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This dissertation, THE EFFECT OF EXECUTIVE FUNCTION INTERVENTIONS ON ACADEMIC PERFORMANCE OF K-8 STUDENTS IN A PUBLIC SCHOOL SETTING, was prepared under the direction of the candidate's Dissertation Committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree of Doctor of Education in the School of Education, Concordia University Irvine.

Belinda Dunnick Karge, Ph.D.
Committee Chair

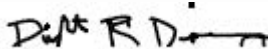Greg Merwin, Ed.D
Committee Member

Edward Eldridge, Ed.D.
Committee Member

The Dissertation Committee, the Dean, and Executive Director of the Doctor of Education Program of the School of Education, as representatives of the faculty, certify that this dissertation has met all standards of excellence and scholarship as determined by the faculty.

Deborah Mercier, Ph.D.
Dean

Dwight Doering, Ph.D.
Executive Director

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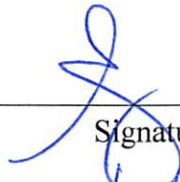
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PO BOX 1046
Address

8/6/18
Date

209-914-9224
Phone Number or E-mail Address

Galt, CA 95632
City/State/Zip

VITA

Sherry Jackson-Gutierrez

ADDRESS   1530 Concordia West
                          Irvine, CA 92612
                          Sherryjackson.2011@yahoo.com

EDUCATION
    EdD   2018   Concordia University Irvine
                          Educational Leadership
    MS   2006   National University
                          Educational Administration
    BS   2000   California State University, Sacramento
                          Criminal Justice

PROFESSIONAL EXPERIENCE
    2017-Current   Principal
                          Cesar Chavez High School
                          Stockton Unified School District
    2009-2017   Principal
                          Peyton Elementary School
                          Stockton Unified School District
    2006-2008   Assistant Principal
                          Monroe Elementary School
                          Stockton Unified School District
    2000-2006   History Teacher/Department Chair
                          Fremont Middle School
                          Stockton Unified School District

THE EFFECT OF EXECUTIVE FUNCTION INTERVENTIONS ON ACADEMIC
PERFORMANCE OF K-8 STUDENTS IN A PUBLIC SCHOOL SETTING

by

Sherry Jackson-Gutierrez

A Dissertation

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Concordia University Irvine

ABSTRACT

This study examined the effects of executive function intervention on the academic performance of students in three kindergarten through eighth-grade schools. The study evaluated MAP (Measurement of Academic Progress) results prior to and after the implementation of the executive function strategies and interventions. The study compared the responses of classroom teachers on an implementation survey to determine the fidelity to the program and collect their opinions about the efficacy of the intervention program and its ability to impact student academic achievement. The outcomes of this study impact the further refinement of the intervention program and provide data to confirm the positive influence of executive function interventions on academic achievement.

The results of this study reflect the application of a mixed-methods, quasi experimental research design.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

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CHAPTER 1: INTRODUCTION

Many students enter their school gates late for class, unprepared, and full of excuses as to why they are not on time, organized, or able to finish their work. These are the students whom teachers often believe aren't interested in school or just don't apply themselves (Guare, Dawson, & Guare, 2012). Behind these tendencies for tardies, incomplete assignments, and poor grades may lay much deeper causes than apathy or parents who don't follow through with their promises to "have a talk with him tonight" after receiving a call from the teacher. These students may not be lacking in discipline or parent involvement. The mental framework to support the skills necessary to be successful in school may not have developed, which can ultimately result in them not being as prepared for academia or adulthood as their peers (Isquith, Crawford, Espy, & Gioia, 2005). This lack of follow-through or inability to begin a task can be linked directly to deficits in their executive functions (National Scientific Council on the Developing, 2011).

Statement of the Problem

Educators focus so closely on academics that they often overlook the causes of a student's educational or social deficits (Bierman, Nix, Greenberg, Blair & Domitrovich, 2008). If a student forgets his or her homework regularly, the teacher may assume the child is irresponsible and determine an appropriate consequence, such as missing recess. At home, parents go above and beyond to accommodate a child's deficits by preparing their backpacks, setting out their clothes, and reminding them of all the things they need to do or not do. However, as adults, these children will no longer have their parents or teachers there to remind them or punish them accordingly. They must learn to utilize strategies to accommodate these deficits independently, or else face real-world consequences (McCloskey & Perkins, 2012). The primary issue that intrigued these capstone researchers is that most educators and school systems

are not aware of executive functions. This chapter will examine this problem, its consequences, and why it deserves to be studied.

There are two typical assumptions made by parents and educators of a student who is not performing well in school. They likely either believe the student is unproductive and needs discipline or the student is apathetic and needs motivation. The dilemma is that too often discipline and external motivation does not work, even when implemented consistently (Guare et al., 2012). No matter how strict the parent or extensive the consequence, a child is not going to meet an expectation that is beyond his or her realm of ability. The same applies to motivational strategies; students may desperately desire a reward that is offered, but if the goal is unobtainable, the positive intention of an incentive program may have the opposite effect (Kaufman, 2010).

The purpose of education is to support children in developing the skills, knowledge, and experiences that will prepare them to become productive members of society (Fay-Stammbach, Hawes & Meredith, 2014). Students must be provided the opportunity to obtain these skills and experiences in their educational careers that will encourage them to think critically and creatively, thus developing them to reach their potential to become contributing citizens in a society of problem-solvers and innovators.

As children are formally introduced to academia, their preparation for education becomes evident and relevant. The countless hours spent in the car singing rhymes and the alphabet song or coloring and cutting pictures at their grandparent's house gives them comfort and some familiarity as they sit in carpet time and small group activities in their preschool class (Isquith et al., 2005). They further refine their social skills through opportunities to share, work through conflicts, and maintain self-control when frustrated with a directive from the teacher or an

uncooperative peer. They pay closer attention to the patterns and rhyming words the teacher

recites as she reads a memorable story (Howse, Calkins, Anastopoulos, Keane, & Shelton, 2003).

These opportunities to extend their working memories and attention spans lay the foundation for

future learning experiences in the years to come.

As teachers prepare for their students, they give cautious thought and time into their

lesson framework for those who continue to struggle. Some of these students will demonstrate

difficulty with recognizing common patterns and symbols or have a hard time sitting with their

bottoms on the carpet, their legs crossed, and hands folded in their laps. Although these students

may have the same educational experiences of their peers, they are not on the same

developmental level of academic and social readiness (Kaufman, 2010). There are many reasons

why children develop at different rates, and it is imperative for educators to examine the origin

of these deficits while providing the instructional strategies and supports to accommodate such

discrepancies.

The rationale for the imbalances of social and academic readiness may differ vastly.

Students enter the educational system at different ages and with different experiences. Some

spend their toddler years with nightly bedtime stories and counting games, where others may

have been exposed to a very limited vocabulary and little intellectual stimulation. Others come

from families with immense educational experiences, while some families have minimal literacy

skills or basic education. Despite these varying environments, some students struggle with the

most basic cognitive functions regardless of their exposure to learning opportunities. These

students may have limited capacities to focus their attention, make connections to previous

experiences, or multitask. Others may have underdeveloped self-regulation skills, limiting their

ability to control their impulses. These important skills are the starting point for learning and

social development and lay the foundation for making choices and developing the cognitive processes needed to succeed (Shaul & Schwartz, 2014).

Purpose of the Study

This study was conducted to determine the effectiveness of the CHIEF executive function curriculum on the academic performance of students. The study was also designed to ascertain if the training offered to classroom teachers and the curriculum provided were effective. This included the training for teachers, lesson plans, mascot designs, use of student planners, and monitoring of implementation through classroom visits and a teacher survey.

The study was conducted at three public schools with students ranging from kindergarten to eighth-grade. These schools were paired with three control schools with similar achievement levels and demographics.

Research Questions

To further explore how the educational system can support the development of executive functions and increase student success, both in their educational careers and in their adult lives, this study poses and researches the following questions:

1. Can the direct instruction of executive function skills and strategies improve student academic achievement?

2. Do students at schools with varying academic achievement levels show success from the implementation of executive function intervention?

3. Do teachers use executive function strategies in their daily instruction?

Historical Background of Executive Functions

Executive functions became a topic of interest for researchers in the 1970s. The awareness of executive function skills dates back to an accidental finding in the 1840s, at which

time Phineas Gage presented a case for future research. Gage was a railroad construction

foreman who survived an iron rod piercing in the frontal lobe of his brain. Although he lived, his

personality and behaviors were altered significantly, which led to further research on the

connection of the frontal lobe to executive functions (Ratiu, Talos, Haker, Lieberman, & Everett,

2004).

A Soviet psychologist, Lev Vygotsky, introduced a theory in the 1920s, known to

researchers today as cultural-historical psychology. Although Vygotsky died before the theory

was fully researched, he believed there was a strong connection of the mind and culture. He

supposed socialization had a significant influence on psychological development. Vygotsky

worked closely with another Russian psychologist by the name of Alexander Luria. Luria

expanded Vygotsky's original theories after his death (Goldstein, Naglieri, Princiotta, & Otero,

2014).

The initial focus of executive function research was to examine the role of the prefrontal

cortex and behaviors in the 1950s. British psychologist Donald Broadbent examined a model of

categorization of automatic and controlled processes to filter information as either relevant or

irrelevant. Broadbent believed this filter, also known as the bottleneck theory, prevented a

person from being overloaded with information (Barkley, 2011).

In the 1960s, Luria expanded the earlier research of Vygotsky by focusing on the

correlation of neurological development and environmental influence. This theory is closely

modeled in current research on the environmental impact on the maximization of neurological

development. Luria presented the model of stages of executive function development, proposing

a correlation between brain development and that of executive functions. The stages include the

development of the brain stem in the first year of life, gross motor development in the second

year, recognition and reproduction in preschool, complex mental capabilities in early school years, and abstract thought-development beginning around age eight with continued development through adulthood (Goldstein et al., 2014).

Karl Pribram, a professor from Georgetown University, has been credited with coining the term "executive functions" through his findings regarding the involvement of the frontal cortex with executive programming of brain activity (Hughes, 2011). Research on the development of executive functions has progressed rapidly in the last thirty years, although the focus has been on the executive skills of adults instead of children. The role of the prefrontal cortex in executive functions was already well-known. However, it was believed that area of the brain wasn't developed until adolescence (Golden, 2011).

Due to this misconception, the assessments designed to rate strengths and weaknesses in executive functioning were made for adults and were not appropriate for children (Isquith, Gioia & Espy, 2004). The updates to this research led to the expansion of studies of executive function skills, growing significantly since the 1980s. The increase in research has also changed from studies related to how the brain controls executive functions to how executive functions relate to academics and then to how these skills are influenced by environment and intervention in childhood (Howse et al., 2003). Assessment methods have also developed with age-appropriate tasks, computer-based evaluations, further distinction between the physiological and psychological aspects of executive functions, and the inclusion of parent ratings of children in their home environments and teacher ratings of children in the academic setting (Hughes, 2011).

A challenge to current research on the development of executive skills is the disagreement between theorists in determining whether executive functions are independent or interdependent skills. One of the most referenced theorists, Akira Miyake, suggests executive

function skills are interrelated, but distinct, known as "unity and diversity." This research

focused on three areas, including inhibition, working memory, and shifting. The results of the

Miyake study showed executive functions to be unique in young adults and inconsistent based on

different tasks (Miyake et al., 2000). In a separate study, Hughes focused on the same three

factors, but concentrated on preschoolers, with findings highlighting the independence of the

executive function skills (Hughes, Ensor, Wilson & Graham, 2009). A 2004 study was also

conducted in preschools but focused on one task instead of multiple tasks. This study suggested

a relationship between working memory and inhibition, but no connections to shifting, meaning

there are some connections within the skills, but they are separate in development (Senn, Espy &

Kaufmann, 2004).

The connection of the components of executive functions tends to be a topic of

disagreement, not only in theory but also in age range, although research of adolescents appears

to support Miyake's "unity and diversity" theory. A 2003 study by Lehto, Juujärvi, Kooistra,

and Pulkkinen, backed Miyake's model in their study of children ages 8-13 in addition to a 2006

study of 7, 11, 15, and 21-year-olds, finding at least partial agreement with the Miyake model

across the age groups (Huizinga, Dolan, & van der Molen, 2006; Lehto, Juujärvi, Kooistra, &

Pulkkinen, 2003). Although these studies support Miyake's theory, they also propose evidence

that the level of consistency in the development may change, which leads to the importance of

research focusing on a range of ages instead of a focused range. Research has not proven the

exact course of development; however, researchers can agree executive functions do not reach

full maturity until late adolescence (Best & Miller, 2010).

Theoretical Framework

Guare and Dawson began their research of executive functions in 1982, treating children with traumatic brain injuries. Through their experiences with patients, they noted a pattern of weakness in complex thinking, ability to self-regulate, attention, and difficulty in school. This observation led them to study the executive skills of children and adults without injury to the brain. From this research in 2012, Guare and Dawson found it common for participants to demonstrate strengths and weaknesses in their executive skills. These findings furthered their research to include interventions to improve areas of weakness (Guare et al., 2012).

Executive functions are defined as eleven separate skills by Guare and Dawson (2010): planning, organization, time management, working memory, metacognition, response to inhibition, emotional control, sustained attention, task initiation, flexibility, and goal-directed persistence. These skills have a direct correlation to learning and productivity, working together to support goal-setting, planning, task initiation, focused attention to a task, self-monitoring, flexibility to modify the plan as needed, and perseverance to complete the task. These same skills also support students' emotional regulation and ability to work with others to complete projects and tasks cooperatively.

Each weakened skill may have a considerable impact on a student's performance and success in his or her educational career, as well as an impact on his or her efficiency in adulthood. These deficiencies have a significant effect on a student's social status and ability to make and maintain friendships at school, as most school friendships develop in the classroom and then transfer outside to the playground or to afterschool playdates (Shaul & Schwartz, 2014). Students who don't work well with others or meet the expectations of their group are likely to have fewer peer relationships and positive interactions (Wagner et al., 2016).

Guare and Dawson (2012) categorized these skills into developmental and functional skills, researching how the skills progress and assist a child in productivity. Although their research notes the emergence of many skills in early years of life, the examiners focused their attention on the impact of such functions during adolescence. Dividing these functions assists in targeting interventions as a goal to increase cognitive flexibility and academic performance, which would differ from a goal for behavior regulation (Guare et al., 2012).

Significance of the Study

Deficits in academic performance can have significant impacts on present and future success. Students with poor academic performance often have difficulties in school that follow the student outside of the classroom, including peer relations and negative behaviors (Diamond, Barnett, Thomas, & Munro, 2007). As school psychologists, teachers, and other support staff learn more about executive functions and the brain development of a child, students are provided greater support, interventions, and strategies to further develop inhibition strategies, extend focus and attention, as well as academic scaffolding and supports to assist in academic progress (Dawson & Guare, 2010).

This study contributes to the overall knowledge base about executive function interventions in a classroom setting. This study focuses on three public schools, each with different achievement levels: low, moderate, and high. The data examined comprises many perspectives of the students in the schools, such as the variation of impact on academics in regard to gender, grade level, and ethnicity, as well as insight into the level of buy-in and implementation of the program from the classroom teachers, and opportunities for refinement to those who created the intervention program. Research has demonstrated that students with executive dysfunction are not as likely to excel academically, thus shedding light on the need to

further develop the executive functions of school-aged children (Guare et al., 2012; National Scientific Council on the Developing, 2011; Röthlisberger, Neuenschwander, Cimeli, Michel, & Roebers, 2012).

Students who struggle in their academic careers often suffer behavioral conflicts with peers and authority figures (Raver et al., 2011). By further researching executive functions, those who work with children can better understand brain development and how to recognize and support executive dysfunction. Students who have been written off as apathetic may have the opportunity to approach schoolwork and responsibilities through a different path than is commonly presented. This research can enlighten those individuals who create the pathways and provide alternative approaches and understanding of the accommodations needed to help struggling students (Rothbart, Posner, & Kieras, 2006). These supports can provide students with greater academic and behavioral success in school, which are likely to lead to greater accomplishments in future endeavors.

Definition of Terms

Dendrite – branches extending from neurons that receive incoming electronic messages from other neurons.

Executive Functions – a general term for a variety of cognitive processes involved in the control and coordination of information, which assists goal-oriented behavior.

Myelin – a fatty substance that insulates neural axons to speed the transmission of electrical messages from one neuron to another.

Myelination – the process of the development of myelin during adolescence to improve the speed of the electronic transfer of information.

Neuron – specialized cells in the brain that send and receive electronic impulses.

Pruning – the process of cutting back neural connections no longer in use.

Prefrontal Cortex – specialized area of the frontal lobe where executive functions are housed.

Socioeconomic Status – a measure of the economic and social position in relation to others, based on income, education, and occupation of an individual or family.

Synapse – a small space between two neurons where electronic messages are released.

Limitations

This study is limited to students from each classroom of six K-8 elementary schools within one large urban school district. The school district selected the three experimental and three control schools. The schools differ in size and demographics, although each school is paired with a control school with similar demographics and size. The study focused on academic data collected from the MAP assessment system in addition to survey data from teachers in the experimental schools. Survey data was not collected directly from students. Statistically significant factors for this study include a wide range of student abilities and needs, such as those with IEPs (Individualized Education Plan) for speech, resource, or behavioral support.

Further limitations also include teacher commitment, survey completion, and implementation of the program. The *Hawthorne Effect*—a reaction whereby subjects improve their performance due to the awareness of the treatment—must also be taken into account; the teachers and students from the experimental groups were aware of the treatment, as opposed to those from the control schools. The control schools would not be affected by the treatment or any expectations of change based on the treatment plan. However, the students and teachers of the experimental groups were aware of the study and knowingly participated in the treatment. This awareness may have affected the level of participation or responses to the survey.

Delimitations

The delimitations of this study include the number of schools. The study was intended to focus on a manageable number of schools and surveys, as well as support monitoring of the implementation of the instructional program. Had the study surveyed students in the schools, the cost would have been additional time and pay for the teachers.

Summary

The study was conducted in a large urban school district in Northern California. Six schools participated, three as the control schools and the others as experimental groups. The schools were similar in population, socioeconomic status, size, and demographics. The teachers and support staff in the experimental schools were provided with two full days of professional development that included an overview of executive functions, information regarding areas of the brain responsible for each executive function, and how the functions can be a benefit or detriment to individual students. The control school teachers did not receive training or information on executive functions. The teachers from the experimental groups were surveyed to determine the level of implementation and general perceptions about executive functions.

Throughout the school year, the teachers of the experimental groups taught lessons developed by a committee of teachers who had been provided with more in-depth training. The results of each student's MAP (Measures of Academic Progress) scores from the fall, winter, and spring testing of two academic years were reviewed, in addition to basic data provided, such as gender, ethnicity, and academic proficiency.

CHAPTER 2: REVIEW OF LITERATURE

Executive functioning is an all-encompassing term for a collection of high-order cognitive processes including goal-setting, planning, self-regulation, and working memory (Isquith et al., 2004). These functions rely on the prefrontal cortex as it sends and receives information from the other regions of the brain. Executive functioning and the prefrontal cortex follow a course of development, building upon each other to support higher cognitive functioning and behavioral control (Aran-Filippetti & Richaud de Minzi, 2012).

Executive functions are cognitive skills that act as the conductors of the brain, enabling students to set goals, plan, and complete tasks, as well as act and react appropriately in social situations (Anderson, 2002). Children who demonstrate executive dysfunction, or weaknesses in their executive functions, are less likely to focus, complete assignments, work well in cooperative groupings, and may have difficulty with anger, self-control, and communication (Flook, Goldberg, Pinger, & Davidson, 2015). Although research into executive functions and how they impact children has only been conducted in the last few decades, there are many resources to support children in developing these skills and to support teachers as they provide strategies and interventions for these students (Leon-Carrion, Garcia-Orza, & Perez-Santamaria, 2004). With the expansion of research available to educators, there remains a significant dilemma, as most teachers are not familiar with executive functions or how to address deficits (Gilmore & Cragg, 2014).

Executive Functions in Education

Researchers have found executive functions to be relevant to academic progress through adolescent development (Biederman et al., 2004; Checa & Rueda, 2011; Reynolds & MacNeill Horton, 2008; van der Donk, Hiemstra-Beernink, Tjeenk-Kalff, van der Leij, & Lindauer, 2013).

Self-control and attention play an important role in preschool, where working memory and inhibition predict academic performance from there through high school (Diamond et al., 2007). Academic achievement is a significant concern for most teachers, parents, and students. Cognitive functioning is of high importance in school success, as students must recall and manipulate numbers and formulas through use of working memory, shift through different steps and strategies for solutions through flexibility, and focus and persevere through tasks by making use of their attention and inhibition skills (Gilmore & Cragg, 2014). A 2007 study by Diamond et al. found demanding tasks had a higher correlation with academic performance, also noting children with lower executive function skills progressed slower in their development. The researchers predict early intervention of executive functioning development to have a significant impact on the academic progress of a child and likely minimize the need for special education services (Diamond et al., 2007).

Executive Functions in Special Education

Special education services are expected to support the student in strengthening areas of deficit. These services can be offered as push-in support to tutor the student more closely, through pull-out services where the student works one-on-one or in a small group with a resource teacher, or by placing the student in a special day class for more intensive support. Students in these programs receive accommodations or modifications to support them while they work on previously-taught material and are presented with new information (Moyes, 2014). While special education provides services to help students access work, these services typically end when the student graduates from high school. The academic deficits addressed in elementary and high school may not be relative to the skills required for a career or entry-level job. A student who has been accommodated throughout his or her educational career will not likely

have access to those same accommodations in adulthood (Johnston-Tyler & Analla, 2015).

Students who graduate face many challenges when they transition from high school to college or

from their parents' homes to living independently. Many of these roadblocks can be removed

with improved executive functions (Hayes & Hosaflook, 2014).

Students who struggle academically are likely to gain the attention of their teachers and

school counselors (Sandall, McLean, & Smith, 2000). These educational professionals collect

data such as test scores, attendance, homework completion, and disciplinary records. If the data

reveals a student is performing well below grade level and has not responded to common

interventions, the student is referred to the school psychologist for assessment to determine

eligibility for special education services based on a specific learning disability or other health

impairment (Odom & Wolery, 2003).

Expansion of Executive Functions to General Education

Research on executive functions has existed since the 1970s. Many books have been

authored to provide strategies for teachers and parents to implement, although the research has

yet to create a system change in education (Isquith et al., 2004). Common strategies for building

executive functions include checklists, planners or daily agendas, visual schedules, graphic

organizers, use of timers in the classroom, warnings for transitions, posted due dates, written

steps and procedures, and strategies for self-regulation. Students can apply these strategies in

their daily instruction to support their organization and task completion (Dawson & Guare,

2010). Parents can post chore lists, provide consistent time for bathing, homework, meals, and

sleeping, and develop incentive plans to reinforce home responsibilities. These strategies greatly

assist children who struggle to complete tasks or remember their materials on a daily basis

(Dawson & Guare, 2012).

Overview of Traditional Research

Executive functions are commonly thought of as the conductors of thought. McCloskey, Perkins, and Van Diviner (2008) define executive functions as a set of multiple cognitive capacities that coordinate the skills responsible for a person's ability to engage in purposeful, organized, strategic, self-regulated, goal-directed processing of perceptions, emotions, thoughts, and actions. Imagine the brain having several orchestra conductors acting simultaneously to tell each section of the orchestra when to start playing, stop playing, when to speed up, and when to slow down. Executive functions act as the conductors for the human brain in a similar way, providing an internal dialogue of where to start, how to organize information, how to communicate, and how to control one's reactions to stimuli (National Scientific Council on the Developing, 2011).

Executive function is an overarching label for the processes of the brain that support a persons' cognitive functioning (Anderson, 2002). Executive functions assist a person in planning out a complex task, use connections to prior learning to support the comprehension and retention of new information, and control problem-solving abilities to support self-control, reasoning, and flexibility (Guare et al., 2012). These thought processes remind a person to set his or her alarm, approximate how long the morning routine will take and when to leave to make it to school on time, and prepare the student to learn. These same skills also support planning out a project, breaking it down into smaller steps, following through on those steps, monitoring the progress and quality, making necessary adjustments, and completing the project (Dawson & Guare, 2010).

Executive functions control social and emotional regulation, as these skills remind a person of the consequence, positive or negative, of their actions and reactions (Pharo, Sim,

Graham, Gross, & Hayne, 2011). The use of reasoning to determine if an idea or feeling is

appropriate to communicate or if it's more appropriate to remain quiet and emotionally in control

are all coordinated through executive functions (McCloskey & Perkins, 2012). Although these

skills provide the ability to function in academic settings and in life, there has been no

correlation found between executive functions and intelligence ratings. Research studies have

concluded there is no direct link between the development of executive function skills and

intelligence level, leading to an open path for the expansion of executive functions for any

intelligence level (Ardila, Pineda, & Rosselli, 2000).

<div align="center">**Brain-Based Research**</div>

Basic genetic components provide the potential for growth and development of executive

skills. The brain is hardwired for executive functions at birth, although this genetic budding

must be fostered. The number of nerve cells increase quickly in infancy and develop a

communication network through a system of synapse connections and branches of axons and

dendrites (Guare et al., 2012). This system allows nerves to give and receive information. As a

child develops, the weight of the brain increases from just under a pound at birth to

approximately 3 pounds in late adolescence, with the number of synapses increasing from 2,500

to 15,000 in just a few years (Guare et al., 2012).

A substance called myelin provides insulation around the synapses to protect the

connection and speed the communication process (Deak & Deak, 2013). Myelination continues

through early adult years. This process also supports the development of white matter, of which

bundles of myelinated axons connect different brain regions to promote brain productivity

(Cooper-Kahn & Dietzel, 2008). Gray matter allows for learning and thinking in the brain. Gray

matter is made up of nerve cells, or neurons, and synapse connections. At birth, a child has

approximately one hundred billion neurons, which is close to the amount of an adult. However, these neurons are not developmentally consistent in their presence from infancy to adulthood (Guare et al., 2012).

From infancy to preschool, the number of neurons rapidly develops and far surpasses the number of neurons in adulthood (Dawson & Guare, 2012). Because these neurons make up the gray matter of the brain, the continuous proliferation of the neurons greatly increases brain size. If this process were to continue without interruption, the expansion of the brain would outgrow the size of the skull. To assist, a process called pruning selectively reduces the unused neurons, thus keeping the brain within the limits of the skull space (Guare et al., 2012). The rapid increase in neurons peaks around the age of five, followed by the pruning process (Tierney & Nelson III, 2009).

Through this process, the neurons not actively used or needed are pruned to allow other utilized neurons to continue growing (Paolicelli et al., 2011). This process can be compared to cleaning the hard drive in a computer to provide needed memory space. As the computer slows due to lack of file space, unneeded information can be deleted to provide for additional space. The brain essentially goes through the same process, which allows it to release neurons not actively used or needed and to consolidate necessary mental skills. This process repeats with another rapid increase just before adolescence, and ongoing pruning follows through the teen years (Pharo et al., 2011). This progression also applies to the executive function skills developed through childhood. If a child does not actively use these individual skills, pruning can occur. This process would not change the hardwired potential of the frontal lobe, but could reduce the skills that are not used consistently (Shaul & Schwartz, 2014).

The process of brain development as it relates to executive function does not follow a common growth pattern. The frontal lobe of the brain, including the prefrontal cortex, serves as the central processing center of executive functions (Röthlisberger et al., 2012). Although other areas of the brain are utilized in the skills considered, the prefrontal cortex is generally referenced as the "hub" of executive functions, with the anterior cingulate, parietal cortex, and hippocampus also supporting these skills. As the prefrontal cortex develops, so do executive functions from infancy through adulthood (Zelazo, Carlson, & Kesek, 2008).

The growth of the prefrontal cortex and these executive function skills increases rapidly in early childhood, with further development enhanced through academic and social experiences through late adolescence and refinement throughout adulthood. This development commonly peaks in the early 30s and then declines with age (Weintraub et al., 2013). Even before birth, the brain of an infant contains approximately 100 billion neurons, which is roughly the same in an adult brain. However, the neurons are not consistent with the development of the brain, as the expansion of the connections within the brain fluctuates at different points of development. The generation of these neurons is the scaffolding of the nervous system in which neurons send and receive information through branches called axons and dendrites (Best & Miller, 2010).

The material that makes up the shading of the brain is referred to as matter. The white matter undergoes the myelination process in which axons communicate information from different areas of the brain (Leon-Carrion, Garcia-Orza, & Perez-Santamaria, 2004). The process is significant to the development of the frontal lobe and continues into early adulthood, as myelin acts as a lining that protects and speeds this exchange of information. Gray matter is made of neurons and their connections, called synapses (Tierney & Nelson III, 2009). The progression of gray matter involves fluctuation in which the number of neurons is reduced and

regenerated. This results in a significant increase in the number of synapses during early childhood as the frontal lobe experiences a period of rapid progression (Turkstra & Byom, 2010). The expansion of gray matter allows the exchange of more information and also affects the physical size of the brain. The "pruning" or consolidation of gray matter is necessary for the growth limitations of the brain and are characterized by a "use it or lose it" process (Turkstra & Byom, 2010).

As the frontal lobe develops, connections are made. If this new information is not utilized, it is considered unnecessary and is pruned away. This process paves the way for the connections that are utilized to grow and expand with use, which is most evident in the rapid expansion of the frontal lobe in preschool, followed by the consolidation of gray matter, and then repeated in early adolescence (Guare et al., 2012). In both development periods, the neural connections that are used are maintained and those that are not utilized are shed. This development of the frontal lobe is a lengthy process, as this region is the last to fully develop (Dawson & Guare, 2010; Reynolds & MacNeill Horton, 2008).

Development of Executive Functions

The development of executive functions is supported by biology and personal experiences (Aran-Filippetti & Richaud de Minzi, 2012; Best & Miller, 2010; Fay-Stammbach et al., 2014). Genetics supply the starting point for cognitive development, but parenting, formal and informal training, and life experience further advance the foundation of genetic potential (Röthlisberger et al., 2012). The growth of these skills is vital for the productive development of cognitive functions and self-regulation in adolescence (National Scientific Council on the Developing, 2011). Children come hard-wired with the genes they receive from their parents. If a parent tends to be disorganized, the child may also have that same tendency. The

environmental stimulus provided to a child may also support or adversely impact the development of a child's executive functions (Fay-Stammbach et al., 2014). Children who are raised in high-stress homes, exposed to abuse or neglect, or are provided little intellectual stimulation are at risk for executive dysfunction (Dawson & Guare, 2012).

The process of executive function development is complex, with the evolution of different skills emerging and progressing at varying ages and rates of expansion (Reynolds & MacNeill Horton, 2008). The various executive functions are often categorized into four main competencies—memory, attention, flexibility, and self-regulation skills—with skill sets evident by age one (Reynolds & MacNeill Horton, 2008). Most children can follow simple commands, make choices, and begin to develop sustained attention by age three. These abilities further develop and increase in complexity by age five. Children of this age begin to problem-solve, demonstrate inhibition, delay gratification, recall and apply previously learned information, and demonstrate cognitive flexibility (Shaul & Schwartz, 2014). The capacity to consistently demonstrate these skills emerges by age seven and continues to develop into early adulthood (Diamond, 2002).

Self-regulation skills are developed in the toddler and preschool years of life and are refined through opportunities for training and practice (Schunk, 1990). Children begin to learn problem-solving, initiation, and inhibition through playing. Children who develop these skills typically find common interests with their peers. Children who do not initiate play are often left out or may be pushed out of play if they exhibit inhibitory weaknesses or complexity in their role in the play activity. These weaknesses may lead the child to frustration and a lack of self-control or influence other children to pull away from opportunities to play with that child (Diamantopoulou, Rydell, Thorell, & Bohlin, 2007).

From early childhood, children demonstrate a desire for independence. This craving to do things their way is evident in the first year of life as a child demands or refuses specific foods or wants to be held or let go. This demand for independence continues to increase through early childhood and then again in adolescence (Pharo et al., 2011). A toddler's tantrum to get what he or she wants has little long-term consequence. However, the demands for independence in teen years often demonstrate an imbalance in preparedness and a desire to do as they please. During this time, parents face competition from outside influences (Turkstra & Byom, 2010). Parents, caregivers, and teachers are no longer the only guides for adolescents, as the influence of their peers often outweighs the adults they previously looked to for counsel. The additional demands placed on adolescents increase as independence in schoolwork and social networking are expected. At the same time that teens are expected to make more mature and independent decisions than they did as children, they also face the introduction of new risk factors such as drugs, alcohol, and sex. Adolescents with weak executive functions are ill-prepared for such challenges (Guare et al., 2012).

Many changes occur in the brain during adolescence, including an increase in the speed and depth of neural connections through the myelination process (Dawson & Guare, 2012). Gray matter increases with the generation of new synapses, followed by another round of pruning to refine those frequently-used skills and slough off those connections that are unutilized. This process is similar to the growth and pruning experienced in the toddler years (Turkstra & Byom, 2010). Changes also extend to the prefrontal cortex, which increases the speed and complexity of thought (Turkstra & Byom, 2010). These variations in the brain support the development of executive functions, including working memory, cognitive flexibility, and inhibition, which continue to expand through adolescence into adulthood,

impacting social and academic progress (Miyake et al., 2000). The increased development of these skills allows for an increase in cognitive functioning, complex tasks, and reflection on planning and strategy (Singer & Bashir, 1999).

Executive Functions and Academics

Students who demonstrate stronger skills in the areas of working memory, self-regulation, and attention have shown more progress in acquiring math and literacy skills in school than peers who have weaker executive functions (Howse et al., 2003). These skills are evident in early childhood, as children who enter school with solid executive skills—including working memory, inhibition, and sustained attention—demonstrate better preparedness for learning literacy and arithmetic (Bierman et al., 2008; McClelland et al., 2007). There is a positive correlation in the development of executive function skills to time spent in an instructional setting. Research has found connections between students with more developed executive functions and higher cognitive skills, leading to increased academic benefit for those students (Shaul & Schwartz, 2014).

Executive function skills support cognitive deconstruction of complex, unfamiliar, or oddly-structured tasks. These skills influence academic performance as they aid the thought processes required for learning and utilizing information in multifaceted assignments. Students with strong working memory skills can process information more quickly and with less instructional support than peers with lower working memory functioning (Diamond et al., 2007). These students can organize thoughts, process with greater speed, and make connections to new information at a rapid pace (Bagby, Barnard-Brak, Sulak, Jones, & Walter, 2012).

Executive functions play a vital role in preparation for school. The social, emotional, behavioral, and academic readiness of a child provides the foundation for learning (Blair &

Razza, 2007). This foundation provides an advantage to early literary and mathematical development and supports students in their first years of school through academic and social skill development (Bull, Espy, & Wiebe, 2008; Riggs, Blair, & Greenberg, 2004). The executive functions emerging in the preschool years also have implications for future cognitive functioning and advanced refinement of skills in later years (Best & Miller, 2010; Gathercole & Alloway, 2008).

Despite the awareness of the importance of executive functions on academics and early education, most research focuses on childhood, adolescence, and adulthood. Only recent developments in executive function assessments and interventions have targeted preschoolers (Isquith et al., 2005). Another reason for the lack of attention to infants and preschoolers cited by researchers is the concern of the inability of preschoolers to demonstrate high levels of cognition or to control behaviors or impulses (Isquith et al., 2005). McCloskey et al. define executive functions as "a diverse group of highly specific cognitive processes collected together to direct cognition, emotion, and motor activity, including mental functions associated with the ability to engage in purposeful, organized, strategic, self-regulated, goal-directed behavior," (McCloskey et al., 2008). With the evident importance of such skills, capturing the earliest evidence of executive functions has been determined as crucial for early detection and intervention of executive weaknesses (Isquith et al., 2004).

The fundamental stage for the development of executive functions is around four years of age, when cognitive complexity begins (R. A. Barkley, 2000; Garon, Bryson, & Smith, 2008). It is important to study these skills in their emergence as the strengths and weaknesses demonstrated at this age are predictive of later development in social, emotional, and academic stability (Shaul & Schwartz, 2014). The findings of the Shaul and Schwartz study suggest the

concurrent development of executive functions and pre-academic skills, with the influence of executive skill development supporting the increase of academic progress.

Students can also experience difficulties in the transition from elementary to middle school. Parents reported significantly higher behavioral problems with their children when they transitioned to middle school as opposed to when their children were in elementary school (Pharo et al., 2011). This transition can be difficult for any student, as there are more peers to encounter, a greater number of teachers, and the expectation of greater independence. This increase in responsibility and the size of peer groups requires higher levels of self-regulation, organization, and working memory. Adolescents who have difficulty making the transitions tend to struggle academically and are at higher risk for behavioral challenges (Jacobson, Williford, & Pianta, 2011).

Parents often choose schools they feel will best serve the needs of their child. This same intent can apply to the support of the executive skills for parents who are aware of the significance of these abilities. Research focusing on school settings was performed in three private schools, each with a different focus. The schools included a Montessori school, a classical private school, and a Catholic school. The focus of the research was to determine how the environment affected executive functions. Montessori classrooms emphasize hands-on learning, with teachers providing formal instruction to the students and then allowing them to work hands-on with the materials. Students may work independently or in groups, with each tracking an explicitly designed plan. Classical educational settings focus on grammar and literature, stemming from Greek and Roman practices. Primary students are taught foundational skills through rhyme, song, and repetition; intermediate students focus on the development of critical thinking skills; and high school students combine their previous learning to develop

persuasive argument skills in speech and writing. Catholic schools focus on moral issues and social injustice, in addition to traditional academics, with faith and spiritual development incorporated into the instructional program. Despite the different theories and approaches to learning, no significant differences were found in the development of executive functions between the schools (Bagby et al., 2012).

Research-Based Classroom Practices

Being aware of the significant impact of developing executive functions in relation to academics, social development, and productivity is crucial to parents and teachers (Shaul & Schwartz, 2014). The more that is known of these functions and of the impact of deficits provides the opportunities for the development and interventions needed for children to successfully progress academically and socially (National Scientific Council on the Developing, 2011). Common strategies to support these skill sets are emerging, and the increased understanding of executive functions has led to further appreciation of the advanced progression of these skills (Isquith et al., 2005).

Traditional strategies are effective for home and classroom environments and can greatly assist children as they develop into adulthood. However, as the children develop throughout life, so do their environments and demands for independence (Turkstra & Byom, 2010). These students must be introduced to the resources available to them so they can find methods and strategies they can apply in the workplace and independent living.

Executive functions are separate but connected skills working together to allow a person to be productive in the many facets of life. However, the most profound aspect of executive functions is the impact they have on a student's ability to succeed academically (Shaul & Schwartz, 2014). Working memory, organization, and flexibility provide the foundation for

reading, writing, and basic math skills required in the primary years of education. Self-regulation allows children to interact with their peers in play and relationships in and outside of the classroom (Schunk, 1990). These skills provide the foundation for developing the many aspects of the academic and social demands children face, serving as building blocks for more complex mathematics, reading comprehension, critical thinking, and writing, in addition to the development of social skills and friendships (Blair & Diamond, 2008).

Researchers of executive functions have explored the variety of skills and provided a broad framework for them. A general overview of the skills is provided in Figure 1.1.

Organization

Organization is the ability to maintain the location and neatness of assignments, materials, and resources to complete tasks and follow through with due dates (Dawson & Guare, 2012). This skill supports time management, appropriate planning, and prioritization of activities and responsibilities. Organization provides the opportunity to assess a complex task, break it down into workable tasks, prioritize the tasks, set goals for completion of each task, and monitor progress (Sharfi & Rosenblum, 2016). A student who struggles with organization is likely to misplace materials and lose assignments, in addition to having a binder and desk with no evidence of practical arrangement.

Sustained Attention/Focus

Sustained attention is the ability to focus on a task through to completion. Attention is vital for task conclusion, as students will have a difficult time finishing a well-planned task if they are consistently distracted. Dysfunction in sustained attention can interfere with the ability to focus or monitor actions to complete a desired task. Mistakes may go undetected by even an outside source (Anderson, 2002). Children with weakened attention skills have difficulty paying

attention in class, cannot sit or listen for a significant length of time, often struggle to follow all steps in directions, and are easily distracted (Dawson & Guare, 2012).

Executive Functions

Monitor/Evaluate:
Activation of routines to enable review of accuracy, track progress, adjustments made as needed

Flexibile/Shift:
Allows for change of focus, adjusts as tasks change, can complete open ended tasks, able to try multiple strategies for resolution

Sustained Attention:
Capacity to attend to a situation or task, despite distractibility, ability to complete tasks, sustained attention, able to return to a task when interrupted, ability to focus and keep working when task difficulty increases

Initiate:
Ability to begin tasks in a timely manner with little prompting, able to start another task when finished with first task

Refuel:
Awareness of the need for a break and ability to identify an activity to renew energy and focus

Goal:
Ability to set goals and actions toward achieving desired outcome

Plan:
Ability to think ahead, prioritize tasks according to importance, create a roadmap to reach a goal, can carry out long term projects

Metacognition:
Ability to explain thought process, ability to problem solve

Working Memory:
Ability to temporarily hold on to information, keep new and old information running in a mental loop

Organize:
Ability to design and maintain methods to support goals, track, schedule, categorize, and sequence, as well as maintain work area, access to materials/assignments

Inhibit:
Ability to think before acting, maintains composure when frustrated, communicates feelings, reacts appropriately, evaluates impact/consequences of behavior, ability to be patient, resists impulse to interrupt, listens to full instructions

Figure 1.1 Executive skills and what they do.

Inhibition

As inhibition develops, so does the ability to suppress reactive response and control impulses. The development of this skill allows for changes in behavioral patterns through

learning and experiences. Impulse control is necessary to act and react to situations and stimuli in a manner that is fitting to the circumstance (Shaul & Schwartz, 2014). It is the basic ability to control anger, regulate emotion, and communicate feelings with thought and reasoning (Arán-Filippetti & Krumm, 2013; Howard, Okely, & Ellis, 2015; Riggs et al., 2004). Progression of this function intensifies from ages three to five with continued improvement and complexity throughout adulthood. As with memory, inhibition utilizes different parts of the brain as development progresses. During infancy and toddler years, the medial frontal lobe is the processing center for inhibition, with a shift to the right frontal lobe as the child matures as a teen and adult. This change in the developmental area of the brain is also noted in behavioral alterations in children as they enter puberty, with risky behaviors and changes in attitude becoming evident (Best & Miller, 2010).

Shifting/Flexibility

Shifting/flexibility is the ability to return to a task or thought process after a distraction or transition from one activity to another. Students who have difficulty with flexibility are likely to experience anxiety with an unexpected change in routine, interruption, or incomplete assignments, such as a teacher telling a student to put away an assignment and work on it later when the student is almost finished with it (Shaul & Schwartz, 2014). This skill provides the ability to change tasks and adjust to new restrictions or demands, or apply various skills to a variety of situations. This skill provides one with the capacity to purposely adjust tone, word choice, and nonverbal signals appropriately in different situations. Flexibility also allows a person to shift perspective in finding and correcting errors, allowing for exceptions to common rules, or using different means to an end (Greenberg, Riggs, & Blair, 2007).

Shifting and flexibility skills increase with age, with cognitive flexibility developing in preschool years and increasing in complexity through adolescence. The ability to learn from mistakes and determine the need for alternative strategies for success develop in early childhood and adapt to more compound strategizing in adolescence (Anderson, 2002). Students in early childhood years demonstrate this function with simple tasks, sorting, and following different rule sets, such as "inside and outside voices." Children in elementary school demonstrate a more mature ability to adjust to rules, conditions, and expectations with direction. This maturation continues through adolescence. The progression of this skill slows from adolescence on through adulthood, although the precision and swiftness of shifting improve in adult years (Best & Miller, 2010). Difficulties with shifting or flexibility may restrict the ability of a person to think of or attempt an alternative strategy when unsuccessful. One may continue the same task or make the same mistake over and over. Changes to schedules, directions, or expectations can be extremely difficult for a child who struggles with flexibility (Anderson, 2002).

Working Memory

Working memory is the ability to retain information and build upon it when processing new information and completing new tasks. This ability to maintain and manipulate information over time allows one to recall and utilize information as needed. This skill provides a foundation for connections to past experiences and acts as a bridge to new learning and skill development. This skill provides one with the capacity to remember a previous conversation, leave and return to a task and pick up where one left off, or to recall a poem, phone number, or address (Diamond & Taylor, 1996).

This function can be traced to the early toddler stage, but is unmistakable in early childhood. In this period, simple task processes or the ability to recall basic ideas increases in

complexity as a child reaches school-age. This skill continues to develop throughout

adolescence and into adulthood. This simultaneous retention, recollection, and processing of

information to make connections to other aspects of information is typically more advanced in

adults than adolescents, which allows greater incorporation of memory storage. This is likely a

result of further development of the brain and refinement of working memory skills, despite

disruptions or interruptions to their focused attention (Bagby et al., 2012). Although memory

continues development at a steady pace, the regions of the brain supporting this skill change

from childhood and the frontal lobe, shifting to the left dorsolateral region during adulthood

(Best & Miller, 2010).

Initiation

Initiation is the ability to start an activity without significant delay. It requires the ability

to start one task promptly and begin the next when the first is complete. Students who struggle

with initiation may not know where to start when assigned a task. They may appear to shut

down when given directions or seem lost after instructions are given. This weakness is not a sign

of misunderstanding, but more of not knowing where to start. Simple sentence frames or

modeling of a problem can assist students with this weakness and provide a model for starting

the task (Dawson & Guare, 2010).

Inhibition

Emotional control is necessary to self-regulate and manage emotions. However, beyond

managing emotional thoughts and behaviors, inhibition helps a person to maintain focus and

attention to tasks, determine the importance of a situation, and react accordingly (Dawson &

Guare, 2012). This skill allows for thoughts and impulses to be processed and filtered, providing

the opportunity for self-regulation, resistance to distractions, and ability to think before acting.

Inhibition allows one to practice self-restraint, specifically in the ability to focus on desired outcomes instead of reacting impulsively. This ability also supports emotional regulation as to maintain composure in difficult situations or not overreact to a perceived wrongdoing (Rothbart et al., 2006). The significance of this skill can be noted in early childhood, as preschoolers with stronger attention and inhibition skills perform higher on reading and language tests than their peers with less developed skills in these areas (National Scientific Council on the Developing, 2011).

Inhibition is believed to be one of the pivotal executive skills, with development beginning in infancy. The progression of this skill leads to more complex task performance and ability to self-regulate as the child matures, with the most notable surge occurring in preschool (Diamond et al., 2007). Improvements continue through childhood and adolescence, with full maturation in adulthood. A 2007 study found changes in the processing regions of the brain at different developmental stages. During infancy, inhibition was noted as global cortical activity, with a more focused use of the medial-frontal lobe in preschool, further confinement to the right frontal lobe in early adolescence, and a greater focus of brain activity from adolescence into adulthood (Bell, Wolfe, & Adkins, 2007). There are also clear behavioral pattern changes demonstrated through the development of inhibition, with the most evident growth in preschool, followed by significant growth in early adolescence and a significant slowing of progression in the teen years (Best & Miller, 2010).

Impact of Executive Dysfunction

Cooper-Kahn and Dietzel present an understanding of EF by providing a clear example of dysfunction through the story of a mother who planned a family road trip without clear detail, such as having an unclear driving route, forgetting to book a hotel, or neglecting to find someone

to feed the pets while the family is away. Needless to say, the trip did not go well (2008). This example may seem farfetched to an adult, but it may not be. There are many students who come to school each day without remembering to pick up their folder, brush their teeth, or have mom sign the permission slip for that exciting field trip they really want to attend. The student may be very well-intentioned and may have even put two or more hours into homework the night before, but still forget to turn it in. He likely does not understand why his teacher and parents are so often irritated with him, as he knows he is trying his best.

Children with executive dysfunction often demonstrate issues with self-regulation, impulsivity, poor planning, and reasoning skills (Pharo et al., 2011). The causes of executive dysfunction vary from environmental influences, genetic influences, and brain functioning. Executive dysfunction may be demonstrated by difficulties with self-control, irritability, impulsivity, and motivation. Children who demonstrate deficiencies in these skill areas often appear disinterested or apathetic. Such students may struggle with appropriate social skills and repeat mistakes that have been corrected more than once (Riggs et al., 2004). These difficulties can result in a child making the same error without making the connection to an inaccurate process or unsuccessful strategy (Anderson, 2002).

Executive skill dysfunction affects the ability to function productively in a classroom setting, as children with weaker attention and self-regulation skills have difficulty sitting still in class, listening to instructions, and following through on tasks (Dawson & Guare, 2012). These underdeveloped skills often transfer to the social and emotional progress of a child. Children with weaker attention and self-regulation skills tend to take more risks, display more aggressive behaviors, are less likely to follow the rules, and may be confrontational (Kochanska, Murray, & Coy, 1997).

Impaired development of these skills has a significant impact on learning, social development, and productivity. Children and adults who have underdeveloped executive functions struggle to stay organized, manage time and resources, maintain friendships, problem solve, and keep a job (National Scientific Council on the Developing, 2011). Those with weaker executive functions have higher possibilities of risky behaviors, including drug and alcohol abuse in adolescence and early adulthood. Underdeveloped inhibition during childhood has also shown to be predictive of criminal behavior in the teen years and financial instability in adulthood (Pharo et al., 2011).

Interventions

The National Scientific Council on the Developing Child National Forum on Early Childhood Policy and Programs notes three significant findings: the importance of early development of cognitive and social aspects of executive functions, the impact of dysfunction on the development of a child, and the importance of intervention in such cases (2011). Although executive functions are profound indictors of productivity across the lifespan of a person, students are not often taught about these skills. Not only is instruction on executive functions limited in the classrooms, but teachers also do not commonly receive training on these functions during their credentialing programs (Flook et al., 2015). Although many teachers lack formal training in executive functioning, they are often the first to note areas of concern in attention, self-regulation, task completion, or age-appropriate abilities, such as speech, coordination, memory, and problem-solving (National Scientific Council on the Developing, 2011).

Evidence from the initial executive function intervention studies indicate increases in literacy and math skills compared to students who did not receive explicit executive skill support (Bierman, 2008). Research also correlates strong executive function skills with higher

achievement in math and early reading skills in preschool and kindergarten students (McClelland et al., 2007). Basic academic-readiness skills, such as following directions, abiding by class and playground rules, sitting quietly in class, listening, and behaving appropriately are also regulated by executive functions. Implications of these findings suggest a need for teacher training and further implementation of executive function support in the classroom (National Scientific Council on the Developing, 2011).

Classroom teachers have many strategies available to support executive functions in any instructional setting. Studies on intervention programs have consistently demonstrated an increase in executive and academic skill. However, there is no evidence to show executive function and academic interventions need to be separate. The targeted skills of memory, attention, and inhibition support the development of literacy and math skills (Diamond et al., 2007). Incorporation of curriculum specifically focused on EF skills promotes skill development and an increase in the academic performance and social development of children (Jacobson et al., 2011). Current findings note the important role executive functions play in the cognitive and social development of preschoolers and the impact they have on school readiness (Röthlisberger et al., 2012).

Executive Functions

Flexibile/Shift:
- Visual Schedules
- Plan and structure transition times
- Countdown/warnings for transitions
- Use of timer
- First, Next
- Must Do/May Do

Working Memory:
- Math Drills
- Daily Oral Language
- Review of previous day's lesson
- Connection to Prior Knowledge
- Checking for Understanding
- Alphabetize word hooks
- Sentence hooks
- Word building flashcards

Initiate:
- Checklist for materials
- Visual aids
- "To Do" list with steps for completion

Monitor /Evaluate:
- Checklists
- Rubrics
- Planners
- Peer Edit
- Meet with teacher to review and troubleshoot work
- Think, record, act, check

Goal:
- Graphic Organizers
- Rubrics
- Planners

Plan:
- Make a checklist for assignments
- Chunk assignments
- "To Do" List with time estimation
- Organize lesson with tight instruction, guided practice and a slow release to independence
- Think, record, act, check

Refuel:
- Use of break system
- Preferred Activity Time
- Kinesthetic Activity

Sustained Attention:
- Visual aids
- Checklists
- Graphic Organizers
- Chunk assignments
- Timer
- Written and Oral Directions

Organize:
- Visual Schedule
- Agenda
- Planners with due dates
- Post assignments on a specific area each day
- Direct instruction to write down assignments
- Timer
- Consistent Routines/Procedures
- Name/Date/Assignment on papers
- Schedule a weekly time to clean out/organize desk, backpack, folder
- Separate work areas for different activities

Inhibit:
- Think About It Worksheets
- Break System
- Time Out Strategy
- ABC Worksheet

Metacognition:
- Graphic Organizers
- Quick Writes

Strategies for Success

Figure 1.2 Traditional strategies for supporting executive functions

To further study executive functions in this developmental range and support long-term development of these skills, different approaches to intervention have been introduced. Interventions range from individual training to group or whole class instruction (Barnett et al., 2008). Individual training typically focuses on one or two executive weaknesses through a

coaching model to set goals and support monitoring and adjustments with a series of reinforcements until the desired behavior or skill is demonstrated independently (Dawson & Guare, 2012). Group training is a more common method of intervention, as more children are treated and costs are less per student (Röthlisberger et al., 2012). Increased research targeting improvement of executive functions has often focused on the effectiveness of intervention programs (Aran-Filippetti & Richaud de Minzi, 2012). Classroom interventions targeting the executive skills of preschoolers include strategies focusing on skill development, teacher training on classroom management techniques, and social-emotional coaching for children (Röthlisberger et al., 2012).

Tools of the Mind has been widely implemented in preschools aiming to increase the executive skills of the students they serve. The results have been increases in attention and impulse control, as well as better performance in behavior and literacy (Farran & Wilson, 2014). The Tools of the Mind program is based on Vygotsky's research of executive functions. The curriculum includes 40 activities, including metacognition, play, and supports for memory and attention. In the 2007 study, executive functions were found to increase in preschool children with the use of the intervention program (Traverso, Viterbori, & Usai, 2015). Although more research is available in regard to Tools of the Mind, no single program or curriculum has proven to have more significant results than the others (Baron, Evangelou, Malmberg, & Melendez-Torres, 2016; Burns, 2005). In three studies targeting the increase of executive skills, all three found an increase in academic performance. In the first study, the Tools of the Mind intervention program was implemented and demonstrated increases in executive functions, academics, and behavior as compared to the control group (Farran & Wilson, 2014).

The second study targeted executive skills through teacher research and implementation, which demonstrated similar results in executive functions and academics (Raver et al., 2011). The third study paired executive function with reading skill interventions and produced consistent findings (Bierman et al., 2008). Children involved in a study at the University of Wisconsin-Madison in 2014 began with weaknesses in socialization and executive functions and showed significant improvement over the control group (Flook et al., 2015). These findings were consistent with other research studies noting the benefits of executive function intervention in general education classrooms (Bierman et al., 2008; Diamond & Lee, 2011).

Scientists and practitioners in the field of neurology are beginning to study methods for increasing executive functions in young children with weakened attention and memory skills. Researchers are attempting to utilize a computer-based program to strengthen the brain circuitry through the use of tasks with increasing difficulty, with initial findings demonstrating further development of the prefrontal cortex. Cogmed Working Memory Training is a computer-based training system for working memory that has shown promising results for children (Klingberg et al., 2005). The growth in working memory has been correlated to increased academic performance, with higher achievement in math and various working memory activities (Holmes, Gathercole, & Dunning, 2009; Klingberg et al., 2005; Klingberg, Forssberg, & Westerberg, 2002).

Specific Studies

Biology

Executive functions are developed after birth and are stimulated by the biological makeup of a child as well as the level of exposure to interactions and experiences that promote the expansion of executive functions. Children are created with specific biological traits that are

passed down from the parents. Many traits and skills are acquired from the parents and can influence the presence of particular functions (Röthlisberger et al., 2012). Parents who are naturally organized may produce children who find organization to be second nature, whereas a child whose parent struggles with organization may also find difficulty with that skill (Dawson and Guare, 2010).

Attention Deficit Hyperactivity Disorder

Executive dysfunction and Attention Deficit Hyperactivity Disorder (ADHD) are found to be correlated; working memory, sustained attention, and inhibition are areas of weakness in those with ADHD. Children with ADHD are often found to have lower executive functioning, and those with executive dysfunction are more likely to drop out of school, abuse drugs, and commit crimes (Diamond et al., 2007). The struggles for children with this diagnosis are evident early in life by their inabilities to sit still or follow directions in class.

Working memory plays a vital role in academic success, as do the abilities to focus and avoid distractions (van der Donk et al., 2013). Students with poor working memory often struggle with classroom expectations of behavior and learning, specifically in areas of reading and arithmetic (Baddeley, 2001; Gathercole & Alloway, 2008). Students with ADHD and poor working memory have difficulty remembering and applying instructions from their teachers, which puts their academic success at risk (Reid, Trout, & Schartz, 2005; van der Donk et al., 2013). Students with ADHD often demonstrate serious difficulties in their academic performance due to weaknesses in organization. These children may have difficulty with working memory, which can impact their progress in achieving goals (Gureasko-Moore, DuPaul, & White, 2007). Students may even avoid goal-setting in order to circumvent demonstrating their deficiencies. However, students who set goals are more likely to complete a task or target.

Students with ADHD are likely to need shorter, timelier goals that lead to long-term goals

instead of only individual long-term goals with no checkpoints. Periodic spot checks provide the

feedback necessary for them to feel frequent success (Johnson & Reid, 2011; Gureasko-Moore et

al., 2007).

An increasing interest in the correlation of executive functions and academic

performance has prompted further research. As more studies have been conducted, a

discrepancy between the performance of children with ADHD and children with no diagnosed

attention disorder has repeatedly been noted. Students with ADHD are common to academic

problems and executive function deficits. They struggle with goal setting, planning,

organization, and focus. ADHD is typically diagnosed in less than 10% of children.

Approximately 50% of students diagnosed with ADHD will also qualify for Special Education

services. These students may be qualified as learning disabled, emotionally disturbed, or other

health impaired (Johnson & Reid, 2011). In their 2013 study, Aran-Filippetti and Krumm

examined the correlation of attention and behavioral profiles of attention deficit and

hyperactivity. The study focused on outcome difference of cognitive areas evaluated with

children with hyperactivity and attention deficits as opposed to peers with low levels in the same

focus areas. Children with hyperactivity and attention deficits consistently scored lower on

attention tasks, although there was no significant discrepancy regarding general intelligence.

Children with attention deficits used less processing time to complete tasks as opposed to their

peers without attention problems. Children with hyperactivity also made a significantly greater

number of errors than the other children in the study.

Studies focusing on preschool students and ADHD are not as common as research in

elementary school and adolescence. However, current research is expanding into early

childhood and confirms the longtime association of ADHD and executive function deficits (Skogan et al., 2015; Willcutt, Doyle, Nigg, Faraone, & Pennington, 2005). Many deficits in academics can be traced to executive functions, as students with ADHD typically struggle with attention, organization, planning, goal setting, and focus. Students with ADHD have difficulty planning due to impulsivity, often wanting to begin a task without thinking through a strategic plan for successful completion. They may also lack the focus to see the task through to the end, even if a plan is provided for them. They may follow the simplest process to complete the task, even if a more complex process will bring significantly greater success (Johnson & Reid, 2011).

Behaviors

Executive functions develop in different stages, which coordinate with the maturation of the brain and cognitive ability. Executive skills are vital to the planning and monitoring of behavior from childhood into adulthood (Reynolds & MacNeill Horton, 2008). Research has determined the brain continues to develop through the various stages of life into adulthood, with behaviors primarily controlled by the frontal lobe (Dawson & Guare, 2010), which is the last region of the brain to develop (Romine & Reynolds, 2005). Researchers have concluded this lack of maturation in the region of the brain which controls judgment and behavior is commonly related to risky behavior in adolescence (Pharo et al., 2011). As children enter adolescence, the natural desire for independence increases; however, at this stage of life, children are also exposed to many risks—such as drugs, alcohol, and sex—in schools and social groups in ways not experienced in earlier years (Turkstra & Byom, 2010).

IQ Correlation

EF skills have a higher correlation to school readiness than the intelligence quotient for a child. In a 2007 study, Diamond, Barnett, Thomas, and Munro observed kindergarten teachers

reporting executive function skills—such as self-regulation and sustained attention—as having a more substantial impact on school preparation than specific academic skills. Another study by Ardila, Pineda, and Rosselli found few correlations between intelligence and executive functions; a follow-up study through the University of Otago in 2011 confirmed this (Pharo et al., 2011).

Socioeconomic Status

Children with lower socioeconomic status (SES) are likely to have poorer EF skills, as opposed to their peers who do not suffer the added stress of financial instability. SES is a complex description that includes a measure of income, employment status, and level of parent education. Socioeconomic status has shown to be a predictor of cognitive and academic achievement and to have an impact on executive functioning (Jacobson et al., 2011).

Multiple studies have found children in lower SES to perform below peers in higher SES in intelligence testing and academic performance. They have also demonstrated less impulse control, more errors, are less reflective, and have a lower ability to resolve conflict than their peers in higher SES (Aran-Filippetti & Richaud de Minzi, 2012). Studies have also determined a connection between lower impulse control and lower performance in academic achievement. Additional studies have found that mothers of higher socioeconomic status provide more linguistically-stimulating environments than mothers of lower socioeconomic status. A child who is exposed to higher amounts of language shows better communication skills and ability to self-regulate.

In their 2012 study, Aran-Filippetti and Richaud de Minzi found a considerably lower executive functioning performance in children of lower SES as compared to children of middle SES. Less access to cognitive stimulation along with higher stress environments contributes to

less development in executive functioning. Research has determined brain development and executive functioning are influenced by the social atmosphere. Research measuring different regions of the brain shows a slower development of the frontal, temporal, and occipital regions. The differences in brain development in lower SES indicate not only reduced cognitive processing, but also lower behavioral control. Children from low SES underperform compared to those of middle SES in behavioral tests and inhibition.

Children who come from lower socioeconomic homes demonstrate weaker performance on a variety of academic assessments (Röthlisberger et al., 2012). The lack of exposure to learning opportunities and resources that promote cognitive skills may contribute to this discrepancy between children who come from poorer homes and those from the upper and middle classes. Parents who are raising children with little income are less likely to be able to provide enrichment opportunities or additional resources compared to parents who are financially stable (Lawson, Hook, & Farah, 2017). Parents who struggle financially are also less likely to have the time for these experiences as they may be working more than one job to provide for the child (Kishiyama, Boyce, Jimenez, Perry, & Knight, 2009). Students who are impoverished face declines in the transition to middle school in areas such as self-esteem, grades, and connection to school (Jacobson et al., 2011).

Environmental Factors

In addition to biological factors, research notes the relevance of environment on the executive functions. Areas of the brain associated with executive functions are also connected with emotion, including stress and anxiety, which impact a child's reactions to these sensations. Ongoing exposure to stress can affect the refinement of executive functions, compromising flexibility and self-regulation (Blair, Zelazo, & Greenberg, 2005).

Exposure to stress from neglect, abuse, or violence can affect the progression of executive functions, and prolonged stress negatively affects the developing brain (Shields, Sazma, & Yonelinas, 2016). Unstable emotions result from turmoil and fear, leading to difficulties with inhibition and impulse control. Children's communication skills develop as they mature, and children who experience these stressful situations may not develop verbal or behavioral regulation skills to practice self-control. Research has shown high-stress environments are closely correlated with weakened memory, attention, and inhibition skills (Wagner et al., 2016). This can be attributed to the effects ongoing stress has on the brain (National Scientific Council on the Developing, 2011).

Children who live in stressful environments spend a considerable amount of their time at home in "fight or flight" mode. When the brain is in this heightened state of alert, the prefrontal cortex is temporarily affected, minimizing its ability to apply the executive functions to support thoughtful actions (Agoston & Rudolph, 2016). Frequent exposure to chaotic environments results in harmful interruptions to the development of the cognitive practices, which impacts children's social, emotional, and academic growth (Arnsten, 1998).

The outside influence of parents and teachers as children mature is remarkable (Röthlisberger et al., 2012). The reception to new learning and experiences is heavily influenced by the adults who surround them. In a productive environment, the adults involved with children in their formative years purposely scaffold routines, expectations, demands, and independent choice by providing appropriate parameters and support systems (Fay-Stammbach et al., 2014). These supports and restrictions vary in flexibility as the children learn and mature, allowing them to experience unique situations in safe environments. As children grow, their parents allow the opportunities for greater learning experiences. These opportunities provide children the ability

to grow and develop their skill sets with the necessary supports until they achieve independence (Kochanska et al., 1997).

Parental scaffolding provides growth opportunities for children to utilize their executive skills and practice these skills with supports before they are expected to use them without parental influence (Fay-Stammbach et al., 2014). Children who experience these opportunities in a caring and sensitive environment with a slow release to greater independence demonstrate stronger resistance to distractions, better emotional control, and ability to follow directions (R. A. Barkley, 2001). However, parents of adolescents who demonstrate weak executive skills face significant challenges in parenting their teens. Although parents are aware of their responsibility to guide and protect their children from errors in judgment which could result in serious consequences, teens still seek greater independence (Pharo et al., 2011). This desire on the teens' part can result in clashes with their parents, as they resist the guidance and advocate for additional freedoms. If parents allow their children to make decisions with little guidance, poor decisions are likely to follow (Guare et al., 2012).

Parent education level also has a strong impact on language acquisition and executive function development. The level of cognitive stimulation, parent involvement, nutrition, health status, sanitary condition, and interactions with the mother influence the cognitive development of the child. Parent education level is associated with executive function performance as higher levels of cognitive interaction and language exposure support stimulation. Stimulating interactions between mother and child are correlated with the impulse control and self-regulation of a child as the child experiences redirection, positive or negative reactions, and verbal and nonverbal feedback from the parent (Fay-Stammbach et al., 2014).

Assessment of Executive Functions

Input from all aspects of the life of a child, including school and home, are important, especially since dysfunction may present itself in different ways in different settings. Research suggests that executive functions develop in intervals and different components develop at dissimilar times (Leon-Carrion et al., 2004). Understanding the development of executive functions is crucial for the assessment process to ensure the timely diagnosis of dysfunction and intervention (Anderson, 2002).

Assessments designed to measure executive functions focused primarily on adults until the last decade, although research began to show the significant development of executive functions in early childhood (Röthlisberger, 2012). The validity of previous assessments on children was not ideal to address these new findings, as the design targeted adults and would not take the interest or development of children into account. Assessments that have been designed with children in mind include interviews, observations, and student work samples as well as rating scales. Children demonstrate a variety of skills and weaknesses in different environments. A child might feel comfortable throwing a tantrum at home with his or her parents, but might not display the same behavior with peers as it would be considered socially unacceptable. A child may struggle significantly with working memory and may have a difficult time recognizing words, letters, sounds, or patterns (Dawson & Guare, 2012). This would be immediately evident in a classroom setting, whereas it may not be as quickly detected in the home environment due to the variance in expectations or responsibilities. For this reason, it is crucial for a child to be assessed by both the parents and teachers if possible to determine the impact of executive function deficits on everyday tasks in both the structured learning environment and unstructured or more relaxed home settings (Dawson and Guare, 2010).

Sources of Executive Function Data

The assessment process can involve a variety of perspectives, including a detailed case history, interviews with parents and teachers, classroom observations, academic work samples, and standardized rating scales (Isquith et al., 2004). Interviews with parents and teachers provide general and specific information regarding the ability of a child to perform on academic activities, such as goal setting, planning, organizing, problem-solving, focusing attention, and task completion as well as home chores and responsibilities. Information from the parent interviews can be compiled into a case history detailing the development of the child, progression of abilities, and environmental factors (Fay-Stammbach et al., 2014). Questions may address the child's ability to complete homework accurately or independently; how chores are done; if prompts, supervision, or encouragement are needed; and how routines are managed. Questions relating to behavior control also address a variety of situations such as common interactions with friends, extended family, and immediate family or with different emotions such as frustration, anger, disappointment, and excitement.

Teacher interviews provide particulars on the capacity of a child to work independently, organize materials, complete tasks, problem solve, and how the child interacts with peers in a variety of situations from group work to playground games (Dawson & Guare, 2012). A case study can provide the details to support a well-formulated intervention plan, as data includes a variety of situations and perspectives along with circumstances and what has worked or not worked in the past.

Behavior checklists are commonly used to determine the strengths and weaknesses of executive function skills. Behavior rating scales can be completed by teachers, parents, and even students who are of age to self-assess. A variety of rating scales for executive functions have

been developed in the last couple of decades with some focusing on specific skills while others cluster together larger areas of skill. One of the most frequently used assessments is the Behavior Rating Inventory of Executive Functions (BRIEF). The inventory ratings are determined on a three-point scale of how frequently a child struggles in one area or another. The ratings are divided as "never," "sometimes," and "always." There are two original versions of the assessment designed for children 6-18 years of age, one completed by parents and the other by teachers. Two additional versions include a preschool rating scale (BRIEF-P) to be completed by parents and teachers, and a self-assessment (BRIEF-SR) for children ages 11-18. This rating scale addresses a range of skills, categorized as behavioral and metacognitive, and eight specific scales for individual skills. Within the behavioral index are inhibition, flexibility, and emotional control. The metacognitive scale includes initiation, working memory planning, and organization. This 86 item scale provides an extensive picture of a child's abilities (Gioia et al, 2000).

The Behavior Assessment System for Children, Third Edition (BASC-3) has been used to assess behavioral and emotional regulation in children of varying stages of development, including preschool, grade school, and adolescence. Perspectives from the child, parent, and teacher are addressed in this rating system. The system includes a variety of assessment scales, including observation, rating scales, and developmental history (Reynolds, Kamphaus, & Vannest, 2011).

The Executive Skills Questionnaire (ESQ), developed by Dawson and Guare, addresses areas of strength and weakness. The scale can be completed by parents, teachers, and adolescents to provide information to align interventions to the specific skill deficits while also

supporting the skill surpluses. This scale can be used by classroom teachers to assist in

differentiating the instruction or composition of small groups (Dawson & Guare, 2010).

The NEPSY-II is an individually administered assessment, which focuses on executive

functions and attention, language, memory, learning, sensorimotor and visuospatial processing,

and social perception. Some assessment options are available that allow the evaluator to create a

customized assessment to support an accurate diagnosis and appropriate intervention (Brooks,

Sherman, & Strauss, 2009).

The Delis-Kaplan Executive Function Scale was developed in 2001 and assesses verbal

and nonverbal executive function skills in children over the age of 8 through adulthood. The

assessment system includes nine test series, including flexibility, initiation, inhibition, problem-

solving, and planning. The data can be used to determine strengths and weaknesses in executive

functioning as well as interventions for addressing the areas of deficit (Delis et al, 2000).

Sources of Academic Data

Classroom observations provide insight into the most common demonstration of

executive functions. This setting is where deficits are first commonly noted and where

interventions are most likely to make a difference (Woitaszewski, Thielen, & Stovall, 2006).

The observer is able to view the child in the natural academic setting where antecedents can also

be observed. This setting provides information for necessary environmental changes or

interventions that may best fit the particular classroom context. Data collected from the

observation can include work samples with details on the length of time taken to begin and

complete the task, accuracy of the task performance as compared to the directions given, and

how the child adjusts to changes in difficulty or expectation (Dawson & Guare, 2010). A

structured observation of a child performing specific tasks, flexibility in changing tasks,

problem-solving strategies, ability to focus, and ability to regulate behavior combined with the

work sample provide a clear informational foundation from which to draw conclusions and

develop support plans for intervention and future success (Dawson & Guare, 2010).

Summary

Deficits in academic and social skills can greatly impact a student's success, both in peer

relations and academic or future career opportunities. Research into executive functions and

how they can be influenced may greatly assist such struggling students by not only developing

cognitive, communicative, and self-monitoring skills, but also by building their confidence and

allowing them to envision the possibilities for their future that they might not have realized.

CHAPTER 3: METHODOLOGY

The purpose of this study was to determine the impact of the direct instruction of executive function skills on the academic performance and the adult perception of the Curriculum Handbook for Instruction of Executive Functions (CHIEF) in three K-8 schools. The results of pre- and post-academic assessment administered to all students in the treatment and control schools, and the survey administered to all teachers from the treatment schools provided quantitative and qualitative data.

Setting and Participants

The setting for this study was an urban Northern California city with a culturally diverse population of approximately 300,000 people. The residents of the city primarily speak English and Spanish, although there is a variety of other languages and the unemployment and crime rates double the state average (Zehr, 2010). The comprehensive high schools in the district were labeled as "drop out factories" by the Department of Education, using a term coined by Bob Balfanz, a Johns Hopkins researcher. This label referred to high schools with a senior class with 50% or fewer students than the freshman class in the same school who are considered chronically failing (Gewertz, 2009). However, the concerns of this city are not limited to education; the crime rates, unemployment rates, and incarceration rates are staggering. The ongoing concern for the future citizens of this community—including education level, employability, and crime prevention—led a school psychologist in the district to question other ways the school district could support the development of the students served. This questioning and the neuropsychology expertise of the psychologist led to the creation of a curriculum program, the Curriculum Handbook for the Instruction of Executive Functions (CHIEF), designed to increase the executive functioning of the students in the district.

This study focused on the implementation of the CHIEF program at three K-8 schools and the effects the program had on student achievement. Each of the experimental schools were paired with similar control schools in regard to demographics, including population statistics such as SES (Socially Economically Disadvantaged), EL (English Learner), gender, ethnicity, academic proficiency in ELA (English Language Arts) and math, the number of students, and gender breakdown. All schools administered the Measures of Academic Progress (MAP) to determine academic growth. The CHIEF program was created by a group of trained general education teachers under the direction of the school district's psychologist and the Special Education Department. The teachers on the curriculum committee met each week to develop the program, including planner activities, lesson plans, and strategies for implementation. The teachers from the experimental schools then utilized the curriculum and strategies in their daily instructional routines.

A survey was conducted to measure the level of implementation and the effectiveness of the program as perceived by the classroom teachers. Surveys were administered to the teachers from each of the experimental schools in February 2018. There were 57 teacher participants who completed the survey.

Sampling Procedures

The experimental and control schools were chosen randomly by the school district, representing the various demographics and performance levels within the school district. The schools chosen represent those of different poverty levels and areas of the inner city location. The study began in Fall 2015 with three pilot schools, which represented a large, typically low-performing impoverished school in the south region of the city, a small school in the north region which represents the average academic performance and income of the district, and a large

school in the north region representing a higher-performing and higher income area than the average.

Table 3.1

Total Population of Schools

Higher-Performing		Moderate-Performing		Lower-Performing	
Experimental School	Control School	Experimental School	Control School	Experimental School	Control School
941	930	543	628	854	594

Each treatment school was paired with a similar control school, including population statistics such as SES (Socially Economically Disadvantaged), EL (English Learner), students who qualify for an individualized education plan (IEP) through special education, ethnicity, and academic proficiency in ELA (English Language Arts) and math. SES status is based on the number of students who qualify for free and reduced meals from the federal government, which is based on parent income and the students' living conditions, including homelessness and foster care. Statistically, 81% ($n= 31,726$) of the students in the district receive free and reduced lunches as determined by their socioeconomic status. 10.38% ($n=4,061$) of the students in the district receive special education services, and 29.8% ($n=11,683$) of the student population receives EL support services. The racial demographics of the district are as follows: 66.6% ($n=26,072$) Hispanic, 10.45% ($n=4,087$) African-American, 8.39% ($n=3,282$) Asian, 5.4% ($n=2,122$) White, and 3.4% ($n=1,353$) Filipino.

The schools researched were grouped into three categories related to achievement, including typically higher, moderate, and lower performance as compared to the averages of the

entire 39,349 student population of the district. The district performance on the state proficiency

exams included 23% for ELA and 17% for math (CDE, 2016).

Table 3.2

2016 State Performance Test Results

	Higher-Performing		Moderate-Performing		Lower-Performing	
	Experimental School	Control School	Experimental School	Control School	Experimental School	Control School
ELA	.37	.25	.21	.17	.22	.08
Math	.28	.21	.21	.18	.17	.09

Table 3.3

Instructional Support

	Higher-Performing		Moderate-Performing		Lower-Performing	
	Experimental School	Control School	Experimental School	Control School	Experimental School	Control School
ELD	.16	.19	.20	.20	.42	.38
IEP	.11	.09	.11	.17	.07	.07

Table 3.4

Socioeconomic Status

	Higher-Performing		Moderate-Performing		Lower-Performing	
	Experimental School	Control School	Experimental School	Control School	Experimental School	Control School
	.80	.85	.82	.82	.86	.90

Table 3.5

Ethnicity

	Higher-Performing		Moderate-Performing		Lower-Performing	
	Experimental School	Control School	Experimental School	Control School	Experimental School	Control School
Hispanic	.40	.35	.43	.52	.78	.63
AA	.13	.10	.23	.19	.05	.19
Asian	.23	.33	.17	.12	.03	.10
White	.05	.04	.04	.07	.02	.02
Filipino	.10	.07	.05	.01	.10	.03

Note. AA = African American

The surveys were given to all classroom teachers in the experimental schools. The surveys were administered at the staff meetings of the experimental schools with a presentation of the research topic, along with information related to the study on the CHIEF program and academic impact on MAP scores. The researcher provided a document which indicated the

participants would remain anonymous and explained the risks involved in participating in the survey. After the presentation, the researcher left the survey to be distributed by a staff member from the experimental school so the participants would not feel pressured to complete the survey if they chose not participate. The staff member also collected the completed forms. The following week, the researcher returned to collect the surveys from the staff member.

Instrumentation and Measures

The researcher used quantitative and qualitative measurement tools to determine the level of implementation of the CHIEF program and the impact of the program on the academic achievement of students. Quantitative data was collected from the academic assessment administered to all students in the experimental and control schools. Qualitative data was provided by the responses to the surveys of the participating teachers from the experimental school sites.

MAP Assessment

All teachers in the district assess students using a consistent testing system called Measures of Academic Progress (MAP). This system, created by Northwest Evaluation Association (NWEA), is a computer test that adapts during each testing session. Each student receives a unique set of test questions and then, based on their responses, the test adjusts. When the student answers accurately, the questions increase in difficulty. If the student's answer is inaccurate, the questions decrease in difficulty until the student can consistently answer correctly. The testing format includes multiple-choice, drag and drop, and other types of questions. Student progress reports contain information and scores from previous and recent tests.

MAP results are provided as a numerical score. This score is used to measure individual student academic growth at different intervals of the year. After each MAP test, students receive a RIT score, which reflects the students' academic skills and abilities. The RIT scale is a stable, equal-interval scale, meaning that a change of ten points indicates the same thing regardless of ability, age, or grade-level. Scores can be compared to determine growth over a period of time. NWEA provides many different reports to help schools and teachers use MAP information. Schools, grade levels, and classes can be monitored to determine academic growth. Teachers use the report to verify the progress of individual students and the class. Students with MAP scores in the same range are typically prepared for similar instruction levels. MAP also gives growth targets to assist students in goal-setting and in understanding what they need to learn to achieve those goals. The system provides charts showing the median scores for students at various grade levels. Unlike state tests, MAP tests are given periodically during the year. However, MAP is based on the same standards as the state summative tests so they measure similar content. Unlike state testing results, MAP results are immediate so teachers know what students know and are ready to learn. The results can be used to target instruction (NWEA, 2016).

Table 3.6

ELA Comparison of Baseline Average RIT Scores on MAP – Fall 2015

	Higher-Performing		Average-Performing		Lower-Performing	
	Experimental School	Control School	Experimental School	Control School	Experimental School	Control School
K	141.7	134.6	134.6	136.9	135.2	130.4
1	161.2	153.8	151.5	149.8	146.0	152.1
2	168.3	165.1	159.2	161.1	159.7	161.2
3	182.3	176.7	178.7	172.8	174.3	167.9
4	193.1	189.8	183.6	182.4	177.3	182.3
5	200.0	196.7	191.1	190.9	195.7	185.5
6	205.6	203.3	198.5	199.0	200.3	187.2
7	213.9	210.7	204.1	202.1	202.8	200.6
8	218.0	216.0	211.7	208.2	205.3	201.6

Table 3.7

Math Baseline Average RIT Scores on MAP – Fall 2015

	Higher-Performing		Average-Performing		Lower-Performing	
	Experimental School	Control School	Experimental School	Control School	Experimental School	Control School
K	139.3	132.5	133.2	135.4	130.6	127.8
1	161.4	153.2	151.8	152.6	145.3	153.3
2	170.5	167.8	165.4	163.1	164.1	164.3
3	185.1	181.2	182.1	180.9	177.0	174.9
4	197.8	196.7	194.2	190.2	189.4	190.6
5	204.4	204.0	200.4	199.0	202.1	195.1
6	203.5	209.3	205.9	206.7	207.0	203.6
7	223.0	219.8	215.4	212.9	214.5	208.9
8	230.8	227.0	225.1	218.7	218.4	214.8

Lesson Design

Throughout the school year, the teachers of the pilot schools taught lessons developed by a committee of teachers who had been provided with more in-depth training and additional strategies in the direct instruction of the executive functions of their students during daily lessons. The results of the ELA and math MAP assessments from fall, winter, and spring testing sessions over the course of three years were reviewed for each grade level and school.

The design of the CHIEF curriculum was a three cycle series of lessons rotated through a particular executive function skill each week (see Appendix A). Each skill had a mascot character, illustrated by students, which represented each skill. The skill characters included:

Table 3.8

CHIEF Mascots

Executive Function	Action Figure
Goal Setting	Goliath Goal
Initiate	Ignacio the Ignitor
Inhibition	Self-Control Sam
Flexibility/Shift	Camille the Chameleon
Planning	Peter Plan
Organize	Ozzie the Organizer
Sustained Attention	Falcon Focus
Working Memory	Memo the Memory Man
Refuel	Rita the Refueler
Monitor/Evaluate	Monitoring Monica

Each cycle of lesson plans provided more depth, experience, and information relating to executive functions. The first cycle introduced the skill of the week, and the second cycle developed the understanding of the skill further and connected the function to the part of the brain used with each skill. The third cycle further developed the understanding of the executive function skills, with the objective of the curriculum being the reinforcement of skills and activities for students to use in continuing to develop their executive functions independently.

The CHIEF curriculum included cycles of lesson plans for each skill. An individual skill was focused on each week, with the pattern continuing until all skills were introduced (see Figure 3.1). At the end of the first cycle in which all skills had been taught for one week at a time, another cycle of lessons began with a review of the skill, but then provided information about the parts of the brain utilized by each skill. The third cycle of lessons followed with strategies to embed skill-development in all aspects of schooling and the personal lives of the students, ranging from time-management to organization of their bedrooms and strategies to deal with anxiety and frustration.

Executive Function
Sequence of Skill Instruction

Week 1	Goal
Week 2	Plan
Week 3	Organize
Week 4	Initiate
Week 5	Sustained Attention
Week 6	Inhibition
Week 7	Shifting/Flexibility
Week 8	Working Memory
Week 9	Refuel
Week 10	Monitor/Evaluate

Figure 3.1 Sequence of Skill Instruction

The introduction of each skill included a five-day grade-appropriate lesson plan for all students in kindergarten to eighth grade. Day one lessons provided an introduction of the skill,

definition of the skill in student-friendly language, and a connection to Common Core learning standards. Each lesson provided teachers with directions, discussion topics, activities, and assessments. Day two of the first cycle included a review of the introduction of the skill from the previous day, as well as examples of the skill in use. Days three through five of the lesson for Cycle One included an activity or assignment for the students to complete using the skill of the week (see Appendix B). In addition to the lessons, a poster of the mascot corresponding to the skill of the week was displayed and referenced throughout the week (see Appendix C). Quotes related to the skills were read each morning on the school announcements and teachers referenced the skill throughout the week (see Appendix D). Student planners were utilized daily, with teachers trained to use them appropriately and make them part of the instructional routines each day, in addition to separate lesson plans for the planners to address each developmental age range (see Appendix E).

Approximately ten weeks after the initial implementation of the curriculum, Cycle Two lessons came back to review the skill, examples, and common uses of the function of the week, with additional information about the brain and how it works to support each skill (See Appendix F). Cycle Two, day one's lessons reviewed the skill and examples of the skill in use, and then day two's lessons introduced the part of the brain responsible for each of the executive functions. Days three through five's lessons incorporated the skill into an activity or assignment designed for each grade level. Cycle Three lessons brought the information and skill together to show the students how the skills are used in their daily lives. The lessons of Cycle Three followed the same format of day one's introduction and review, day two's examples and strategies, and days three through five had the skill embedded in an activity or assignment.

Classroom teachers and administrators were provided two days of training to support their understanding of executive functions and how the brain works. Before the curriculum training, the teachers were given information regarding what executive function strategies look like in the classroom and were asked to give examples of what they were already aware of in their classes (see Appendix G). The teachers were asked to take a questionnaire to assess the strengths and weaknesses of their own executive functions (see Appendix H).

When the implementation of the curriculum began, administrators and program leaders conducted regular classroom visits to observe and support the process. Feedback was provided to the teachers at the end of each lesson cycle to encourage collaboration and further development of the lessons (see Appendix I).

Survey

The survey included fifteen questions regarding the implementation of the CHIEF curriculum. The questions were designed using a 5-point Likert scale (0 = not at all, 1 = slightly, 2 = moderately, 3 = very, 4 = extremely). Four open-ended questions gave additional insight into the opinions of the teachers regarding suggestions for improvement of the curriculum. The first five questions addressed the fidelity of program implementation by the individual teachers. The next five questions regarded the quality of the professional development opportunities. And the remaining five questions focused on the beliefs of the teachers in the program. The same survey was administered at three K-8 experimental schools in Northern California. 57 teacher participants responded to the survey (see Appendix J). The teachers who participated in the survey also reported their gender, age, years of teaching, education level, and life level of current teaching assignment (see Table 3.9, 3.10, 3.11, 3.12, 3.13, and 3.14).

Table 3.9

Survey Participation

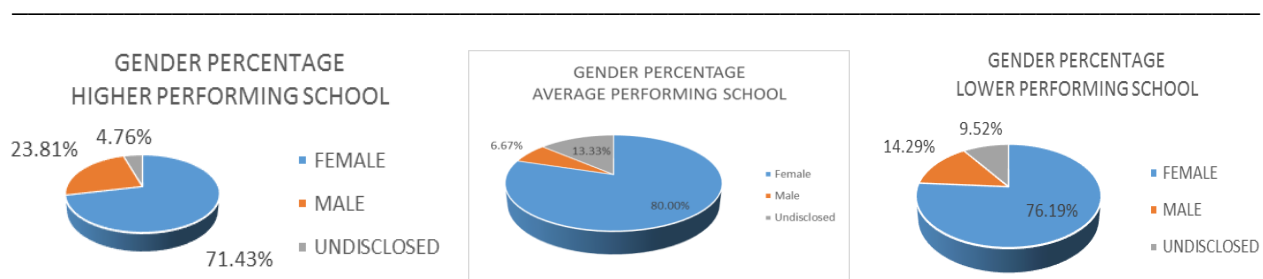| Higher-Performing	Moderate-Performing	Lower-Performing
.62	.50	.65

Table 3.10

Teacher Gender

Table 3.11

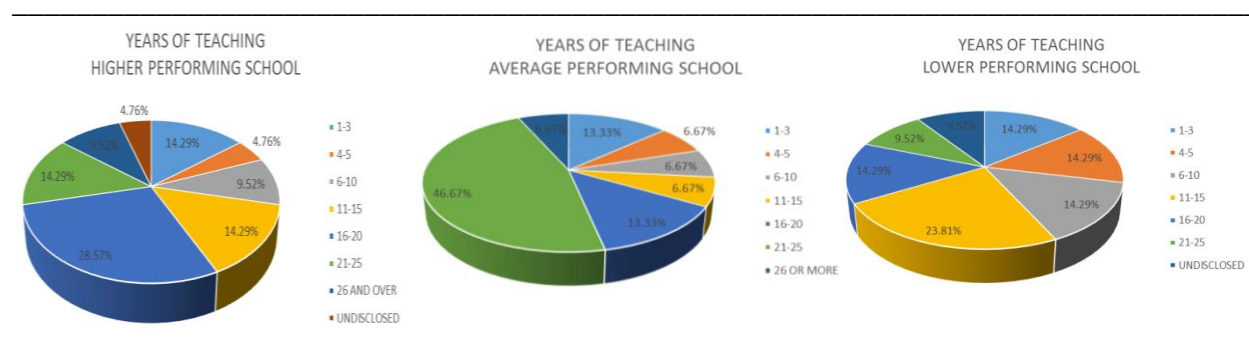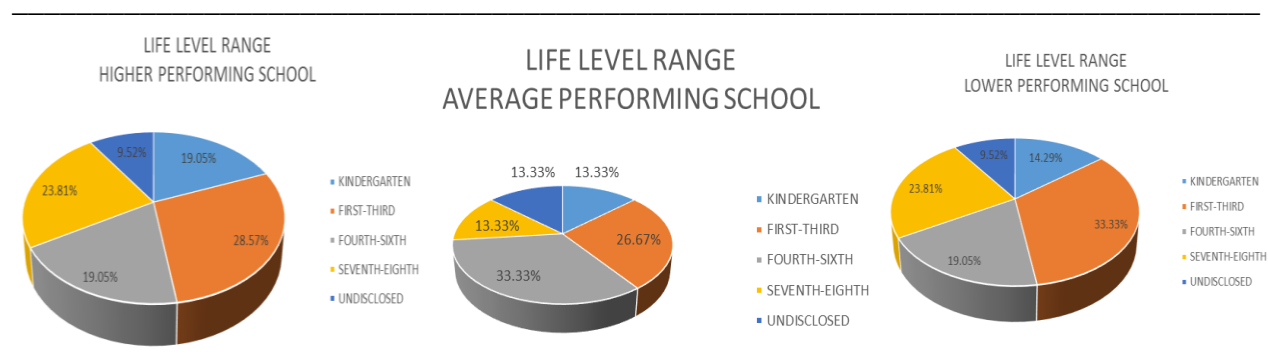*Teacher Age*
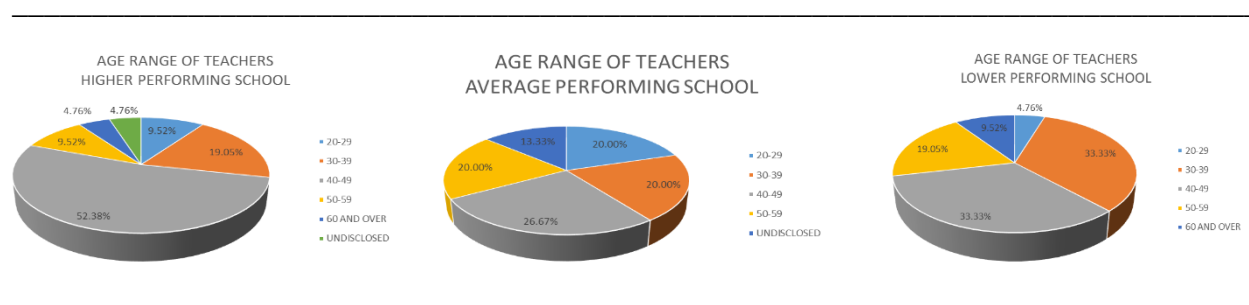
Table 3.12

Teacher Level of Education

TEACHER EDUCATION LEVEL
HIGHER PERFORMING SCHOOL

4.76%

42.86%

52.38%

- BACHELORS
- MASTERS
- UNDISCLOSED

TEACHER EDUCATION LEVEL
AVERAGE PERFORMING SCHOOL

6.67%
6.67%

33.33%

53.33%

- BACHELORS
- MASTERS
- DOCTORATE
- UNDISCLOSED

TEACHER EDUCATION LEVEL
LOWER PERFORMING SCHOOL

9.52%

33.33%

57.14%

- BACHELORS
- MASTERS
- UNDISCLOSED
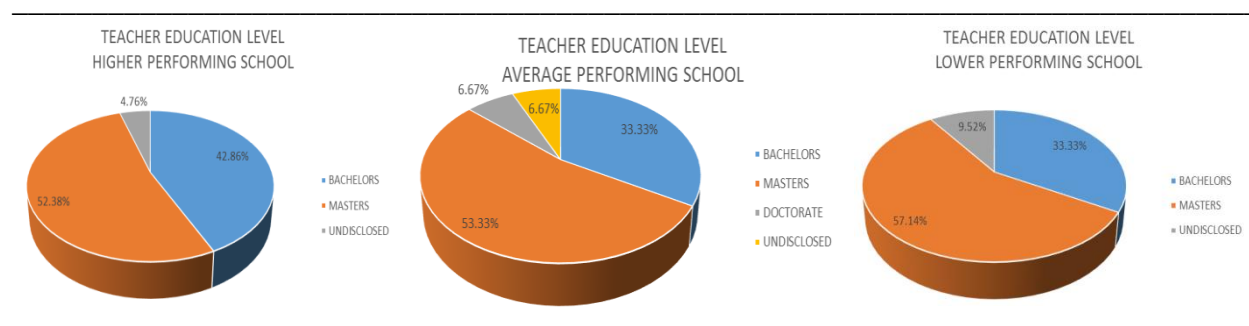
Table 3.13

Years of Teaching Experience

YEARS OF TEACHING
HIGHER PERFORMING SCHOOL

4.76%
14.29%   4.76%

9.52%   9.52%

14.29%

28.57%   14.29%

- 1-3
- 4-5
- 6-10
- 11-15
- 16-20
- 21-25
- 26 AND OVER
- UNDISCLOSED

YEARS OF TEACHING
AVERAGE PERFORMING SCHOOL

13.33%   6.67%

6.67%

6.67%

46.67%

13.33%

- 1-3
- 4-5
- 6-10
- 11-15
- 16-20
- 21-25
- 26 OR MORE

YEARS OF TEACHING
LOWER PERFORMING SCHOOL

9.52%   14.29%

14.29%   14.29%

14.29%

23.81%

- 1-3
- 4-5
- 6-10
- 11-15
- 16-20
- 21-25
- UNDISCLOSED

Table 3.14

Current Life Level Teaching Assignment

LIFE LEVEL RANGE
HIGHER PERFORMING SCHOOL

9.52%

19.05%

23.81%

28.57%

19.05%

- KINDERGARTEN
- FIRST-THIRD
- FOURTH-SIXTH
- SEVENTH-EIGHTH
- UNDISCLOSED

LIFE LEVEL RANGE
AVERAGE PERFORMING SCHOOL

13.33%   13.33%

13.33%

26.67%

33.33%

- KINDERGARTEN
- FIRST-THIRD
- FOURTH-SIXTH
- SEVENTH-EIGHTH
- UNDISCLOSED

LIFE LEVEL RANGE
LOWER PERFORMING SCHOOL

9.52%

23.81%   14.29%

33.33%

19.05%

- KINDERGARTEN
- FIRST-THIRD
- FOURTH-SIXTH
- SEVENTH-EIGHTH
- UNDISCLOSED

Validity and Reliability

The use of a control group lowered the threat to the validity of this study. The same pretests and posttests were administered to the groups, with the focus group receiving treatment. Although the groups were not equivalent, the consistency of the treatment to the focus group and the comparison of the assessments were likely to show a change in the focus group with no change in the control groups (Lunenburg & Irby, 2007).

The survey was reviewed by the statistics professor of the researcher, the committee chairperson, and a pilot group of colleagues. The survey was reviewed by the school district's research department for approval. The survey was also submitted to the Institutional Review Board of Concordia University Irvine for approval.

Plan for Data Collection

MAP testing was conducted with all K-8 students in the experimental and control schools to provide a baseline for academic performance before treatment. Students from all schools were administered the MAP test three times per year for two years after the treatment began. The results of the pretreatment assessments were compared to the posttreatment results of the experimental schools, and the results of the control schools from the MAP assessments were taken in the same time period as the experimental schools.

The survey was administered to teachers from the experimental schools at each of their staff meetings. The purpose and risks associated with the survey were reviewed with the participating teachers.

The initial portion of the survey included three sections with five Likert scale questions in each. The first set of questions focused on the fidelity of program implementation. The second

set addressed the quality of professional development received. The third portion concentrated on the individual teacher's belief in the program.

The next section of the survey consisted of four open-ended questions designed to provide information regarding ways to improve the program. Through these questions, teachers were given the opportunity to give suggestions and opinions of what they would change or include in the program to make it more effective. Responses to this question typically included short paragraphs which explained any concerns the participants had about the curriculum or program design. The second open-ended question addressed the level of implementation of the program by each teacher. This question was designed to have the individual teachers explain the level to which they implemented the program as designed. This question also allowed for specific reasons why the program may not have been fully implemented.

The third question allowed the teachers to express their opinions about the effect the program had on the students and the impact it would have on the school as a whole. Lastly, the fourth question gauged the impact the teachers believed this program would have on the district, as the program was to be replicated at other campuses.

Plan for Data Analysis

This research used a quasi-experimental, two-group pretest/posttest design to address the research questions outlined in this study. The study was primarily quantitative and included pretests and posttests to focus on academic performance. A qualitative aspect was introduced through a survey of the teachers participating in the study. Use of this design lowered the threat to the validity of the study because there was a control group. The same pretests and posttests were administered to the groups, with the focus group receiving treatment. Although the groups were not equivalent, the consistency of the treatment to the focus group and the comparison of

the assessments were likely to show a change in the focus group with no change in the control group (Lunenburg & Irby, 2007).

Student MAP scores were analyzed to determine the level of academic growth within the grade levels of the treatment schools and control schools. The academic growth of the students in the experimental schools was compared to that of the control schools to determine if there was a significant impact on the academics of the students in the experimental schools who were instructed with the treatment program.

Survey results from 57 teachers were used to measure the level of belief in the effectiveness of the CHIEF curriculum in the regular instructional routines at the treatment schools. The results of the survey regarding lesson implementation by the teachers from each of the treatment schools were compared to the academic growth of the same schools to determine the impact on student academic performance.

The analysis process was designed to determine the effectiveness of the program on the students and the level of implementation during instruction. Although the quantitative research examined the impact on student performance as measured by their MAP scores, the qualitative research focused on the implementation and effectiveness of the program design.

Table 3.15

Data Analysis

Research Question	Measurement Instrument	Data Analysis
Can the direct instruction of executive function skills and strategies improve student academic achievement?	NWEA Student Growth Summary Report	MAP pretest, posttest 1 and 2 identify similarities and differences in the academic performances of each grade level from one year to the next in the treatment schools in comparison to control schools.
Do students at schools with varying academic achievement levels show success from the implementation of executive function intervention?	Chi-square test to examine differences in the percentage of students in lower-, average-, and higher-performing schools.	MAP pretest, posttest 1 and 2 identify similarities and differences in growth of the school levels.
Do teachers use executive function strategies in their daily instruction?	Descriptive statistical analysis of percentage data for each question and overall topic area.	Survey data was analyzed to determine the fidelity of the CHIEF program implementation, quality of teacher professional development, teacher belief in the program, and demographic data, including years of teaching and life level taught.

Ethical Issues

The researcher considered several ethical issues related to the study. One consideration included the possibility of teachers feeling pressured to participate in the study. Teachers were informed in writing and verbally that their participation was voluntary. An additional consideration involved the types of questions on the survey, as they related to the teachers' commitment to the program and the degree to which they actually utilized the curriculum. This area was addressed by having the surveys be confidential. The privacy of the participants was

maintained by categorical grouping, using life level and range of teaching years rather than individual names. There was also concern about the control group participating in the study but not receiving treatment. To remedy this, the control group was scheduled to receive treatment at the conclusion of the study.

Summary

This study served as a means to determine the effectiveness of direct instruction of executive function skills. The data collected was used to measure the academic progress of students with and without treatment. Findings were limited by the differences between the control students and the pilot students, as well as the interest of the teachers completing the survey and level of implementation of the instruction program. However, the pretest data allowed for a baseline to determine student academic proficiency before treatment. The use of a control school with similar demographics, size, and location also provided a formula for future replication of the study.

CHAPTER 4: RESULTS

The intent of this study was to examine the influence of executive function intervention on academic performance. This was accomplished by examining the results of the English Language Arts (ELA) and math assessments of the Measurement of Academic Proficiency (MAP) RIT score changes in student assessment and the qualitative and quantitative responses of the teachers implementing the Curriculum Handbook for the Instruction of Executive Functions (CHIEF) program. Chapter Four provides an analysis of the MAP score comparisons in addition to the descriptive analysis of the responses of the fifteen select-response and four open-ended survey questions.

MAP Data

A chi-square test was used to examine differences in the percentage of students at lower-, average-, and higher-performing schools within the district that met their NWEA MAP growth targets from fall to spring. Each analysis included only students who had remained at the same school since the fall of each year. The test indicated significant differences in the percent of students meeting growth targets at treatment versus non-treatment schools among average-performing schools. For the analysis of the fall-to-winter percent of students meeting growth, the 3x6 table of year versus school grouping was split into nine 2x2 tables for each year (2015-16, 2016-17) and performance level (higher, average, or lower), isolating "met growth" from "did not meet growth" at treatment versus non-treatment school (see Table 4.1). To control for Type I error, the Bonferroni correction was applied to the p-value; the accepted significance of $p<.05$ was divided by the nine statistical tests performed, resulting in a more stringent criterion for statistical significance of $p<.005$. These analyses showed that, at average-performing schools in 2018, students at the non-treatment sites were more likely to meet their growth targets, $\chi^2(1,$

$N = 936) = 17.02$, $p < .005$. Although the differences between average-performing schools in

2015-16 and 2016-17 were not statistically significant, in these years, more of the students at the

non-treatment schools met their growth targets.

Table 4.1

Students Meeting Fall-to-Winter Growth Targets

Year	Higher – Tx	Higher – Non-Tx	Average – Tx	Average – Non-Tx	Lower – Tx	Lower – Non-Tx
2018	51.9%	50.2%	42.3%*	55.7%*	44.7%	51.4%
2017	50.8%	44.6%	46.9%	53.7%	50.5%	46.4%
2016	50.0%	45.6%	51.1%	52.0%	45.7%	46.5%

*$p < .005$

Similar results followed from the analysis of the percentage of students who met fall-to-

spring growth targets. The 2x6 table of year versus school grouping was split into six 2x2 tables

for each year (2016-17 and 2017-18) and performance level (higher, average, or lower), isolating

"met growth" from "did not meet growth" at treatment versus non-treatment schools, the year

(2015-16 or 2016-17), and the performance category of the school (see Table 4.2). To control

for Type I error, the Bonferroni correction was applied to the p-value; the accepted significance

of p<.05 was divided by the six statistical tests performed, resulting in a more stringent criterion

for statistical significance of p<.008. These analyses showed that, at average-performing schools

in 2016 and 2017, students at the non-treatment site were more likely to meet their growth

targets, $\chi^2(1, N = 713) = 7.39$, $p = .007$ and $\chi^2(1, N = 662) = 9.10$, $p = .003$, respectively.

Table 4.2

Students Meeting Fall-to-Spring Growth Targets

Year	High – Tx	High – Non-Tx	Medium – Tx	Medium – Non-Tx	Low – Tx	Low – Non-Tx
2017	57.7%	52.5%	46.4%	58.1%	52.5%	44.8%
2016	54.1%	47.6%	48.8%	59.0%	52.9%	49.2%

*p < .008

Math MAP Data

Students in the treatment and non-treatment schools were administered the MAP assessment for reading and math in the fall, winter, and spring of the 2015-2016 and 2016-2017 school years. Students' proficiency levels were measured by a RIT score. Student growth projections were created through the MAP assessment system, which generates a growth projection or goal for each school year.

In the fall of 2015, all students were administered the math MAP assessment, which was completed prior to treatment. The treatment students from the higher-range school outperformed their non-treatment peers in all grades except sixth. By the end of the school year, the treatment school excelled beyond their peer group in all but fifth and sixth grades.

In the 2015-2016 school year, students in both schools exceeded their projected growth in kindergarten, with the treatment students scoring 5.2 points above their growth target, and the non-treatment students performing 4.9 points higher. Students in both first grade groups also exceeded their targets, with the treatment students gaining 3.9 points higher, and the non-treatment students growing 3.1 points higher than their projection. Although both second grade classes exceeded their growth targets, the treatment school gained .9 points above, and the non-treatment gained 2.7 points higher than their goal. There was a discrepancy in third grade, with the treatment school falling .8

points short of their goal, and the non-treatment school surpassing their goal by 1.3 points. Both schools fell significantly short of their goals in fourth grade, with the treatment students falling 5.2 points short, and the non-treatment students coming in 7.5 points lower than their goal. In the fifth grade groups, there was another discrepancy, with the treatment school falling 3.6 points shy of their goal, and the non-treatment students achieving .2 points above. Both sixth grade student groups exceeded their targets with one point for the treatment school, and three points for the non-treatment school. The students in both groups failed to meet their seventh grade goals, as the treatment school fell 3.2 points short, and the non-treatment school came in 3.1 points under their goal. Last, there was a discrepancy in eighth grade, as the treatment school made a .6-point gain, but the non-treatment school fell 2.3 points under their projected growth target (see Tables 4.3 and 4.4).

In the next school year, the higher-performing treatment schools only outperformed the RIT scores of the non-treatment school in grades kindergarten through third. By the spring of 2017, no grade level performance comparisons had changed. In regard to growth, the kindergarten groups both made considerable growth, with the treatment school gaining 4.3 points more than their target, and the non-treatment school exceeded their target by 2.2 points. First grade students continued this trend with the treatment school surpassing their goal by 5.6 points, and the non-treatment school excelled beyond their goal by 3.4 points. However, both second grade groups met their growth targets; the treatment group only exceeded their goal by .2 points, whereas the non-treatment school gained 2.7 points beyond their goal. The third and fourth grade groups all fell short of their goal, with the treatment students in third grade demonstrating .6 points less than their projected growth, and fourth grade earning 4.9 points less than their goal. The non-treatment school students also failed to meet their targets, with third graders falling .7 points short and fourth graders showing 2.3 points less than their projection.

Both fifth grade groups demonstrated growth, with the treatment school surpassing their goal by .2 points, and the non-treatment school growing 1.5 points beyond their goal. Each of the sixth grade groups also exceeded their projections, with a 1.6-point gain for the treatment school, and an additional 2.4-point gain for the non-treatment school. There was a significant discrepancy in the seventh and eighth grade student groups, as the treatment school met and exceeded their goal, while the non-treatment students in the same grades failed to meet their growth targets. The seventh grade students had an additional 1-point growth, and the eighth grade students had a 3.4-point growth in the treatment school, whereas the seventh grade students from the non-treatment school fell 2.8 points short of their goal, and the eighth graders were 1.6 points shy of their goal (see Tables 4.3 and 4.4).

Table 4.3

Higher-Performing Treatment School Growth Points by Grade Level in Math

Grade	2015-16 Actual	2015-16 Projected	Met Y/N	2016-17 Actual	2016-17 Projected	Met Y/N
K	23.2	18.0	Y	24.1	19.1	Y
1	21.7	17.8	Y	15.4	18.5	N
2	15.8	15.0	N	12.1	15.2	N
3	11.5	12.2	N	6.0	12.7	N
4	5.4	10.6	N	9.3	10.9	N
5	5.1	8.7	N	8.6	9.1	N
6	7.4	6.4	Y	6.5	7.0	N
7	2.4	5.6	N	8.0	5.5	Y
8	5.3	4.7	Y	-	-	-

Table 4.4

Higher-Performing Non-Treatment School Growth Points by Grade Level in Math

Grade	2015-16 Actual	2015-16 Projected	Met Y/N	2016-17 Actual	2016-17 Projected	Met Y/N
K	24.2	19.3	Y	22.0	18.6	Y
1	21.3	18.2	Y	18.2	15.5	Y
2	17.7	15.0	Y	11.9	12.6	N
3	13.5	12.2	Y	8.4	10.7	N
4	3.0	10.5	N	10.5	9.0	Y
5	8.9	8.7	Y	9.5	7.1	Y
6	9.7	6.7	Y	2.9	5.7	N
7	2.4	5.5	N	2.7	4.3	N
8	2.2	4.5	N	-	-	-

The RIT scores from the average-performing treatment school were higher than the non-treatment school in the pre-treatment assessment. All grade levels outperformed the control school, except grades one and two. However, by the spring of 2016, only grades three, five, seven, and eight remained higher.

In this assessment window, both schools saw improvement in kindergarten. The first grade students at the treatment school scored significantly higher, achieving 6.8 points above their projected growth, and the non-treatment students made average growth. The second grade students both made growth, although the non-treatment school students' growth surpassed those of the treatment schools. There was a significant discrepancy in the scores of the third grade students, as the treatment school performed four points higher than their projected growth, and the non-treatment

school scored 4.9 points below their projected growth. Fourth grade displayed a reverse discrepancy with the treatment school students falling 2.1 RIT points below their projections and the non-treatment school achieving 2.7 points above. Students in the fifth grade from the treatment school fell short of their projected growth by .4 points, while the non-treatment students grew two points higher than their target. Sixth grade students in both schools made average growth, although there was a discrepancy in seventh grade. The students from this grade level who were from the treatment school fell 1.7 points below their growth target, and the non-treatment school students achieved 3.3 points above. Last, the eighth grade students from both schools dropped, with the treatment students falling five points under the projection, and the non-treatment students falling 3.5 points lower.

In the 2016-2017 MAP results, the RIT scores from the fall assessment were lower than the non-treatment school in all grades except second and fourth. In the spring administration of the MAP assessment, the non-treatment schools had higher RIT scores in all grades except for fifth. Fifth grade students from the treatment schools outperformed the non-treatment school students by four points.

In kindergarten, there was a significant discrepancy between the schools, with the treatment school falling one point below their growth target and the non-treatment school growing 5.1 points above. First grade students from each school made significant gains, with the treatment school gaining an additional 3.2 points and the non-treatment school exceeding their target by 6.3 points. There was another discrepancy in second grade, with the treatment school falling 1.8 points short of their target and the non-treatment school growing 2.5 points beyond their target. The third grade students also displayed a discrepancy; the treatment school fell .2 points shy of their projected growth target, and the non-treatment school scored 1.4 points beyond their target.

The discrepancies between the schools continued with fourth and fifth grade, with the fourth

grade class falling 3.9 points below for the treatment school, and the non-treatment school gaining

1.3 points more than their target. The fifth grade students had a discrepancy in their scores as well;

the treatment school fell 2.4 points under their goal, and the non-treatment students scored 1.3 points

higher than their goal. However, the treatment school RIT scores were actually four points higher

than the non-treatment school. Both seventh grade student groups failed to meet their target. Last,

the eighth grade students also demonstrated a discrepancy between their projected and actual growth,

as the treatment school achieved 2.2 points above their target, and the non-treatment students fell .9

points under their projection (see Tables 4.5 and 4.6).

Table 4.5

Average-Performing Treatment School Growth Points by Grade Level in Math

Grade	2015-16 Actual	2015-16 Projected	Met Y/N	2016-17 Actual	2016-17 Projected	Met Y/N
K	20.4	19.1	Y	21.9	18.7	Y
1	25.0	18.2	Y	13.7	15.5	Y
2	15.6	15.1	Y	12.3	12.5	N
3	16.2	12.2	Y	6.7	10.6	N
4	8.2	10.3	N	11.0	8.6	Y
5	8.8	8.4	Y	7.9	6.6	Y
6	5.3	6.4	N	5.1	5.1	Y
7	3.5	5.2	N	5.9	3.7	Y
8	3.9	4.4	N	-	-	-

Table 4.6

Average-Performing Non-Treatment School Growth Points by Grade Level in Math

Grade	2015-16 Actual	2015-16 Projected	Met Y/N	2016-17 Actual	2016-17 Projected	Met Y/N
K	23.8	18.7	Y	19.7	18.6	Y
1	24.5	18.2	Y	17.6	15.4	Y
2	17.6	15.1	Y	7.7	12.6	N
3	13.6	12.2	Y	13.1	10.4	Y
4	11.3	10.0	Y	9.8	8.3	Y
5	9.6	8.3	Y	9.1	6.6	Y
6	10.2	6.6	Y	8.5	5.2	Y
7	3.7	5.1	N	.5	4.0	N
8	3.1	4.0	N	-	-	-

The RIT scores in the fall of 2015 reflected higher performance of the treatment students in grades kindergarten, fifth, sixth, seventh, and eighth. By the end of the same year, grades second through eighth demonstrated stronger scores than the non-treatment school.

Students in both kindergarten groups demonstrated strong growth; the treatment school gained 1.8 points over their goal, and the non-treatment school gained 6.3 points over their target. First grade also revealed consistent growth, with the treatment school gaining 3.5 points over their goal and the non-treatment school growing 1.2 points over their projection. There were significant discrepancies in second through fifth grades. Students in second grade exceeded their goal by 2.8 points at the treatment school, whereas the students in the non-treatment school fell 1.8 points short of their goal. Third grade students at the treatment school achieved 2.8 points above their goal, and

the non-treatment school came 1.8 points short of their target. Students in fourth grade at the

treatment school met their goal with .1 points over the target, and the non-treatment students fell 5.1

points below their projection. Students in both sixth and seventh grade groups fell short of their

goal, with the treatment school coming 1.3 points short of their sixth grade goal while their seventh

grade group had a .8-point deficit. The non-treatment schools had a three-point loss on their growth

target in sixth grade, and a .3-point deficit in eighth grade (see Tables 4.7 and 4.8).

RIT scores changed in the following year as the treatment schools outperformed the non-

treatment schools at the beginning of the year in first and third through eighth grades. By the end of

the 2016/2017 school year, all treatment school grade levels demonstrated higher proficiency than

the non-treatment schools.

Growth projections for the students in the treatment kindergarten were met, though the non-

treatment school had no valid kindergarten data for comparison. Both first grade groups met their

goals with the treatment school increasing their growth by 2.2 points, and the non-treatment school

gaining 2.7 points over their target. There were discrepancies in grade level growth in second and

third grade. Second grade students from the treatment school met their goal with an increase of .3

points, whereas the non-treatment school fell 2.1 points short of their goal. In third grade, the

treatment school met their target with 2.3 points over their goal, although the non-treatment school

missed their goal by 1.1 points. Fourth grade groups both fell short of their goal, with the treatment

school earning .4 points less than their target and the non-treatment school achieving 5.3 fewer

points than their projection. Other discrepancies were found in the fifth and sixth grade data. The

treatment school surpassed their goal by 1.1 points, and the non-treatment school fell short of their

goal by .2 points in the fifth grade comparison, while the treatment school in sixth grade met their

goal with an additional .2 points, and the non-treatment school needed 1.9 points to meet their goal.

Both seventh and eighth grade groups met their goal projection for the year, with seventh graders from the treatments school excelling by 2.5 points, and the non-treatment school gaining .7 points over. The eighth grade treatment students surpassed their goal by 3.2 points, and the non-treatment school gained 4.1 over their growth projection (see Tables 4.7 and 4.8).

Table 4.7

Lower-Performing Treatment School Growth Points by Grade Level in Math

Grade	2015-16 Actual	2015-16 Projected	Met Y/N	2016-17 Actual	2016-17 Projected	Met Y/N
K	21.4	19.6	Y	20.9	18.7	Y
1	21.0	18.5	Y	16.0	15.7	Y
2	17.9	15.1	Y	14.9	12.6	Y
3	14.9	12.1	Y	10.2	10.6	N
4	10.1	10.0	Y	9.7	8.6	Y
5	8.0	8.5	N	7.0	6.8	Y
6	5.3	6.6	N	7.7	5.2	Y
7	4.4	5.2	N	7.4	5.2	Y
8	8.4	4.0	Y	-	-	-

In the fall of 2015, all students were also administered the math and reading assessment, which was repeated during the winter and spring of the same year, as well as all three terms the following school year. The various performance levels were also compared for ELA performance and growth.

Table 4.8

Lower-Performing Non-Treatment School Growth Points by Grade Level in Math

Grade	2015-16 Actual	2015-16 Projected	Met Y/N	2016-17 Actual	2016-17 Projected	Met Y/N
K	-	-	-	-	-	-
1	21.6	18.9	Y	21.6	18.9	Y
2	13.3	15.4	N	13.3	15.4	N
3	11.4	12.5	N	11.4	12.5	N
4	4.8	10.1	N	4.8	10.1	N
5	8.1	8.3	N	8.1	8.3	N
6	4.7	6.6	N	4.7	6.6	N
7	5.5	4.8	Y	5.5	4.8	Y
8	7.9	3.8	Y	-	-	-

Students from the higher-range school outperformed their non-treatment peers in all grade levels. By spring of 2016, the treatment school students continued to outperform their rival group, with the exception of sixth grade. Although the treatment school had higher RIT scores than the non-treatment school, the growth of the individual grade levels varied.

Both groups of kindergarteners made their growth projections with the treatment school gaining an additional 2.9 points. The non-treatment school students also surpassed their goal, with 3.9 points beyond their projections. There were discrepancies in the growths of first and second graders, as the treatment students failed to meet their targets in first grade by .6 points and by .9 points in second grade. The non-treatment students met their goals in both grade levels, with the first graders meeting their goal by one point and the second graders by two

points. The third and fourth grade groups were consistent in their growth, as both third grade groups made their goal. The treatment school met their goal by .9 points, and the non-treatment school achieved their goal by 1.5 points. The fourth grade groups both failed to meet their growth targets, with the treatment school achieving 1.1 points under their goal, and the non-treatment school falling under their projection by 5.2 points.

The fifth and sixth grade results were inconsistent, as the fifth grade students from the treatment school met their goal by 1.7 points, and the non-treatment school fell short by 1.2 points. The sixth graders at the treatment school did not meet their target, as they needed an additional two points, although the non-treatment schools achieved their goals by 3.5 points. Both seventh grade groups missed their targets, as the treatment school achieved 2.8 points less than their goal, and the non-treatment school was 5.1 points short of their target. The eighth grade results varied; the treatment school met their projections by .9 points, and the non-treatment school was .4 points short of their goal (see Tables 4.9 and 4.10).

The trend of the treatment school having higher proficiency rates continued into the 2016/2017 school year, as the fall and spring assessment results demonstrated higher performance in all grade levels. Student growth projections were also analyzed for comparison.

Students in kindergarten through second grade consistently outperformed their comparison group in regard to growth and proficiency. Kindergarten students in the treatment school grew by 3.5 points over their target, and the non-treatment school grew by 2.5 points over their goal. The first grade treatment students achieved 6.3 points over their projection, and the non-treatment school gained 1.8 points over their goal. Second grade treatment students achieved 3.3 points over their projection, and the non-treatment school met their goal by .9 points. Both third and fourth grade groups failed to meet their growth targets. The third grade

treatment group fell short by .7 points, and the non-treatment school missed their goal by .9 points. The fourth grade students from the treatment school missed their projection by 1.1 points, with the non-treatment school falling short by three points.

The fifth grade group results differed, as the treatment school fell short of their goal by .5 points, and the non-treatment school made their growth with an additional 3.5 points. The sixth grade groups each made their targets, as the treatment school earned 1.1 points over their goal, and the non-treatment school made their goal with an additional 2.4 points. Grades seven and eight's results varied, as the treatment school met their seventh grade target by .7 points, and the comparison group fell short by 2.8 points. The eighth grade treatment group met their goal by 4.3 points, although the non-treatment school missed their target by .1 points (see Tables 4.9 and 4.10). Of the higher-performing groups, the treatment school maintained consistent growth in kindergarten and eighth grade, but the fourth grade group failed to make their targets each year. The non-treatment school fell short of their goal by .1 points (see Tables 4.9 and 4.10)

In the average-performing groups, the treatment school had higher RIT scores in the fall of 2015 as compared to the non-treatment school in all grades, aside from kindergarten, second, and sixth grade. In the spring of 2016, only grades five and eight continued to outperform the comparison school.

Kindergarten through second grade, and grades fourth, sixth, and eighth had consistent growth results in the treatment and non-treatment schools. Kindergarten students in the treatment school met their goal by 1.4 points, as did the non-treatment school by 4.4 points. First graders from the treatment school achieved their growth goal by 1.9 points, and the control school exceeded their goal by 6.7 points. Second grade students all met their growth projections,

with the treatment school gaining one point beyond their target, and the comparison school

achieving 2.3 points over their goal.

Table 4.9

Higher-Performing Treatment School Growth Points by Grade Level in ELA

Grade	2015-16 Actual	2015-16 Projected	Met Y/N	2016-17 Actual	2016-17 Projected	Met Y/N
K	18.9	16.0	Y	23.3	17.0	Y
1	16.1	16.7	N	17.8	14.5	Y
2	13.6	14.3	N	10.5	11.2	N
3	11.9	11.0	Y	7.2	8.3	N
4	7.1	8.2	N	6.0	6.5	N
5	8.1	6.4	Y	6.0	5.1	Y
6	3.0	5.0	N	4.7	4.0	Y
7	.9	3.7	N	7.3	3.0	Y
8	3.7	2.8	Y	-	-	-

The third graders from the treatment school met their goal by .6 points, but the students

from the non-treatment school fell 1.7 points under their projection. Fourth graders from both

schools met their targets, with treatment students meeting their goal by one point, and the control

students earning their goal with 2.3 additional points. The fifth grade group did not have

consistent results. The treatment school gained 1.7 points over their goal, while the non-

treatment students missed their goal by .4 points. The sixth grade treatment and non-treatment

students both met their goals by 2.3 points. The seventh grade groups had differing results, with

the treatment school falling 3.2 points short of their goal, and the control group achieved their

goal by 1.4 points. Both eighth grade groups met their goal, with the treatment school scoring

1.9 points more than their projection and the control school surpassing their goal by 1.6 points

(see Tables 4.11 and 4.12).

Table 4.10

Higher-Performing Non-Treatment School Growth Points by Grade Level in ELA

Grade	2015-16 Actual	2015-16 Projected	Met Y/N	2016-17 Actual	2016-17 Projected	Met Y/N
K	20.7	17.1	Y	18.8	17.0	Y
1	17.5	16.5	Y	15.7	17.0	N
2	16.4	14.4	Y	10.7	14.8	N
3	9.9	11.4	N	5.5	11.4	N
4	3.1	8.3	N	10.2	8.5	Y
5	5.3	6.5	N	7.6	6.7	Y
6	8.5	5.0	Y	1.1	5.1	N
7	-1.3	3.8	N	2.9	3.9	N
8	2.5	2.9	N	-	-	-

In the fall of 2016, the students were given the same assessment. The results showed

fifth and sixth grades had higher proficiency in ELA than the control school. Only the fifth

grade maintained this advantage in the spring of 2017. The growth rates of the treatment school

followed the same trend of declining results. Fourth, fifth, and eighth grades were the only ones

that met their growth targets, as compared to all grades except third in the control school.

Kindergartners from the treatment school were .5 points short of their target, while the non-

treatment students exceeded their goal by 2.9 points. The first grade group from the treatment school fell short of their goal by 2.6 points, although the control school surpassed their goal by six points. The second grade students missed their target by .6 points, although the comparison school exceeded their growth by 1.4 points. The third grade growth pattern was consistent, with both schools failing to meet their target. The treatment school missed their target by .5 points, and the control school fell short by .7 points.

Both fourth grade groups met their targets, with the treatment group increasing their growth by 1.7 points over their goal, and the control group exceeding their projection by 5.3 points. Both schools met their target with an additional 3.5 points in fifth grade. There were discrepancies in sixth and seventh grades with the treatment school falling short by 1.2 points in grade six and .2 points in grade seven. The comparison school met their goal for grade six by 3.8 points and for seventh grade by 2.1 points. Both schools met their grade eight goal, with the treatment school gaining an additional 2.1 points, and the control school with 3.2 points (see Tables 4.11 and 4.12).

Table 4.11

Average-Performing Treatment School Growth Points by Grade Level in ELA

Grade	2015-16 Actual	2015-16 Projected	Met Y/N	2016-17 Actual	2016-17 Projected	Met Y/N
K	18.5	17.1	Y	14.4	17.0	N
1	17.7	16.4	Y	14.3	14.9	N
2	15.6	14.6	Y	11.2	11.7	N
3	11.8	11.2	Y	10.4	8.7	Y
4	9.5	8.5	Y	10.5	7.0	Y

5	8.4	6.7	Y	4.1	5.3	N
6	7.5	5.2	Y	3.9	4.1	N
7	0.8	4.0	N	5.8	3.7	Y
8	5.2	3.1	Y	-	-	-

Table 4.12

Average-Performing Non-Treatment School Growth Points by Grade Level in ELA

Grade	2015-16 Actual	2015-16 Projected	Met Y/N	2016-17 Actual	2016-17 Projected	Met Y/N
K	20.1	16.7	Y	23.0	17.0	N
1	23.1	16.4	Y	16.1	14.7	N
2	16.8	14.5	Y	10.3	11.6	N
3	9.9	11.6	N	14.0	8.7	N
4	11.0	8.6	Y	10.5	7.0	N
5	6.3	6.7	N	9.2	5.4	N
6	7.5	5.2	Y	6.2	4.1	N
7	5.4	4.0	Y	6.6	3.4	N
8	4.8	3.2	Y	-	-	-

Students who participated in Fall 2015's MAP reading assessment and were included in the lower-performing treatment school demonstrated greater proficiency than the students in the non-treatment schools in kindergarten and grades third and fifth through eighth. Students took the same assessment later that year, at which time grades second through eighth demonstrated higher RIT scores than their peer groups at the non-treatment school.

In regard to growth targets, students in the treatment and non-treatment schools both surpassed their projections in kindergarten, with treatment students gaining 1.8 points over their goal, and the non-treatment school exceeding their goal by 6.7 points. There were reverse discrepancies in the first and second grades, with the treatment school missing their target by 1.7 points in first grade, and the non-treatment school achieving .1 points over their goal. The second grade students from the treatment school met their goal with .7 points over their target, while the non-treatment school fell 4.5 points short of their projection. Both third grade groups failed to meet their projected growth target, as the treatment school missed their goal by 1.1 points, and the non-treatment school fell 3.9 points short of their projection.

The fourth grade groups differed in their results, with the treatment school gaining 4.6 points over their objective, and the non-treatment school scoring 4.4 points less than their target. Both fifth grade groups missed their goal; the treatment school was .9 points shy of their target, and the non-treatment school was 2.1 points away from their goal. Students in sixth through eighth grades met their projected growth targets, as the sixth graders from the treatment school exceeded their goal by 1.4 points, and the non-treatment school met their goal by scoring .8 points above their target. The seventh grade students from the treatment school earned 2.2 points over their projection, and the non-treatment school scored 1.1 points over their goal. The eighth graders in both schools made significant gains, as the treatment school earned 5.9 points beyond their target, and the non-treatment school had a 7-point gain on their projection (see Tables 4.13 and 4.14).

The assessment results from the next year were consistent from fall to spring, as the first and third through eighth grade students from the treatment school maintained higher RIT scores throughout the year.

Students from the kindergarten group at the treatment school fell short of their target by 3.1 points, and the non-treatment school did not have valid data for this grade level. However, students in grades first and second demonstrated consistent results. The first grade treatment school met their goal by earning an additional .2 points, while the non-treatment students did not meet their projected growth targets. Second grade treatment school students were 2.6 points short of their goal, and the non-treatment students fell 4.6 points lower than their target. The third grade students evenly met their projected growth target at the treatment school, while the non-treatment school failed to meet their goal by 4.6 points. In fourth grade, the treatment school met their goal by 3.8 points, but the non-treatment school missed their goal by 2.8 points. The fifth grade groups both fell short, the treatment school by 2.1 points, and the non-treatment school by .7 points. There was a notable difference in the sixth grade results; the treatment school passed their goal by 3.8 points, and the non-treatment school fell short by 2.1 points. The seventh grade treatment students exceeded their goal by 3.1 points, and the non-treatment school earned 7.4 points over their projection. The eighth grade students in the treatment school scored 4.5 points higher than their target, and the non-treatment students passed their goal by 9.4 points (see Tables 4.13 and 4.14).

Table 4.13

Lower-Performing Treatment School Growth Points by Grade Level in ELA

Grade	2015-16 Actual	2015-16 Projected	Met Y/N	2016-17 Actual	2016-17 Projected	Met Y/N
K	16.8	17.0	N	17.1	16.9	Y
1	14.6	16.3	N	12.4	15.0	N
2	15.3	14.6	Y	11.6	11.6	Y

3	10.4	11.5	N	12.5	8.7	Y
4	13.3	8.7	Y	4.8	6.9	N
5	5.5	6.6	N	9.1	5.3	Y
6	6.5	5.1	Y	7.2	4.1	Y
7	6.2	4.0	Y	7.8	3.3	Y
8	9.3	3.4	Y	-	-	-

Table 4.14

Lower-Performing Non-Treatment School Growth Points by Grade Level in ELA

Grade	2015-16 Actual	2015-16 Projected	Met Y/N	2016-17 Actual	2016-17 Projected	Met Y/N
K	24.4	17.7	Y	17.6	16.8	Y
1	16.6	16.5	Y	10.2	14.8	N
2	10.0	14.5	N	7.2	12.1	N
3	8.0	11.9	N	6.1	8.9	N
4	4.2	8.6	N	6.3	7.0	N
5	4.8	6.9	N	3.3	5.4	N
6	6.3	5.5	N	11.9	4.5	Y
7	5.1	4.0	Y	13.1	3.7	Y
8	10.5	3.5	Y	-	-	-

Survey Data

In total, 57 teacher surveys were included in the analysis. 43 (75.4%) of the participating teachers were female, 32 (56%) had furthered their education beyond a bachelor's degree, and 31

(54.4%) had at least 16 years of teaching experience. Of the 57 surveys returned, 21 were submitted from the higher-performing school, 15 from the average, and 21 from the lower-performing school.

The survey comprised 15 closed-end questions, organized into three focus areas: "Fidelity of Program Implementation," "Quality of Professional Development," and "Belief in the Program." Each of the areas included five questions. All of the selected response options were organized on a five-point scale: "Not at All" (0), "Slightly" (1), "Moderately" (2), "Very" (3), and "Extremely" (4). In addition to the 15 selected response questions, four open-ended questions provided short answers to specific questions regarding the curriculum. The teachers were asked what they felt should be improved in the development of the executive function program. If a teacher indicated they did not fully implement the program, they were asked to provide the reason. The teachers were asked to explain how they believed the program would affect the school overall. Additionally, the teachers were asked to identify what impact they believed the program would have on the district.

The initial set of questions focused on the fidelity of the implementation of the CHIEF curriculum program. The first question asked how closely the teachers followed the instructional sequences of the lesson plans. Of the 57 respondents, two (3.5%) answered "extremely," 11 (19.2%) answered "very close," 26 (45.6%) chose "moderately close," ten (17.5%) answered "slightly close," and eight (14%) answered "not at all close" to following the lesson plans (see Table 4.15).

Table 4.15

Question 1: How closely are you following the instructional sequences of the lesson plans?

Not at All	Slightly	Moderately	Very	Extremely
8	10	26	11	2
(14%)	(17.5%)	(45.6%)	(19.2%)	(3.5%)

n=57

The next question asked if the teachers had embedded the mascot characters from the CHIEF program into their instructional routines. Of the 57 respondents, three (5.2%) answered "extremely," 14 (24.5%) answered "very close" to the program design, 17 (29.8%) chose "moderately close," 12 (21%) chose "slightly," and 11 (19.2%) answered "not at all" (see Table 4.16).

Table 4.16

Question 2: Have you embedded the executive functions characters into your instructional routines?

Not at All	Slightly	Moderately	Very	Extremely
11	12	17	14	3
(19.2%)	(21%)	(29.8%)	(24.5%)	(5.2%)

n=57

The survey then focused on the incorporation of the executive function strategies in the classroom environment. Of the teachers responding, five (8.7%) answered "extremely," 24 (42.1%) reported "very," 17 (29.8%) responded "moderately," six (10.5%) answered "slightly," and four (7%) chose "not at all" (see Table 4.17).

Table 4.17

Question 3: Does your classroom environment incorporate the EF strategies you have learned?

_____

	Not at All	Slightly	Moderately	Very	Extremely
	4	6	17	24	5
	(7%)	(10.5%)	(29.8%)	(42.1%)	(8.7%)

_____

n=57

The fourth question regarded the extent of inclusion of executive functions in the lesson

plans. Two (3.5%) noted an extreme inclusion, 20 (35%) reported they were very much

included, 17 (29.8%) stated they were moderately included, 14 (24.5%) indicated they were

slightly included, and three (5.2%) reported executive functions were not at all included in their

lesson delivery (see Table 4.18).

Table 4.18

Question 4: To what extent is EF included your instructional delivery?

_____

	Not at All	Slightly	Moderately	Very	Extremely
	3	14	17	20	2
	(5.2%)	(24.5%)	(29.8%)	(35%)	(3.5%)

_____

n=57

In the last question of the first series, participating teachers were asked to identify the

extent to which they considered executive functions when planning their lessons. One (1.7%)

answered "extremely," 16 (28%) chose "very," 21 (36.8) indicated "moderately," 11 (19.2%)

answered "slightly," and eight (14%) reported "not at all" (see Table 4.19).

Table 4.19

Question 5: To what extent do you consider EF skills when planning lesson delivery?

	Not at All	Slightly	Moderately	Very	Extremely
	8	11	21	16	1
	(14%)	(19.2%)	(36.8%)	(28%)	(1.7%)

n=57

In the last question of the first series, participating teachers were asked to identify the extent to which they considered executive functions when planning their lessons. One (1.7%) answered "extremely," 16 (28%) chose "very," 21 (36.8%) indicated "moderately," 11 (19.2%) answered "slightly," and eight (14%) reported "not at all" (see Table 4.20).

Table 4.20

Question 5: To what extent do you consider EF skills when planning lesson-delivery?

	Not at All	Slightly	Moderately	Very	Extremely
	8	11	21	16	1
	(14%)	(19.2%)	(36.8%)	(28%)	(1.7%)

n=57

There was a clear variation in the fidelity of implementation of the program as noted in Figure 4.1. The higher- and lower-performing schools had remarkably less fidelity in regard to teaching the program lessons (see Figure 4.1). In question one, the higher-performing school's average response was 1.85, with 15 (71.4%) of the teachers reporting they were at least moderately following the program. The average-performing school's average response was 1.78, with 10 (66.6%) of the teachers reporting they were at least moderately following the program. The lower-performing school's average response was 1.71, with 14 (66.6%) of the teachers reporting they were at least moderately following the program.

In the second question, the higher-performing school's average response was 1.85, with 13 (61.9%) of the teachers reporting they were at least moderately embedding the characters. The average-performing school's average response was 1.78, with 10 (66.6%) of the teachers reporting they were at least moderately using the characters. The lower-performing school's average response was 1.71, with 14 (66.6%) of the teachers reporting they were at least moderately implementing the character component.

Question three showed the higher-performing school's average response was 2.61, with 19 (90.4%) of the teachers reporting they were at least moderately incorporating the strategies. The average-performing school's average response was 1.70, with nine (60.0%) of the teachers reporting they were at least moderately using the strategies. The lower-performing school's average response was 2.35, with 17 (80.9%) of the teachers reporting they were at least moderately incorporating the strategies in their classroom environment.

In the fourth question, the higher-performing school's average response was 2.47, with 17 (80.9%) of the teachers reporting they were at least moderately including executive functions in their instructional delivery. The average-performing school's average response was 1.83, with eight (53.3%) of the teachers reporting they were at least moderately including the strategies. The lower-performing school's average response was 1.86, with 14 (66.6%) of the teachers reporting they were at least moderately incorporating the strategies in their instruction.

In question five, the higher-performing school's average response was 2.04, with 16 (76.1%) of the teachers reporting they were at least moderately including executive functions in their lesson plans. The average-performing school's average responses were 1.72, with nine (60.0%) of the teachers reporting they were at least moderately planning with the strategies in mind. The lower-performing school's average responses were 1.81, with 13 (61.9%) of the

teachers reporting they were at least moderately considering executive function skills when

lesson-planning.
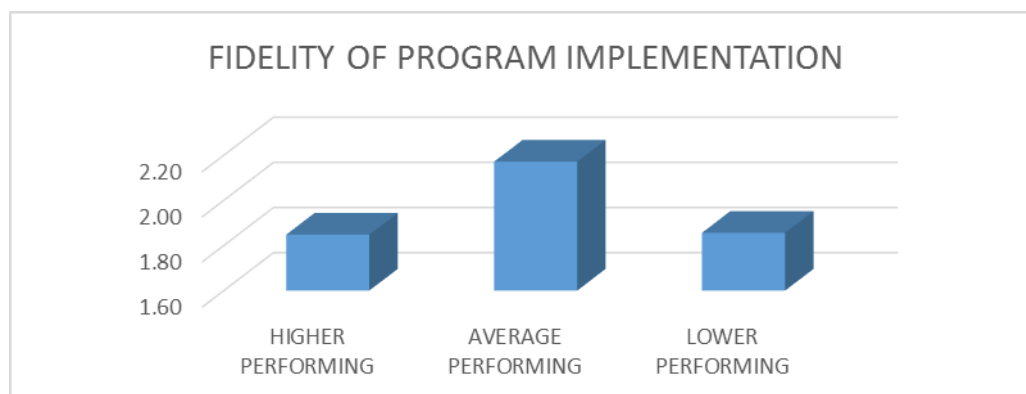
Figure 4.1 Fidelity of Program Implementation

Table 4.21

Fidelity of Program Implementation

		District Performance Level					
Question	Response	Higher Count %		Average Count %		Lower Count %	
How closely are you following	Not at All	3	14.2%	3	20.0%	2	9.5%
the instructional sequences	Slightly	3	14.2%	2	13.3%	5	23.8%
of the lesson plans?	Moderately	10	47.6%	4	26.6%	12	57.1%
	Very	4	19.0%	6	40.0%	1	4.7%
	Extremely	1	4.7%	0	0.0%	1	4.7%
Have you embedded the	Not at All	3	14.2%	5	33.3%	3	14.2%
executive functions	Slightly	5	23.8%	1	6.6%	6	28.5%
characters into your	Moderately	5	23.8%	2	13.3%	10	47.6%
instructional routines?	Very	8	38.0%	4	26.6%	2	9.5%
	Extremely	0	0.0%	3	20.0%	0	0.0%
Does your classroom	Not at All	0	0.0%	3	20.0%	0	0.0%
environment incorporate	Slightly	1	4.7%	3	20.0%	2	9.5%
the executive function	Moderately	9	42.8%	1	6.6%	7	33.3%
strategies you have learned?	Very	8	38.0%	7	46.6%	9	42.8%
	Extremely	3	14.2%	1	6.6%	1	4.7%
To what extent are executive	Not at All	0	0.0%	3	20.0%	0	0.0%

functions included your instructional delivery?							
	Slightly	4	19.0%	3	20.0%	7	33.3%
	Moderately	5	23.8%	2	13.3%	10	47.6%
	Very	10	47.6%	6	40.0%	4	19.0%
	Extremely	2	9.5%	0	0.0%	0	0.0%
To what extent do you consider executive function skills when planning lesson delivery?	Not at All	1	4.7%	4	26.6%	3	14.2%
	Slightly	4	19.0%	2	13.3%	5	23.8%
	Moderately	9	42.8%	5	33.3%	7	33.3%
	Very	7	33.3%	4	26.6%	5	23.8%
	Extremely	0	0.0%	0	0.0%	1	4.7%

The next set of questions addressed the quality of professional development offered to the teachers who were expected to implement the CHIEF program. The first question in this section regarded the comfort level the teachers reported concerning the information presented to them about executive functions. Eight (14%) reported they felt extremely comfortable with the information, 18 (31.5%) stated they were very comfortable, 18 (31.5%) indicated they were moderately comfortable, nine (15.8%) noted they were slightly comfortable, and three (5.2%) reported they were not at all comfortable with the information presented on executive functions (see Table 4.22).

Table 4.22

Question 6: How comfortable do you feel with the information that has been presented to you about EF?

Not at All	Slightly	Moderately	Very	Extremely
3	9	18	18	8
(5.2%)	(15.8%)	(31.5%)	(31.5%)	(14%)

n=57

The next question in this series asked teachers to share their level of comfort with the CHIEF curriculum. Five (8.7%) reported they felt extremely comfortable with the curriculum, 18 (31.5%) stated they were very comfortable, 18 (31.5%) indicated they were moderately comfortable, 11 (19.2%) noted they were slightly comfortable, and four (7%) reported they were not at all comfortable with the program (see Table 4.23).

Table 4.23

Question 7: How comfortable are you with using the EF curriculum?

_____

	Not at All	Slightly	Moderately	Very	Extremely
	4	11	18	18	5
	(7%)	(19.2%)	(31.5%)	(31.5%)	(8.7%)

_____

n=57

   The survey then asked teachers to share how comfortable they were with the identified

executive function skills. Six (10.5%) reported they felt extremely comfortable with the skills, 24

(42.1%) stated they were very comfortable, 20 (35%) indicated they were moderately comfortable

with the skills, five (8.7%) noted they were only slightly comfortable, and one (1.7%) reported he or

she was not at all comfortable with the identified executive function skills (see Table 4.24).

Table 4.24

Question 8: How comfortable are you with the identified individual EF skills?

_____

	Not at All	Slightly	Moderately	Very	Extremely
	1	5	20	24	6
	(1.7%)	(8.7%)	(35%)	(42.1%)	(10.5%)

_____

n=57

   Next, the survey asked the participating teachers to report if they believed the lesson plans

were well-developed. Four (7%) reported they felt extremely comfortable with the development of

the plans, 15 (26.3%) stated they very much believed in the lesson plan development, 17 (29.8%)

indicated they moderately believed in the lesson plan, five (8.7%) noted they only slightly believed

in the lesson development, and 14 (24.5%) reported they did not at all believe in the development of

the lessons in the curriculum (see Table 4.25).

Table 4.25

Question 9: Do you believe the lesson plans for the EF program are well-developed?

_____

	Not at All	Slightly	Moderately	Very	Extremely
	14	5	17	15	4
	(24.5%)	(8.7%)	(29.8%)	(26.3%)	(7%)

_____
n=57

   The last question in the quality of professional development series asked the teachers if they

believed the level of training they received was extensive enough for successful implementation of

the program. Six (10.5%) reported they believed the training was extremely sufficient, 11 (19.2%)

stated they very much believed the training was extensive enough, 19 (33.3%) indicated they

moderately believed the professional development was enough for successful implementation of the

program, 13 (22.8%) noted they only slightly believed the professional development was enough,

and seven (12.2%) did not at all believe the professional development was extensive enough for

successful implementation by the average teacher (see Table 4.26).

Table 4.26

Question 10: Do you believe the depth of the professional development you have received for the EF

program has been extensive enough for the average teacher to successfully implement the program?

_____

	Not at All	Slightly	Moderately	Very	Extremely
	7	13	19	11	6
	(12.2%)	(22.8%)	(33.3%)	(19.2%)	(10.5%)

_____
n=57

   The average-performing schools showed higher results than the other treatment schools,

as noted in Figure 4.2. The lower-performing schools had remarkably less fidelity in regard to

the level of training received (see Figure 4.2). In question six, the higher-performing school's

average response was 2.38, with 18 (85.7%) of the teachers reporting they were at least

moderately comfortable with the executive function information presented to them in the

training. The average-performing school's average response was 2.31, with 9 (60.0%) of the

teachers reporting they were at least moderately comfortable. The lower-performing school's

average response was 2.3, with 17 (80.9%) of the teachers reporting they felt at least moderately

comfortable with the information.

In the next question, the higher-performing school's average response was 2.23, with 16

(76.1%) of the teachers reporting they were at least moderately comfortable with the curriculum.

The average-performing school's average response was 2.11, with 10 (66.6%) of the teachers

reporting they were at least moderately comfortable using the program. The lower-performing

school's average response was 1.96, with 15 (71.4%) of the teachers reporting they were at least

moderately comfortable with the curriculum.

Question eight showed the higher-performing school's average response was 2.70, with

20 (95.2%) of the teachers reporting they were at least moderately comfortable with the

executive function skills. The average-performing school's average response was 2.41, with 12

(80.0%) of the teachers reporting they were at least moderately comfortable with the skills. The

lower-performing school's average response was 2.34, with 18 (85.7%) of the teachers reporting

they were at least moderately comfortable with the identified executive function skills.

In the ninth question, the higher-performing school's average response was 1.85, with 14

(66.6%) of the teachers reporting they at least moderately believed the lesson plans were well

developed. The average-performing school's average response was 1.80, with ten (66.6%) of the

teachers reporting they at least moderately believed the plans were well developed. The lower-

performing school's average response was 1.51, with 12 (57.1%) of the teachers reporting they at least moderately believed the lesson plans were well-developed.

In question ten, the higher-performing school's average response was 1.95, with 14 (66.6%) of the teachers reporting they at least moderately believed the depth of the training was extensive enough for average teachers. The average-performing school's average response was 1.91, with nine (60.0%) of the teachers reporting they at least moderately believed the training was of appropriate depth. The lower-performing school's average response was 1.85, with 13 (61.9%) of the teachers reporting they at least moderately believed the training was extensive enough for implementation of the program.
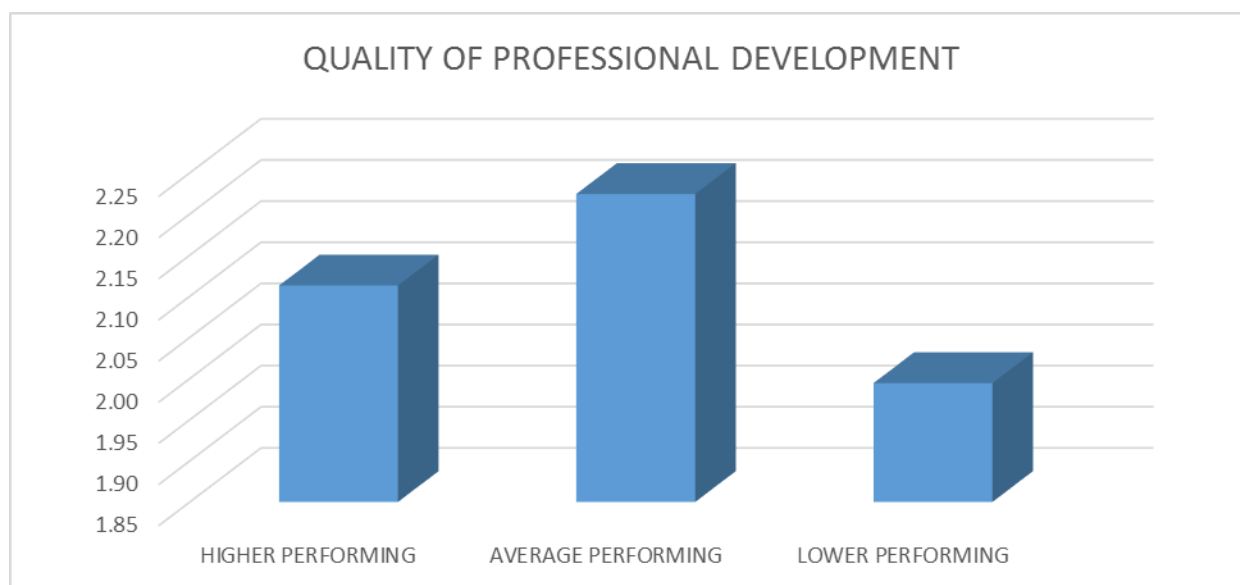
Figure 4.2 Quality of Professional Development

Table 4.27

Quality of Professional Development

Question	Response	District Performance Level					
		Higher Count %		Average Count %		Lower Count %	
How comfortable do you feel with the information that has been presented to you about executive functions?	Not at All	0	0.0%	3	20.0%	0	0.0%
	Slightly	3	14.2%	3	20.0%	3	14.2%
	Moderately	9	42.8%	0	0.0%	9	42.8%to
	Very	7	33.3%	4	26.6%	7	33.3%
	Extremely	2	9.5%	5	33.3%	1	4.7%
How comfortable are you with using the executive function curriculum?	Not at All	0	0.0%	2	13.3%	1	4.7%
	Slightly	4	19.0%	3	20.0%	4	19.0%
	Moderately	6	28.5%	1	6.6%	11	52.3%
	Very	9	42.8%	6	40.0%	3	14.2%
	Extremely	1	4.7%	3	20.0%	1	4.7%
How comfortable are you with the identified individual executive function skills?	Not at All	0	0.0%	1	6.6%	0	0.0%
	Slightly	0	0.0%	2	13.3%	3	14.2%
	Moderately	8	38.0%	3	20.0%	9	42.8%
	Very	10	47.6%	6	40.0%	8	38.0%
	Extremely	2	9.5%	3	20.0%	1	4.7%
Do you believe the lesson plans for the executive function program are well-developed?	Not at All	3	14.2%	5	33.3%	6	28.5%
	Slightly	3	14.2%	0	0.0%	2	9.5%
	Moderately	8	38.0%	1	6.6%	8	38.0%
	Very	6	28.5%	5	33.3%	4	19.0%
	Extremely	0	0.0%	4	26.6%	0	0.0%
Do you believe the depth of the professional development you have received for the executive function program has been extensive enough for the the average teacher to successfully implement the program?	Not at All	0	0.0%	5	33.3%	1	4.7%
	Slightly	6	28.5%	1	6.6%	6	28.5%
	Moderately	9	42.8%	2	13.3%	8	38.0%
	Very	3	14.2%	3	20.0%	5	23.8%
	Extremely	2	9.5%	4	26.6%	0	0.0%

The third series of questions addressed the teacher belief in the program. The first question in this section asked the teachers to give feedback regarding their belief the program would have an impact on student learning. Eight (14.0%) reported they had an extreme belief in the impact of the program on student learning, 14 (24.5%) stated they very much believed the program would impact learning, 19 (33.3%) indicated they moderately believed in the impact of the program, 11 (19.2%) noted they slightly believed the program would impact student learning and four (.07%) did not at all believe the program would impact student learning (see Table 4.28).

Table 4.28
Question 11: Do you believe the EF program will have an impact on student learning?

_____

	Not at All	Slightly	Moderately	Very	Extremely
	4	11	19	14	8
	(.07%)	(19.2%)	(33.3%)	(24.5%)	(14.0%)

_____

n=57

The next question in this section asked the teachers if they believed the development of executive function skills would benefit students. Ten (17.5%) reported they believed that the development of these skills would be extremely beneficial for students, 22 (38.5%) stated they very much believed these skills would benefit students, 17 (29.8%) indicated they moderately believed in the development of these skills, five (.08%) noted they slightly believed in the benefit of the skills, and three (.05%) did not at all believe the development of these skills would benefit students (see Table 4.29).

Table 4.29

Question 12: Do you believe that the development of EF skills will benefit students?

_____

	Not at All	Slightly	Moderately	Very	Extremely
	3	5	17	22	10
	(.05%)	(.08%)	(29.8%)	(38.5%)	(17.5%)

_____

n=57

The third question in this section asked the teachers if they believed students with further-developed executive function skills were more likely to be successful beyond their peers who struggle with executive function skills. 14 (24.5%) answered "extremely," 20 (35.0%) stated they very much believed students with further-developed skills would be more successful than their peers, 18 (31.5%) chose "moderately," one (.01%) answered "slightly," and four (.07%) did not at all believe further-developed skills would lead to greater success (see Table 4.30).

Table 4.30

Question 13: Do you believe students with further-developed EF skills are more likely to be successful beyond their peers who struggle with EF skills?

_____

	Not at All	Slightly	Moderately	Very	Extremely
	4	1	18	20	14
	(.07%)	(.01%)	(31.5%)	(35.0%)	(24.5%)

_____

n=57

The fourth question in this section asked the teachers if they believed executive function skills were an important part of student development. 13 (22.8%) reported they believed these skills were extremely important, 26 (45.6%) stated they very much believed these skills were important, 11 (19.2%) indicated they moderately believed in the skills' importance, four (.07%) only slightly

believed the skills were important, and three (.05%) did not at all believe these skills were important

for development (see Table 4.31).

Table 4.31

Question 14: Do you believe that EF skills are an important part of student development?

_____

Not at All	Slightly	Moderately	Very	Extremely
3	4	11	26	13
(.03%)	(.07%)	(19.2%)	(45.6%)	(22.8%)

_____

n=57

The last question in this section asked the teachers if they believed this program would have

an impact on student success in the classroom. 10 (17.5%) answered "extremely," 19 (33.3%)

answered "very much," 17 (29.8%) chose "moderately," five (.08%) answered "slightly," and five

(.08%) chose "not at all" (see Table 4.32).

Table 4.32

Question 15: Do you believe this program will have an impact on student success in the

classroom?

_____

Not at All	Slightly	Moderately	Very	Extremely
5	5	17	19	10
(.08%)	(.08%)	(29.8%)	(33.3%)	(17.5%)

_____

n=57

There was another significant variation by site regarding belief in the program questions,

with average-performing schools showing higher results than the other treatment schools, as

noted in Figure 4.3. In question 11, the higher-performing school's average response was 2.19,

with 10 (66.6%) of the teachers reporting they at least moderately believed the executive

function program would have an impact on student learning. The average-performing school's average response was 2.19, with 15 (71.4%) of the teachers reporting they believed the program would impact student learning. The lower-performing school's average response was 2.3, with 17 (80.9%) of the teachers reporting they at least moderately believed in the impact.

In the next question, the higher-performing school's average response was 2.80, with 20 (95.2%) of the teachers reporting they at least moderately believed the development of executive function skills would benefit students. The average-performing school's average response was 2.39, with 11 (73.3%) of the teachers reporting they at least moderately believed in the benefits of the program. The lower-performing school's average response was 2.38, with 18 (85.7%) of the teachers reporting they at least moderately believed the development of these skills would benefit students.

Question 13 showed the higher-performing school's average response was 2.90, with 20 (95.2%) of the teachers reporting they at least moderately believed students with further-developed executive function skills would be more likely to succeed than their peers. The average-performing school's average response was 2.55, with 11 (73.3%) of the teachers reporting they at least moderately believed in greater success due to increased skills. The lower-performing school's average response was 2.62, with 21 (100%) of the teachers reporting they at least moderately believed students with higher skills would have greater success than their struggling peers.

In question 14, the higher-performing school's average response was 2.90, with 19 (90.4%) of the teachers reporting they at least moderately believed executive function skills are an important part of student development. The average-performing school's average response was 2.64, with 11 (73.3%) of the teachers reporting they at least moderately believed in the

importance. The lower-performing school's average response was 2.80, with 20 (95.2%) of the

teachers reporting they at least moderately believed that executive function skills are important

for development.

In question 15, the higher-performing school's average response was 2.66, with 19

(90.4%) of the teachers reporting they at least moderately believed the program would have an

impact on student success. The average-performing school's average response was 2.28, with

ten (66.6%) of the teachers reporting they at least moderately believed in the impact. The lower-

performing school's average response was 2.40, with 17 (80.9%) of the teachers reporting they at

least moderately believed the program would impact student success.

Table 4.33
Belief in Program

Question	Response	District Performance Level					
		Higher Count %		Average Count %		Lower Count %	
Do you believe the	Not at All	0	0.0%	3	20.0%	1	4.7%
executive function program	Slightly	3	14.2%	2	13.3%	4	19.0%
will have an impact on	Moderately	10	47.6%	2	13.3%	7	33.3%
student learning?	Very	3	14.2%	5	33.3%	6	28.5%
	Extremely	3	14.2%	3	20.0%	2	9.5%
Do you believe the development	Not at All	0	0.0%	3	20.0%	0	0.0%
of executive function skills	Slightly	1	4.7%	1	6.6%	3	14.2%
will benefit students?	Moderately	5	23.8%	3	20.0%	9	42.8%
	Very	12	57.1%	3	20.0%	7	33.3%
	Extremely	3	14.2%	5	33.3%	2	9.5%
Do you believe students	Not at All	1	4.7%	1	6.6%	0	0.0%
with further-developed	Slightly	0	0.0%	2	13.3%	0	0.0%
executive function skills	Moderately	5	23.8%	3	20.0%	10	47.6%
are more likely to be	Very	9	42.8%	6	40.0%	9	42.8%
successful beyond their peers	Extremely	6	28.5%	3	20.0%	2	9.5%
who struggle with							
executive function skills?							

Do you believe executive function skills are an important part of student development?	Not at All	0	0.0%	3	20.0%	0	0.0%
	Slightly	2	9.5%	1	6.6%	1	4.7%
	Moderately	2	9.5%	3	20.0%	6	28.5%
	Very	13	61.9%	2	13.3%	10	47.6%
	Extremely	4	19.0%	6	40.0%	4	19.0%
Do you believe this program will have an impact on student success in the classroom?	Not at All	0	0.0%	3	20.0%	1	4.7%
	Slightly	2	9.5%	1	6.6%	2	9.5%
	Moderately	7	33.3%	3	20.0%	7	33.3%
	Very	8	38.0%	3	20.0%	8	38.0%
	Extremely	4	19.0%	5	33.3%	2	9.5%
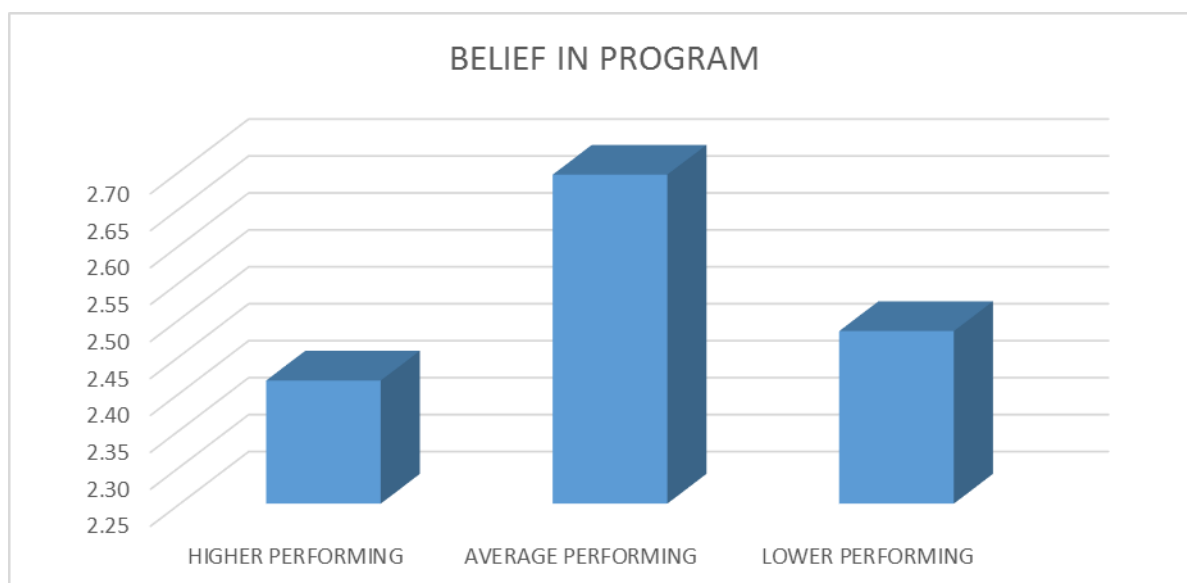
Figure 4.3 Teacher Belief in the Program

The first in the series of open-ended questions asked the teachers what they felt should be improved in the development of the executive function program. 15 (26.3%) reported they would have wanted some form of adjustment to the lessons, 11 (19.2%) stated they felt more professional development was needed, six (10.5%) indicated they felt the lessons should have been more student-friendly or developmentally appropriate, and 18 (31.5%) believed no changes were necessary.

The next question asked the teachers to share if they were fully implementing the program and, if not, to provide the reason. 24 (42.1%) reported concerns with time constraints and the amount of core curriculum already required. 13 (22.8%) stated they were fully implementing the program. Six (10.5%) indicated they needed more training. Five (.08%) believed the executive function skills should have been embedded in their content curriculum instead of independent lessons. Five (.08%) reported the need for modification of the program to meet the developmental needs of the student population. And four (.07%) noted limited resources to fully implement the program.

The third question asked the teachers how they believed their school would be affected by the program. Five (.08%) believed the program would support student planning and organization, ten (17.5%) stated they did not believe there would be an impact, four (.07%) noted a belief in behavioral changes to come, 13 (22.8%) believed there would be an overall positive impact, and nine (15.7%) believed they would see a positive academic impact.

The last question asked the teachers what impact they believed the program would have on the school district. 11 (19.29%) reported their belief that academic skills would increase, ten (17.5%) stated they felt there would be positive changes, five (.08%) noted the need for consistent implementation for a difference to be evident, six (10.5%) reported they were unsure of what the impact may be, and four (.07%) stated they did not believe there would be an impact.

Table 4.34

Open-Ended Questions

_____

Question	Repeated Responses
What do you feel should	Improvement or changes to the lesson plans

be improved in the development of the EF program?	Additional professional development
	Program needs to be more student-friendly
	No improvements need to be made
If you are not fully implementing the program, what is the reason?	Time constraints
	Did fully implement the program
	Skills should be embedded into content curriculum
	Lessons had to be modified for student development level
	More training needed
	Need more resources
How do you believe this program will affect the school overall?	Students will be better organized
	There will be no effect
	Positive impact in general
	Positive impact on behavior
	Academic improvement
What impact do you believe this program will have on the district?	Improved academic skills
	Positive impact overall
	Unsure of impact
	No impact expected
	Consistent implementation needed for impact

CHAPTER 5: DISCUSSION

The purpose of this study was to determine the effect of executive function interventions on the academic performance of kindergarten through eighth grade students in a public school setting. The researcher used quantitative and qualitative measurement instruments. The researcher examined results from of the Measures of Academic Progress (MAP) assessments in math and English Language Arts (ELA) from the 2015/2016 and 2016/2017 school years. The MAP assessments are nationally normed tests created by the Northwest Evaluation Association (NWEA). The exams are computer adaptive tests designed to measure the academic growth of individual and student groups three times per year in ELA and math. The results of the assessments allow educators to compare achievement levels and academic growth at a local and national level. Results of the fall and spring assessments were examined for this study, with treatment occurring after the Fall 2015 test administration.

In addition to the analysis of MAP data, the researcher surveyed 57 teachers in the treatment schools in regard to three focus areas: the implementation of the Curriculum Handbook for the Instruction of Executive Functions (CHIEF), the quality of professional development provided for the teachers, and the teachers' belief in the program. The survey consisted of three sets of select response questions, with five questions relating to each of the focus areas. An additional four open-ended questions allowed for specific and individualized feedback on the program.

Summary of the Study

The following three research questions were the focus of the study:

1.   Can the direct instruction of executive function skills and strategies improve
        student academic achievement?

2.   Do students at schools with varying academic achievement levels show success from the implementation of executive function intervention?

3.   Do teachers use executive function strategies in their daily instruction?

Research Question One

The first question asked, "Can the direct instruction of executive function skills and strategies improve student academic achievement?" The first question examined the impact of executive function-focused instruction on academic achievement. Results from the MAP assessments were used to determine the findings. The hypothesis of the study assumed an increase in academic achievement in the treatment schools. However, the direction of the difference was the opposite of what the hypothesis predicted in the average-performing school grouping and in multiple grade levels within content areas. In a comparison of whole-school data for each of the groups, the higher-performing treatment school showed 54.1% of the students met their growth target, whereas only 47.6% of the non-treatment students met their goal in the 2015/2016 fall to spring comparison. The same group also had stronger growth in 2016/2017, with the treatment school showing 57.7% of students meeting their growth target as compared to 52.5% of the control school students. Average-performing group comparisons suggested a trend of disparate performance on this measure, with 47.6% of the treatment group meeting their growth target and 59% of the non-treatment students accomplishing their growth goal. The lower-performing school groupings followed a pattern similar to the higher-performing groups. The treatment school outperformed the control school in both years, with 52.9% in 2015/2016 and 52.5% in 2016/2017 as compared to 49.2% and 44.8%.

Research Question Two

Question two asked, "Do students at schools with varying academic achievement levels show success from the implementation of executive function intervention?" The intent of this analysis was to closely examine the grade level performances of students in schools with varying overall performance as compared to the district average. The individual grade level data for math and ELA showed varying levels of growth. In the higher-performing schools' comparison for math, both schools demonstrated consistency in their growth patterns in several different grade levels. Kindergarten and grades first and eighth from the treatment school steadily met their growth targets, although fourth grade consistently failed to meet their growth targets. In the non-treatment school, kindergarten and grades first, second, and sixth demonstrated growth regularly, while grades four, seven, and eight continued to fall short of their growth targets.

In the average-performing school, there were considerable discrepancies in the grade level performances. The non-treatment school made significant growth in kindergarten; the treatment school failed to make their target, but the first grade students all made gains. However, there were discrepancies in multiple grade levels. For second grade, the treatment school failed to make their projected growth while the non-treatment school grew. Third grade followed the same trend with the treatment school falling short of their target and the non-treatment school increasing. The fourth grade of the treatment school fell below their target, and the non-treatment school exceeded their goal. Fifth grade students in the treatment school fell short of their goal, and the non-treatment students achieved higher than their goal. Seventh grade students in both groups failed to meet their target, and the eighth grade students showed a reverse discrepancy from the average-performing school trend, with the treatment school surpassing their target and the non-treatment students falling short of their projection. Although the average-performing treatment school failed repeatedly to

meet their grade level growth projections, the RIT scores—or academic proficiency overall—was higher than the non-treatment school. Additionally, treatment school growth was only consistent from year to year in first grade, with other grade levels fluctuating in growth performance. Growth in the non-treatment school remained consistent in kindergarten and first, second, fourth, fifth, and sixth grade.

The lower-performing schools typically followed the trends of the higher-performing schools. The treatment school met their growth targets in all grade levels except fifth, sixth, and seventh in the 2015/2016 school year, as opposed to the non-treatment school only meeting their target in first, seventh, and eighth grade. The next year showed improvement for the treatment school, as all grades except third met their growth projection. The control school met their growth goal in only kindergarten and seventh grade. The lower-performing treatment school also maintained stable growth over two years in grades first, third, fourth, and eighth. The non-treatment school did not have consistent growth in any grade level, although the fourth and sixth grade levels demonstrated growth deficiencies both years.

The ELA growth targets had similar results for the higher-performing schools. The treatment school met their targets in kindergarten and grades third, fifth, and eighth, as compared to the control school meeting their projections in kindergarten and grades first, second, and sixth in the 2015/2016 school year. The following year, the treatment students in kindergarten and grades first, fifth, sixth, and seventh met their targets, as did the non-treatment students in kindergarten and grades fourth and fifth. Through the analysis of growth trends over the two-year period, the treatment schools had consistent growth in kindergarten and eighth grade, whereas the fourth grade growth was consistently weak. In the control schools, kindergarten through second grade and sixth grade had

stable growth over the two-year period, although their fourth and seventh grade growth was consistently low.

The average-performing treatment school's ELA growth projections improved, as opposed to their performance in math. All grade levels met their growth targets in 2015-2016, aside from seventh grade. The non-treatment students met their projections in kindergarten and grades first, second, fourth, sixth, seventh, and eighth. In the 2016/2017 school year, both groups showed less improvement, with the treatment school meeting their target in grades third, fourth, and seventh. The control school failed to meet their targets in all grade levels that year. The growth continuum over the course of the two years was consistent at the treatment school in grades four, five, and eight, and in grades kindergarten, first, second, fourth, sixth, seventh, and eighth for the control schools. No grade levels demonstrated consistent growth deficiencies at either school.

The lower-performing schools' results showed increased performance in the treatment school, as opposed to a few grade levels meeting their projections in the non-treatment group. Grades second, fourth, sixth, seventh, and eighth from the treatment school met their 2015/2016 growth targets, whereas the kindergarten and grades first, seventh, and eighth met their goals in the control group. In the 2016/2017 school year, the treatment school met its targets in kindergarten and grades second, third, fifth, sixth, and seventh. The control school met its targets in kindergarten and grades seven and eight. Growth patterns in the treatment school showed stability in grades fourth and sixth through eighth, while the fifth grade consistently failed to meet its target. The non-treatment school only had consistent growth in eighth grade, but the second, third, and fourth grades failed to make significant growth in either year.

Research Question Three

Research question three asked, "Do teachers use executive function strategies in their daily instruction?" This question examined the teacher fidelity in teaching the CHIEF program, quality of professional development, and teacher belief in the program.

Teacher responses at all schools showed similar trends in the focus areas of the survey. Although the average-performing school consistently gave higher responses to the questions, all schools' averages indicated the fidelity to the program was less than full. The higher- and lower-performing schools reported only slight implementation of the program, and the average-performing school reported only moderate fidelity. 13 (22.7%) of the teachers surveyed answered they were "very" or "extremely" close in following the lesson plans of the program. 17 (29.7%) indicated they had embedded the program characters into their classroom routines. 29 (50.8%) shared that they had incorporated what they had learned. 22 (38.5%) reported that executive function skills were, at minimum, "very" included in their instructional delivery. However, only 17 (29.7%) stated they considered executive functions when planning their lessons.

The inconsistent implementation of the program correlated with teacher concern that the lesson plans often needed to be modified for the developmental levels of their students, as reported in the open-ended questions. Teachers also noted the need for more professional development, which may indicate why their implementation was less than "very." Just over 50% of the teachers reported using the strategies they had learned. Therefore, further instructional support for the program would likely assist teachers in their confidence in how to utilize the program. The teachers also reported time constraints as a concern in regard to program implementation.

When examining the question set concerning the quality of professional development, teachers indicated varying degrees of satisfaction. Overall, the higher- and average-performing schools reported moderate support for the training received, whereas the lower-performing school reported only slight consideration for the professional development they received. 26 (45.5%) of the teachers surveyed reported feeling comfortable with the information received in the training. 23 (40.2%) of the teachers noted feeling comfortable with the program, and 30 (52.6%) reported they were comfortable with the skills. However, only 13 (22.7%) reported closely following the lesson plans, and only 19 (33.3%) shared they had "very" or "extremely" strong belief in the lesson plans. Additionally, just 17 (29.7%) believe the training received was extensive enough for the average teacher to implement the program successfully. Teacher implementation may be low due to perceived lack of training. Some teachers noted they were new and had not received training.

The teachers' responses regarding their belief in the program still varied by school; the average-performing school had greater faith in the program than the higher- and lower-performing schools. 22 (38.5%) believed there would be a "very" or "extreme" impact on student learning. Teacher implementation may be low due to lack of belief in the impact of the program. If teachers feel student learning will not be impacted, they may not have been as likely to fully implement the program regardless of expectation or training.

32 (56%) of the teachers reported a "very" or "extreme" belief that the development of executive function skills would benefit students. 34 (59.5%) of the teachers reported a "very" or "extreme" belief that students with further-developed executive function skills would be more likely to succeed beyond their peers who struggle with executive functions. 39 (68.4%) of the teachers believed executive function skills were a "very" or "extremely" important part of student development.

However, teacher belief in the benefit of executive function skills did not correspond with the 13 (22.7%) teachers with "very" or "extreme" fidelity to the program. Another reason for this discrepancy may be found in the teachers' responses to the question regarding belief that the program would have an impact on student success in the classroom, as only 29 (50.8%) ranked this area with a "very" or "extreme" rating.

Teacher response to the open-ended questions provided some insight into the variations in fidelity and quality of the professional development, as 21 (36.8%) desired modifications to the lesson plans, and 11 (19.2%) believed more professional development was necessary. 24 (42.1%) shared their struggles with time constraints and the requirement to teach a considerable amount of core content in a short period of time.

Although 22 (38.5%) believed the program would have a positive impact on academics in general, ten (17.5%) teachers did not believe the program would have an effect on the students. The trend of hesitation to buy-in continued with the questions relating to the impact on the district, as 15 (26.3%) reported they weren't sure or did not believe there would be an effect on the district.

Although the survey and MAP data were inconsistent, the researcher personally observed the program implementation in the higher-performing school. The teachers reported lower levels of implementation and less belief in the program than the average-performing schools; however, evidence of the program was consistently apparent in the classrooms. For example, teachers frequently incorporated the mascots and sayings into their routines. A teacher would call the attention of the class by saying, "Hocus Pocus," and the students would respond with "Now let's focus" to indicate they were giving their full attention. This was a mascot and slogan incorporated into the lesson cycle for sustained attention. Many strategies were incorporated into their daily

routines for classroom management, such as checklists and group points for being on-task or completing assignments.

Another common strategy used to support inhibition was a break system. Students who had a hard time controlling themselves were trained to indicate their need for a timeout or a mental break and were allowed to go to a break area to gather their thoughts and prepare to return to the activity. Many teachers also included organization strategies in their lessons through the use of graphic organizers, checklists, and rubrics. Teachers assisted students who struggled with flexibility by giving them a clear agenda and assignments that were chunked into sections. These strategies were coupled with a timer to help them prepare for transitions and cut-off points within an assignment. This helped students who struggled with leaving assignments unfinished to find an end-point where they could leave off for that moment and know they could return later. Many of these embedded strategies were memorialized through photographs during classroom walkthroughs, as noted in Appendix I.

Implications

The MAP and survey data brought concerns about the CHIEF program implementation to light. Results from academic assessment were inconclusive. While it was reported that many teachers believe in the program and in the importance of executive functions for student success, the implementation of the program is lower than their belief would suggest. If the teachers had more extensive training in the CHIEF program, they would likely feel more confident in the information and present it to their students. Time constraints, resources, and the appropriateness of the lesson plans for all student developmental levels were noted as concerns by the teachers. With further training and better understanding of the program, teachers could embed executive functions into their lesson plans and make the necessary adjustments to meet their students' developmental needs

or personal teaching styles for instructional delivery. Additional training and implementation for a

longer period of time would also allow teachers and schools to build their resource and material

banks to provide greater support for those who need it.

Recommendations for Further Study

The researcher will provide the results of this study to the school district and school

psychologist who oversees the program for review. The goal is to use the information to make

adjustments to the program and its current implementation. Further research is recommended to

determine if there is academic growth after greater implementation is reported. It is also

recommended to examine academic impact after a longer period of time, as this study was concluded

after the first full year of implementation of the program. Evidence of the effects of executive

function intervention on academics and of executive function skills themselves may be more

apparent in later years, which could be measured through MAP assessments and teacher surveys, as

well as executive function assessments, such as the Behavior Rating Inventory of Executive

Functions (BRIEF) mentioned previously in Chapter Two of this study.

Another recommendation for future research should include parent training and support.

Many of the executive functions develop during preschool years. Due to preschool not being

mandatory in California, providing information to parents about the importance of executive

function development prior to school entrance may result in a positive impact on student success.

Conclusion

Overall, the results of the study were inconclusive. MAP assessments showed greater growth

in the higher- and lower-performing schools as compared to the average-performing schools;

however, the average-performing schools reported greater implementation of the program than the

higher- or lower-performing schools. The reality is that students continue to enter classrooms each

day with executive function weaknesses that should be addressed to support them socially and academically. Greater support to teachers through professional development and resources can provide better guidance for the instruction of executive functions. Although the results of the study may not have demonstrated a significant academic impact, a follow-up study conducted later in the implementation period may produce more consistent results.

Summary

This study was conducted to determine the effectiveness of executive function interventions on the academic performance of K-8 students in a public school setting. Results from academic assessments via MAP testing and teacher surveys were used to analyze the impact of the CHIEF program on academic achievement and determine if schools with varying academic needs showed different levels of success. The study also examined how different teachers implemented executive function strategies in their daily instruction, as measured by a teacher survey. The results proved to be inconsistent, as the academic growth performance in specific schools did not coordinate with the level of implementation reported by the teachers from those schools.

Many teachers reported believing in the importance of executive function skills and the positive impact further development of those skills would likely have on student success, yet many of those same teachers did not report a strong implementation of the program provided to them. Teachers reported the need for further professional development and the desire to adjust lesson plans to meet the developmental needs of their students. As schools in this Northern California school district continue seeking ways to better support students, executive function interventions may be a foundation for future success in individual academic, social, and emotional skills. Through professional development, schools will continue increasing their aid for students through instructional and executive function intervention support.

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Appendix A

Executive Functions Development Program: Lesson Design

This manual is designed to teach one executive function per week, in repeating cycles, with an implementation of two-four strategies. This instruction should take the place of bell work.

Day 1 – Overview of one EF skill (10 min)

Day 2 – Review of the EF skill and Introduction of Strategies (10 min)

Day 3-5 – Implementation of Strategy (untimed - embedded in curriculum)

Executive Functions: A General Overview

Executive functions (EF) are responsible for a person's ability to engage in purposeful, organized, strategic, self-regulated, goal-directed behavior. They are a collection of processes which direct the use of other cognitive capacities which people have, including reasoning, language, visual skills, and memory. Here is a consensus list of EF skills.

Initiate - The ability to begin a task in a timely fashion.

Inhibit- The capacity to think before acting. It allows us the opportunity to evaluate a situation, and the impact/consequences of our behavior, before responding. It includes the ability to curb impulses.

Flexible/Shift- Allows for a change of focus in reaction to what is occurring, either in our minds, or in our environment.

Plan-   The ability to think ahead, and to create a road map for reaching a goal. It is similar to "Organize." However, it more of the "dawning" of the awareness of possible events to come, and the "gearing up" for the more detailed "organization" EF to follow.

Organize- The ability to design, and maintain, methods to support the "planning" for a goal. This often includes systematically tracking, scheduling, categorizing, sequencing, etc. to enhance efficiency.

Sustained attention - (McCloskey, Fralick-Ball, Dawson and Guare)The capacity to attend to a situation or task in spite of distractibility, fatigue, or boredom. Its prerequisite is intact inhibition so that one can then focus one's attention on something.

Working Memory-- The ability to temporarily hold information in one's head in order to use it to complete a task. It keeps new, and old, information running in a mental loop until the data is manipulated, organized, stored, and/ or acted upon to meet a goal.

Monitor/Evaluate- The activation of routines which enable us to review the accuracy of what we think, feel, or do. It involves observing our behavior, and then tracking our progress toward a goal. It directs any adjustments which might be indicated, rather like the brain's quality control system.

Appendix B

Executive Function
Sequence of Skill Instruction

Week 1	Goal
Week 2	Plan
Week 3	Organize
Week 4	Initiate
Week 5	Sustained Attention
Week 6	Inhibition
Week 7	Shifting/Flexibility
Week 8	Working Memory
Week 9	Refuel
Week 10	Monitor/Evaluate

Executive Functions: Goal

Grade: K

<u>Cycle 1</u>

Day: 1 (10 minutes)

EF Skill: Goal

EF Action Figure: Goliath Goal

Definition of Goal: Ability to determine what we want in the future and decide to take action to accomplish it.

Kid Friendly Definition: A goal is deciding what you want to do and deciding you are going to do it.

Specific EF Slogan:

"The first step to success is setting a goal."

"You can't reach your dream until you have a dream to reach for."

Objective: We will chant about goals.

Lesson Component:

Teacher will	1. Engage/connect: Ask students if they know what they want to be when they grow up. 2. Students say what they want to be. Tell students "If you know what you want to be, you have a **goal**. 3. Input A **goal is deciding what you want to do and deciding you are going to take action to do it**. (Have students echo definition in parts.) (Give various examples of goals that

	relate to your students. Examples: stay on green, get 100% on spelling test, read x # of books etc.) Tell students: "You need to do two things to have a goal. First, you need to think about the future. The future is a time that hasn't happened yet. To remind you that we are looking into the future we will wear special glasses. (hand out, or teacher only can wear). Now, look into the future and think of something you want to accomplish. Next you need to decide you are going to do something. You need to work toward your goal. (Show action figure) This is *Goliath Goal.* What do you think he is doing? (discuss) Goliath always accomplishes what he wants because he is good at setting goals." 4. Teach chant. Students can do inside with a step clap motion and then do outside at recess as a jump rope chant.
Student Will	1. Listen; WTYN; echo teacher, chant: 2. "Goal Getter, Goal Getter, Go, go, go. Goals get me where I want to go. Goal Getter, Goal Getter, Set my goal. I'll reach my dream. I won't say no."
Checking for Understanding	Students give an example of a goal. Listen to students chant.

*Terms: WTYN: Whisper to your neighbor

Executive Functions: Goal

Grade K

__Cycle 1__

Day: 2 (10 minutes)

EF Skill: Goal

EF Action Figure: Goliath Goal

Definition of Goal: Ability to determine what we want in the future and decide to take action to accomplish it.

Kid Friendly Definition: A goal is deciding what you want to do and deciding you are going to do it.

Specific EF Slogan:

"The first step to success is setting a goal."

"You can't reach your dream until you have a dream to reach for."

Objective: We will sing about goals.

Lesson Component:

Teacher Will	1. Connect: Remember when we got a day off to celebrate Martin Luther King's birthday? We will also get a day off for Presidents Day. We remember these famous people because they did great things. Do you want to do great things? If you do, you need to set goals. 2. Input: Review definition of goal. Have students echo, then say what a goal is. Show Goliath Goal and remind students that he always accomplished what he wanted because he could set goals. Tell students "Setting a goal

	helps your brain work the way you want it to work. That is why successful people set goals then work to reach their goals." Discuss Martin Luther King (I have a dream), Discuss George Washington, Abe Lincoln and their goals and how they accomplished their goals and now have their own special day. With students brainstorm other famous people of interest to students and how they set a goal and worked to accomplish it. Example: a famous baseball player dreamed of playing in the majors and decided to practice baseball every day; a popular musician practiced playing and singing to become a member of a group. 3. Teach "Set a Goal" song set to the Frozen hit song "Let it Go" (chorus only) or substitute another currently popular melody. 4. With students, brainstorm goals of interest to them then complete sentence frames: I will _____. I will work hard to _____."
Student will	1. Echo; pair/share; discuss; Write sentence frames: "I will ____. I will work hard to _____". sentences. Sing: (melody of "Let it go" from Frozen) Set a goal. Set a goal. I won't hold back anymore Set a goal. Set a goal. I want my life to soar. I can see ahead of me. Someone great is who I'll be. I can choose to work for more. The first step toward that door Set a goal.

Check for understanding	Listen to student discussions and singing. Read students sentences.

Executive Functions: Goal

Grade K

Cycle 1

Days: 3-5 (untimed- used in lesson)

EF Skill: Goal

EF Action Figure: Goliath Goal

Definition of Goal: Ability to determine what we want in the future and decide to take action to accomplish it.

Kid Friendly Definition: A goal is deciding what you want to do and deciding you are going to do it.

Specific EF Slogan:

"The first step to success is setting a goal."

"You can't reach your dream until you have a dream to reach for."

Objective: We will set a goal and work toward it.

Lesson Component:

Teacher will	Connect to prior knowledge: Review Goal definition and Goliath Goal action figure, and activities (chant & song) from Day 1 and 2
	Engage: "You have learned so much in kindergarten so far. WTYN some of the things you have learned. There is still so much to learn to get ready for

	first grade. Are you excited about going to first grade next year? "
	Pick a goal to work on (ex: read all 41 K HF words fluently, count to 100 by 1s, 10s, and 5s, get 100% on assessment). Guide students to use planner and practice plan checklist to prepare for success on reading, spelling test or other goal you selected. Have students help brainstorm ideas for checklist but steer them toward a workable checklist that will be posted in room. Consider having all students sign the goal and planning checklist. Ex: We will read all the kindergarten words. To help us reach this goal we will 1. Practice the words at school every day. 2. Use the words in our journal writing, 3. Practice the words at home every evening until I can read them easily and smoothly.
	Have student draw self-portrait with "I will ___ (goal)" in speech bubble. Post in room.
Student will	Students will write in planner.
	Students will help brainstorm ideas for a checklist to help meet goal. Students will use checklist for practice plan.
	Student will draw picture of self with speech bubble stating goal in "I will _____" format.
	From time to time teacher will lead students to set additional goals and students will write additional speech bubbles with more "I will___" statements to add to self-portrait.

Checking for understanding	Observe student planner, self-portrait with I will statement, practice plan checklist, and progress on meeting goal.

Executive Functions: Goal

Grade: K

Cycle 2

Day: 1 (10 minutes)

EF Skill: Goal

EF Action Figure: Goliath Goal

EF Brain Correspondence: WB (Whole Brain), Neurons

Definition of Goal: Ability to determine what we want in the future and decide to take action to accomplish it.

Kid Friendly Definition: A goal is deciding what you want to do and deciding you are going to do it.

CHIEF Program Slogan: "We are neural gardeners!"

Specific EF Slogan:

"The first step to success is setting a goal."

"You can't reach your dream until you have a dream to reach for."

Objective 1: We will revisit our goals.

Objective 2: We will meet the brain and sing about it.

CCSS: Listening and Speaking K:

1. Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups. Follow agreed-upon rules for discussions (e.g.,

listening to others and taking turns speaking about the topics and texts under discussion).

Lesson Component:

Teacher Will	Teacher will:
	Connect: (Show Goliath Goal) "Remember at the beginning of the year we met Goliath Goal. He told us that when you set a goal you decide what you want in the future and take action to do it. A goal is more than wishful thinking. A goal is something you are willing to work for so you can have a good future. You can have long term goals. Example: "I will be a computer programmer when I grow up." You can have short term goals. Example: "I will get 100% on today's test." You can have in between goals. Example: "I will work hard to make honor roll every quarter this year." Remember when you set a goal for yourself? You wrote about what you wanted to be when you grow up. (Have students review their goals by referring to their "I will" speech bubbles). We also set some short term goals to help you reach your long term goal. We set goals to learn letter names and sounds and high frequency words (or whatever goals the class set). You have made good progress toward meeting those goals. Whisper to your neighbor about what you have learned so far in kindergarten."
	Engage: "When you learned, what part of you did the learning?" (Take ideas from the class until someone suggests the brain.) "Yes, your brain does the learning and the thinking. In fact, it is your brain that sets goals! (Choose student volunteer to stand in front of class to demonstrate body parts which you will point

out. Have students touch or point to each part on their own body.) "You have many wonderful parts. Inside you have a skeleton made of bones to give you your shape and hold you up. You have muscles so you can move. You have eyes for seeing and ears for hearing, and skin for feeling, a nose for smelling, and a tongue for tasting. But best of all you have a wonderful brain."

Input: Your brain controls every part of you. It tells your heart to beat and your lungs to breathe. It tells your muscles when to move. It is your brain that makes sense of what your eyes see and your ears hear and your skin feels. Your brain is in charge of your whole body. It makes you who you are!"

Show poster of the brain.   "This a drawing of what your brain looks like inside your head. It is one small part of your body but it is the most important part. It controls everything else. All of your thinking and learning, all of your thoughts and ideas, all your memories, even your feelings happen inside your brain. Your brain makes you who you are."

Teach the following song to the tune of "The duck with the feather on his back."

> I have a brain and my brain is me.
>
> It helps me hear and it helps me see.
>
> It feels and thinks and learns for me.
>
> It makes me who I want to be.

Student Will	Students will: remember, pair share, discuss, listen, sing.
Checking for Understanding	<u>Check for understanding:</u> Ask children to point to various body parts, including brain. Then ask "What do you use to think? (You model and students point to brain.) "What do you use to learn? (You model and students point to brain.) "What do you use to see?" (You model and students point to eyes and brain.) "What do you use to hear? (You model and students point to ears and brain.)

Executive Functions: Goal

Grade: K

<u>Cycle 2</u>

Day: 2 (10 minutes)

EF Skill: Goal

EF Action Figure: Goliath Goal

EF Brain Correspondence: WB (Whole Brain), Neurons

Definition of Goal: Ability to determine what we want in the future and decide to take action to accomplish it.

Kid Friendly Definition: A goal is deciding what you want to do and deciding you are going to do it.

CHIEF Program Slogan: "We are neural gardeners!"

Specific EF Slogan:

"The first step to success is setting a goal."

"You can't reach your dream until you have a dream to reach for."

Objective: We will discuss how we set goals and where in our brain that happens.

CCSS: Listening and Speaking - K

1. Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups. Follow agreed-upon rules for discussions (e.g., listening to others and taking turns speaking about the topics and texts under discussion).

Lesson Component:

Teacher Will	**Connect:** Review definition of goal. Show poster of the brain and review *brain* by singing song from day one.
	Input: "When we set a goal we need to think about many things. We need to think about the future. What do you want to be or do or have in the future? To help us decide what we want for our future we need to think about the past. What experiences have you had that you enjoyed? What have you seen or heard about that that sounds like something you would like to try? Then we need to think about the present. What are you good at? What do you want to get better at so you can reach your dreams? Put on your thinking cap and set a goal for yourself. (Give students think time.) Whisper to your neighbor what your goal is.
	You just did a lot of thinking. Where did you do that thinking? (Take volunteers to give answer.) That's right. You did that thinking in your brain. Your brain has different parts and each part specializes in something important. One part makes sense of what you see. One part makes sense out of what you hear. One part is involved with your emotions. One part makes sure your heart beats and your lungs breathe so you don't have to think about those things. And some parts direct other parts and control how you act and think and feel. There are a lot of other things going on in your brain, too. All the parts work together to make you who you are.
	When you set goals you think about a lot of different things so you use a lot of your brain. We will keep your brain very busy today.

Student Will	sing, envision a goal for themselves, pair share
Checking for Understanding	

Executive Functions: Goal

Grade: K

Cycle 2

Days: 3-5 (untimed- used in lesson)

EF Skill: Goal

EF Action Figure: Goliath Goal

EF Brain Correspondence: WB (Whole Brain), Neurons

Definition of Goal: Ability to determine what we want in the future and decide to take action to accomplish it.

Kid Friendly Definition: A goal is deciding what you want to do and deciding you are going to do it.

CHIEF Program Slogan: "We are neural gardeners!"

Specific EF Slogan:

"The first step to success is setting a goal."

"You can't reach your dream until you have a dream to reach for."

Objective: We will work toward our goal of being good writers. (Or substitute any curricular need of the moment.) We will write our opinion about which job is the best job. (Adapt if needed to fit your curricular needs.)

CCSS: K Writing 1. Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic ... they are writing about and state an opinion or preference about the topic.

Lesson Component:

Teacher Will	**Connect: "**This week we have been talking about goals. We talked about what you want to be when you grow up, which is your long term goal. We also talked about our goals for kindergarten like becoming good readers and writers.
	Input: Today we will put the two sets of goals together. You will write your own opinion about what you think is the best job. Our **short term** goal for today is to write a good sentence with a capital letter at the beginning, an end mark at the end, spaces between the words and your best handwriting. We will practice some of our high frequency words and we will practice sounding out words as we work toward our goal of becoming good writers. You will use many parts of your brain to do this task. You will make your brain smarter and faster by doing this task. "Have students suggest jobs and state their argument as to why that job is the best. Make a list. Add other jobs that students don't generate on their own. Example: President of the United States, doctor, scientist, artist, singer, actor, mom, astronaut, engineer, police officer, dancer, professional athlete, teacher, computer programmer, video game designer, veterinarian, travel writer, food critic.
	State the sentence frame "I think the best job is _____" and have students repeat. Have one or more students write the high frequency words *I*, *the,* and *is* with teacher writing *think,* in proper place, then have whole class help sound out *best* and *job.* When sentence frame is properly written on board, have class

	read it together then write and illustrate their own sentence.
Student Will	form an opinion, pair/share their opinions, write about their opinion
Checking for Understanding	

Executive Functions: Goal

Grade: K

Cycle 3

Day: 1 (10 minutes)

EF Skill: Goal

EF Action Figure: Goliath Goal

EF Brain Correspondence: WB (Whole Brain), Neurons

Definition of Goal: Ability to determine what we want in the future and decide to take action to accomplish it.

Kid Friendly Definition: A goal is deciding what you want to do and deciding you are going to do it.

CHIEF Program Slogan: "We are neural gardeners!"

Specific EF Slogan:

"The first step to success is setting a goal."

"You can't reach your dream until you have a dream to reach for."

Objective: We will celebrate meeting our goal.

Standard: CCSS: Listening and Speaking:

1. Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups. Follow agreed-upon rules for discussions (e.g., listening to others and taking turns speaking about the topics and texts under discussion).

Lesson Component:

Teacher Will	Show action figure, whole brain poster, and review kid friendly definition and slogan for goal. Remind students that they have set both short term and long term goals throughout the year.
	"Remember, one of our goals for kindergarten was to learn letter names and sounds. We have now learned all the letter names and all the consonant sounds and short vowel sounds. Pat yourself on the back and give yourself a silent hooray (or however you celebrate accomplishments in your class). You did a great job accomplishing that very important kindergarten goal. Let's think *how* we reached that goal.
	We had a **plan** for learning letters (point to plan poster). Our plan was to sing and chant and write letter names and sounds every day. We had a name song and a sound song for the alphabet and several chants and worksheets for each letter. We looked at picture cards and objects for each letter. We practiced every day. Our plan helped us reach our goal.
	We **organized** our work (point to organize poster). We have a special place on the wall for our big letter cards, a special place to keep our small letter cards, a special place for our pictures and a special place for our realia. We have a special time every day to practice letter names and sounds.
	We **initiated** (started**)** our plan at the beginning of the year (point to initiate poster) and we stayed **focused (**point to sustained attention poster) on our goal the whole year so far. We had to use **self-control** so we didn't get distracted. Occasionally things came up so we

	couldn't follow our usual routine but we were **flexible** and made adjustments when necessary. We had to use our **working memory** whenever we learned about a new letter. We **monitored** your progress every day with quick checks, and from time to time I would test you on your progress. We used all the executive functions to meet our goal. Look up at our executive function posters and think about how we met our goal to learn letter names and sounds. Think about your favorite part of this process (Give a brief think time.) Whisper to your neighbor about how you learned letter names and sounds." "It was a lot of work meeting our goal but it was worth it! You can be proud of yourself! Let's celebrate your success." (Optional) Hold a "We met our goal party". Play music featuring alphabet songs. Offer letter cookies or letter Cheez-It crackers. Students can make then decorate headbands out of sentence strips on which they write "I met my goal to learn all letter names and sounds". If possible, give out "I met my goal bracelets" (available online).
Student Will	remember, listen, pair share, discuss, and cheer.
Checking for Understanding	

Executive Functions: Goal

Grade: K

__Cycle 3__

Day: 2 (10 minutes)

EF Skill: Goal

EF Action Figure: Goliath Goal

EF Brain Correspondence: WB (Whole Brain), Neurons

Definition of Goal: Ability to determine what we want in the future and decide to take action to accomplish it.

Kid Friendly Definition: A goal is deciding what you want to do and deciding you are going to do it.

CHIEF Program Slogan: "We are neural gardeners!"

Specific EF Slogan:

"The first step to success is setting a goal."

"You can't reach your dream until you have a dream to reach for."

Objective: We will discuss how we met one of our goals.

Standard: CCSS: Listening and Speaking K :

393419080.   Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups. Follow agreed-upon rules for discussions (e.g., listening to others and taking turns speaking about the topics and texts under discussion).

Lesson Component:

Teacher Will	Show action figure, whole brain poster, and review kid friendly definition and slogan for goal. Remind students that we are discussing goals and how we met those goals by using executive functions.
	"Another goal we set was to learn to count, recognize, and write numbers. We have learned to count to 100 and write numerals to 20 so far. (Adjust numbers as necessary to match where you are in the curriculum.) You can be proud of yourselves for making good progress on meeting our goal. Put on your thinking caps and think about how we learned numbers. (Give think time.) Whisper to your neighbor some of the ways we met our goal. (Whisper time) (Point to each EF action figure poster as you mention each EF skill.) Did I have a **plan** for you? Yes. Our plan was to work on 0-5, then 6-10, then 11-20, and next we will work on 20-100. Did we **organize** our time, materials, and thinking? Yes. We have a special time for math every day. We have ten frames and counters and many manipulatives which we keep in a special place so we can find them easily. We think about numbers in different ways and relate the numbers to each other. Every day we **initiate** our math with a number warm up. Then we **stay focused** on the new learning. You used **self-control** to stay focused and to use your manipulatives carefully. After you mastered one group of numbers you had to **shift** your focus to a new group of numbers. We really used our **working memory** to learn each new number. Sometimes we had to take a break from our regular learning and do math in a

	different way with songs, dancing, jumping, or other activities to **refuel** our brain. Every day we did quick checks to **monitor** your progress in learning numbers. Look up at our executive function posters and think about how we are using all the executive functions to reach our goal of learning numbers. Now think about your favorite part of learning numbers so far. I will call on quiet hands." As students report their favorite parts of math instruction, relate it to an EF skill. For example, if a student says "I like when we jump 20 times" respond with "That refuels our brains, doesn't it." If a student says "I like when we do math with liker cubes" respond with "We really have to keeps those manipulatives organized so we don't lose them. You now know to clean them up and where to put them." To "I like playing Around the World" respond "That really takes a lot of sustained attention, doesn't it, and we must use our working memory." OPTIONAL: Hold a "We know our numbers" party, similar to the letter party.
Student Will	remember, listen, pair share, discuss, and cheer.
Checking for Understanding	

Executive Functions: Goal

Grade: K

Cycle 3

Days: 3-5 (untimed- used in lesson)

EF Skill: Goal

EF Action Figure: Goliath Goal

EF Brain Correspondence: WB (Whole Brain), Neurons

Definition of Goal: Ability to determine what we want in the future and decide to take action to accomplish it.

Kid Friendly Definition: A goal is deciding what you want to do and deciding you are going to do it.

CHIEF Program Slogan: "We are neural gardeners!"

Specific EF Slogan:

"The first step to success is setting a goal."

"You can't reach your dream until you have a dream to reach for."

Objective: We will set a new goal. We will discuss how we will meet that goal by using executive function skills.

Standard: CCSS: Listening and Speaking K :

393418576.   Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups. Follow agreed-upon rules for discussions (e.g., listening

to others and taking turns speaking about the topics and texts under discussion).

Lesson Component:

Teacher Will	Day 3:
	• Show action figure, whole brain poster, and review kid friendly definition and slogan for goal. Remind students that we are discussing goals and how we meet them "We have met some of our goals and are making good progress on reaching others. Meeting our school goals will help you get smart and give you the skills you need to reach your dream and have a good life. We will set a new goal to help you work toward your dream." Lead your class in a discussion toward setting a goal that meets your curricular needs. For example, fluently read the first 50 words on the Dolch list, count to 100 by 1s,5s and 10s, or write properly formatted paragraphs using high frequency and decodable words.
	Day 4:
	• After the class has set a new goal, discuss the executive functions needed to reach that goal. For example: "To reach our goal of reading 50 high frequency words we need a plan. What do you think would be a good **plan**? (Take suggestions. Lead discussion toward your plan then work in other EF skills.) Example: "We will practice every day during language time. We will learn 2 or 3 new words every week. We will practice as a class using flash cards and little books that use the new words.

	Day 5: • You will practice on your own using small flashcards and word lists. We will write sentences using those words. We will **organize** our flash cards and keep the class set on the whiteboard tray and your small ones in your pencil box where you can find them easily. Whenever you finish your work early you will **initiate, or start** your practice with your small flashcards. You will need to **stay focused** to be successful. You must use **self-control** to remain focused and hardworking so you can be successful. Whenever we learn a new word you will need to keep your **working memory** running. Sometimes we will sing and dance the spelling of new words to **refuel** our brains. I will frequently test you on the words and you can work with a partner testing each other to **monitor** your progress. Whisper to your neighbor how you are going to learn new words.
Student Will	Day 3-5 remember, listen, pair share, discuss, and cheer
Checking for Understanding	

Executive Functions: Initiate

Grade: 3

Cycle 1

Day: 1 (10 minutes)

EF Skill: Initiate

EF Action Figure: Ignacio Ignitor

Definition of Initiate: Ability to begin tasks in a timely manner. Ability to start another task when finished with first task.

Kid Friendly Definition of Initiate: Initiate means start.

Specific EF Slogan:

> Don't delay your dream
>
> 3-2-1 Blast off!
>
> Don't procrastinate. Initiate!
>
> Just start it !

Objective: To learn how to get started on a task,and just and do it!

CCSS SL1**:** 1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.

Resource for this lesson : http://marlacummins.com/adhd-initiation-getting-started/

Lesson Component

Teacher Will	- Introduce Ignacio Ignitor character, and the word the character represents: *Initiate*. - Give the definition of *Initiate* and have the students read the definition aloud.

	- Ask the students if there are things that teachers or parents ask them to do things they don't want to do, even though they know that they should. Do they have trouble getting started on those things? - Ask for ideas from the group: What are some of those things that you have trouble starting? Give examples (clean your room, write a book report) if necessary to get them started thinking. - Make a list on chart paper of the things that 3rd graders have trouble starting. Try to get 5 to 7 things. - Ask students to think about why they have trouble starting those things. - Have the students talk in table groups, then share out with the class. Show the class the chart of sentence frames you have made and tell them that they can use these prompts in their discussion. See below. - Tell the class that tomorrow we will talk about how we can help ourselves get started on these kinds of tasks.
Student Will	- Listen to the teacher describe Ignacio Igniter and the definition of *Initiate.* - Participate in class discussion. - Participate in table talk groups, using sentence frames. - Share out results of small group discussion.
Checking for Understanding	- Listen to discussion. - Check for use of sentence frames.

Sentence Frames for Small Group Discussion

I agree that _____ because _____.

My thinking is similar to yours because _____.

I agree with _____, but I don't agree with _____, because _____.

Executive Functions: Initiate

Grade: 3

Cycle 1

Day: 2 (10 minutes)

EF Skill: Initiate

EF Action Figure: Ignacio Ignitor

Definition of Initiate: Ability to begin tasks in a timely manner. Ability to start another task when finished with first task.

Kid Friendly Definition of Initiate: Initiate means start.

Specific EF Slogan:

Don't delay your dream

3-2-1 Blast off!

Don't procrastinate. Initiate!

Just start it !

Objective: To learn how to get started on a task, and just do it!

CCSS SL1**:** 1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.

Resource for this lesson : http://marlacummins.com/adhd-initiation-getting-started/

Lesson Component

Teacher Will	- Review lesson and charts from Day 1. - Tell students that today we are going to think about ways to start tasks as a class and individually. Both are important.

	• Tell the students that in class, we can use a timer to signal us when to initiate a task. • Show the timer and how it works if the class is unfamiliar with the use of the timer. • Tell the class that after an assignment is given, you will set the timer for 15 or 20 seconds. If students haven't initiated the task by the time it rings, they need to refocus and get to work. • Tell the class that since they may not have a timer at home, they need to think of some ways to remind them to initiate a task. Ask for some suggestions, giving a hint as necessary (Specific EF Slogan: 3-2-1 Blast Off!). • Tell the class that they are to write another way to initiate a task in their planner. Set the timer for 20 seconds.
Student Will	• Listen. • Offer ideas on how to initiate a task. • Begin writing in planner by the time the timer rings.
Checking for Understanding	• Listen to student responses. • Note which students have initiated writing in their planners by the time the timer rings.

Executive Functions: Initiate

Grade: 3

Cycle 1

Day: 3-5 (Untimed- used in lesson)

EF Skill: Initiate

EF Action Figure: Ignacio Ignitor

Definition of Initiate: Ability to begin tasks in a timely manner. Ability to start another task when finished with first task.

Kid Friendly Definition of Initiate: Initiate means start.

Specific EF Slogan:

Don't delay your dream

3-2-1 Blast off!

Don't procrastinate. Initiate!

Just start it!

Objective: To learn how to get started on a task by prioritizing, setting up the environment for the task, overcoming fear, waking up your brain and doing it!

CCSS SL1**:** 1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.

Common Core Standard in reading, writing, or math as decided upon by the individual teacher.

Resource for this lesson: http://marlacummins.com/adhd-initiation-getting-started/

Lesson Component

Teacher Will	**Days 3 & 4**

	• Select any single classroom assignment that the students work on independently. Tell the students that they are going to work on *Initiation* as well as their subject assignment. • Distribute a copy of the Checklist (below) to each student. Explain that you will give an assignment and then you will set the timer. When the timer rings, the students should be working on the assignment. If a student is <u>not</u> working when the timer rings, they must complete the checklist immediately, then return to work on their assignment. If the student <u>is</u> working when the timer rings, they are to continue working and fill out the Checklist when the assignment is completed. Allow for clarifying questions. • After giving directions for the assignment, set the timer for 1 minute. • When the timer rings, make a mental note of which students are working on their assignments and which are completing the checklist. • Offer help or redirection to students who have not started assignment or checklist within 15 seconds of the timer's ring. **Day 5** • Use the same procedure as for days 3 and 4. • Follow the assignment completion with a discussion. Ask students if the checklist helped them understand why they had trouble initiating the assignment. Was it easier to get started today than it was on Wednesday?
Student Will	• Listen to the directions for using the checklist. • Ask clarifying questions if necessary. • Begin working on the assignment as soon as the teacher completes the instructions. • Complete the Checklist when the timer rings, or when the assignment is completed. • Respond to teacher's question.

Checking for Understanding	• Observe work on assignment. • Listen to student responses.

See checklist

My checklist/To Do List for the assignment.

1. Did I start the assignment right away? (I was working on the assignment when the timer went off)	Circle One Yes / No If you circled YES...give yourself a smile and pat yourself on the back for getting on task right away! If you circled NO, then answer the questions to the right so the next time the answer will be YES!	If no, what stopped me from starting right away? In the future could this problem be prevented? Yes/ No How or why not?
********************* Checklist Evaluation: Did the checklist help me get started on the task more quickly?	********************* YES or NO	********************* How did it help? If it did not help, why not?

Executive Functions: Initiate

Grade: 3

Cycle 2

Day: 1 (10 minutes)

EF Skill: Initiate

EF Action Figure: Ignacio Ignitor

EF Brain Correspondence: PFC (Prefrontal Cortex), ACC (Anterior Cingulate Cortex), Neurons

Definition of Initiate: Ability to begin tasks in a timely manner. Ability to start another task when finished with first task.

Kid Friendly Definition of Initiate: Initiate means start.

CHIEF Program Slogan: "We are neural gardeners!"

Specific EF Slogan:

Don't delay your dream

3-2-1 Blast off!

Don't procrastinate. Initiate!

Just start it!

Objective: Students will learn that they improve their brains when they initiate tasks. Students will initiate tasks by conducting a "getting to know you" activity.

Standard: CCSS SL1 :1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.

Materials Needed: a big bag of blocks

Lesson Component:

Teacher Will	1. Teacher will review Ignacio Igniter and the definition of Initiate. Teacher will explain that by initiating tasks, students are working on the PFC and ACC of their brains, and their neurons, and that their brains will work better. 2. Teacher will show the students the PFC and ACC in the Initiate Brain poster, and their Initiate brain handout if they are using that too. 3. Have students color lightly color the PFC and ACC, if it hasn't been colored, or just point to it. 4. **GETTING TO KNOW EACH OTHER WITH blocks.** Have kids sit together in groups of 3-4. Give them a bag full of blocks, and have them pick as many as they want, but don't tell them what they will be doing. After everyone has taken 1-? many blocks, tell them that they must tell everyone one in the group one thing about themselves per block. ● It will be kind of funny because some students may have picked a lot of blocks, but the whole purpose is that they have to stay in task and listen as others as they are sharing. (Have 1-2 kids per group share today, and 1-2 kids per group finish this game tomorrow). (The challenge with playing this game is having kids initiate saying things about themselves. This is a good way of having kids practice initiating, which can involve: clearing their mind, setting a focus, thinking about what they will say, and then just diving into saying their thoughts). The fun part about this is that they will learn things about their peers that they did not know, if they listen closely.

Student Will	1. Students will review Ignacio Igniter and the definition of Initiate with the teacher and how the PFC and ACC of their brains will work better. 2. The students will look at the Initiate brain poster/brain handout which highlights the PFC and ACC. 3. Students will color lightly color the PFC and ACC, if it hasn't been colored, or just point to it. 4. Students will play the game: "Getting to Know Each Other."
Checking for Understanding	

Executive Functions: Initiate

Grade: 3

Cycle 2

Day: 2 (10 minutes)

EF Skill: Initiate

EF Action Figure: Ignacio Ignitor

EF Brain Correspondence: PFC (Prefrontal Cortex), ACC (Anterior Cingulate Cortex), Neurons

Definition of Initiate: Ability to begin tasks in a timely manner. Ability to start another task when finished with first task.

Kid Friendly Definition of Initiate: Initiate means start.

CHIEF Program Slogan: "We are neural gardeners!"

Specific EF Slogan:

> Don't delay your dream
>
> 3-2-1 Blast off!
>
> Don't procrastinate. Initiate!
>
> Just start it!

Objective: Students will learn that they improve their brain PFC (Prefrontal Cortex) and ACC (Anterior Cingulate Cortex) when they initiate tasks. Students will initiate tasks by conducting a "getting to know you" activity.

Standard: Common Core Standard SL1:1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.

Lesson Component:

Teacher Will	1. **Have students play the GETTING TO KNOW EACH OTHER WITH blocks.**
	Have kids sit together in groups of 3-4. Give them a bag full of blocks, and have them pick as many as they want, but don't tell them what they will be doing.
	After everyone has taken 1-? many blocks, tell them that they must tell everyone one in the group one thing about themselves per block.
	• It will be kind of funny because some students may have picked a lot of blocks, but the whole purpose is that they have to stay in task and listen as others as they are sharing. (Have 1-2 kids per group share today).
Student Will	1. Students will review Ignacio Igniter and the definition of Initiate with the teacher and how the PFC and the ACC of their brains will work better.
	2. Students continue playing this game from where they left off yesterday.
	GETTING TO KNOW EACH OTHER WITH blocks.
	Have kids sit together in groups of 3-4. Give them a bag full of blocks, and have them pick as many as they want, but don't tell them what they will be doing.
	After everyone has taken 1-? many blocks, tell them that they must tell everyone one in the group one thing about themselves per block.

	• It will be kind of funny because some students may have picked a lot of blocks, but the whole purpose is that they have to stay in task and listen as others as they are sharing. (Have 1-2 kids per group share today. The challenge with playing this game is having kids initiate saying things about themselves. This is a good way of having kids practice initiating, which can involve: clearing their mind, setting a focus, thinking about what they will say, and just diving into saying their thoughts).
Checking for Understanding	

Executive Functions: Initiate

Grade: 3

Cycle 2

Day: 3-5 (Untimed- used in lesson)

EF Skill: Initiate

EF Action Figure: Ignacio Ignitor

EF Brain Correspondence: PFC (Prefrontal Cortex), ACC (Anterior Cingulate Cortex), Neurons

Definition of Initiate: Ability to begin tasks in a timely manner. Ability to start another task when finished with first task.

Kid Friendly Definition of Initiate: Initiate means start.

CHIEF Program Slogan: "We are neural gardeners!"

Specific EF Slogan:

Don't delay your dream

3-2-1 Blast off!

Don't procrastinate. Initiate!

Just start it!

Objective: To learn how to get started on a task by prioritizing, setting up the environment for the task, overcoming fear, waking up your brain and doing it!

Standards: CCSS Creative Expression 2.1. Explore ideas for art in a personal sketchbook.

Resource for this lesson : http://www.beyondbooksmart.com/executive-functioning-strategies-blog/what-cartoon-characters-teach-us-about-executive-function-skills (T-shirt artwork only used from this site) Please see below as to directions on how this webpage is used as a resource. You do not need to click on the link, as it is only cited as a reference.

Lesson Component:

Teacher Will	**Days 3-4**
	1. Assign an art project. Students will design a t-shirt, as a way of them monitoring how long it would take them to start the task. (Also a Monitoring Monica thing.) Have them draw the following T-Shirt. Give a few minutes for the art piece.
	On Day 3, they can use the same colors, or change the colors, but on Day 4, they must create a different design, and use different colors.
	Have them keep track of how long it took them to get started on both days, and they should notice that on Day 4, they started faster than on previous days. They can also speculate that if they purposely monitor their time, their ability to initiate things they want to do will improve. (This is also a Monitoring Monica thing, an example of Monica helping Ignacio out at getting better at initiating.)
	2.Students chant "We are neural gardeners!"

	Day 5:
	1. Have students will draw 2 more neurons or stars, in orange. Please have the students put these on the PFC and ACC areas of the brain only. Continue to save this worksheet.
	2.On Friday, Day 5, use the website Neuroscience for Kids-Songs and have the kids sing the song, "I've Been Working On My Neurons" to the tune of the "I've been working on the railroad." http://faculty.washington.edu/chudler/songs.html
Student Will	**Day 3 and 4** 1. Students will do an art project. They will design a t-shirt, as a way of them monitoring how long it would take them to start the task. (This is also a Monitoring Monica thing.) Have them draw the following T-Shirt. On Day 3, they can use the same colors, or change the colors, but on Day 4, they must create a different design, and use different colors.

	Have them keep track of how long it took them to get started on both days, and they should notice that on Day 4, they started faster than on previous days. They can also speculate that if they purposely monitor their time, <u>their ability to initiate things they want to do will improve.</u> (This is also a Monitoring Monica thing, an example of Monica helping Ignacio out at getting better at initiating.) 2.Students chant "We are neural gardeners!" **Day 5:** 1. Students will draw 2 more neurons or stars, in orange. Please have the students put these on the PFC and ACC areas of the brain only. Continue to save this worksheet. 2.On Friday, Day 5, use the website Neuroscience for Kids-Songs and have the kids sing the song, "I've Been Working On My Neurons" to the tune of the "I've been working on the railroad." http://faculty.washington.edu/chudler/songs.html
Checking for Understanding	

Executive Functions: Initiate

Grade: 3

Cycle 3

Day: 1 (10 minutes)

EF Skill: Initiate

EF Action Figure: Ignacio Ignitor

EF Brain Correspondence: PFC (Prefrontal Cortex), ACC (Anterior Cingulate Cortex), Neurons

Definition of Initiate: Ability to begin tasks in a timely manner. Ability to start another task when finished with first task.

Kid Friendly Definition of Initiate: Initiate means start.

CHIEF Program Slogan: "We are neural gardeners!"

Specific EF Slogan:

Don't delay your dream

3-2-1 Blast off!

Don't procrastinate. Initiate!

Just start it!

Objective: That students will see their own personal brain as a power station and that they are in control of their brain and their learning.

Introduce: *Our brain has the habit of envisioning the upcoming assignment as a huge workload that seems impossible to do...a giant mountain of an upcoming task.*

Our brain also tends to focus on the most difficult parts or sections, and this is where procrastination begins to set in: as we try to avoid the "hard work", we find ways to skate around it and trick ourselves into thinking that we're busy….but we really have not started on the task. As a class list the things we do to keep ourselves from starting our homework when we feel is

impossible to do. (sharpening a pencil, organizing our backpack, cleaning our binder, etc.). Point out that we tend to distract ourselves.

Standard: CCSS SL1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.

Lesson Component:

Teacher Will	Ask the class to think about what they do when they know they have to get their homework done. Do they wait for their parents to tell them to do the work or do they get started on their own?
	If they wait for their parents, then ask them to think of ways they could get started on their own...and if they already get started on their own ask the students to write down three ways they motivate themselves to start doing their homework.
	Have the students share their three ways with a partner. Monitor the room as they are sharing.
	Select a few students to share their ideas with the entire class. Tell the students that tomorrow they will work on learning some more ways to begin a task that is a challenge to start.
Student Will	Participate in the discussion.
	Write three ways they motivate themselves to get started on tasks.
	They share with partners.
Checking for Understanding	Ask students which action figure helps them to initiate and why.

Executive Functions: Initiate

Grade: 3

Cycle 3

Day: 2 (10 minutes)

EF Skill: Initiate

EF Action Figure: Ignacio Ignitor

EF Brain Correspondence: PFC (Prefrontal Cortex), ACC (Anterior Cingulate Cortex), Neurons

Definition of Initiate: Ability to begin tasks in a timely manner. Ability to start another task when finished with first task.

Kid Friendly Definition of Initiate: Initiate means start.

CHIEF Program Slogan: "We are neural gardeners!"

Specific EF Slogan:

> Don't delay your dream
>
> 3-2-1 Blast off!
>
> Don't procrastinate. Initiate!
>
> Just start it!

Objective: Students will create a **plan** on what they will do first, second and third for their **goal** of completing homework.

Standard: CCSS SL1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.

Note to Teacher: This cycle is unique for we will be integrating multiple EF skills throughout the various lessons. As you may be aware, multiple EF skills are utilized simultaneously to complete most tasks.

Lesson Component:

Teacher Will	Use Homework as the common goal students will work on to practice the skill of initiating or starting a task:
	How to Find Motivation to Do Homework
	Questions and Answers
	Very few students like to do homework and everyone seems to put it off. After all, why start your work now when you can watch another episode of your favorite TV show?
	Usually, the problem isn't an unwillingness to do the homework at all, the problem, most of the time, is finding the motivation, and then starting your task. Now it's time to learn how to get over your procrastination and to become motivated to study. In the long run homework is good and teachers set it to help you learn more.
	Step 1 is to **PLAN and Organize**
	Plan ahead to have free-time after school. If you go to the after school program, do as much of your homework as you can. The more you do while you are at school, the less you will need to do at home. Ask your teachers while they are available: they are there to assist you. Let

	them help you. Teachers are willing to help you after school if you ask. Put the hardest homework at the top of your list. Why? Well, this allows you to kick it up a notch! You can start working until you get to a problem you need to think about…move on, and continue re-thinking about that problem as you complete your other pieces of homework. Then your subconscious mind has some time to process that problem...then go back to it and try it again. By using this method of moving on you will get your homework done. And, you will give your mind time to remember and to make connections to the lessons you were taught by your teacher in class. Having a **PLAN** and **Organizing** on how you are going to do your homework will motivate you to START (**Initiate**) your homework. Have students write down a PLAN on how they are going to do their homework. That way when they get home they will be more motivated to use the Executive Function of Initiate to get their homework done.
Student Will	Listen to the teacher and participate in the discussion. Make a PLAN on how they are going to do their homework. (not a time…but what piece of homework they will do first, second and so on)

	Follow their PLAN that night when they do their homework and come back to class the next day prepared to talk about their experience.
Checking for Understanding	Students will have a realistic plan completed for the teachers to see.

Executive Functions: Initiate

Grade: 3

Cycle 3

Day: 3-5 (Untimed- used in lesson)

EF Skill: Initiate

EF Action Figure: Ignacio Ignitor

EF Brain Correspondence: PFC (Prefrontal Cortex), ACC (Anterior Cingulate Cortex) , Neurons

Definition of Initiate: Ability to begin tasks in a timely manner. Ability to start another task when finished with first task.

Kid Friendly Definition of Initiate: Initiate means start.

CHIEF Program Slogan: "We are neural gardeners!"

Specific EF Slogan:

Don't delay your dream

3-2-1 Blast off!

Don't procrastinate. Initiate!

Just start it!

Objective: Over the next 3 days the students will refine their homework Plan and how they will motivate themselves to get started on their homework.

Standard: CCSS SL1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.

Note to Teacher: This cycle is unique for we will be integrating multiple EF skills throughout the various lessons. As you may be aware, multiple EF skills are utilized simultaneously to complete various task.

Lesson Component:

Teacher Will	Day 3:
	Spend about two minutes discussing with the class their homework experience from the night before.
	Introduce the next concept of
	Organizing yourself so it will become easier to get started on your homework:
	Make a **routine (Organizing)**. A routine will get you into doing homework as a habit. **Schedule (Organize)** the time you will work on your homework. If you have one hour between school and your soccer or football practice, schedule the time to get **started (Initiate)** on your homework for that time, before you are too exhausted from practice to focus on your assignments.
	Have students report when they will actually do their homework...an exact time after school.
	Day 4:
	Ask the class about their homework experience the night before...allow time for a small class discussion.
	<u>Introduce the concept of **prioritizing (Plan)** the work:</u>
	Prioritize. Divide your homework according to your ability in the subject, for instance. What are the concepts you struggle with? Then tackle that first. If you get stuck, take a **break (Refuel)** from that task and move to an easier assignment. If it's a long-term project, chunk it into smaller portions and do that portion last, a little each day. Not that it's not as important. But you need to spend

	the most time on what is due the next day, i.e. prioritize (**Plan**) and a work <u>a short time</u>, <u>but every day</u>, <u>on longer assignments.</u> (Scheduling is a form of **Organize**)
	Have students write down the type of homework they can get done quickly, and the type of homework that takes them a longer period of time to do. Have a classroom discussion that involves giving suggestions on how students might prioritize their homework.
	Have students make a list or plan on which pieces of homework they will do first and second based on their priorities that evening. (**Plan- prioritize. Organize- sequence activities**) Tell them to be prepared to have a discussion about their experience tomorrow in class.
	Day 5:
	Reflection/ Evaluation/ Monitor
	Have students review their homework accomplishments for the week. Did they do better this week? What tools did they use to help themselves become motivated to finish their homework? What did they learn from this experience?
Student Will	
	Day 3:
	Participate in the discussion. Make a routine for getting homework done.

	Day 4 Report the homework experience from the night before, participate in the discussion. Learn how to prioritize the homework. Day 5: Report the homework experience from the night before using the prioritized method. Evaluate the homework experience from the week and **monitor** by checking to see if all pieces of homework were completed that week.
Checking for Understanding	Teacher will check to see that students have completed the tasks. Make sure to bring into the discussion the EF Action Figures when talking about the various Executive Function Skills that are used to help a person use the Executive Function of Initiate.

Executive Functions: Organize

Grade: 8

Cycle 1

Day: 1 (10 minutes)

EF Skill: Organize

EF Action Figure: Ozzie Organizer

Definition of Organize: The ability to design and maintain methods to support the "planning" for a goal. This often includes systematically tracking, scheduling, categorizing, sequencing etc. to enhance efficiency.

Kid Friendly Definition of Organize: Organize means you have a system to keep track of your materials, your time, and your ideas, so that you can really get to your goal.

Specific EF Slogan: It's easier to reach your dream when you are organized.

Objective: Students will understand what organize is.

Lesson Component:

Teacher Will	• Display Ozzie the Organizer • Talk about who Ozzie is and what he does • Read to students the definition of organize
Student Will	• Explain what it is to organize
Checking for Understanding	• As a "ticket out the door", have students write down the definition of organize.

Executive Functions: Organize

Grade: 8

Cycle 1

Day: 2 (10 minutes)

EF Skill: Organize

EF Action Figure: Ozzie Organizer

Definition of Organize: The ability to design and maintain methods to support the "planning" for a goal. This often includes systematically tracking, scheduling, categorizing, sequencing etc. to enhance efficiency.

Kid Friendly Definition of Organize: Organize means you have a system to keep track of your materials, your time, and your ideas, so that you can really get to your goal.

Specific EF Slogan: It's easier to reach your dream when you are organized.

Objective: Students will demonstrate the understanding of "organize"

Lesson Component:

Teacher Will	- Review who Ozzie the Organizer is and what he does - Review what it means to organize - Ask students describe to their neighbor how their clothes are organized in their dresser (ie: socks in one drawer, shorts in another etc.)
Students Will	Have students draw a picture of how their bedroom is organized.
Checking for Understanding	Students will present their drawings to a partner and explain the organization.

Executive Functions: Organize

Grade: 8

Cycle 1

Day: 3

EF Skill: Organize

EF Action Figure: Ozzie Organizer

Definition of Organize: The ability to design and maintain methods to support the "planning" for a goal. This often includes systematically tracking, scheduling, categorizing, sequencing etc. to enhance efficiency.

Kid Friendly Definition of Organize: Organize means you have a system to keep track of your materials, your time, and your ideas, so that you can really get to your goal.

Specific EF Slogan: It's easier to reach your dream when you are organized.

Objective: For students to demonstrate understanding of "organize"

Common Core Standard: SL8.5

Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Lesson Component:

Teacher Will	• Review "Organize" and Ozzie the Organizer activities from Day 1 and 2 • Teacher will model "organize" by showing students examples of Powerpoint presentations and pointing out how they are laid out and organized.
Student Will	• Get into their assigned groups from last week.

	• They will discuss and determine important information needed to highlight in their Powerpoint presentation
Checking for Understanding	• Teacher will review all groups work. • Teacher will walk around room and provide support.

Executive Functions: Organize

Grade: 8

Cycle 1

Day: 4

Objective: For students to demonstrate understanding of "organize"

Common Core Standard: SL8.5

Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Lesson Component:

Teacher Will	- Review "Organize" and Ozzie the Organizer activities from Day 1-3 - Teacher will review "organize" and students examples of Powerpoint organization.
Student Will	They will organize their Powerpoint presentations

Executive Functions: Organize

Grade: 8

Cycle 1

Day: 5

Objective: For students to demonstrate understanding of "organize"

Standard: CCSS: SL8.5

Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

Lesson Component:

Teacher Will	• Review "Organize" and Ozzie the Organizer activities from Day 1-4 • Teacher will review "organize" and students assignment of Powerpoint organization.
Student Will	• They will finish organizing their Powerpoint presentations • They will present before and after examples of their organization to another group.
Checking for Understanding	• Teacher will review all groups work. • Teacher will walk around room and provide support.

Executive Functions: Organize

Grade: 8

Cycle 2

Day: 1 (10 minutes)

EF Skill: Organize

EF Action Figure: Ozzie Organizer

EF Brain Correspondence: PFC (Prefrontal Cortex), Neurons

Definition of Organize: The ability to design and maintain methods to support the "planning" for a goal. This often includes systematically tracking, scheduling, categorizing, sequencing etc. to enhance efficiency.

Kid Friendly Definition of Organize: Organize means you have a system to keep track of your materials, your time, and your ideas, so that you can really get to your goal."

CHIEF Program Slogan: "We are neural gardeners!"

Specific EF Slogan: It's easier to reach your dream when you are organized.

Objective: To learn how to organize our mind, so our mind will be enable us to accomplish the goal we are working on. (Objective by the end of the week is to be organized as we move forward working towards mastery of our long term goal.)

Lesson Component:

Teacher Will	Display Ozzie the Organizer. Remind students who Ozzie is and what he does. Read to students the definition of organize.

Student Will	Explain what it is to organize. As a "ticket out the door", students will write down the definition of organize.
Checking for Understanding	Exit ticket of organize definition

Executive Functions: Organize

Grade: 8

Cycle 2

Day: 2 (10 minutes)

EF Skill: Organize

EF Action Figure: Ozzie Organizer

EF Brain Correspondence: PFC (Prefrontal Cortex), Neurons

Definition of Organize: The ability to design and maintain methods to support the "planning" for a goal. This often includes systematically tracking, scheduling, categorizing, sequencing etc. to enhance efficiency.

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Objective: To learn how to organize our mind, so our mind will be enable us to accomplish the goal we are working on. (Objective by the end of the week is to be organized as we move forward working towards mastery of our long term goal.)

Lesson Component:

Teacher Will	Review who Ozzie the Organizer is and what he does. Display picture of brain that shows which part of the brain is being used when getting organized.
	Explain that organize uses the prefrontal cortex.
	Hand out a blank picture of the brain to each student.

	Using the picture that you displayed to the students, have students color their pictures of the brain and label the prefrontal cortex. Review what it means to organize. Ask students describe to their neighbor how they like to organize their school binder. Is it by subject? Do you use dividers? Do you have a folder for homework? Is there a calendar or planner in it?
Student Will	Label and color brain. Discuss with group helpful tips on how they stay organized with their binder.
Checking for Understanding	• Colored picture of brain • Correct labeling of brain

Executive Functions: Organize

Grade: 8

Cycle 2

Day: 3-5 (Untimed- used in lesson)

EF Skill: Organize

EF Action Figure: Ozzie Organizer

EF Brain Correspondence: PFC (Prefrontal Cortex), Neurons

Definition of Organize: The ability to design and maintain methods to support the "planning" for a goal. This often includes systematically tracking, scheduling, categorizing, sequencing etc. to enhance efficiency.

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Specific EF Slogan: It's easier to reach your dream when you are organized.

Objective: To learn how to organize our mind, so our mind will be enable us to accomplish the goal we are working on. (Objective by the end of the week is to be organized as we move forward working towards mastery of our long term goal.)

Standard: CCSS: WHST 8.1.a. Write arguments focused on discipline-specific content. a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

Lesson Component:

Teacher Will	Day 3:
	1. Review the definition of "Organize" and Ozzie the Organizer activities from Day 1 and 2, and the

	picture of the brain using the PFC (prefrontal cortex.) 2. Tell students that they will be using their PFC when doing the following activity: Give students a list of events leading up to the Revolutionary War (or any other event if you are not currently studying the Revolutionary War.) Students will organize these events into different categories ie: in order of dates, in order of importance, in order of outcome etc. Day 4: 1. Pose the question: Why is it important for us to know that the PFC is the part of the brain that helps us with Organization? (Suggested: project question, write it on chart paper etc…) 2. Have students discuss with a partner. 3. Call on volunteers to answer but if there are no volunteers call on students randomly. Day 5: 1. Review PFC and Organization 2. Have students organize a timeline in which they will place the famous speeches, such as Washington's Farewell Address, Jefferson's 1801 Inaugural Address, John Q. Adams' Fourth of July 1821 Address). 3. Students can choose to present to the class or small group.
Student Will	Day 3-5 1. Students will organize these events into different categories ie: in order of dates, in order of importance, in order of outcome etc. 2. Discuss 3. Make a Timeline

Checking for Understanding	Final Products

Executive Functions: Organize

Grade: 8

Cycle 3

Day: 1 (10 minutes)

EF Skill: Organize

EF Action Figure: Ozzie Organizer

EF Brain Correspondence: PFC (Prefrontal Cortex), Neurons

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Kid Friendly Definition of Organize: Organize means you have a system to keep track of your materials, your time, and your ideas, so that you can really get to your goal."

CHIEF Program Slogan: "We are neural gardeners!"

Specific EF Slogan: It's easier to reach your dream when you are organized.

Objective: To learn how to organize our mind, so our mind will be enable us to accomplish the goal we are working on. (Objective by the end of the week is to be organized as we move forward working towards mastery of our long term goal.)

AVID Component Option: Cornell Notes (Check Teacher Will and Student Will Section)

Lesson Component:

Teacher Will	Display Ozzie Organizer. Remind students who Ozzie is and what he does. Read to students the definition of organize. Remind students which part of the brain is being used when organizing.

	AVID Component: Show students the example of Cornell Notes and how it is organized.
Student Will	Explain what it is to organize. As a "ticket out the door", students will write down the definition of organize. AVID Component: Students will use the Cornell Notes to organize a lesson the teacher gives.
Checking for Understanding	• Exit ticket of organize definition

Executive Functions: Organize

Grade: 8

Cycle 3

Day: 2 (10 minutes)

EF Skill: Organize, and Goal, Monitor, Sustained Attention

EF Action Figure: Ozzie Organizer, and Goliath Goal, Monitoring Monica, Sustained Attention

EF Brain Correspondence: PFC (Prefrontal Cortex), Neurons

Definition of Organize: The ability to design and maintain methods to support the "planning" for a goal. This often includes systematically tracking, scheduling, categorizing, sequencing etc. to enhance efficiency.

Kid Friendly Definition of Organize: Organize means you have a system to keep track of your materials, your time, and your ideas, so that you can really get to your goal.

CHIEF Program Slogan: "We are neural gardeners!"

Specific EF Slogan: It's easier to reach your dream when you are organized.

Objective: To learn how to organize our minds, so our minds will enable us to accomplish the goals we are working on. By the end of the week, we will aim (short term **goal**) to be **organized** as we move forward working towards mastery of our long term goal.

AVID Component: Binder Check (See Teacher Will, Student Will Section, and Check for Understanding)

Lesson Component:

Teacher Will	Review with students the 10 ideas listed below about how to stay organized as a student. Notice how #1 is having a goal. Again this shows how common it it to integrate EF skills. **GOALS.** Start by setting several

goals you would like to achieve this year. Once you have determined your goals, break them down into smaller, mini-goals. Studies have shown that writing down your goals increases the likelihood that they will be achieved. Once you have set your mini-goals for the week or month, write them down
in a planner or notebook. Review these goals from time to time and check them
off as you complete them.

GIVE YOURSELF PLENTY OF **TIME** EACH MORNING. (**Organize**) Think about how much time you need in the morning to get ready for school. If it takes you an hour to get out of bed, shower, and walk to school, then wake up at least an hour and 15 minutes before you need to leave will ensure that you're not left scrambling to get out the door in time.

LAY OUT YOUR CLOTHES THE NIGHT BEFORE. To save **time** (**Organize**) in the morning, plan what you will wear the night before. Laying out your clothes in advance will help you to avoid rushing around to find something to wear the next morning.

GET ORGANIZED. As the school year progresses, students tend to hang on to unnecessary clutter. You can help yourself stay organized by cleaning out your binder and backpack regularly. Make sure that you have a designated folder for important papers, such as announcements, graded work, and ongoing projects. Keep your notes organized in a notebook or binder with

labeled tabs. Throw away any papers that you no longer need at the end of each week.

CREATE A DAILY AGENDA. Set aside some time each day to write out a To Do list of all of the things you need to accomplish that day. (**Organize**)

As you complete each task, you can check it off of your list. (**Monitor**)

FIND A QUIET PLACE TO STUDY. Find a quiet, comfortable area to study and complete your homework each day. Make sure that is area is well-lit and free from distractions, such as a television. (promotes **Sustained Attention**)

GET PLENTY OF SLEEP. Go to bed at a regular time each night to ensure that you get plenty of sleep for the next day. Studies suggest that teenagers need between 8-9.5 hours of sleep each night. Getting enough sleep will help you to be more alert and prepared to learn each day. (**Sustained Attention**)

EAT YOUR FRUITS AND VEGGIES. You can help yourself stay healthy by eating three balanced meals each day. Avoid eating too many sugary snacks as they can make you feel tired. (Improves **all EF skills**)

	USE A PLANNER. Write down assignments, tests, and other important dates/events in a student planner. This will help you stay **organized**, and if you ever forget what you need to do, you can easily refer back to your planner to check. **SCHEDULE YOUR WORK TIME.** Set aside a specific time each day to study and complete your homework. For example, you may choose to **schedule (Organize)** your work time between the hours of 3-4 every day. If you know that you have a big test coming up and that you'll need additional study time, try adding 30 minutes or an hour to your schedule each day that week. Don't wait until the night before and try to squeeze in 5 hours of study time at once. You should also know that you usually learn better with shorter, distributed, review/practice than you do with one long, marathon, review/practice session. Helpful resource for additional information: http://www.getorganizednow.com/art-students.html Avid Component: Show how the AVID binder is organized and demonstrate where each thing needs to be in the binder.
Student Will	Listen as teacher reviews list on organization. Encourage students to take brief notes as you discuss. AVID Component: Students organize their AVID binder and check to ensure that it is correctly organized.

| Checking for Understanding | • Student notes
AVID Component: Check students' binders. |

Executive Functions: Organize

Grade: 8

Cycle 3

Day: 3-5 (Untimed- used in lesson)

EF Skill: Organize, and Goal, Plan

EF Action Figure: Ozzie Organizer, and Goliath Goal, Peter Plan

EF Brain Correspondence: PFC (Prefrontal Cortex), Neurons

Definition of Organize: The ability to design and maintain methods to support the "planning" for a goal. This often includes systematically tracking, scheduling, categorizing, sequencing etc. to enhance efficiency.

Kid Friendly Definition of Organize: Organize means you have a system to keep track of your materials, your time, and your ideas, so that you can really get to your goal.

CHIEF Program Slogan: "We are neural gardeners!"

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Objective: To learn how to organize our mind, so our mind will be enable us to accomplish the goal we are working on. (Objective by the end of the week is to be organized as we move forward working towards mastery of our long term goal.)

Standard:

Day 3: CCSS: SL 8.1 - Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.

Day 4: CCSS: Literacy W 8.4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Day 5: CCSS: Literacy W 8.4 - Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

Lesson Component:

Teacher Will	Day 3:
	Review "Organize" and Ozzie Organizer activities from Day 1 and Day 2. Remind students of the 10 ideas to help keep them organized. Pass out a copy for each student to have.
	Ask students to highlight in yellow, all of the ideas they need to work on.
	Have students highlight in green all of the ideas they hope to try.
	Compare their results with their neighbor.
	Have students make a plan to carry out these ideas.
	Day 4:
	Explain that good writers use the EF skill of organizing before they start writing. Today, students will practice organizing their thoughts on a topic using a graphic organizer.
	You may choose to have students draw a simple graphic organizer on a sheet of paper (five boxes in total, one for the introduction, three for the body, one for the conclusion) or find a pre-made organizer online.
	Give the class a sample essay topic to use for this activity. Afterward, have students work with a partner to complete the graphic organizer and decide which information they will include in each paragraph. How will the introduce their topic in the first paragraph? Which

	sub-topics will they discuss in the body paragraphs? What information will they include in their conclusion? Day 5: Repeat activity from Day 4 using a different sample topic or essay type. For example, if you had students practice creating an organizer for a narrative paper, you may now have them practice creating an organizer for a persuasive essay.
Student Will	Day 3: Students will highlight and discuss as directed by the teacher. Day 4: Working with a partner, students will complete a graphic organizer for a sample essay topic as described above. Day 5: Students will work with a partner to create a graphic organizer for a persuasive essay about a topic they choose.
Checking for Understanding	Have students submit their graphic organizers at the end of the period. Review student work and discuss common errors the following day as a warm up activity. Repeat activity from Day 4 using a different sample topic or essay type. For example, if you had students practice creating an organizer for a narrative paper, you may now

	have them practice creating an organizer for a persuasive essay.

Appendix C

Ignacio Igniter
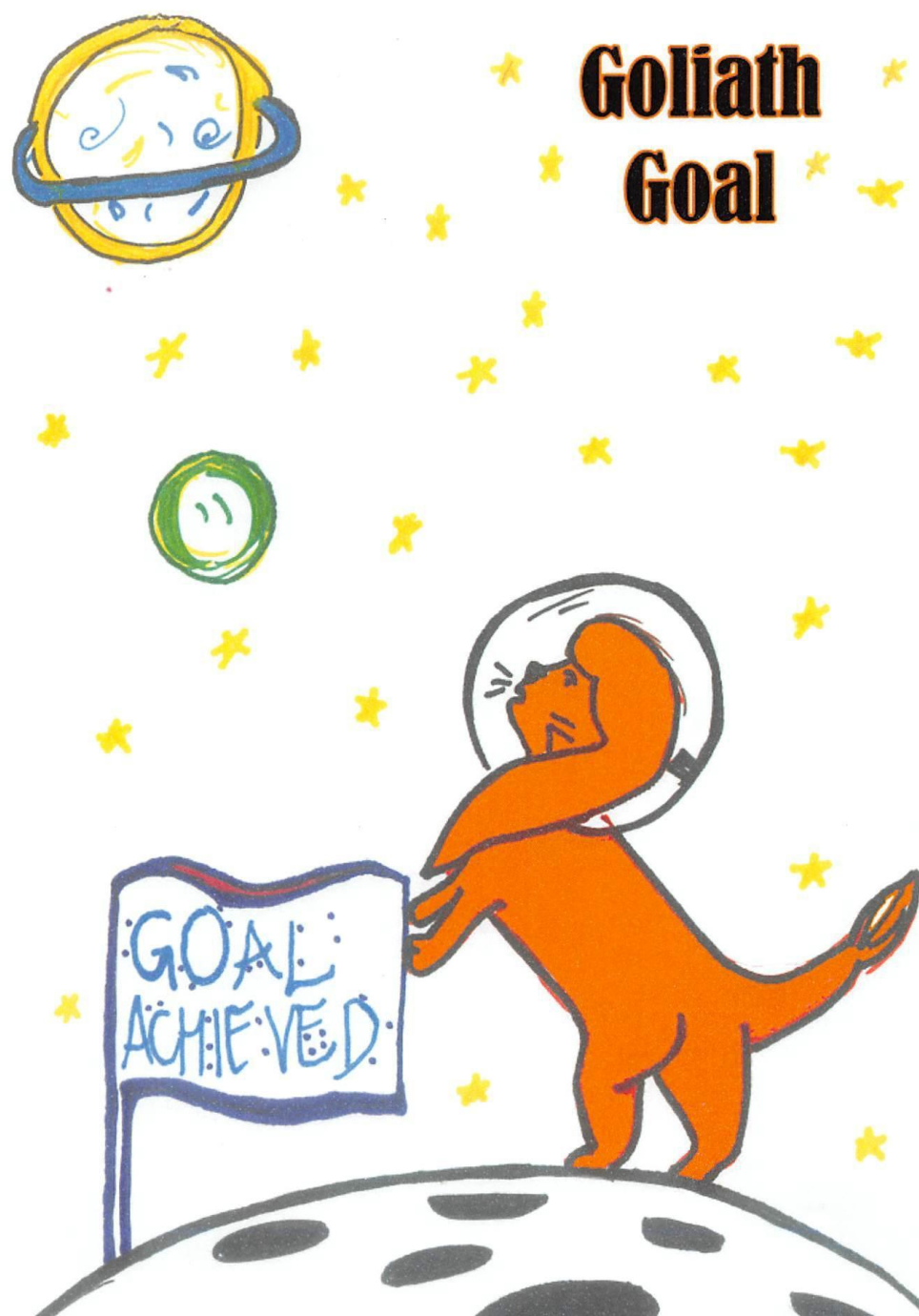
Ozzie Organizer
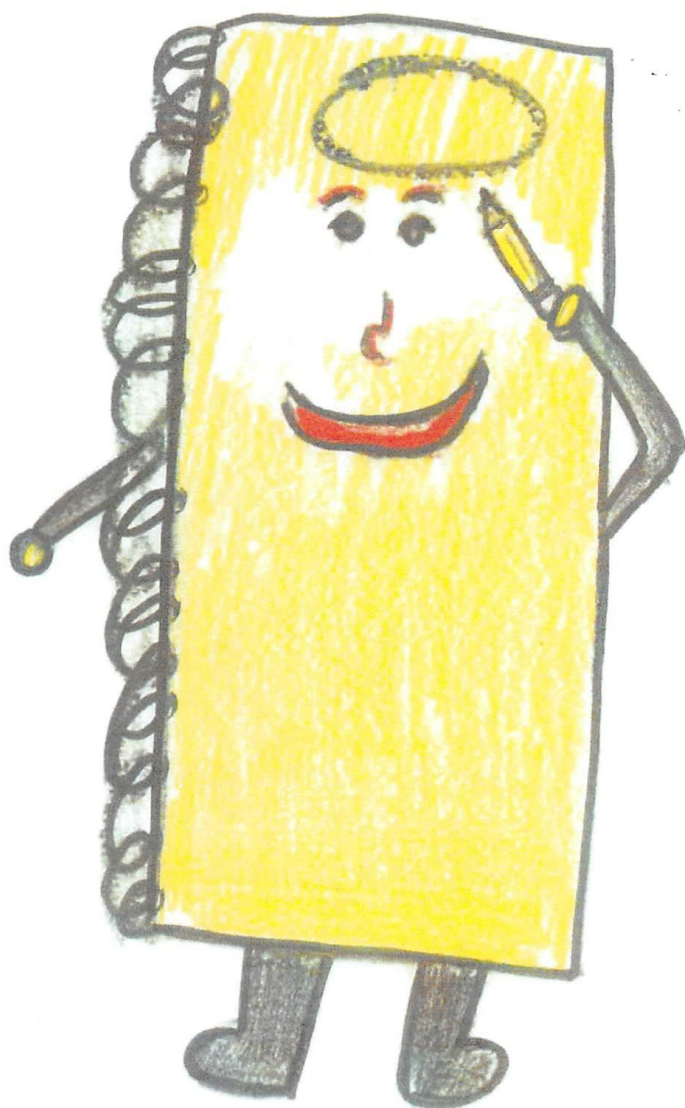
Appendix D

Quotes for Goal

MONDAY
Nothing can stop the man with the right mental attitude from achieving his goal; nothing on earth can help the man with the wrong mental attitude.
Thomas Jefferson

TUESDAY

What you get by achieving your goals is not as important as what you become by achieving your goals.

Zig Ziglar

WEDNESDAY

Setting a goal is not the main thing. It is deciding how you will go about achieving it and staying with that plan.

Tom Landry

THURSDAY
The greater danger for most of us lies not in setting our aim too high and falling short; but in setting our aim too low, and achieving our mark.

Michelangelo

FRIDAY
Review your goals twice every day in order to be focused on achieving them.
Les Brown

Quotes for Initiation

Monday

What you do today can improve all your tomorrows.
Ralph Marston

Tuesday

Aim for the moon. If you miss, you may hit a star.
W. Clement Stone

Wednesday

Things do not happen. Things are made to happen.
John F. Kennedy

Thursday

Accept the challenges so you can feel the exhilaration of victory.

George S Patton

Friday

Do something today that your future self will thank you for.

Author unknown

Quotes for Organize

Monday

Organizing s what you do before you do something, so that when you do it, it is not all mixed up.

AA Milne

Tuesday

Organization is the foundation to get the rest of my life in gear.

Kathi Lipp

Wednesday

Being organized is being in control.

Unknown

Thursday

Stop waiting for the perfect time to be organized. That this moment and make some progress.

Heidi Leonard

Friday

Organizing is really just one big game of Tetris.

Unknown

Appendix E

Review of Planners

Where do I start?

- All planner sessions should be conducted soon after the school day or period starts.

    -The purpose is to look at the day ahead, plan, goal set, and monitor, etc. It is important that they develop the habit of looking into future possibilities/outcomes.

How do I use them?

- The planners aren't just for homework any more. The teacher can choose among the many options. Since the planners cover grade spans, the teacher can adjust the activity as needed to match age/grade level skills.

    - The planners can be used to support time management, goal monitoring for AR progress monitoring and class projects, vocabulary development, organization, parent communication and many others.

    - The planners for each of the EF schools also address goals, emotions, monitoring and evaluating actions, and reach beyond academic tasks.

- Kindergarten teachers may elect to give planners to students to keep only at school, or to take home, or neither. However, regardless of the student's possession of planners, the planner sessions should be conducted.

How long will this take?

- The planner sessions should initially last approximately 10-15 minutes. The teachers and the students will become more accustomed to doing them. At that point sessions are likely to shrink down to less than 10 minutes due to familiarity.

Why am I doing this?

- The Planner sessions and EF Development Program is for gen ed and special ed students.

    -Planners help students plan their day, organize their time, and prioritize what they need to do. Planners are not only starting the day off with EF skills, but also helps them monitor their progress throughout the year.

Primary Planner
(Letter of the Week)

1 Week Plan: (10 minutes per day)

Objective: A creative way to get your kids thinking about the past, present and future.

Letter of the Week: C ...Check

Animal Friends: Chase Checks off his work when it's done. Do you check off your work when it's done?

Definition: The act of inspecting or verifying.

Monday	-Read Animal Friends. -Give the definition of check. -Give examples of things students might check. (LOW 1) -Students give their ideas on the meaning of check.
Tuesday	-Review Animal Friends. -Review the definition of check. -Provide examples of how to check. (LOW 2) -Students explain what they see.
Wednesday	-Review Animal Friends. -Review examples of check. -Students explain what they see. (LOW 1) -Students provide real life samples of how they use check.
Thursday	-Review Animal Friends. -Review definition of check. -Provide checklist template for students to complete. (LOW 3) -Go over with students how to check off the list. (LOW 3)
Friday	-Review Animal Friends. -Review definition of check. -Provide blank template for students to complete. (LOW 4) -Have students create a checklist for...Samples...Homework, Taking an AR Quiz, Brushing their teeth, Cleaning their room etc.

Elementary Planner
(Words of the Week...WOW)

1 Week Plan: (10 minutes per day)

Objective: To increase students spelling and reading.

Words of the Week:

Problem	We'll	Brought	Major	Sopranos
Basic	Great	Career	Voice	Annoy
Elements	Each	Possible	Middle	Excited
Declared	Suddenly	Des Moines	Requirement	Rejuvenate

Words of the Week

SPELLING

1. dinosaur
2. pollution
3. qualify
4. disconnect
5. exercise
6. secretary

Monday	-Go over words of the week. -Go over spelling patterns. -Have students manipulate their words of the week to create new ones on their whiteboards.
Tuesday	-Review words of the week. -Review spelling patterns. -Go over the "Four Square" template. (WOW 1) -Have students spell a word as they exit your class for recess.
Wednesday	-Review words of the week. -Go over the "Four Square" template (WOW 1) -Create 4 "Four Square" using their words of the week.
Thursday	-Review the words of the week. -Have students create 6 "Four Square" of selected words.
Friday	-Review the words of the week. -Play around the world with words of the week mixing it up between using word in a sentence, spelling the word, giving a definition to the word or reading the word.

Intermediate Planner

(Weekly Word…WW)

1 Week Plan: (10 minutes per day)

Objective: To increase your students vocabulary.

Weekly Word: ephemeral

Synonyms	Antonyms	Sentence Samples
transitory, transient, fleeting, passing, lived, momentary, brief, short	Permanent	-To go through very **ephemeral** thought processes which did not necessarily need to reach any tangible conclusions. -Yet it's often the **ephemeral** moments which are the most precious 20 years on.

Definition: adj: lasting only one day or a very short time.

Monday	-Go over the weekly word and its definition. -Go over that it is an adjective and that it is used to modify or describe a noun. -Have students write the word and the definition in a notebook. -Post word and definition. -Use the word throughout the day (teacher and students).
Tuesday	-Review the weekly word and its definition. -Have students use the word in a sentence. -Have students find the antonyms and synonyms of the word and write in notebook.
Wednesday	-Review weekly word and definition. -Students provide examples of words in a sentence. -Model to students how to create a Mad Lib using weekly word. (WW 1)
Thursday	-Review weekly word and definition. -Have students create their own Mad Lib making corrections as needed.
Friday	-Review weekly word and definition. -Have students complete another student's Mad Lib making corrections as needed.

Appendix F
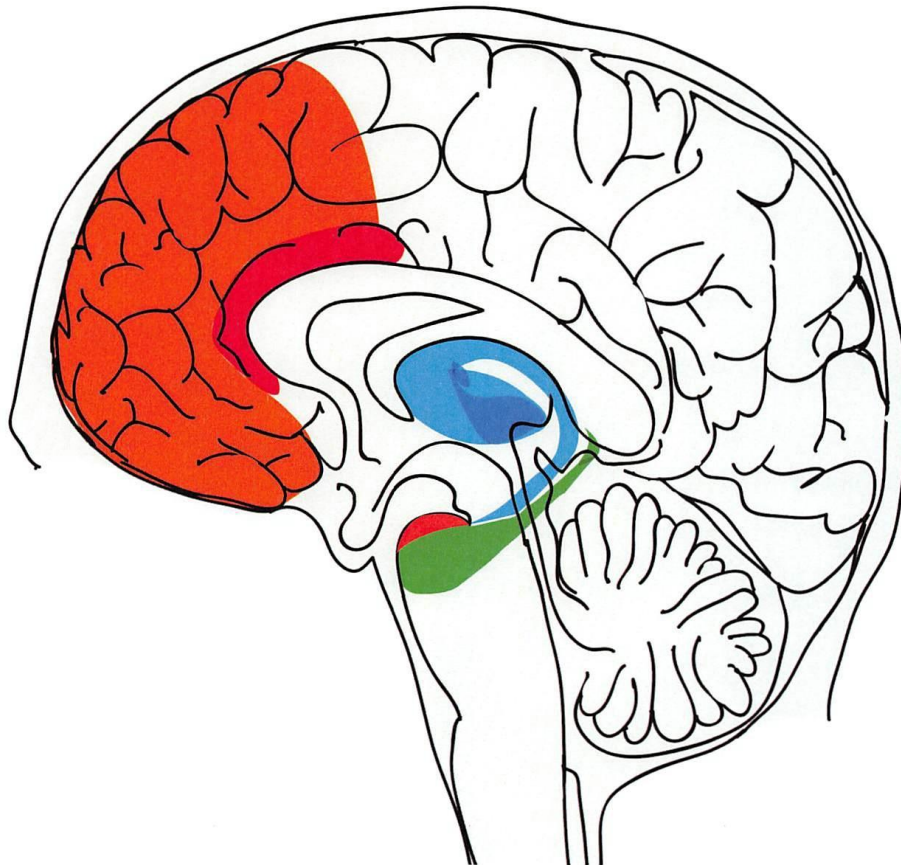
Goal: *Whole Brain*

- **PFC** (Prefrontal Cortex)
- **LS** (Limbic System)
  Hippocampus
  Amygdala
- **BG** (Basal Ganglia)
- **ACC** (Anterior Cingulate Cortex)
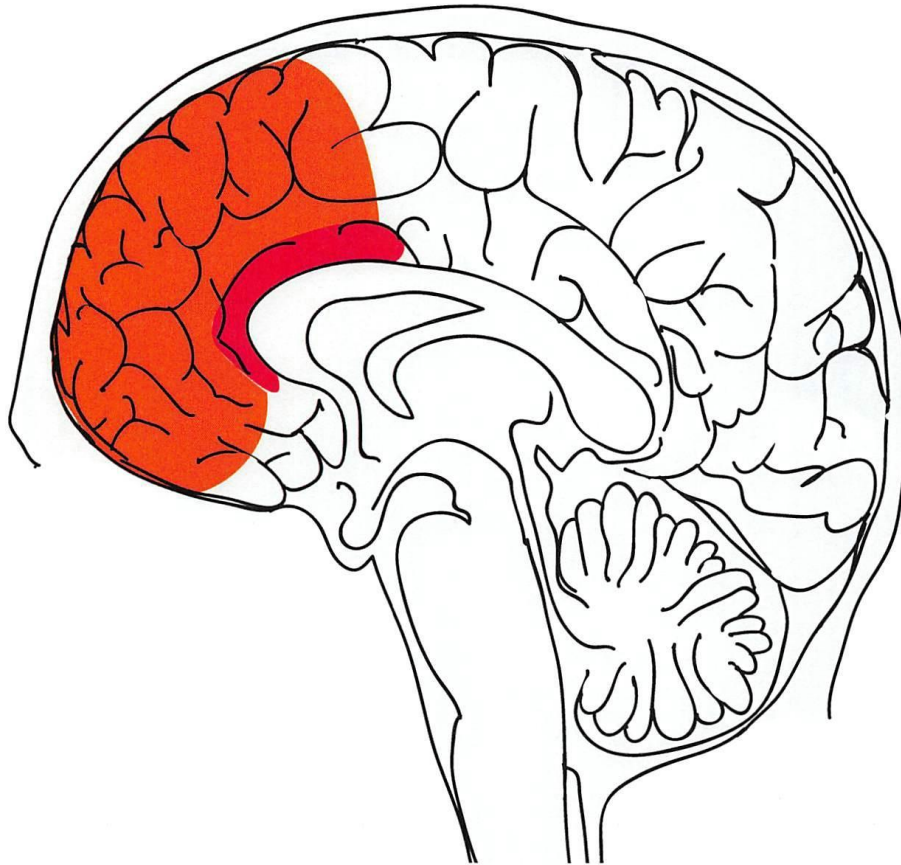
Initiate

- **PFC** *(Prefrontal Cortex)*
- **ACC** *(Anterior Cingulate Cortex)*
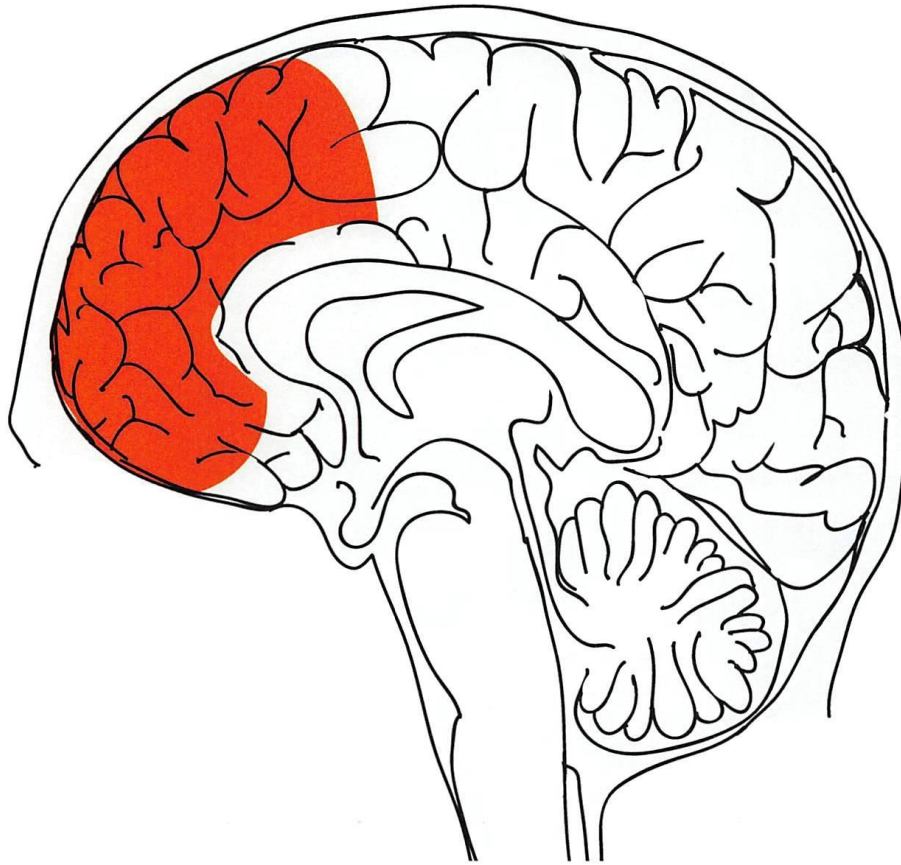
Organize

- **PFC** *(Prefrontal Cortex)*

Appendix G

EF Professional Development
Initial Agenda

Prezi on weaknesses vs strengths

- Review common weaknesses and where we want kids to be

EF Questionnaire

EF already Going on Campus

- Kindergarten, 4x4, etc. and student success examples
- AVID, common writing process and graphic organizers, 4 squares, 8 squares/"tutor", recipe

Strategies in the Classrooms

-Blank Tree Activity (teachers fill in what they already do)

Expectations and Rollout

- Calendar of lessons
- Find digital copy on Google Docs

Lesson Plans

- Day 1, 2, 3-5 Plan
- Lesson examples
- Action Figures

Planners

- Components (word of the week, weekly AR goal, etc)

Closing Activity

- M&M sharing (Teachers get snack size bag, go around the group, pull one M&M at a time)
    o Brown – share a strategy you do/will use for working memory
    o Blue - share a strategy you do/will use for refuel
    o Yellow - share a strategy you do/will use for sustained attention
    o Red - share a strategy you do/will use for inhibition
    o Green - share a strategy you do/will use for organization
    o Orange - share a strategy you do/will use for shift/flexibility

Appendix H

Executive Function Questionnaire

-        Executive functions include planning, managing time, remembering, and reasonably controlling emotional states. The clinician's assessment of an individual's answers to the questions below (and also of the individual's family's answers, if possible) can help determine whether a patient is experiencing a deficit in executive functions.

-        A common cause of Executive Function Disorder is ADD, but there are other causes as well, such as depression, Alzheimer's, schizophrenia, and anxiety. For this reason, simply adding up an individual's score on all the questions is not useful for making the diagnosis of ADD. The main value of the questionnaire is to identify issues that are important to assess when carrying out an evaluation. Clinical judgment and experience are required to interpret the answers and make the proper diagnosis.

Scoring Key

Answer how well each statement describes you when you don't use special aids or tricks you have developed to get around or compensate for difficulties you might have. Score each answer as follows:

0 -   doesn't describe me at all

1 -   describes me somewhat

2 -   describes me pretty well

3 -   describes me very well

Score

	Score
INITIATION	
I have trouble getting started doing things	
I procrastinate	
COMPLETION	
I have trouble completing things	
EXECUTION	

I don't do tasks efficiently (good job in short time)	
It is hard for me to do two or three tasks in a row.	
I don't always do what needs to be done.	
DISTRACTION	
I am easily distracted by things I hear or see even when I am trying to concentrate	
PERSEVERANCE AND FOCUS	
I don't stick to tasks that are optional	
I can't stick to a task even if I have to	
I often switch from doing one thing to another	
INATTENTIVENESS	
I don't pay attention when I should	
I day dream/space out	
I have trouble listening while others speak to me	
I am absent minded	

Score

MEMORY	
I have trouble remembering things I want to do	
I get so deeply into one thing that I forget others	
I have trouble with my short term memory	
I lose or misplace things	

TIME	
I confuse appointment times	
I forget appointments	
I am often late for appointments	
FUTURE AWARENESS AND PLANNING	
I have trouble making plans long in advance	
I let my gas tank needle get close to empty	
I rarely get to trains at least 10 minutes early	
ORGANIZATION	
I get disorganized	
My personal work area is messy	
I put on my seat belt after the car has started moving	
I don't prioritize or plan my day	
I can't work well without structure or direction	
I have difficulty taking command of my time.	
I waste a lot of time doing nothing.	
PHYSICAL ACTIVITY (HYPERACTIVITY)	
I need to keep walking, moving around	
I have trouble sitting still, I fidget	
FRUSTRATION/IMPULSIVENESS	

I get angry easily	
I am easily frustrated	
I get impatient easily	
I interrupt when other people are talking	
I am impulsive, do things without thinking	
I don't express or communicate my anger constructively	
ANXIETY	
I focus and concentrate better if I am somewhat anxious.	
MULTI-TASKING (parallel)	
I have trouble doing more than one thing at a time well	
I often try to do more than one task at a time	
I tend to make things more complicated than they need to be	

Score

MULTI-TASKING (serial)	
I dislike tasks that require a long series of steps	
SLEEP	
I have trouble getting to sleep because my mind is going	
UNCATEGORIZED	

I get so deeply into one thing that I forget other things I have to do	
I believe that there is usually a quick solutions to problems	
I do not like to commit because I don't know how I will feel in the long term	

Impressions/Comments:

_____
_____
_____
_____
_____

Appendix I

Executive Function Classroom Visits

EF Skill: Goal EF Action Figure: Goliath Goal Getter

<u>Classroom Examples:</u>

Rm 12 AR Goal Boards
Rm 10 Career Dreams
Rm 12 Math Facts Walls
Rm 29 GPA Requirements
Rm 23 Stamina Goals
Rm 21 Personal Goals
Rm 26 SMART goals
Rm 32 MAP Goals
Rm 34 Goal for each lesson
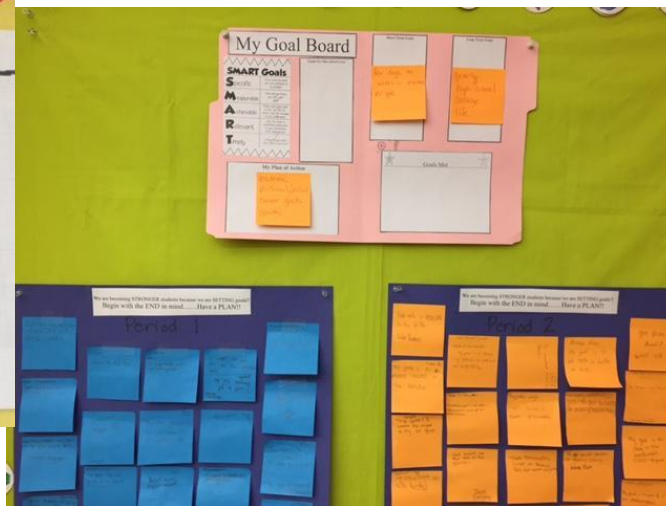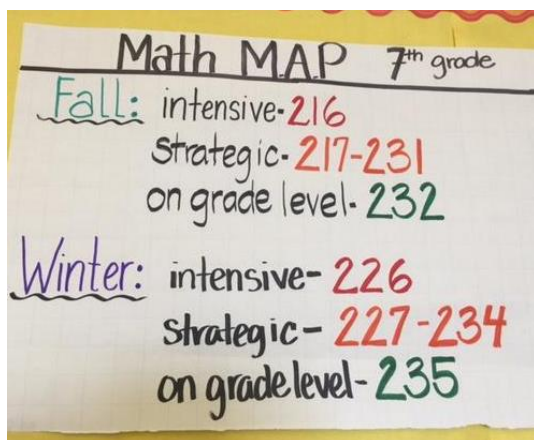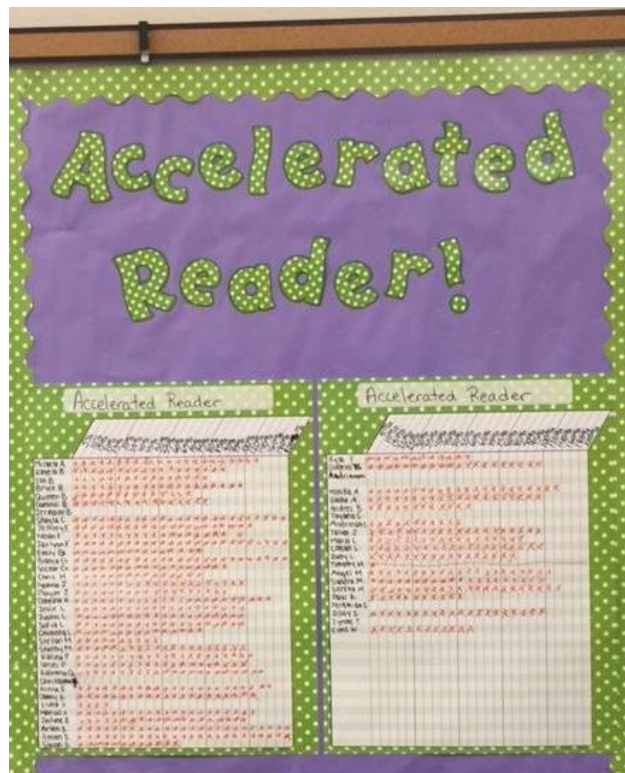
EF Skill: Initiate
EF Action Figure: Ignacio the Ignitor

Classroom Examples:
Rm 27 Visual Prompts
Rm 25 Group Points
Rm 24 What to do
Rm 5 Help, Break
Rm 9 Visual Schedule
Rm 5 First, Then Chart
Rm 34 Slant
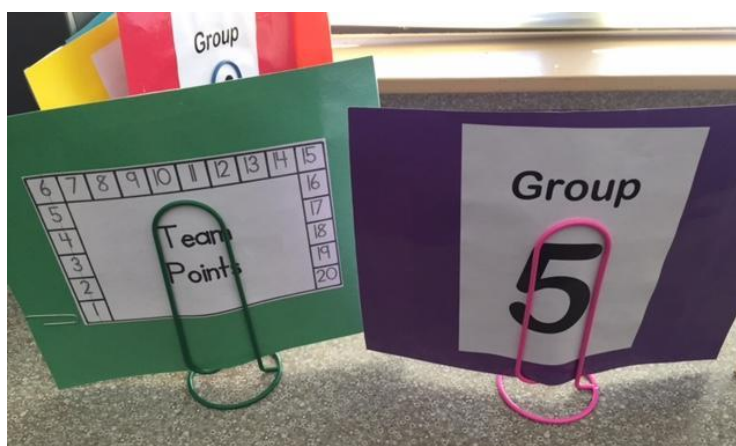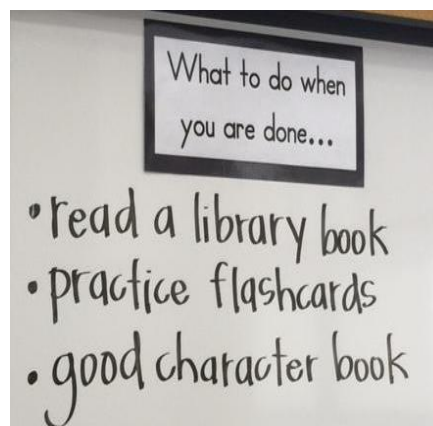
EF Skill: Inhibit
EF Action Figure: Self-Control Sam

Classroom Examples:
Rm 16
Conflict Stoppers
Rm 6 Manners Board
Rm 6 Behavior Chart
Rm 5 Flowers/Candle
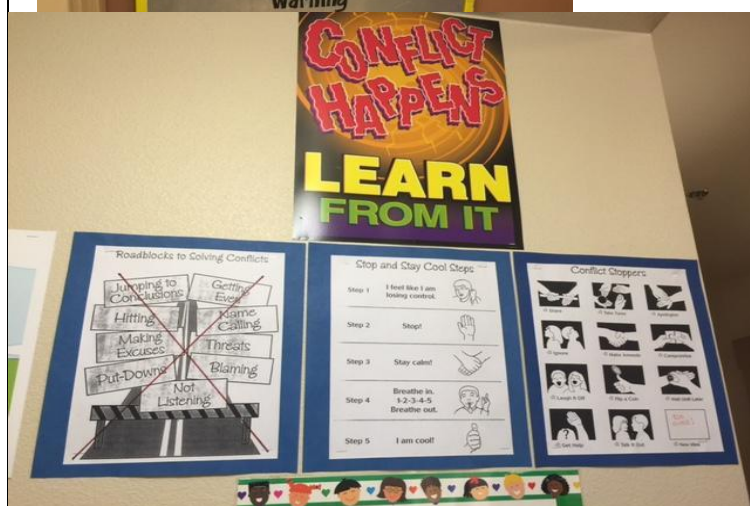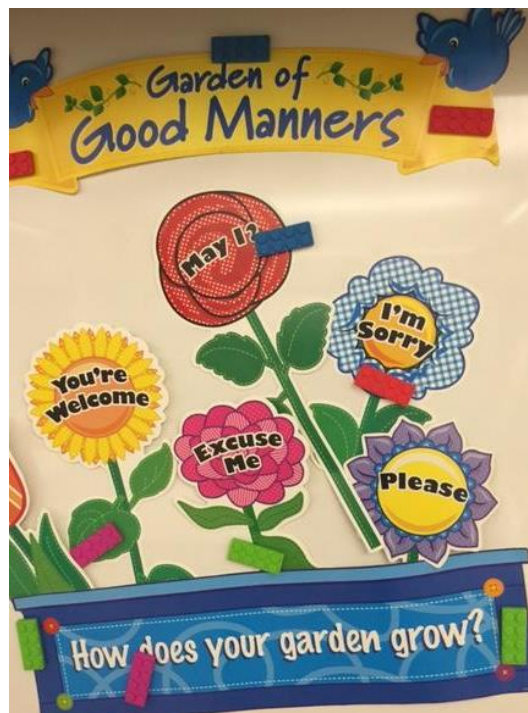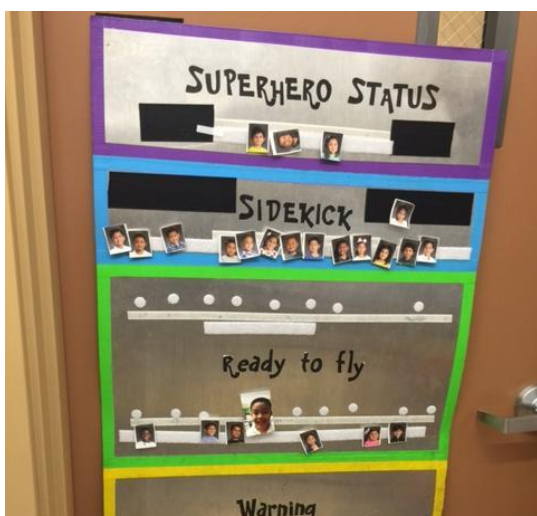
EF Skill: Flexibility/Shift
EF Action Figure: Camille the Chameleon

Classroom Examples:

Rm 12 Agenda

Rm 3 Small Group Picture Board

Rm 28 Visual Schedule

Rm 21 Timer

Rm 34 Five Minute Warning

Rm 34 Red, Yellow, Green System

Rm 2 Stand on 1, Push in Chair 2, Walk 3
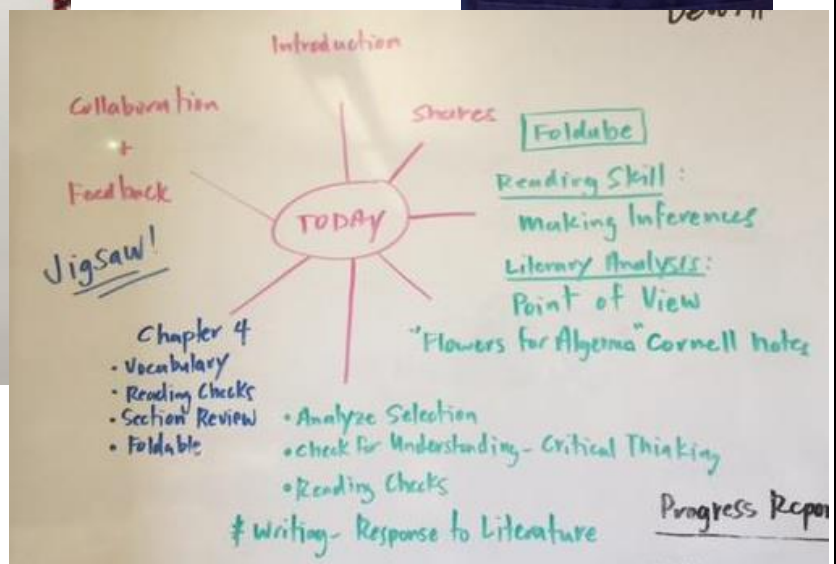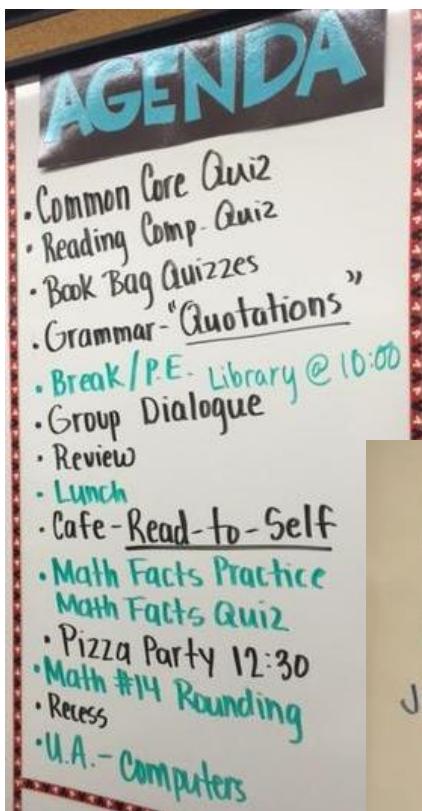
EF Skill: Planning
EF Action Figure: Peter Plan

Rm 12 Job Wall
Rm 31 Writing Graphic Organizers
Rm 34 Planning Checklists
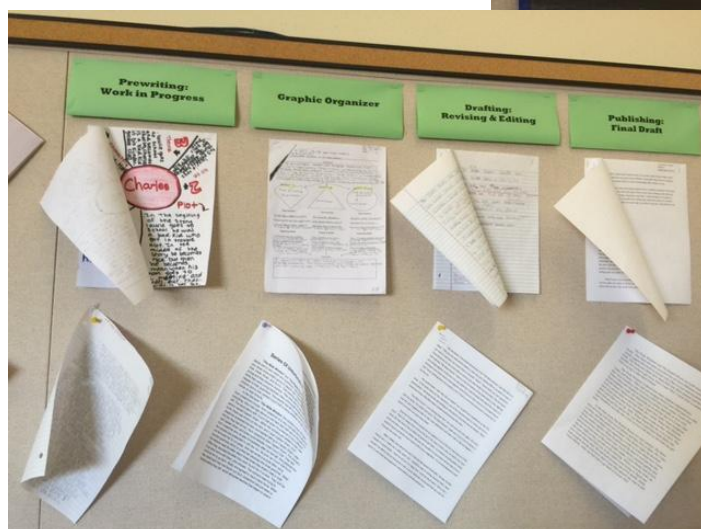
EF Skill: Organize
EF Action Figure: Ozzie Organizer

Classroom Examples:

Rm 24 Project Displays for Unit
Rm 28 HW Board
Rm 27 8 Square
Rm 26 Post It Strategies
Rm 32 Model of Organization Strategy
Rm 34 Planners
Rm 30 Binder Organization
Rm 27 Daily Desk Checks
Rm 17 Wed Folders
Rm 34 Weekly Desk Purge

EF Skill: Sustained Attention
EF Action Figure: Hocus Pocus

Classroom Examples
Rm 14 Timer
Rm 3 Bell
Rm 23 Stamina Building
Rm 24 Think Pair Share
Rm 33 Kinesthetic Learning
Rm 4 Allow Movement
Rm 34 Frequent Transitions
Rm 2 Engaging Instruction
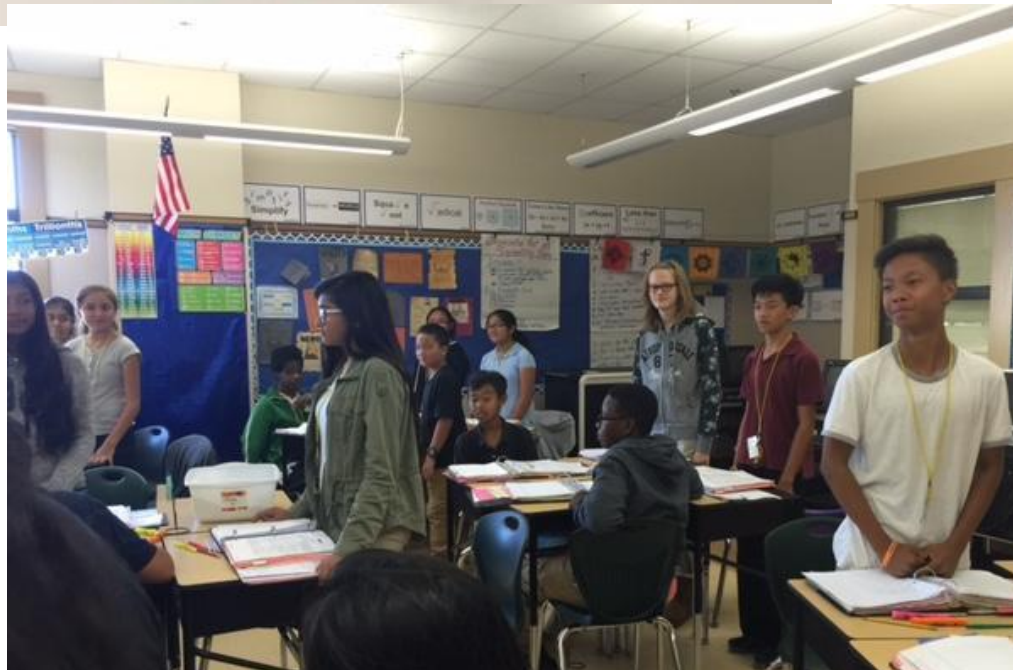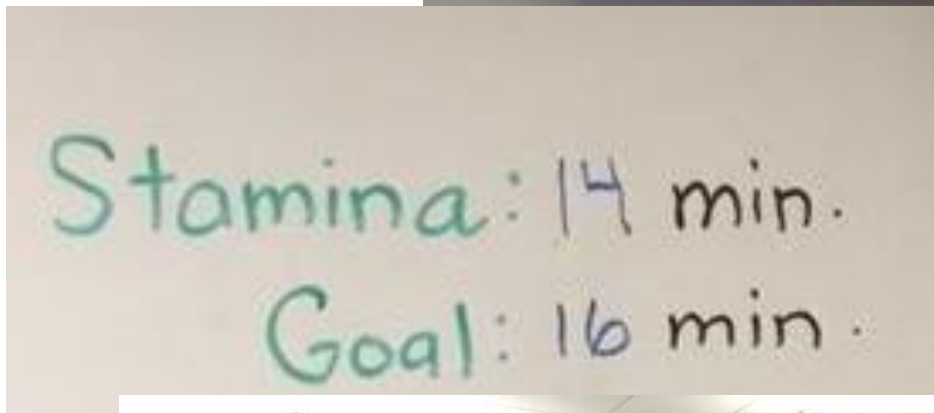
EF Skill: Monitor/Evaluate
EF Action Figure: Monitoring Monica

Classroom Examples

Rm 16 Monitor/Fix Up

Rm 12 Job Wall

Rm 14 Team Points

Rm 6 Behavior Points

MS – Shout Out Wall

Rm 26 Ticket out the door

Rm 17 AR Progress

Rm 34 Positive and Frequent Feedback
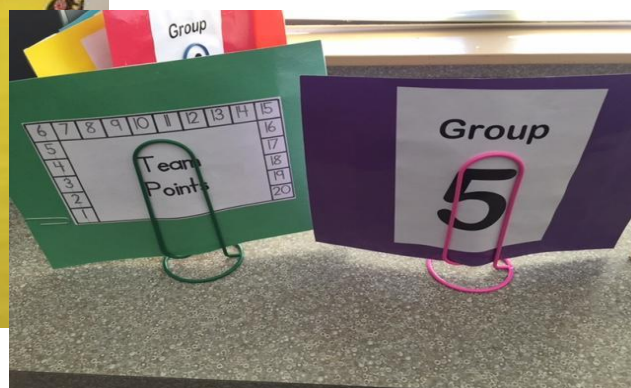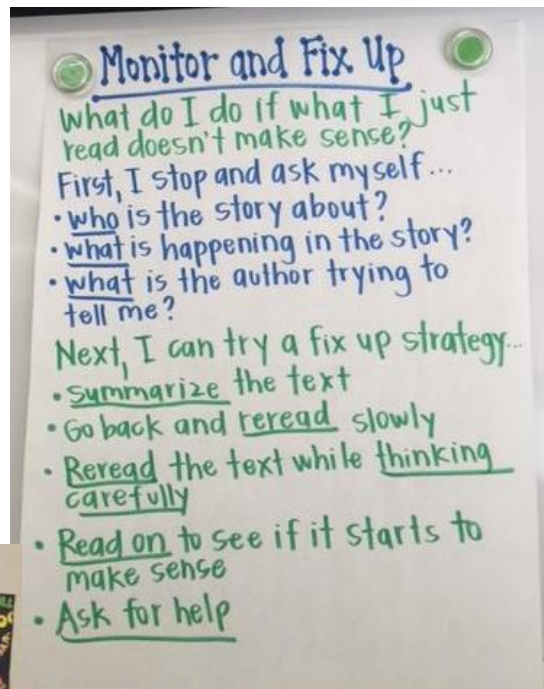
EF Skill: Working Memory
Action Figure: Memory Man

Classroom Examples

Rm 16 Multiplication Wall
Rm 14 Multiplication Songs
Rm 10 Academic Vocabulary
Rm 9 Numeracy Wall
Rm 33 Mental Math
Rm 20 Highlighting Strategies
Rm 30 DOL Strategies
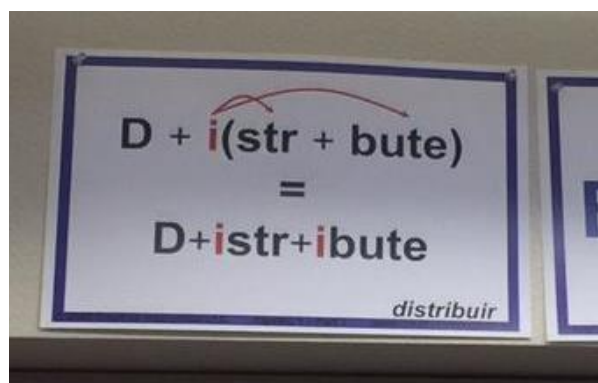
EF Skill: Refuel
EF Action Figure: Rita the Refueler

Classroom Examples:
Rm 16 Drops in the Bucket
Rm 8 Must Do May Do
Rm 5 Break Cards
Rm 34 Stretch Break
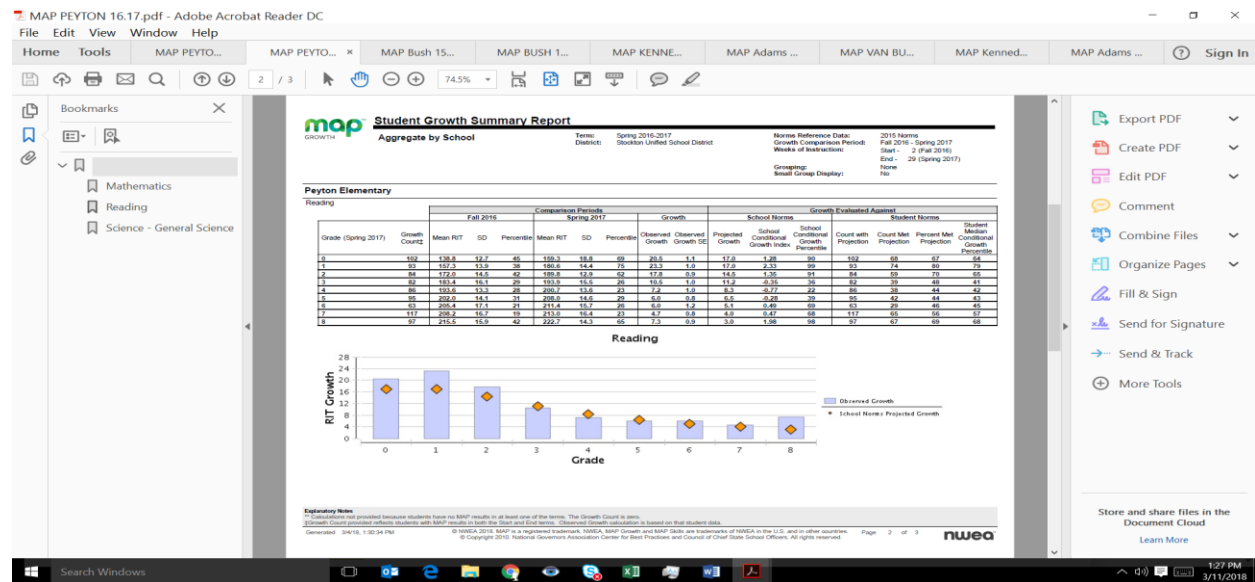**Rm 4 Frequent Movement/ Transitions**
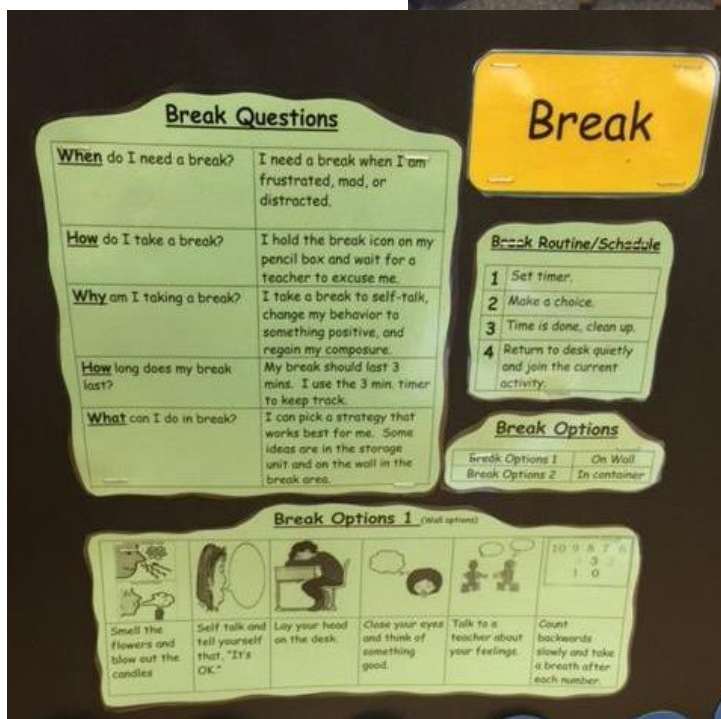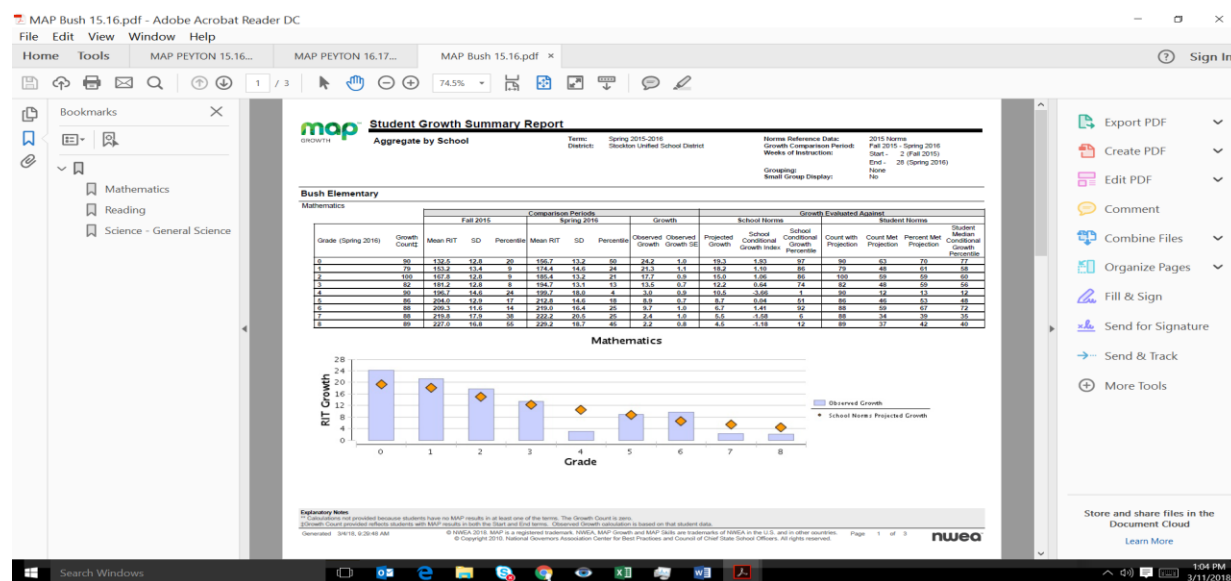
Appendix J

Higher Performing Treatment School 2015-2016 Math Student Growth Summary Report

Higher Performing Non-Treatment School 2015-2016 Math Student Growth Summary Report

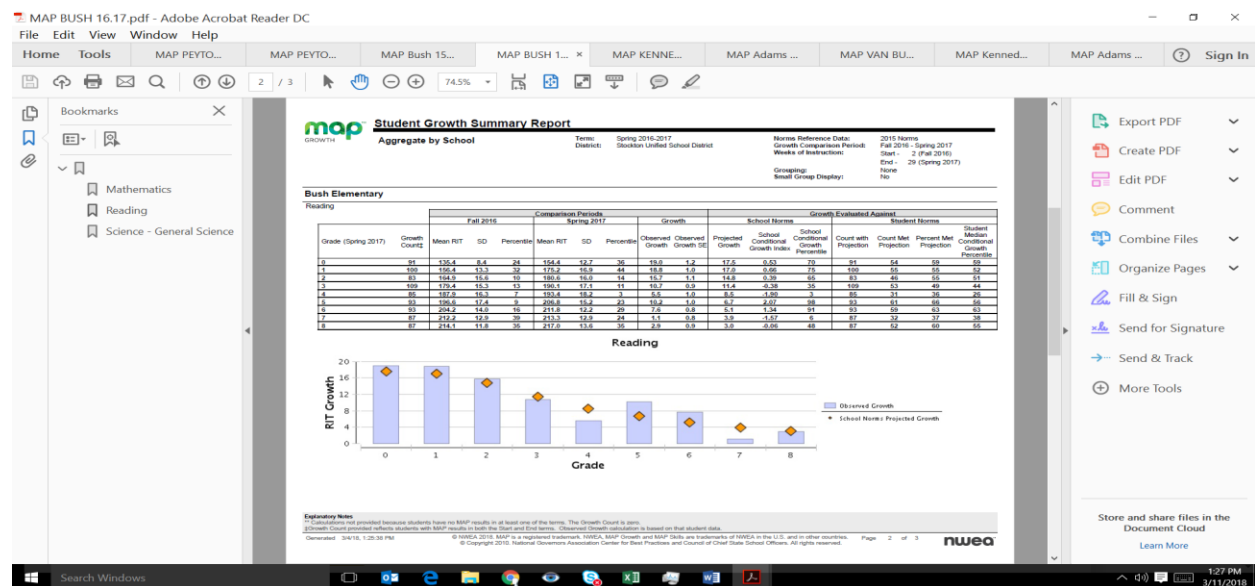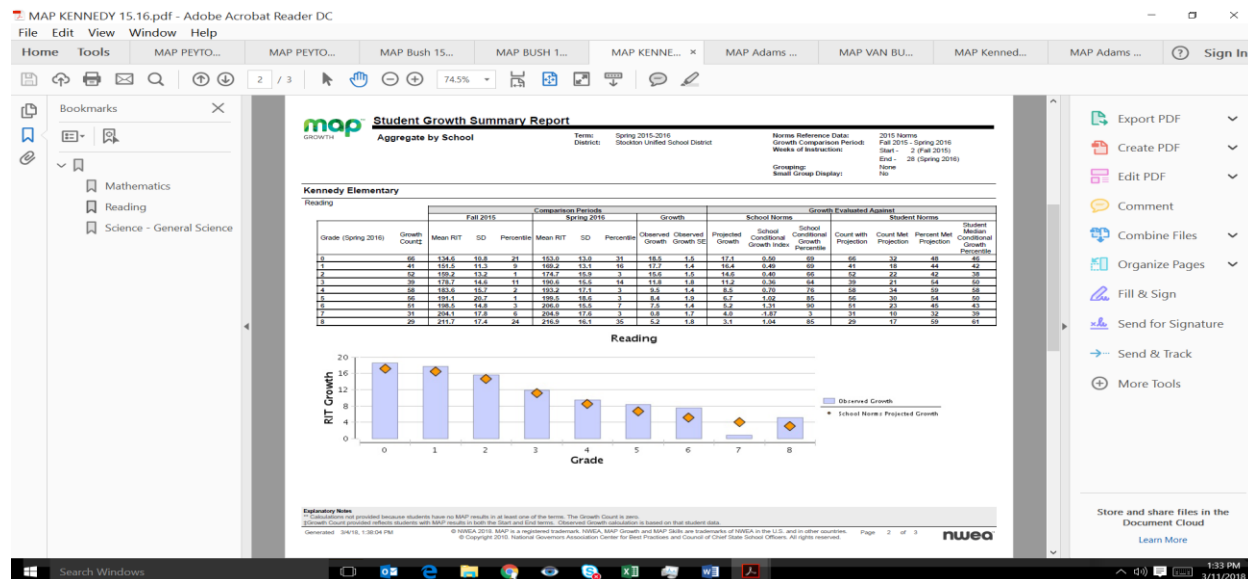Higher Performing Treatment School 2016-2017 Math Student Growth Summary Report

Higher Performing Non-Treatment School 2016-2017 Math Student Growth Summary Report

Average Performing Treatment School 2015-2016 Math Student Growth Summary Report
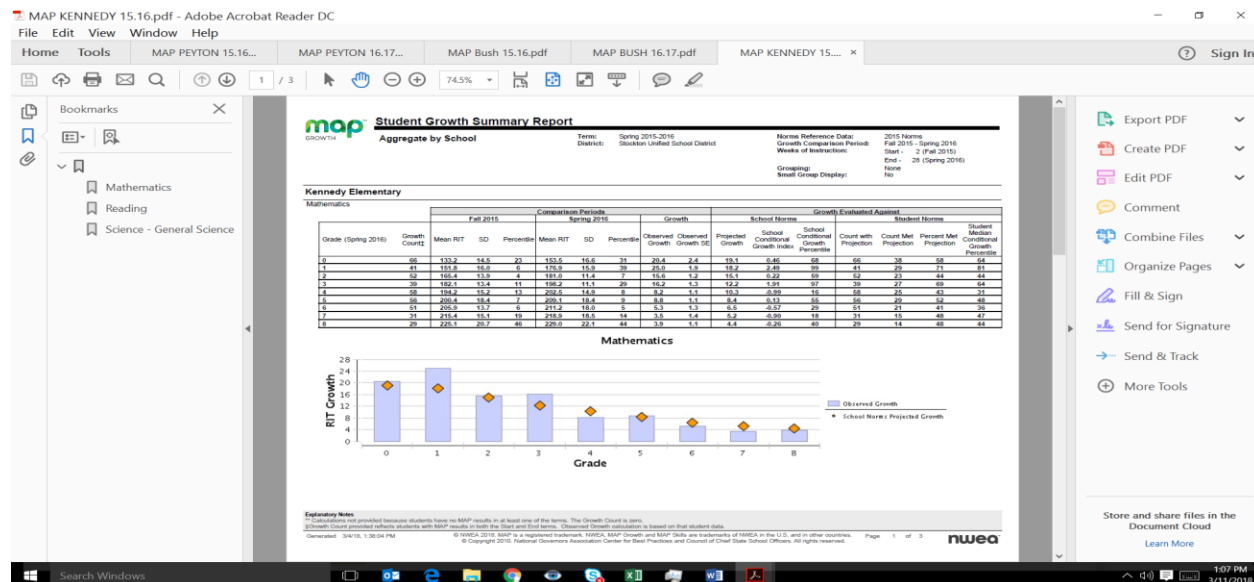
Average Performing Non-Treatment School 2015-2016 Math Student Growth Summary Report
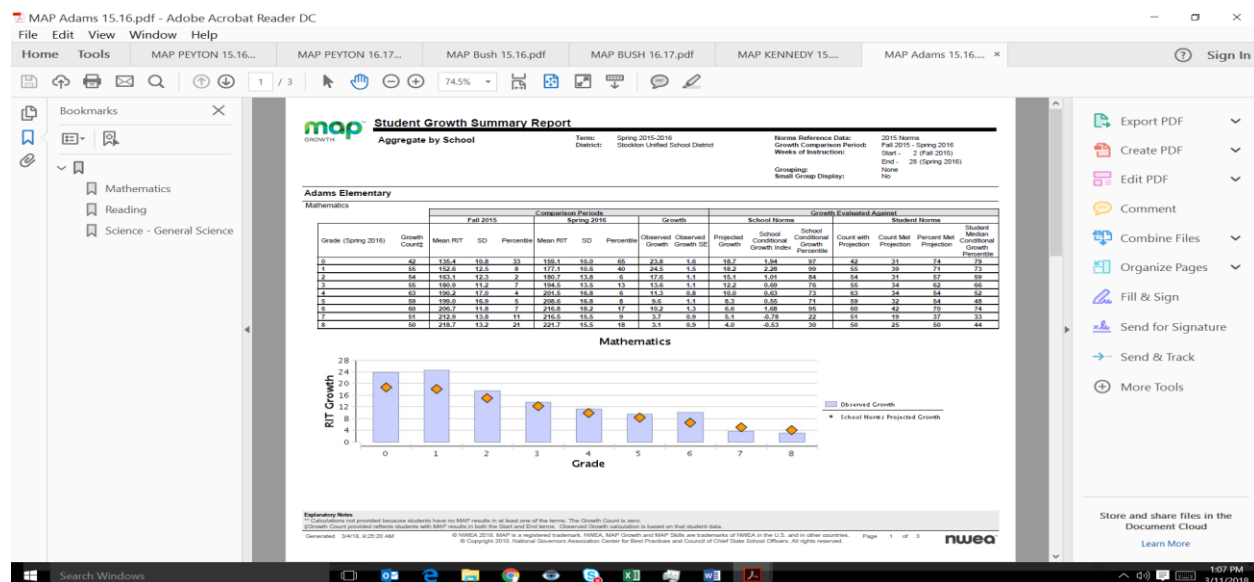
Average Performing Treatment School 2016-2017 Math Student Growth Summary Report

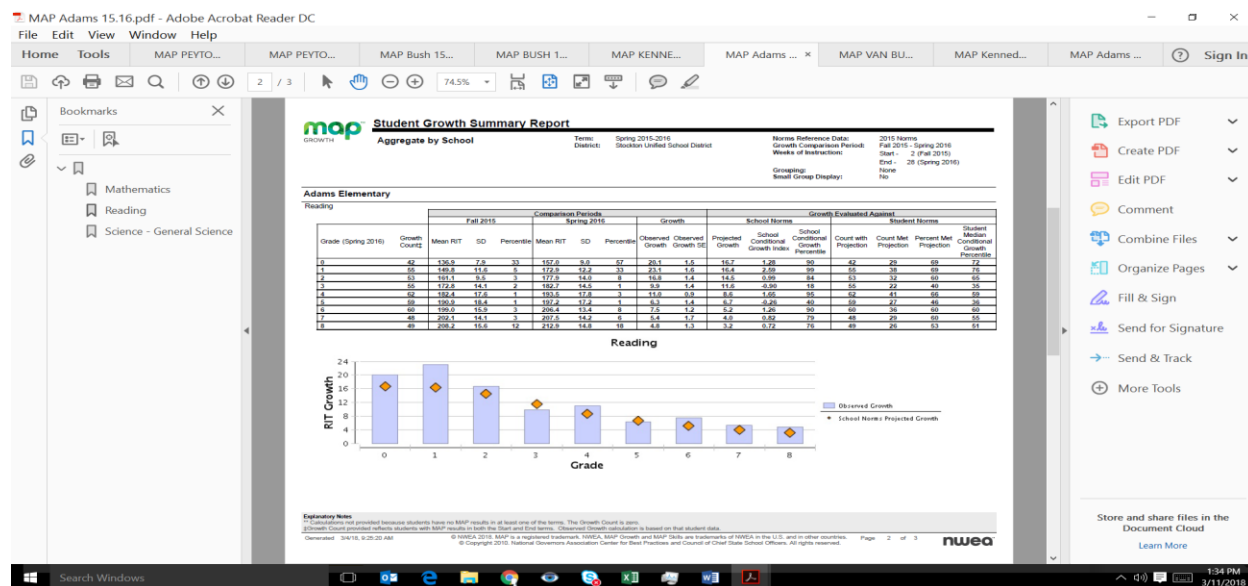Average Performing Non-Treatment School 2016-2017 Math Student Growth Summary Report
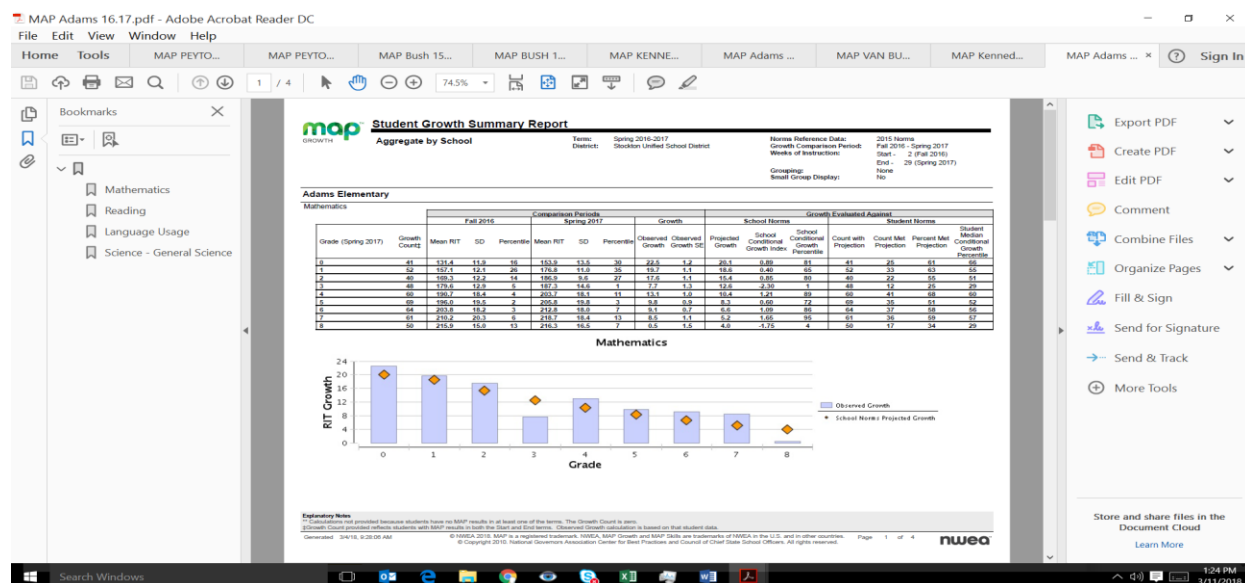
Lower Performing Treatment School 2015-2016 Math Student Growth Summary Report

Lower Average Performing Non-Treatment School 2015-2016 Math Student Growth Summary Report

Higher Performing Treatment School 2015-2016 ELA Student Growth Summary Report

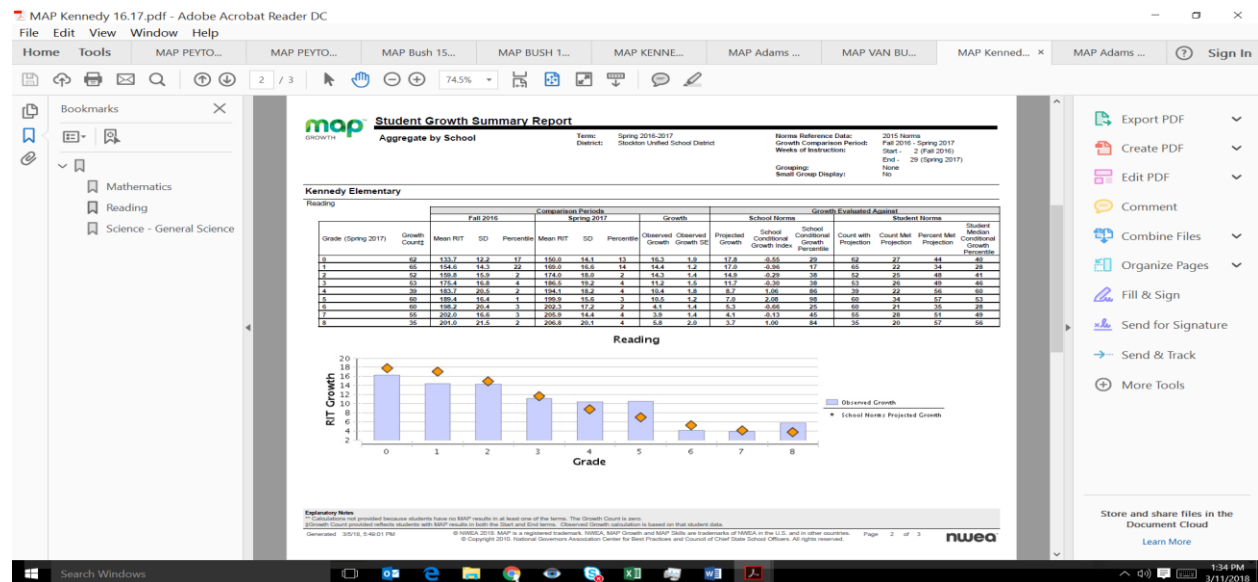Higher Performing Non-Treatment School 2015-2016 ELA Student Growth Summary Report

Higher Performing Treatment School 2016-2017 ELA Student Growth Summary Report

Higher Performing Non-Treatment School 2016-2017 ELA Student Growth Summary Report

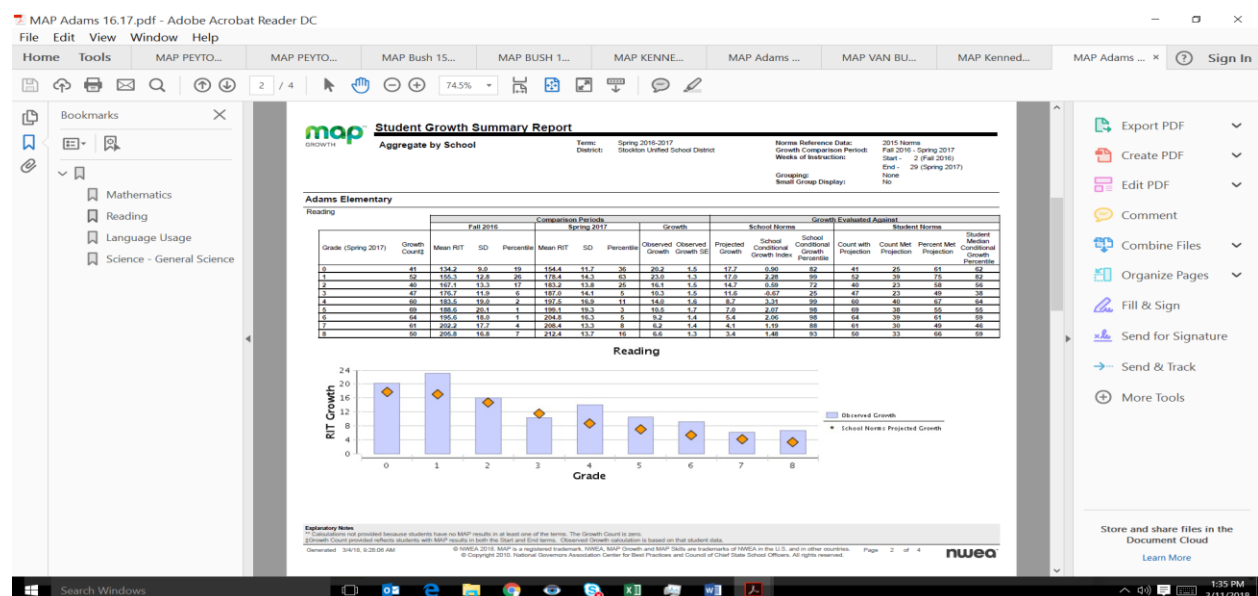Average Performing Treatment School 2015-2016 ELA Student Growth Summary Report

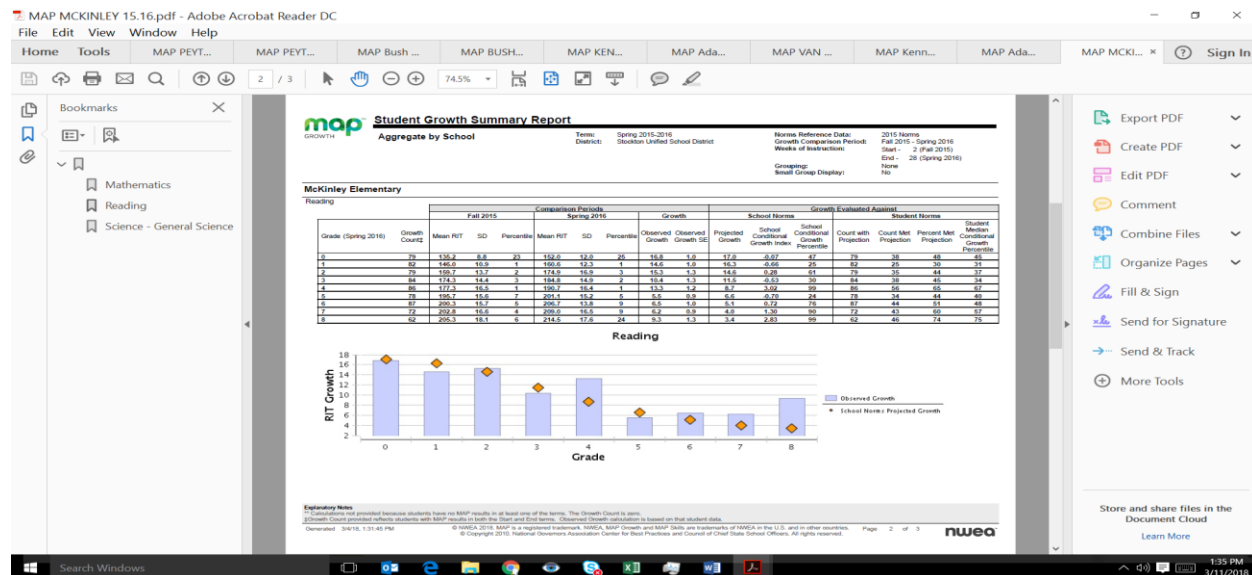Average Performing Non-Treatment School 2015-2016 ELA Student Growth Summary Report

Average Performing Treatment School 2016-2017 ELA Student Growth Summary Report
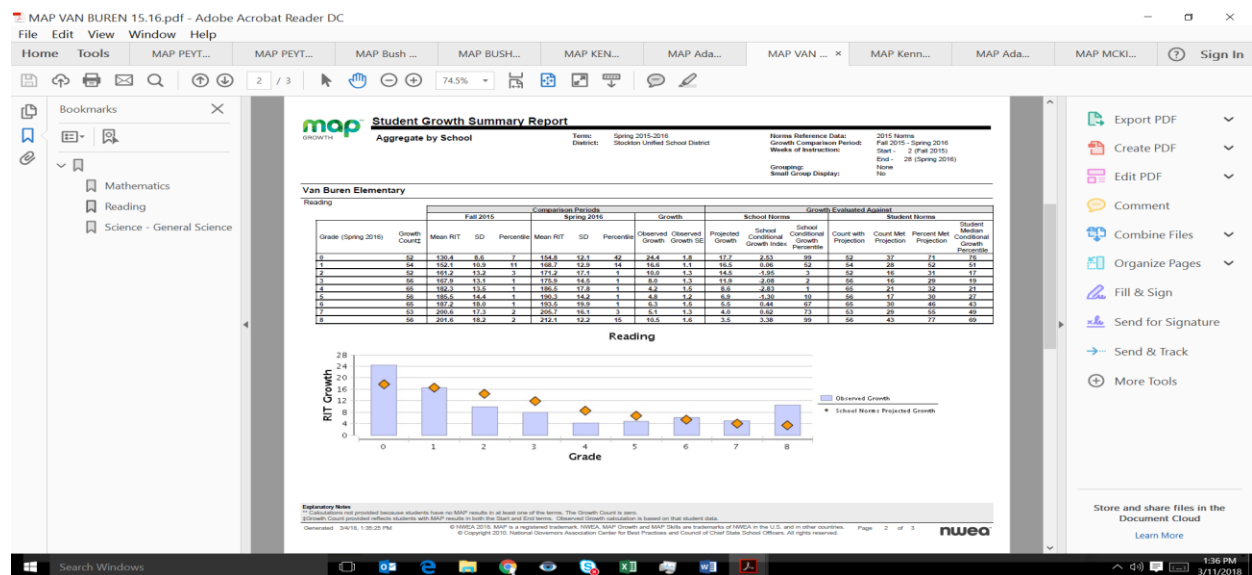

Average Performing Non-Treatment School 2016-2017 ELA Student Growth Summary Report

Lower Performing Treatment School 2015-2016 ELA Student Growth Summary Report

Lower Performing Non-Treatment School 2015-2016 ELA Student Growth Summary Report

Lower Performing Treatment School 2016-2017 ELA Student Growth Summary Report

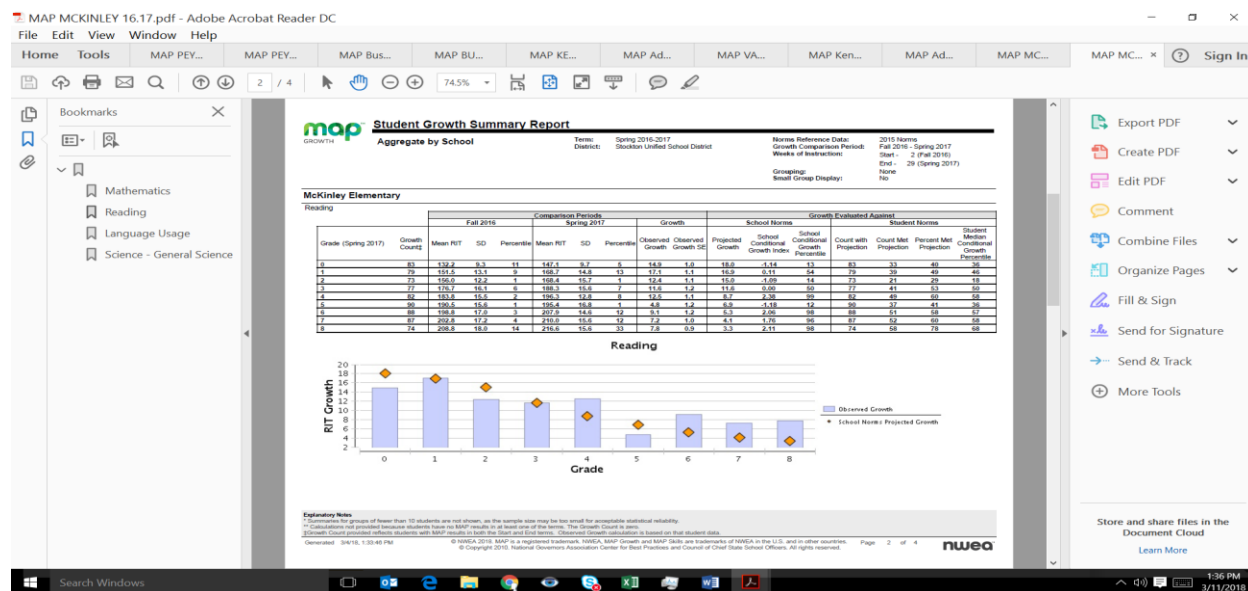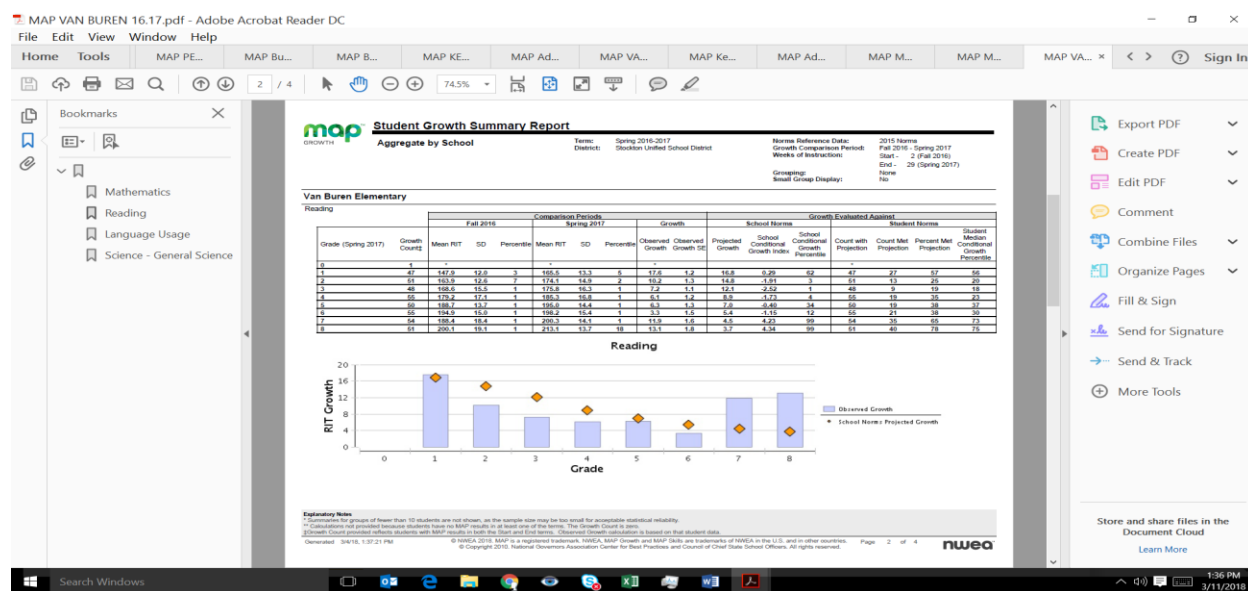Lower Performing Non-Treatment School 2016-2017 ELA Student Growth Summary Report

Appendix K

Teacher Survey

Instructions: The purpose of this survey is to determine the level of implementation of the CHIEF program. Because of your experience with executive functions, your participation in the survey is very valuable. Please select the response that most closely resembles your thoughts on the topics below:

Fidelity of Program Implementation

Question	Responses
How closely are you following the instructional sequences of the lesson plans?	Extremely Very Moderately Slightly Not at all
Have you embedded the Executive Functions characters into your instructional routines?	Extremely Very Moderately Slightly Not at all
Does your classroom environment incorporate the EF strategies you have learned?	Extremely Very Moderately Slightly Not at all
To what extent is EF included your instructional delivery?	Extremely Very Moderately Slightly Not at all
To what extent do you consider EF skills when planning lesson delivery?	Extremely Very Moderately Slightly Not at all

Quality of Professional Development

Question	Responses
How comfortable do you feel with the information that has been presented to you about EF?	Extremely Very Moderately Slightly Not at all
How comfortable are you with using the EF curriculum?	Extremely Very Moderately Slightly Not at all
How comfortable are you with the identified individual EF skills?	Extremely Very Moderately Slightly Not at all
Do you believe the lesson plans for the EF program are well developed?	Extremely Very Moderately Slightly Not at all
Do you believe the depth of the professional development you have received for the EF program has been extensive enough for the average teacher to successfully implement the program?	Extremely Very Moderately Slightly Not at all

Belief in the Program

Question	Responses
Do you believe the EF program will have an impact on student learning?	Extremely Very Moderately Slightly Not at all
Do you believe that the development of EF skills will benefit students?	Extremely Very Moderately Slightly Not at all
Do you believe students with further developed EF skills are more likely to be successful beyond their peers who struggle with EF skills?	Extremely Very Moderately Slightly Not at all
Do you believe that EF skills are an important part of student development?	Extremely Very Moderately Slightly Not at all
Do you believe this program will have an impact on student success in the classroom?	Extremely Very Moderately Slightly Not at all

Please provide a short answer to each of the questions below:

Open Ended Questions

Question
What do you feel should be improved in the development of the EF program?
If you are not fully implementing the program, what is the reason?
How do you believe this program will affect the school overall?
What impact do you believe this program will have on the district?

Please circle the answer that applies to you:

Demographic Information

Gender	Male Female
Age (range)	20-29 30-39 40-49 50-59 60+
Years of Teaching (circle range)	1-3 4-5 6-10 11-15 16-20 21-25 26+
Current Life Level Assignment	TK/Kinder Primary Intermediate Middle School
Level of Education	Bachelors Masters Doctorate