duckworth's studies from earlier generations. Although the reasons for this increase are not completely clear, Duckworth (2016) suggested it could

be a result of a change in cultural norms or maturation of individuals over time and refers to it as the "reverse Flynn effect" (pp. 84-85).

This "reverse Flynn effect" may explain the positive outcome on the PSSA reading scores. Teachers are from a different generation than their students and have developed personal goals that have required them to overcome obstacles to achieve. Four out of five of the teachers interviewed believed that they made a difference in students' successes on the PSSA. If teachers with high degrees of grit support students in obtaining positive PSSA scores because of their individual goals, rather than the students' goals, then it is possible that teacher grit may increase, but student perseverance might be negatively influenced. This negative influence could be the result of several things.

The first possibility is that students are not interested in persevering on the PSSA reading assessment, but they are encouraged to do the deliberate practice recommended by the teacher, so even though their perseverance is negatively correlated to the teacher, the students still meet with success because of the practice. The second possibility has to do with student motivation. Interviewed teachers expressed frustration with students that are apathetic or unmotivated in the classroom. Students may be extrinsically motivated to succeed, but the consequence could be a decrease in intrinsic motivation, which leads to apathy.

The third implication is related to high grit teachers and their impact on student achievement in spite of the lack of student motivation. Individuals with high degrees of grit are able to overcome obstacles and accept challenges to achieve the desired outcome. In this case, the desired outcome is student achievement and the obstacle is lack of student motivation. The teachers' interviews revealed that one of the largest obstacles

was lack of student motivation and having to push students to be successful. The teachers with the highest grit scores did indeed have students with better achievement scores that the district and state averages in most cases, which indicates that they have learned how to persevere in spite of obstacles.

It is possible that there may be a conflict between outcome-based scores (PSSA) and perseverance because outcome-based assessments are designed to determine if students have acquired the necessary content and are able to use it within the assessments. Outcome-based assessment practice does not provide students the opportunities to practice challenging cognitive demands, such as problem solving and overcoming obstacles, in an attempt to ensure that they are successful on a mandated test.

This implication could have some potentially negative consequences. The decrease in perseverance from age-group to age-group, referred to as the "reverse Flynn effect" could possibly be a result of perseverance being negatively impacted from generation to generation. For students to develop grit, they need to be afforded the opportunity to develop interests or passions and perseverance in spite of overwhelming obstacles. Students begin to develop interests at an early age; however, perseverance takes much longer.

In order for students to develop perseverance, they need to be given the opportunity to fail. Teachers with higher degrees of grit persevere with the goal of positive outcome-based assessment results for their students. This goal is essential for teachers and students due to evaluations and placement respectively. High grit teachers are providing students the instruction needed to be successful according to current

criteria; however, the results of this research suggest that this may have negative consequences on student perseverance.

Recommendations for Professional Learning

The first recommendation for educators is to provide students opportunities to fail. In our current education system, it is not acceptable for students to fail. If students do not meet with success on an outcome-based assessment, they continue through school without direct repercussion. Oftentimes students are placed in classes that might be less rigorous because of assessment results. Placing students in less rigorous classes may result in decreased opportunities to deal with setback, overcome obstacles, and focus on long-term goals, which are important components of grit.

It should be noted that this recommendation is not to suggest that teachers should not be supportive of students. Grit is a two-factored concept, and both interest and perseverance need to work together. Providing students the opportunity to grapple within or slightly beyond their ZPD will provide the opportunity for them to persevere, but perseverance has to be fostered in an environment where students are engaged and motivated to persevere.

As a part of this recommendation, growth mindset must be considered, especially for our most talented students. Talented students do not often have opportunities to fail and as a result, when they are confronted with an obstacle, they struggle with persevering. Unfortunately, many talented students have a fixed mindset and believe that they are talented because they were "born that way," so when they are not immediately successful their mindset is that they are not smart enough. Providing them opportunities

to grapple with their passion provides the opportunity for talented students to develop perseverance.

A second recommendation is to consider effective ways to ensure opportunities for students to increase their grit and overall academic achievement. Outcome-based assessments are an easy way to assess outcomes, but are not a way to support students in developing the skills they need for lifetime success. Just as in the case of nature vs. nurture, there is also the dilemma of teaching content vs. allowing students to develop the necessary non-cognitive skills to be successful. Individuals need positive cognitive and non-cognitive experiences to be successful. A recent study of twins conducted by researchers in London revealed an estimated 37 percent of the perseverance sub-scale is based on heredity and 20 percent of the passion sub-scale is based on heredity (Duckworth, 2016, p. 82). With these percentages, consideration should be taken in regards to nurturing grit as well as other non-cognitive traits.

A third instructional recommendation is to realize that grit has to be fostered. Grit is not taught or imparted to students. Students will not become grittier just because the teacher has a high degree of grit. Grit can be developed and grown through experiences. Educators can foster grit through providing opportunities that are engaging for students, but also fall within their ZPD, so there is the potential to fail, but it would occur in a safe environment and be a learning experience. In many countries, children are asked, “What did you fail at today?” If students are given the opportunity to fail, reflect, and retry they will develop perseverance.

The fourth recommendation is to improve teacher support in understanding the importance of grit and possible strategies to promote grit and other non-cognitive skills.

Due to the increase in understanding of grit, growth mindset and flow theory, there appears to be a perfect opportunity for preservice teachers to take a course on the research behind these theories and practical strategies to support them. Additionally, in-service teachers should receive job-embedded professional learning to develop the strategies need to support non-cognitive skills.

A fifth recommendation would be a possible modification of current instructional practices for students. Although students need to learn certain content, how this content is provided should be considered. Effective use of the gradual release of responsibility model (Pearson & Gallagher, 1983) should be revisited, to ensure that students are given the opportunity to work through challenges and persevere. There needs to be a balance between support and opportunities for students to have to struggle to meet with success.

A final recommendation is to focus on supporting students in developing interest. Although it is not difficult for individuals to follow their passion, it can be a challenge to find a passion that is purposeful enough to persevere. Students will ask why school is important, or why certain classes are important. The role of education is changing and schools need to become more effective at informing students not just about content, but circumstances that develop strategies for ongoing success. Students need multiple exposures to a variety of experiences to learn what is available and about what they are truly passionate.

All of these recommendations are present at a time in education that requires this type of thinking. In December of 2015, ESSA was signed in to legislation. Although this legislation gives more local control to states and districts, it also requires a focus on an indicator that could pertain to non-cognitive skills, such as grit. One way to consider

supporting students in developing grit involves the current initiatives on science, technology, engineering and math (STEM), which require students to think critically and work through real world application.

Additionally, there is a stronger focus on ensuring college and career readiness. Within the PA Academic Standards for Career and Work, educators are to support students in developing interests, connect interests to strengths, create goals and explore careers beginning in 3rd grade (Pennsylvania Department of Education (PDE), n.d.). These standards are relevant for college and career readiness, which is a large part of the Future PA Ready Index. The Future PA Ready Index is a new accountability measure from PDE and has 45% of the score attributed to a college and career ready focus (Future Ready PA Index, 2017). Students developing grit will better prepare them for the 21st century workforce.

Recommendations for Future Research

This research has provided more questions than answers and the suggestions for future research are many. Grit is a relatively new concept and has possible implications in education. The recommendations for future research in this section directly relate to the education field, although they could extend to other populations.

One recommendation is to research a larger population of teachers with high grit scores and the impact of those scores on student achievement. Although this research provided a conversation starter, the results of this research were on a very small population of teachers. Additionally, it may be beneficial to consider utilizing a measure such as the Pennsylvania Value-Added Assessment System (PVAAS), which is a growth measure rather than an achievement measure. This tool would provide insight into

student growth over time and in relationship to other classroom experiences.

Another research recommendation is to delve deeper into the results that revealed a decrease in student scores in the area of perseverance in relation to teacher grit scores. What would cause grit scores to be significantly less at the end of the year, as compared to the beginning of the year? This information would suggest that teachers with higher degrees of grit may influence a student's grit in the area of perseverance. It would be beneficial to increase the population size and perhaps focus on a specific content or grade level. An extension of this recommendation is to include teachers with high degrees of grit, or low degrees of grit.

A third recommendation for research is to review the impact of grit on student success post-high school. Since grit develops beginning with interest and then increasing in perseverance, it may be advantageous to explore the outcome of student success after they become adults. Also, there is identified concern regarding the impact of talent on student grit because of the lack of need to overcome obstacles. It is recommended to research the implications of fixed mindset vs. growth mindset on talented students' ability to acquire high degrees of grit.

Finally, research regarding instructional practices and their impact on grit would be of value. The teachers within this study did not have any direct support in promoting grit.

Conclusion

This research was based upon three theoretical constructs: (1) positive psychology, (2) growth mindset and (3) flow theory. Positive psychology looks to resiliency factors that affect achievement, engagement, self-discipline, and recovery from

failure and adversity (Seligman, 2011). Growth mindset is the belief that intelligence is not fixed and when confronted with difficulties in achieving a desired goal, one can still succeed because success is not based upon what a person is born with (Dweck, 2006; Gladwell, 2008; Pink, 2009). Lastly, flow theory research suggests that optimal experiences occur when interest, goal setting, and opportunity connect with perseverance and talent (Csikszentmihalyi, 1990). This research study sought to explore if a teacher's degree of grit related to a student's change in grit and if teacher's grit was connected to student reading achievement.

The findings revealed that the connection between teacher grit scores and E-O-Y student grit scores was a statistically negative one. Conversely, teachers with higher grit scores positively support student reading achievement scores. Students overall grit scores increased in spite of the change from a positive to negative correlation between teacher and student grit.

There are still many questions regarding the effect of teacher grit on student achievement, and further research on this topic is necessary. Positive psychology has given credence to the importance of grit in overall life success and that this success is enhanced through experiences that promote non-cognitive skills such as grit (Costa & Kallick, 2008; Henderson, 2013; Henderson & Milstein, 2003; Seligman, Ernst, Gillham, Reivich & Linkins, 2009; Tough, 2012). Although students' overall grit scores improved, it does not appear that it is a result of teacher grit.

This research also connects to the implications of student success, student achievement scores, and grit. Teachers have a large impact on student success and student success is connected to the development of non-cognitive skills such as grit;

however, it remains to be seen if teachers can support students to increase their growth in these areas in the current education system. This research was a small beginning of the process, but an important one. Current educational direction connects the importance of not only developing content knowledge, but also providing support in developing non-cognitive skills such as grit. Implications of this research for modifications in educational practice and further research is recommended to continue to discover ways to support student success through the development of non-cognitive traits such as grit.

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Appendix A

Short Grit Scale

Short Grit Scale

Directions for taking the Grit Scale: Please respond to the following 8 items. Be honest – there are no right or wrong answers!

1. New ideas and projects sometimes distract me from previous ones.*
   - Very much like me
   - Mostly like me
   - Somewhat like me
   - Not much like me
   - Not like me at all

2. Setbacks don't discourage me.
   - Very much like me
   - Mostly like me
   - Somewhat like me
   - Not much like me
   - Not like me at all

3. I have been obsessed with a certain idea or project for a short time but later lost interest.*
   - Very much like me
   - Mostly like me
   - Somewhat like me
   - Not much like me
   - Not like me at all

4. I am a hard worker.
   - Very much like me
   - Mostly like me
   - Somewhat like me
   - Not much like me
   - Not like me at all

5. I often set a goal but later choose to pursue a different one.*
   - Very much like me
   - Mostly like me
   - Somewhat like me
   - Not much like me
   - Not like me at all

6. I have difficulty maintaining my focus on projects that take more than a few months to complete.*
   - Very much like me
   - Mostly like me
   - Somewhat like me
   - Not much like me
   - Not like me at all

7. I finish whatever I begin.
   - Very much like me
   - Mostly like me
   - Somewhat like me
   - Not much like me
   - Not like me at all

8. I am diligent.
   - Very much like me
   - Mostly like me
   - Somewhat like me
   - Not much like me
   - Not like me at all

Scoring:

1. For questions 2, 4, 7 and 8 assign the following points:
   5 = Very much like me
   4 = Mostly like me
   3 = Somewhat like me
   2 = Not much like me
   1 = Not like me at all

2. For questions 1, 3, 5 and 6 assign the following points:
   1 = Very much like me
   2 = Mostly like me
   3 = Somewhat like me
   4 = Not much like me
   5 = Not like me at all

Add up all the points and divide by 8. The maximum score on this scale is 5 (extremely gritty), and the lowest score on this scale is 1 (not at all gritty).

Grit Scale citation

Duckworth, A.L, & Quinn, P.D. (2009). Development and validation of the Short Grit Scale (Grit-S). *Journal of Personality Assessment, 91,* 166-174. http://www.sas.upenn.edu/~duckwort/images/Duckworth%20and%20Quinn.pdf

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Appendix B

Teacher Interview Protocol

Thank you for participating in this research. I will be asking you five questions. These questions are related to your perceptions of your role in education and student reading achievement as it relates to the PSSA scores. There are no wrong answers. I will be recording your responses. If at any point during the interview you decide to no longer participate, we can end. You can say pass when I ask questions. If you decide after the interview that you do not wish to include your responses in the research, please call or email me on the consent form you signed.

Do you have any questions before we start?

1. What grade(s) and content(s) do you teach?
2. How long have you been in education?
3. What do you hope students will have acquired after a year in your classroom?
4. What do you believe to be your role in student reading achievement?
5. What impact do you believe you have in student reading achievement on high-stakes tests?
6. Are there any additional comments you want to share that will be helpful in my research?

Thank you for your time. Do you have any questions for me?

Appendix C

Classroom Observation Protocol

SWOT Analysis Template Grit in the Classroom			
criteria examples	strengths	weaknesses	**criteria examples**
criteria examples	opportunities	threats	**criteria examples**