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Getting an Early Start: Promoting the Growth Mindset in Kindergarten Children

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GETTING AN EARLY START: PROMOTING THE GROWTH MINDSET IN KINDERGARTEN CHILDREN

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Dissertation Approval

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Abstract

Expanding the current mindset research focus from the adolescent population to kindergarten-age children and examining the variables that impact mindsets in young children were the prominent goals of this study. The first research question sought to uncover information regarding the relationship between parents' mindsets (growth or fixed) and observable behavioral markers associated with the mindsets that present in young children. Four behaviors were of primary interest: level of engagement, type of self -verbalizations, anxiety-related behavior and guessing behavior. Also examined was the relationship between parents' mindsets and children's mindsets. The second research question explored the association between these aforementioned behavioral markers and children's mindsets. The third research question examined the effectiveness of a growth mindset kindergarten classroom intervention.

Although no significant associations existed between children's mindsets and any of the behavioral markers, significant effects were revealed when examining the association between parents' mindsets and children's level of engagement and between parents' mindsets and children's anxiety-related behavior. Although no significance was found between parents' mindsets and children's mindsets, findings showed that parents with a fixed mindset invariably had a child with a fixed mindset (85.7%), whereas parents with a growth mindset were equally likely to have a child with a fixed mindset (58.3%) or a growth mindset (41.7%). The implications of the associations found between child and parent variables (mindset and behaviors) are further explored in this study.

This study has shown that it is possible to extend adolescent growth mindset intervention programming, because kindergarten students were able to learn a growth

mindset through a multisession classroom intervention. Students evidenced knowledge gain about the brain as well as a transformation from a fixed mindset to a growth mindset. Findings from this present research elucidate the pivotal role that parents play in their young children's lives and make suggestions for future early intervention programming. Because intervention effectiveness has been established, the framework from this piloted growth mindset classroom intervention can be utilized for future intervention design targeted for kindergarten youth.

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Chapter 1

Introduction

When considering requirements for a meaningful, successful, and fulfilled life, having a positive mindset presents as a crucial component. The development of a positive mindset is paramount to setting life goals, creating reasonable steps towards achieving those goals, and enjoying the gratifying satisfaction that accompanies successful goal attainment. A mindset, or implicit theory, (Dweck, 2006) refers to how individuals conceptualize specific human qualities, such as athletic ability, morality, or intelligence (Gucciardi, Jackson, Hodge, Anthony, & Brooke, 2015). A cornerstone of mindset research posits that differences in individuals' beliefs about human qualities exist, and that these differences can have extensive implications on cognition, behavior, and overall well-being (Gucciardi, Jackson, Hodge, Anthony, & Brooke, 2015). The type of mindset that one holds, regardless of its accuracy, drives how one approaches, interprets, and appraises situations (Reich & Arkin, 2006). A salient element of mindset is the view that an individual holds on the mutability of human behaviors and personality traits. An *entity view* holds that traits are fixed and unchangeable, but an *incremental view* asserts that traits are malleable and able to be modified (Dweck & Bempechat, 1983; Bandura & Dweck, 1985). Although mindset can be studied in a variety of human qualities, of particular importance is its application towards intelligence.

To enhance understanding of the prominent role that mindset plays in intelligence, a brief discussion of the conceptualization of intelligence is warranted. Theories of human intelligence are manifold and myriad. Some theories view intelligence as a one dimensional, general notion of intelligence commonly referred to as "*g*" or general factor,

which is the basis for all other specific factors associated with intelligence (Jensen, 1998). Also in existence are multifactor theories of intelligence, positing that intelligence comprises multiple, interdependent ability areas (Gardner, 1983). There are also alternative theories that do not fit into either one of these categories, one of which is Sternberg's Triarchic Theory (Sternberg, 1985; 1997), the Theory of Successful Intelligence. This theory holds that achieving success in life, given one's culture and socioeconomic status, is how true intelligence is defined. Embedded in this theory is the idea that individuals' abilities to achieve success within their idiographic context depends on optimizing their strengths and compensating for their weaknesses by engaging in analytical, creative, and practical thinking to adapt, shape, and select environments (Sternberg, 1997; 2003; Gillies, 2011). Individuals must then be adept in evaluating their strengths and weaknesses to create appropriate goals for themselves and place themselves in situations in which they can persist through effort and hard work. A willingness to persevere and take risks is involved in the balancing and designing of an environment that strives for adaptive success based on strengths, through multiple ability outlets.

Analytical abilities are exercised in decision making and critical thinking through reasoning, analyzing, evaluating, comparing, and inferencing. Creative abilities involve the processing of information in novel situations, generating and marketing intriguing ideas, and integrating disparate information from diverse areas. Practical abilities are those that are emphasized within one's personal milieu; these help individuals select, adapt to, and shape environments and allow for generalization of procedural knowledge across various daily tasks (Sternberg, 2003; Gillies, 2011). Of all these ability areas, classroom-based tests as well as standardized intelligence tests predominantly measure

analytical abilities (Sternberg, 2003). Sternberg's theory identifies traditional intelligence tests and placement examinations as underscoring analytical ability as the most important measure of intelligence and predictor of success, but warns that there are many inherent dangers in employing such a narrow viewpoint. If an individual is adept at creative or practical abilities but weaker in analytical abilities, academic institutions may discount such individuals from their programs. Individuals may begin to aggrandize this area of weakness, to the detriment of valuing their strengths. The types of goals that one sets may be deleteriously influenced by negative feedback from society's elucidation of analytical intelligence as the one true intelligence that matters. The amount of effort put forth may be impacted because analytical shortcomings may plague one's beliefs about his or her capacity to be successful. An emphasis on weakness may obscure the recognition and valuing of strengths in other areas; this would preclude the ability to capitalize on those undervalued skills.

Paralleling the dangers involved in endorsing a narrow, one-dimensional view of intelligence as "g" or endorsing a view that prioritizes analytical ability above all else, is having an entity view of intelligence, or seeing it as incapable of being changed. These narrow mindsets shape how individuals evaluate themselves, the aspirations that they may form, the type and amount of effort put forth to reach aspirations, and the response towards potential barriers. Just as important as the question "How is intelligence defined?" is the question "How does intelligence exist?"

When applying the entity and incremental views towards intelligence, two types of mindsets are produced. Individuals that have a *fixed mindset* believe that intelligence is an inborn trait that cannot be modified, but those with a *growth mindset* believe that

intelligence can be increased through effort and hard work (Dweck, 1999; 2006). These two disparate mindsets impact a plethora of variables. The role that mindset plays in intelligence is extremely salient in shaping the types of learning goals that are generated, the amount of effort exerted to achieve those goals, and the response towards obstacles hindering goal attainment.

Characteristics of Mindset

The benefits of students having a growth mindset over a fixed mindset have been enumerated throughout the social sciences research, the majority of which has been targeted on adolescence (Dweck, 1999; 2006). Multiple studies have linked the growth mindset to powerful, positive, and meaningful outcomes, with findings suggesting that underlying elements of mindset have been formed by the time children are of pre-school age (Stipek & Mac Iver, 1989; Kurtz-Costes, McCall, Kinlaw, Wiesen, & Joyner, 2005; Stipek, 1981; Bempechat, London, & Dweck, 1991; Heyman, Dweck, & Cain, 1992; Ruble & Dweck, 1995), which beckons the question about the reason why the growth mindset has not been explored in greater depth with early school-aged children.

Students with a growth mindset believe that intelligence can be honed and that the brain can change and grow with practice, effort and experience. Students who possess a fixed mindset believe that intelligence is static and innate and ultimately incapable of change. These students believe that effort should not have to be exerted when performing tasks because natural intellectual ability alone should yield success. Individuals with a fixed mindset view mistakes as failures and challenges are shied away from for fear of failure or fear of appearing unintelligent (Dweck, 1999; 2006). Conversely, individuals embodying a growth mindset understand that effort and persistence are requirements for

success. Those with a growth mindset view mistakes as educational opportunities for evolution that are a natural part of learning. Challenges are embraced as opportunities for brain growth (Dweck, 1999; 2006).

The Impact of Teachers' and Parents' Mindsets on Students' Mindsets

The implications of teachers' mindsets and their impact on instructional approaches have been a salient topic of study in recent research. When educators hold a growth mindset, students that begin in the lower rankings at the start of the year typically flourish and join their high-achieving peers towards the culmination of the year. Interplay between various dynamics is at work when one examines the influence of teacher mindset on student performance. Implicit beliefs regarding the malleability of intelligence influence messages being communicated to students about the definition of intelligence and the confidence that teachers have in their students' abilities to alter their intelligence (Dweck & Bempechat, 1983; Rattan, Good, & Dweck, 2012).

The instructional approaches taken by teachers are also influenced by the mindset that teachers hold, with those holding a growth mindset offering more support and explicit problem- solving techniques to students when compared with teachers that hold a fixed mindset (Swann & Snyder, 1980). Research has demonstrated that teachers' mindsets have a significant impact on how students view themselves as learners (Pretzlik, Olsson, Nabuco, & Cruz, 2003).

Just as students' and teachers' mindsets heavily influence student achievement, effort, response to setbacks and engagement in challenges, parents' mindsets also play an integral role in influencing these arenas. Parents have a unique ability to create self-fulfilling prophecies regarding their children's academic functioning, because parental

views have cascading effects regarding how the parent behaves toward the child and the expectations communicated to the child. The child then reacts in a complementary way, often functioning academically in the way the parent has predicted (Eccles, 1983; Eccles, Wigfield, & Schiefele, 1998).

Parental views on the malleability of intelligence have shown to be a stronger influence than the child's previous school performance on their child's self-perception of academics (Fredricks & Eccles, 2002). Parents' perceptions of academic competence were also shown to be a stronger prediction of children's perceptions of their academic competence than actual achievement levels (Frome & Eccles, 1998). The impact of parents' perceptions of children's academic competence outweighs the impact of teachers' perceptions in many cases (Entwisle, 1997). Although extant research provides support for the strong relationship between parents' perceptions and students' perceptions regarding intelligence and academic competence, there is a dearth of literature that explores this phenomenon in children as young as kindergarten-age (Kärkkäinen, Räty, & Kasanen, 2011). Parents play especially pivotal roles in shaping young children's development and outlook on learning (Phillips & Shonkoff, 2000) and are vital role models in young children's lives, making this a critical area of study.

Teaching Students a Growth Mindset

Although educational reform in the United States has evolved into a practice emphasizing high-stakes testing and rigorous academic standards, the achievement gap between low-performing students and average functioning students continues to widen (Laursen, 2015). Educational experts have acceded to the idea that seeking to improve other areas of the students' lives, in addition to academics, is a key factor. This

realization has led to the burgeoning of research on developmental factors that also influence the student's likelihood for success, such as the growth mindset (Laursen, 2015). Contemporary research has shown that it is possible to teach students, directly, the growth mindset. Educational practices that inspire an intrinsically-motivating desire to learn through embracing challenging work provide one way to instill a growth mindset in learners. Creating a supportive environment that fosters intellectual curiosity without the anxiety encountered when making mistakes is another way to cultivate the growth mindset in classrooms.

Direct strategies that teach the growth mindset may include talking and reading about it; a variety of books are available on this topic. Learning through research projects and reports about people who have a growth mindset is yet another avenue to instill a growth mindset in students. Teaching principles of a growth mindset is done by educating students on how to develop and attain long-term goals. Having students take growth mindset surveys is another interesting way to help students to embrace this topic (Laursen, 2015). Although these and other general strategies exist, a more specific intervention program that is built on the teachings of the growth mindset has been developed (Mindset Works, Inc., 2015; Blackwell, Trzesniewski, & Dweck, 2007).

Brainology® is a revolutionary, interactive computer-based program that teaches middle- and high school-aged students to adopt a growth mindset (Mindset Works, Inc., 2015; Blackwell, Trzesniewski, & Dweck, 2007). In this program, students follow two computer-animated teens as they navigate through a virtual school day and encounter problems along the way. Strategies for studying and addressing school problems are faced, and the teenaged students learn to problem-solve by visiting a brain lab,

conducting brain experiments, and learning the neuroscience about brain growth through learning. Students also learn to apply the concepts learned in Brainology® directly in their everyday lives (Dweck, 2008). Boosts in academic achievement through standardized testing and classroom performance, increases in student motivation and improvement in resilience and overall behavior are some examples of variables that have been positively impacted by teaching students a growth mindset (Ramsden, et al. 2011; Aronson, Fried, & Good, 2002; Good, Aronson, & Inzlicht, 2003; Blackwell, Trzesniewski, & Dweck, 2007).

Statement of Problem

The majority of research conducted on the fixed and growth mindsets has been centered on the adolescent population. Research has specifically explored variables impacting mindset, features that serve to characterize each mindset, and interventions to teach a growth mindset to students. Although previous research discussed the difficulties in addressing the concept of mindset with early school-aged children, current research has overturned those antiquated notions, with the realization that adjustments simply need to be made in working with this younger age group (Stipek & Mac Iver, 1989; Kurtz-Costes, McCall, Kinlaw, Wiesen, & Joyner, 2005; Stipek, 1981; Bempechat, London, & Dweck, 1991; Heyman, Dweck, & Cain, 1992; Ruble & Dweck, 1995).

Three important areas of research need to be studied further. First, learning more about the variables affecting young children's mindsets such as parents' mindsets will help to promote parent training programs and interventions to equip children with the tools that they need to be successful in cultivating a growth mindset. Second, when clearer delineations of features associated with the fixed mindset and growth mindset can

be established in young children, appropriate interventions that exhibit features of a fixed mindset can be generated, targeting children. Identifying features of mindset in young children will also serve as a springboard for further research on risk factors, protective factors, and preventative programming to foster a growth mindset culture in young children. Third, ameliorating an understanding of developmentally appropriate mindset-related interventions will augment and optimize future early-intervention growth-mindset programming for young children. In working with early school-aged children, the exploration of parent-related variables affecting mindset, features characterizing the growth and fixed mindsets, and developmentally appropriate growth-mindset intervention programming is needed.

Purpose of the Study

The majority of mindset literature targets adolescent samples although numerous studies have voiced the importance of teaching mindset at a younger age (Stipek & Mac Iver, 1989; Heyman, 1998; Bempechat, London, & Dweck, 1991; Heyman, Dweck, & Cain, 1992; Ruble & Dweck, 1995). It is vital, then, to explore what attributes may contribute to a fixed or a growth mindset in early school-age children. Although the impact of students', parents', and teachers' mindsets on adolescent functioning has been examined, further research is needed in analyzing the relationship between parents' mindsets and young children's mindsets because the parent is typically the most important attachment in a young child's life. Due to children's lack of sophisticated language and lack of higher-order cognitive processing, exploration of observable behavioral characteristics that serve to characterize the mindsets in early school-aged children is needed. Although effective intervention programs have directly taught the

growth mindset to middle school and high school-aged students, the paucity in intervention programming for early school aged children exists. However, recent findings have indicated that aspects of mindset have been created and solidified by pre-school age children (Heyman, Dweck, & Cain, 1992; Herbert & Dweck, reviewed in Dweck, 1991; Stipek, Recchia, & McClintic, 1992; Stipek, 1995; Burhans & Dweck, 1995). This study is intended to investigate interventions that can promote growth mindsets in kindergarten children.

The primary research questions addressed in this study are:

1. What parent beliefs are associated with children's mindset and behavioral performance?
2. What are observable behavioral features of the growth and fixed mindsets in kindergarten children?
3. What is the impact of classroom-based interventions designed to teach kindergarten children about the brain and the growth mindset?

Chapter 2: Review of the Literature

Introduction

In the quest to optimize educational experiences and learning, factors contributing to student achievement have been researched, with a particular emphasis on students' perceptions about their academic competence (Leondari & Gialamas, 2002). Beliefs about academic competence affect achievement motivation and how individuals' behave in academic settings (Stipek, 1993; Weiner, 1992; Stipek, & Gralinski, 1996). Dweck (1986) and her colleagues have pioneered research studying students' implicit theories, or mindsets, regarding intelligence (Dweck & Bempechat, 1983; Dweck & Leggett, 1988; Dweck, 2006). Mindsets are important implicit theories that laypeople devise over time, allowing beliefs to be formed regarding human traits and the stability of those traits. These unsubstantiated belief systems allow individuals to interpret events and attach meaning to them (Ross, 1989). Mindsets ultimately drive the way that humans think, perceive, respond, and behave (Dweck, 2012). Mindsets, or implicit theories, are not overtly formed, but imbedded in the mind over time. Although an individual may not be fully aware of the mindset that he or she may employ regarding a particular event, the powerful impact that mindset has on guiding human behavior is uncompromising (Burnette, O'Boyle, VanEpps, Pollack, & Finkel, 2013).

In addition to holding beliefs about *what* comprises an attribute, (e.g. "what is intelligence?"), another crucial aspect of mindset concerns *how* an attribute exists. An entity view or what has been termed a fixed mindset, posits that a trait is innate and largely unchangeable. Conversely, an incremental view, or growth mindset, holds that a trait is not static, but malleable. Aligning with each mindset is a constellation of

behaviors, cognitions, perceptions, and responses (Dweck & Leggett, 1988; Dweck, 2008; Dweck, 2009; Burnette et al., 2013).

The Etiological Trajectory of the Fixed and Growth Mindsets

Helpless and mastery responses. Tracing the origin of the *fixed* mindset and *growth* mindset is important in uncovering underlying characteristics inherent to both mindsets. In a seminal study by Diener & Dweck (1978; 1980), late grade-school age students were given concept formation tasks. They successfully solved the first eight problems but failed to solve the next four problems, as the design intended, due to the level of difficulty exceeding their abilities given their ages. Researchers analyzed the changes in cognition, affect, and behavior that took place as students began to experience failure. Students demonstrated equal ability levels prior to the experiments, employed equal problem solving strategy use (with training aids when necessary), and demonstrated equal engagement and interest. However, two polarized response styles were elicited when students began to experience defeat; these were categorized as the *helpless response* and the *mastery-oriented response* (Diener & Dweck, 1978; Diener & Dweck, 1980). 'Helpless' students held negative cognitions, conveyed through negative self-talk about perceived areas of personal incompetence that contributed to the failure. Helpless children also exhibited negative affect demonstrated through self-described boredom with the task or a desire to discontinue the task. Along with negative cognitions and affect, helpless students showed marked decreases in performance over successive failure trials, with over 60% beginning to employ ineffective strategies commensurate with a preschooler's performance, despite prior demonstration of sophisticated and effective strategy use (Diener & Dweck, 1978; Diener & Dweck, 1980).

In stark contrast, those characterized as having a mastery-oriented response expressed positive cognitions that revealed an optimistic stance and showed perceptions of difficult problems as challenges to be conquered (i.e., 'I did it before, I can do it again'). Positive affect was also observed as mastery-oriented students appeared equally positive or more positive during the more arduous tasks, seemingly excited by the challenges involved. Aside from notable differences in cognition and affect, 80% of mastery-oriented students also maintained or increased their level of problem-solving strategies during the failure trials. These students engaged in hypothesis testing strategies and verbally mediated strategies to guide their performances and promote self-monitoring (Diener & Dweck, 1980).

These polarized response styles were studied further in other research conducted by Licht & Dweck (1984). These two characterized response styles were used to divide students into two groups. Both groups learned a new lesson on operant conditioning by means of an instruction booklet. At the beginning of the booklet was a passage on imitation, an unrelated topic. Half of the students read a passage on imitation that was clear and forthright but the other half read a passage on imitation that was overwhelmingly and purposefully complex and confusing. The goal of the study was to examine whether or not differences would exist in the mastery of the material, between mastery-oriented children and helpless children in the confusion and non-confusion categories. Similar mastery rates were yielded between the mastery-oriented children and the helpless children in the non-confusion category, with 68.4% mastery-oriented children and 76.6% helpless ones reaching the mastery criterion. However, in the confusion category, 71.9% of mastery-oriented children demonstrated mastery, but only

34.6% of helpless children did. Therefore, when a task was identified as straightforward and less challenging, both groups performed equally well; but when the task elevated in complexity, the helpless children showed ineffective problem solving and performance when compared with the mastery-oriented children (Licht & Dweck, 1984). Dichotomous patterns of cognition, affect, and performance resulted in two very different response styles, characterized as the helpless response style and the mastery-oriented response style. Although these contrasting response styles were noted, further investigation was necessary to uncover what precipitated these patterns to manifest.

Helpless and mastery responses trace back to performance and learning goals. To glean information regarding impetuses for the helpless and mastery-oriented response style, Elliot & Dweck (1988) conducted research in which they hypothesized that students engaging in these two disparate response patterns formed two very different goals. An experiment was conducted in which individuals' goals were manipulated by orienting them toward an evaluation of ability or toward learning a skill. A pretest was then given and they received feedback on their current ability levels.

It was hypothesized that those who were oriented towards an evaluation of their abilities and who also had perceived low ability would engage in the helpless response style. If those oriented towards an evaluation of their abilities possessed high ability on the pretest, it was hypothesized that they would show cognition, affect, and behavior consistent with the mastery-oriented style. It was also predicted that those who were oriented toward a skill-learning goal, whether they had high or low ability, would show the mastery-oriented response style. All results provided support for the hypotheses.

Therefore, students who held learning goals sought to gain competence and their

current ability levels did not contribute to their response styles. They subsequently engaged in the positive cognitions, affect, and desire to take on challenging tasks that characterized the mastery-oriented individuals. Students who held performance goals relied more heavily on their perceived ability levels with the task to dictate which response style they employed; the helpless response style which demonstrated negative cognitions, affect, and a desire to avoid negative evaluation, was triggered by having low ability and a performance goal to prove competence rather than gain it (Elliot & Dweck, 1988).

Performance goals and learning goals trace back to theories of intelligence.

It was evident that the two different response styles, mastery-oriented and helpless, present in earlier research, were derived from two different types of goals: learning goals and performance goals. To investigate further what predicates the formation of these dissimilar goals, implicit theories of intelligence were studied, with a focus on the adolescent population. In a study by Bandura & Dweck (1985), older grade-school age children who endorsed an incremental view of intelligence, or a belief that intelligence could develop, were more likely to choose learning goals when faced with an experimental task than were children who endorsed an entity view that intelligence was fixed. Entity-view endorsers were more prone to adopt performance goals. In another study by Henderson & Dweck (1990), it was found that students undergoing a transition into junior high school who maintained an incremental view of intelligence earned significantly higher grades in the first year of junior high school than those who endorsed an entity view, even when controlling for previous achievement levels.

In addition to a preference for learning goals and earning higher grades, in a longitudinal field study, Blackwell, Trzesniewski, & Dweck (2007, Study 1) reported that adolescents who held an incremental view of intelligence also held more positive beliefs about effort and chose more effective, effort-based strategies when responding to setbacks. Adolescents who endorsed an incremental view at the onset of junior high school increased in math grades over the next two year trajectory, when compared with those endorsing an entity view. In a second experimental study by Blackwell, Trzesniewski, & Dweck (2007, Study 2), junior high school students who were taught the incremental theory of intelligence stopped declining academically in mathematics and showed increases in motivation, as rated by teacher reports. Conversely, students who did not receive the incremental theory intervention continued to decline academically. When looking at the influence of mindset on college students, those taught an incremental theory attained higher grades than those in a no-treatment control group and also attained higher grades than those in another control group that were taught a lesson on the "multiple intelligences" theory of abilities (Aronson, Fried, & Good, 2002).

To summarize, students with an entity view of intelligence showed a maladaptive pattern; they created performance goals, in which the main focus was to gain positive evaluations of their competence; however, they showed a helpless response when faced with obstacles and shied away from challenges and academic risks. Their primary focus was on their perceived competence, but challenging work was viewed as a potential threat to self-esteem. Conversely, students with an incremental view showed an adaptive pattern of responding; they created learning goals, in which increasing competence was the central objective and they showed a mastery-oriented orientation, seeking challenges

that cultivated learning and showed persistence in the face of barriers. The primary focus for these students was on mastery through effort, perseverance, and strategy (Diener & Dweck, 1978; Diener & Dweck, 1980; Dweck & Bempechat, 1983; Bandura & Dweck, 1985; Dweck & Leggett 1988; Elliot & Dweck, 1988). Students in these studies had equal ability levels and some of the most academically advanced students exhibited the maladaptive pattern (Diener & Dweck, 1978; Diener & Dweck, 1980), strengthening the case for the strong influence that mindset wields.

Theories of intelligence: the fixed and growth mindsets. Dweck and colleagues later conceptualized the entity view as the fixed mindset and the incremental view as the growth mindset (Blackwell, Trzesniewski, & Dweck, 2007; Dweck, 1999, 2007). The attributes of the growth mindset and fixed mindset have been clearly defined in research conducted with adolescent samples. Students possessing an entity view on intelligence and thus a fixed mindset (a) believe in the stability of intelligence, (b) view mistakes as poor reflections of their fixed abilities, and (c) reject challenging academic opportunities for fear of failure. Students holding an incremental view and thus a growth mindset (a) see intelligence as malleable, (b) view mistakes as fundamental to the learning process and (c) accept rigorous academic challenges to buttress their learning (Blackwell, Trzesniewski, & Dweck, 2007; Dweck, 1999, 2007).

The Need to Study Mindsets in Early School-Aged Children

The majority of extant literature is focused on adolescent populations; there is a dearth of available research when one attempts to examine the mindsets as applied to early school-aged children, despite the known benefits of early intervention at such an integral stage of development (Kinlaw & Kurtz-Costes, 2007). This paucity in research

may be explained by earlier research that has cited many reasons for precluding early school-aged children from growth mindset research. First, it has been purported that young children already endorse a growth mindset over a fixed mindset. Second, it was hypothesized that young children do not appear to engage in behaviors associated with the fixed mindset, such as viewing mistakes as poor reflections of their fixed abilities, creating performance goals over learning goals, and engaging in a helpless pattern of responding following setbacks. These reasons for not studying the mindsets in early school-aged children will be explored further in succeeding paragraphs.

One reason for limiting research on the growth mindset in early-school aged children was based on the belief that an incremental view, or growth mindset, was already largely in existence in this population. The emphasis on evaluating young children on classroom conduct rather on than high-intensity intellectual content is one reason proposed for this finding. The school experience for young children focuses primarily on tasks that cultivate socially-appropriate behavior. Children may be given continued feedback from the teacher until they attain success on school products. Overwhelmingly, positive praise and evaluation is given to young students (Stipek & Mac Iver, 1989), which is believed to foster a growth mindset. Ability and effort are seen as constructs that are intertwined in young children. Therefore, younger children are more likely than older children to espouse a belief that individuals who work hard are smart, but those who do not work hard are not smart.

Focusing mindset research on adolescents was seen as a higher priority because as students progress through school, the workload increases in both complexity and amount. An increase in negative evaluative feedback on school performance takes place. Ability

and effort become distinct and ability is viewed as fixed, which engenders a shift towards acceptance of a fixed mindset, or entity view (Stipek & Mac Iver, 1989). The belief that students that work hard are smart, but those that do not work hard are not smart, has been shown to attenuate as children become older and an inverse relationship has been reported between effort and ability with the justification that if someone is intelligent, he or she should not have to work hard (Blackwell, Trzesniewski, & Dweck, 2007; Nicholls, 1978).

Despite the notion that most young children endorse a growth mindset, a budding body of literature examining age-related differences in the endorsement of a fixed or growth mindset in elementary students has supported the notion that although individual differences exist, developmental differences between age groups have not been found in this population (Dweck, 1999; Cain & Dweck, 1995; Pomerantz & Ruble, 1997; Bempechat, London, & Dweck, 1991; Kinlaw & Kurtz-Costes, 2007). Other research has found developmental changes in endorsement of one mindset over the other in middle school and high school age students because a salient decline in acceptance of a growth mindset has been reported (Stipek & Mac Iver, 1989; Kurtz-Costes, 2005; Dweck, 1999; Pomeranz & Saxon, 2001). It is important to note that research has demonstrated the fact that there is not a sweeping acceptance of the growth mindset in all young children, and that individual differences do exist.

Another reason for the lack of research efforts on the growth mindset in young children postulated that characteristics of the fixed mindset were not observed in this population. Adolescents with a fixed mindset view mistakes as poor reflections of their fixed abilities. In young children, effort and ability do not appear to be conceptualized as

two distinct constructs, but are intricately entangled in a young child's understanding of intelligence (Stipek & Mac Iver, 1989). A differentiation of ability and effort takes place as children progress through elementary school (Yussen & Kane, 1985). Some research has suggested that effort and ability do not become conceptually disentangled until the age of 11 (Nicholls, 1978). Children's fusion of ability and effort as undifferentiated constructs leads to the view of ability as a skill that can be further developed; therefore an endorsement of the growth mindset is purportedly, already instilled in young children. Furthermore, if children believe that their ability can grow and develop, attributing failure to ability does not have the deleterious ramifications that it has on adolescents, who believe ability to be unchangeable (Dweck & Elliot, 1983; Nicholls, 1978; Burhans & Dweck, 1995). Due to the notion that children cannot perceive ability and effort as distinct, it was suggested that they did not view mistakes as indicators of deficient - fixed abilities. Therefore, the need to study further, the growth mindset in this population was not realized (Stipek and Mac Iver, 1989). This perspective, however, fails to examine how this characteristic of the fixed mindset may manifest in young children. As can be seen further in this study, a much more developmentally complex understanding is needed.

As children progress through development, they begin to weave a working theory of intelligence through a framework that begins to organize as young as kindergarten age. Children are described to be in the early stages of forming naïve, or implicit theories of intelligence, which is an amalgam of overlapping constructs. Rather than viewing intelligence as a distinct trait, a global conceptualization of intelligence as encompassing various social, emotional, and behavioral factors appears to be endorsed in young

children (Stipek & Mac Iver, 1989; Kurtz-Costes, McCall, Kinlaw, Wiesen, & Joyner, 2005). Early school-aged children are more likely to associate intelligence with global attributes such as classroom behavior, athletic ability, and social characteristics; older children view intelligence as more strictly related to cognitive capacities (Bempechat, London, & Dweck, 1991; Yussen & Kane, 1985, Stipek & Mac Iver, 1989). Links between mindsets, types of goals set (performance vs. mastery), and motivational levels were more strongly related for students in second and fourth grades when compared with kindergarten students, indicating that beliefs about the controllability of intelligence begin to be associated more robustly with other achievement-related constructs as children progress through development (Kinlaw & Kurtz-Costes, 2007). Therefore, younger children are prone to viewing an individual who is a fast runner or socially amicable as also being smart; older children, however, are more decidedly prone to provide task-specific or cognitive abilities as contributors to intelligence (Stipek, 1981; Stipek & Mac Iver, 1989; Bempechat, London, & Dweck, 1991; Heyman, Dweck, & Cain, 1992; Ruble & Dweck, 1995).

Recent research has shown that although children may not distinguish ‘intelligence’ as a separate ability, there seems to be a more integrative notion of the general self, which can be evaluated as ‘good’ or ‘bad’ (Heyman, Dweck, & Cain, 1992; Herbert & Dweck, reviewed in Dweck, 1991). By age two, children begin to make connections between their behavior and subsequent approval or disapproval from others, but by age three, children start to internalize social norms and use these norms as a benchmark for evaluation of their own behavior (Stipek, Recchia, & McClintic, 1992; Stipek, 1995). It is a belief that preschool and kindergarten age children endorse a basic

'good/bad' assignment system when labeling various constructs of the self (Heyman, Dweck, & Cain, 1992; Bempechat et al. 1991; Ruble & Dweck, 1995).

Young children's' views on mistakes. In one study (Heyman et al. 1992), 107 kindergarten students participated in three role-playing scenarios in which they simulated putting forth great effort to complete a project. In each case, right before the child handed the completed project to the teacher, a flaw was indicated by the teacher. For one of the scenarios, the story ended here (no-feedback story) and the child's evaluation of his or her product was assessed. In the other two stories (feedback stories), the flaw was again pointed out and the teacher expressed disapproval of the student and of the product. The child was asked to evaluate his or her product after each scenario. Half of the children heard the no-feedback story first and the other half heard it last. Forced and open-ended questions were posed to the students following each role-playing scenario. For those who heard the no-feedback story first, almost all of the children, (94.4%) rated their products to be a 5 or 6 out of a 6 point scale, indicating very high ratings when criticism was not faced. Any ratings below 5, therefore, were considered to be downgraded due to criticism. Children were then divided into two groups: *high products raters* (average rating in the feedback conditions was 5 or more) and *low product raters* (average rating in the feedback conditions was less than 5). Children were asked four questions to gauge how they viewed their performances as reflective of their traits and abilities. They were asked: (1) Did everything that happened make you feel like you were good or not good at painting? (2) Did everything that happened make you feel like you were a good or not a good girl? (3) Did it make you feel like you were a nice or not a nice girl? (4) Did it make you feel like you were smart or not smart? Low product raters were more likely than high

product raters to make overarching, negative self-evaluations after they received criticism, which included negative evaluations of their goodness. Additionally, low product raters were more susceptible to interpret specific scenarios as reflecting global goodness or badness. At the beginning of the experiment, general beliefs about goodness were assessed through questioning. For example, children were told, “Imagine a new boy (or girl) is in your class. You look over at his schoolwork and see that he got lots and lots wrong and has a big frown on his paper. Does this mean that he is bad?” Only 19% of high product raters asserted that the boy was bad but 48% of the low product raters did so. Low product raters were more easily prone to assert that poor performance equates to badness. As can be seen in this study, characteristics associated with the fixed mindset in adolescence have been paralleled in young children. Therefore, young children may not see mistakes as reflecting on low intelligence; however, they may see mistakes as reflecting in a more global sense, on the fundamental ‘goodness’ or ‘badness’ of their self.

Self-worth as malleable or fixed. This perception of a good or bad self has the potential to mediate characteristics of the fixed mindset seen in adolescence. Similar to the entity and incremental views of intelligence described in adolescence, young children can view sense of worth as unconditional or as contingent. Those with a contingent self-worth form what Burhans & Dweck (1995) refer to as ‘self-valuation goals’, similar to the performance goals set by adolescence in which the gaining of positive evaluation and avoidance of negative feedback is the objective. Those who view self-worth as contingent and form goals to establish and preserve self-worth contribute to the helpless response in young children (Burhans & Dweck, 1995). Although young children may not set

performance goals to validate their fixed intelligence and circumvent negative criticism, they may form self-valuation goals to gain favorable judgment of their self-worth and sustain positive feedback.

Helpless and mastery responses in young children. Another tenet of the fixed mindset apparently not engaged in by young children concerns how individuals respond to failure, engaging in a helpless pattern of responding after they experience setbacks (Diener & Dweck, 1978; Diener & Dweck, 1980). An important mediator of the helpless response has been shown to be an understanding of traits as distinct and stable; individuals interpret failure as reflections of poor fixed ability. As mentioned previously, it has been shown that children lack the cognitive capacity to view traits as stable and separate from one another. Due to the developmental and cognitive differences between young children and older children, it is difficult for young children to process complex trait knowledge (Kurtz-Costes, McCall, Kinlaw, Wiesen, & Joyner, 2005). Due to this, it was assumed that children did not engage in a helpless response pattern, further supporting the notion that examining the growth mindset in early-school aged children would be futile.

In three separate studies (Cain & Dweck, 1995; Herbert & Dweck, reviewed in Dweck, 1991; Smiley & Dweck, 1994), helplessness in children was examined. Measures to gauge affect, behavior, and cognition were taken, using developmentally appropriate means. Previous studies may have used developmentally inappropriate procedures or assessment methods that utilized terms such as ‘ability’; this may have been too abstract for young children. Conversely, these studies used a puzzle task which is developmentally meaningful for this age group. The same procedure was used in all three

studies. Children were given four puzzles tasks to complete. The first three puzzles were too difficult for the children to solve in the allotted time and the fourth puzzle was much easier and able to be solved in time. After the last puzzle was successfully solved, all four puzzles were brought back for the children, just as the children had left them. Children were then asked to choose one of the four puzzles to complete. Children that chose to complete one of the unsolved puzzles were categorized as 'persisters' and those that chose to redo the puzzle that they had already completed were labeled as 'nonpersisters'. When asked about the reason for their decisions, persisters supplied reasons that expressed a willingness to take on challenges, but the nonpersisters expressed a desire to avoid challenges (Cain & Dweck, 1995; Herbert & Dweck, reviewed in Dweck, 1991; Smiley & Dweck, 1994). The desire to take on challenges aligns with the notion of academic risk-taking perceived in adolescents with the growth mindset.

In the Herbert and Dweck (reviewed in Dweck, 1991) study, Eighty-nine 4-and 5-year olds were participants, with 36% presenting as nonpersisters and 64% presenting as persisters. On each of the four puzzle trials, children were asked to indicate how they felt by choosing a picture of a face (ranging from a big smile to a big frown). Of the nonpersisters, 71% reported decreasing affect over time as compared with 47% of persisters. Children were also asked two questions to gauge attributions and future predictions of performance. The first question asked children whether or not they believed they could complete any of the given puzzles if they had more time, or if they believed that they were simply not good enough at puzzles. In response to this question, 64% of persisters verified that they could complete one of the puzzles if they had more time, but only 29% of nonpersisters said they could finish if given extended time;

therefore, 71% of nonpersisters rated themselves to be not good enough at puzzles. The second question asked the children if they could do any of the puzzles if they tried their very hardest. In response, 54% of nonpersisters did not believe that they could finish a puzzle, even if they tried their hardest; however, only 19% of persisters believed this. These response patterns are analogous to the lack of persistent engagement and negative affect observed in older school-aged children.

In a similar study by Smiley & Dweck (1994), 51% of preschool and kindergarten students were identified as nonpersisters and 49% were identified as persisters. Prior to the failure trials, pretest puzzles were given to all participants to ensure equal ability levels amongst children. Results showed that no differences existed between completion times of the two groups on the pretest puzzles. Again, reasons for puzzle choices were extracted and were expressed either as an acceptance of challenges or an avoidance of challenges. Spontaneous utterances from children during failure trials were recorded and nonpersisters were significantly more likely to convey sentiments of concern regarding performance. Negative affect was reported significantly more often for nonpersisters during failure trials, when compared with persisters. A follow-up measure was given to children, using a secondary tower-building task to ascertain the generalizability of findings on the puzzle task. Children were instructed to build blocks towers until they wanted to stop or until the tower fell over. After the first failing trial of the block building task, nonpersisters lowered their predictions on future performance significantly more so than did persisters. These results were garnered despite equivalent predictions initially stated at the onset of the task between the two groups. In addition to lowered

expectations, nonpersisters stopped building before their tower tumbled significantly earlier than persisters.

In yet another similar study, Cain & Dweck, (1995) classified 36% of first graders as nonpersisters and 64% of first graders as persisters. This study replicated findings from aforementioned studies, demonstrating that more nonpersisters than persisters viewed themselves as not good enough at puzzles; they lowered predictions about future performance following failure, and reported negative affect.

Collectively, these studies demonstrated that between 36%-51% of children between the ages of 4 and 7 demonstrate affective, behavioral, and cognitive characteristics commensurate with the helpless response pattern. After experiencing failure, some children: (a) stopped or curtailed persistence with the task at hand, (b) viewed the failure as a signal that they could not perform the task, (c) lowered their predictions of future performance on similar tasks, and (d) conveyed negative affect.

Features of the Mindsets Measured in Young Children

Although presenting differently, characteristics of the fixed and growth mindsets are ostensible in young children. In addition to the way in which the characteristics of the fixed mindset manifest differently between age groups, a difference between kindergarten-age children and adolescent children is also found in how mindset is reported. This is due inevitably to the developmental discrepancies between the two age groups. For example, children ages 5 to 7 years old lack the metacognitive and verbal ability to articulate how intelligence exists. In a study by Stipek (1981), when kindergarten and first grade students were asked in an open-ended way to explain a smartness rating that they had assigned themselves, many were unable to do so, often

conveying the idea that they ‘just knew’ they were smart. Any information that was transmitted discussed smartness in terms of behavioral traits, such as following classroom rules or completing work. This makes sense when considering the emphasis on social/emotional and behavioral functioning in kindergarten classrooms (Apple & King, 1978; Stipek & Mac Iver, 1989). To reiterate, the first research question inquired about the observable behavioral features of the growth and fixed mindsets in early school-aged children.

Due to the cognitive, behavioral, and social-emotional differences between adolescents and early school-aged children, the way that the mindsets are defined and measured must be altered to fit a developmentally appropriate paradigm. The present work seeks to identify early behavioral markers of the fixed or growth mindset. Similar to the aforementioned studies, behaviors associated with the mindsets will be measured; in contrast to these previously cited studies, information will not be elicited from young children, but naturally observed while age-appropriate academic tasks are taking place. This will allow for more objective behavioral information to inform the type of mindset that a child might espouse. Based on the research discussed previously, four prominent behaviors associated with mindset in older children, emerged as manifesting in young children as well. These behaviors are identified as: *engagement with task, spontaneous verbalizations, anxiety-related behavior*, and *academic risk-taking,* which in young children will be looked at as *guessing behavior.*

Although persistence with tasks was studied previously, an earlier prerequisite behavior for persistence with tasks was examined in this present work. Students who hold a growth mindset are more likely to engage with academic tasks and work industriously

to perform well on those tasks (Ommundsen, 2001, 2003; Stipek, Newton, & Chudgar, 2010). In this study, engagement with tasks was observed through a tabularized matrix behavioral coding system that examined eye contact and physical proximity. Eye contact was checked either as (1) *on target* or (2) *poor/limited,* and physical proximity was checked as (1) *neutral/extended towards task* or (2) *retracting.* Students exhibiting on-target eye contact and neutral/extending proximity were coded as *fully engaged.* Students who displayed poor/limited eye contact and retracting proximity were coded as *disengaged*. Students with on-target eye contact but retracting proximity *or* poor/limited eye contact but neutral/extending proximity were coded as *somewhat engaged.*

Spontaneous verbalizations were also studied through natural observation. In this way, verbalizations were not elicited, but were recorded if they occurred freely. Verbalizations were coded into one of three mutually exclusive and exhaustive categories: (1) *positive* (2) *negative* or (3) *none.* Recording spontaneous verbalizations allowed for the expression of affect and self-cognitions. When children engage in spontaneous verbalizations, or 'what they are thinking about', a broad range of cognitions is able to be monitored (Diener & Dweck, 1978). *Positive* verbalizations included any statements expressing: positive affect, belief in one's ability to perform the task, self-encouragement to engage in strategies to complete the task, and positive self-monitoring statements. *Negative* verbalizations included any statements expressing: negative affect, disbelief in one's ability to perform the task, self-discouragement regarding strategies used to complete the task, and negative self-monitoring statements. If verbalizations were neither positive nor negative and instead were irrelevant, they were not recorded into either category. If verbalizations expressed a neutral sentiment without any connotations

of value, they were not recorded into either category. If no verbalizations occurred, this was recorded as *none.*

Another observable behavior of interest to provide insight into specific affect and the endorsement of a growth or fixed mindset was the presence of anxiety-related behaviors. Anxiety has been tied with negative effects in academic tasks, such as declines in performance over time, negative affect and cognition, and handicapping physiological responses. Anxiety is also linked to students' capacities to cope with academic setbacks and challenges (Martin & Marsh, 2008). Young children who endorse contingent self-worth create 'self-valuation goals', similar to 'performance goals' in adolescence, in which the gaining of positive evaluations and avoidance of negative feedback is the objective. This avoidance of negative evaluation is fueled by anxiety and contributes to the helpless response in young children (Burhans & Dweck, 1995; Cetin, Ilhan, & Yilmaz, 2014). In previous studies, the presence of anxiety was typically expressed through spontaneous utterances and fear-based self-talk (Dweck, 2006; Diener & Dweck, 1978; Diener & Dweck, 1980). Those with a fixed mindset fear situations in which they feel challenged beyond their abilities. In young children, this predisposition for the fixed-mindset was observed naturally through behavioral characteristics associated with anxiety. Anxiety-related behaviors were operationally defined as: nail-biting, nervous affect, minimal/limited responding, repetitive motoric behavior, quick /shallow breathing, excessive sweating, blushing, shakiness, and/or clinginess to caregiver. Students exhibiting any one of these behaviors were coded as having *anxiety-related behavior*. Absence of these behaviors resulted in a coding of *no anxiety-related behavior.*

In order to tap children's tendency to embrace challenges or take on academic risks, children's "guessing" behavior was measured. Academic risk taking behavior involves sharing ideas even though there may be uncertainty about the accuracy of those ideas. Asking questions and attempting to solve problems in various ways are also associated with academic risk taking (Cetin et. al., 2014). Academic risk taking involves embracing both the known and the unknown outcomes of participating in learning, as well as a decision to participate in the learning act. In this study, any child who appeared uncertain of a response communicated either verbally (e.g., "I don't know") or through gestures (e.g. shrugging shoulders, head shaking back and forth) and was given one verbal prompt: "You can take a guess. Do you want to take your best guess?"

The number of times that an *uncertain response* occurred, as defined previously, was recorded. Each time an *uncertain response* occurred and the examiner prompt was given, either one of two mutually exclusive boxes was checked; whether the child chose to take a (1) *guess* or to refrain from guessing (2) *no guess* was recorded. In addition to measuring risk taking behavior, decisions to take a guess or to not take a guess also revealed persistence with the task at hand.

It is hypothesized that children who are fully engaged, who exhibit positive verbalizations, who demonstrate an absence of anxiety-related behavior, and who demonstrate guessing behavior will be strongly associated with endorsement of a growth mindset.

The Impact of Adults' Mindsets on Children's Mindsets

Ecological theory purports that academic success is influenced by everyday encounters and exchanges between environmental and individual variables

(Brofenbrenner, 1979). Therefore, in addition to identification of the features characterizing the growth and fixed mindsets, of equal importance is an exploration of contributors influencing the development of the mindsets.

Teachers' mindsets. A facet of research crucial to uncovering the basis of students' mindsets is the type of mindset that the teacher holds. Teachers are powerful stakeholders in children's lives and exert substantial influence on students. Teachers naturally make judgments about students' intelligence as they engage in dynamic interactions with their students. These judgments, whether conscious or not, have noteworthy ramifications on how students view themselves and how their peers view them (Lau & Chan, 2003). Interestingly, teachers who have more experience tend to employ a fixed mindset when considering students' intelligence because they attribute academic success to innate, stable abilities. This is in contrast to new teachers' growth mindsets, because this group is more likely to attribute student success to controllable factors, such as effort (Georgiou, 2008). This is, purportedly, due to differences in pre service training that places special emphasis on development (Lynott & Woolfolk, 1994). It has also been hypothesized that this finding is due to teachers becoming more skeptical about their ability to augment student achievements throughout the greater number of years that they teach (Peterson et. al., 2011).

Dweck & Bempechat (1983) hypothesized that teachers' implicit theories of intelligence may dictate how children internalize the way in which intelligence is defined and also what intelligence means. Teachers' definitions of intelligence represent a view of intelligence that is synonymous with the one on which traditional IQ tests are based; how students' view themselves as learners often mirrors their teachers' views of students'

intelligence (Pretzlik, Olsson, Nabuco, & Cruz, 2003). Even after controlling for children's general intelligence, teachers' perceptions of children's academic competence weigh heavily on children's ensuing academic performance (Gut, Reinmann, & Grob, 2013). In a study examining self-perceptions of academic competence among high-ability students, it was found that individuals with disproportionately low levels of self-perceived academic competence were instructed by teachers who held low expectations for them and thus these students expected less of themselves regarding future academic success (Phillips, 1984). Low perceptions of competence can manifest as helpless-oriented responses such as giving up prematurely when academic challenges are faced or as circumventing challenges altogether (Stipek, 1998).It is important to note, that starting in Kindergarten, children's self-views on their aptitude for academic success begins to impact their feelings towards school. Children who have positive self-perceptions about their academic prowess have higher levels of motivation and are more susceptible to working hard and initiating and persisting with academic tasks (Stipek, 1998).

The type of praise that is provided to students produces different messages about what is most meaningful in goal attainment, and this, therefore engenders disparate motivational frameworks (Cimpian, Arcem, Markman, & Dweck, 2007). Praise has therefore received significant attention in the literature as a salient influence in affecting students' mindsets. In one study, fifth grade students performed academic tasks and then were praised either for their intelligence or for their effort. Students' mindsets and definitions of intelligence were then assessed. Students who were praised for their intelligence were more likely to agree with statements that aligned with a fixed mindset, whereas students that were praised for their effort agreed more often with statements that

aligned with a growth mindset. Similarly, students praised for their intelligence cited more definitions involving innate, fixed ability, whereas students praised for effort referenced more adaptable skill and knowledge areas that they could ameliorate through hard work and learning (Mueller & Dweck, 1998).

In addition to influencing students' mindsets, teachers' mindsets also influence the instructional approaches employed and subsequent response styles that ensue. In one study, teachers who were led to believe that students' intelligence was fixed did not offer problem-solving solutions; instead, they instructed students to develop their own strategies for solving problems. Conversely, teachers who believed that intelligence was malleable provided more supportive assistance to students and taught problem-solving skills directly to students (Swann & Synder, 1980). In another study (Rattan, Good, and Dweck, 2010), undergraduate and graduate school instructors simulated teacher roles and were provided with anecdotes describing students with low math abilities. Participants who endorsed a fixed mindset were more readily prone to: (1) categorize a student as having low ability based on a single test score, (2) choose to comfort a student for his or her apparent low math ability, and (3) utilize teaching strategies that could reduce further involvement with the field and therefore reduce future opportunities in the field. Well-intentioned teachers conveyed a message of caring and comfort for perceived areas of weakness, rather than strategy-based messages that presumed controllability; this engendered an environment in which students felt less motivated and viewed teachers as being less engaged in their learning (Rattan, Good, and Dweck, 2010). When looking specifically at the subject of math, Dweck (2008) asserts that instructors with a growth mindset place special emphasis on the process involved in comprehending math concepts.

An emphasis on the process elucidates student effort as pivotal to increasing math intelligence. Instructors who hold a fixed mindset focus heavily on the products or the answers to math problems.

It is palpable that teachers' mindsets play a significant role in how teachers educate and interact with students and therefore how students' view themselves as learners. These findings have valuable implications on training and intervention programming in schools. A less-developed area of research is the examination of parents' mindsets and the inevitable influence that they have on young children. This field of study could also provide valuable insight into parent training and intervention programming.

Parents' mindsets. Due to their strong, influential roles in adolescents' lives, the teachers and of course the mindsets that teachers possess, have an ostensible impact on the adolescents' mindsets. However, especially for early school-aged children, attention must be turned towards another important stakeholder, the parent. The second research question asked what parent beliefs were associated with children's mindset and with their behavioral performance.

The strength of parental influence. Parents influence their children in many ways. Corresponding with social constructivist theories, children do not formulate self-perceptions surrounding attainment of success based on actual reality, but through reality as interpreted through the lens of parents. When parents hold negative perceptions of their child's academic competence, the child's academic functioning is negatively impacted but when parents hold positive perceptions of their child's academic competence, academic functioning is buttressed. Parents therefore socialize children by

way of their expectations of children (Parsons, Adler, & Kaczala, 1982; Eccles, 1983). This interaction becomes reciprocal because parents' perceptions of their children's academic abilities shape how they respond to children, the directions in which they may steer children and their subsequent expectations. Children react in a complementary way by perceiving education in a certain light and performing accordingly. In this way, parents' perceptions become a self-fulfilling prophecy for children. For example, parents that hold high views of their children's academic abilities may orient them towards certain academic areas and engage them in activities that serve to accentuate their academic talents; however, parents who do not hold high perceptions of their children's academic abilities may orient them towards different areas for further development such as a job in the labor field or a career in sports.

Parents' perceptions of their children and expectations for them were shown to be related both to the children's perception of their parents' views and to the children's self-view. In one study, parents' perceptions regarding academic achievement were more strongly tied to children's self-views and expectations than were the children's actual historical performance in math (Parsons et al., 1982). Similarly, parents' views of their children's ability and effort also predicted children's self-views in math and in English and had a stronger relationship to children's self-views than their actual former grades (Frome &Eccles, 1998). Parents' perceptions of children's ability were a more robust predictor of children's subsequent academic achievement than were teachers' perceptions of children's ability (Gut, Reinmann, & Grob, 2013; Entwisle, 1997). It is clear that parents play a significant role in socializing children to certain expectations and perceptions and that they influence children directly regarding the formation of the

children's own perceptions and expectations that they hold for themselves. This may be done through messages communicated to children about the attribution of success.

Parents influence children through messages and control. Messages that convey confidence in children's abilities have been shown to be predictors of children's academic achievement in both low-and high-ability students. Supportive behavior was shown to be most depressed among parents of low-ability students. Therefore, lower perceptions of low achieving students may compound difficulties that are faced by these students, resulting in decreased motivation and academic performance (Phillipson, 2010). A connection was demonstrated between elevated numbers of problem behavior and lower successive academic performance, which was explained by lower perceptions of children's ability by both teachers and parents (Gut, Reinmann, & Grob, 2013). Another way that parents communicate their perceptions to their children lies in the element of control. Controlling parents convey distrust in their children's ability to problem-solve and severely limit children's autonomy. Antithetically, parents who support their children's autonomy communicate trust in the children's ability to work out tasks and solve problems, which enables children to create their own strategies for problem solving (Grolnick, Gurland, DeCourcey, & Jacobs, 2002). These two different ways of handling control express messages that may engender two very disparate responses, namely mastery-oriented or helpless responses (Grolnick & Ryan, 1989). On one hand, as children receive messages that communicate confidence in the capacity to be successful with tasks, they may feel receptive to take on challenges and work through difficulties. On the other hand, if children are being given messages that they cannot be successful independently and that they require external support from parents, they may be less

motivated to work independently and may show an unwillingness to face difficult tasks. The effects of mothers' control on children's mastery were shown to mitigate mastery and the effects of mothers' control were both immediate and sustained over time, emphasizing the need for parental intervention in fostering autonomy in children. Supporting children's problem-solving strategies or goading them to talk through problems represents two ways that parents can relinquish control in a positive way (Moorman & Pomerantz, 2010).

The relationship between parents' mindsets and children's behavior. It has been shown through parents' perceptions of their children's abilities, with a specific focus on the mindsets, that the more highly mothers endorsed an entity view (fixed mindset), the more predictive were their perceptions of their children's abilities, with resulting effects on their children's ensuing academic and emotional functioning. Children who were assessed to have the lowest level of competency invariably showed the lowest levels of functioning when mothers held an entity view in contrast to an incremental view (growth mindset) (Pomerantz & Dong, 2006). It was postulated that the reason behind these findings was due to entity-theorist mothers involving themselves with their children in unproductive ways when their children encountered challenges. This unproductive involvement has deleterious ramifications on children's academic and emotional functioning (Moorman & Pomerantz, 2010). This was elucidated in a study by Moorman & Pomerantz (2010), in which mothers were oriented to hold an entity view or an incremental view and were then instructed to work with their children on a set of challenging tasks. Mothers who were persuaded to employ an entity view emphasized performance over process, exerted accentuated control over tasks, and expressed

themselves with more negative affect than those who were oriented towards an incremental view, or growth mindset. Further findings revealed that responses varied towards helplessness exhibited by children, with entity theorists responding in unproductive ways, when compared with incremental theorists.

In a similar study, children performed a series of experimental tasks and were coded either as engaging in helpless patterns of responding or as in mastery-oriented patterns of responding, contingent on the type of interaction the children had with their mothers while completing the tasks. When compared with mothers of mastery-oriented children, mothers associated with the helpless-oriented children were more likely to respond to their children's discouraging and helpless statements by recommending that the child stop the task. This finding is important because it underscores the important reciprocal nature involved in the parent-child interaction when exploring the fixed and growth mindsets (Hokoda & Fincham, 1995).

Research conducted by Pomerantz & Dong (2006) replicated many main effects found in previous research (Frome & Eccles, 1998) concerning parental perceptions of children's competence on children's perceptions of competence and academic achievement. In addition, this study also generated novel findings; it was shown that parents' views and perceptions also predicted children's attributions of competence, mastery orientation, and affective functioning over time. Specifically, when compared with children whose mothers held positive perceptions of their academic competence, children with mothers who held negative perceptions of their academic competence were more prone to view academic failure as fixed, widespread, and innate and were more susceptible to view academic success as apt to change, external, and specific. However,

the main effects of mothers' perceptions were moderated by their mindsets and were apparent only when mothers endorsed a fixed mindset. Results showed that those mothers' perceptions acting as self-fulfilling prophecies in predicting children's functioning was apparent for mothers who held more of a fixed mindset. Self-fulfilling prophecies were therefore not evident for those who did not believe in a fixed mindset. In alignment with prior research, this study showed that parents' views and perceptions predicted children's views of their academic competence as well as their actual grades. It is important to note that when parents held negative perceptions of their children's competence and also endorsed an entity view, more negative functioning in children was found. However, if parents held positive perceptions and an entity view, more positive functioning in children was found. Although this latter finding may be true, the positive functioning observed may not be sustainable; when these children are presented with challenges, they may engage in a helpless response pattern (Pomerantz & Dong, 2006). This elucidates the need to teach parents to adopt a growth mindset through appropriate intervention training programs.

Mindsets affect parental views on children's performance. Just as children form different types of goals, parents hold different goals for their children. In one study, parents who held performance goals emphasized demonstration of competence; parents who held mastery goals were more concerned with their children gaining competence. Mothers who held performance goals were more likely than their counterparts to focus on fixed ability and to attribute performance to innate capacities rather than to hard work. In contrast to their peers, mothers who held performance goals were also more likely to opt

for children's grades and standings, rather than input about the child's work ethic (Ames & Archer, 1978).

Parents who espouse a fixed mindset may see their child's performance as indicative of whether or not he or she is successful at a specific task. If the child is not successful, the parent may feel threatened because this performance is viewed as a deficit that cannot be improved upon. Parents may emphasize the product of a task (i.e. grades), enact control over situations (i.e. managing how children problem solve), and express negative affect (i.e. conveying disappointment in children). Conversely, parents employing a fixed mindset may see a child's performance as reflective of where the child stands in the learning process, may constructively participate with their child (i.e. helping him or her to discover different ways to attempt a task), and express positive affect (i.e. encouraging their child's ability to work hard at the task) (Moorman & Pomerantz, 2010).

Parents receive information about their student's attainment through various channels. Although parents are able to glean information from preschool and daycare about their child's functioning, it is not usually until school-age that a parent begins to receive both intrapersonal (child compared with himself or herself) and interpersonal (child compared with other same-aged peers) evaluative information about their child. (Stipek & Mac Iver, 1989). In one study (Kärkkäinen et al., 2011), parents' intrapersonal and interpersonal ratings of the malleability of their child's academic success in mathematics and Finnish were strongly intertwined. This implies a synthesis of feedback about the child's functioning, compared with himself or herself, and the child's functioning compared with his or her peers. Interestingly, both intrapersonal and interpersonal ratings of malleability were moderate, suggesting a somewhat pessimistic

view that children can improve upon their abilities. It was further shown that parents held higher ratings of malleability for intrapersonal success than for interpersonal success. Interestingly, when looking at responsibility attribution in parents, it has been found that parents typically attribute student success with fixed ability and attribute student failure with a lack of effort. This attributional pattern serves as a protective mechanism because students are able to be viewed positively for an innate ability, but are encouraged to try harder due to limited effort expenditure that is believed to be controllable and thus able to be improved upon in the future (Rytkönen, Aunola, & Nurmi, 2007). This self-protecting attribution pattern was supported in the research study discussed previously (Kärkkäinen et al., 2011); parents' ratings of their children's actual capacities in mathematics and Finnish revealed an inverse connection to their ratings of the likelihood that their child could improve. Therefore, when a child was doing poorly, parents were more likely to rate that the child could improve, whereas if the child was doing well, ratings suggested less room for malleability which signaled the idea that a child possessed fixed capacity, less susceptible to change.

The need to study parental factors. Despite the paramount influence that parents exert over their children's education, limited research has examined this influence within the context of the mindset literature, specifically when looking at early school-aged children. This is a valuable area of research because if strong associations do exist, then interventions targeting the augmentation of a growth mindset in parents will become paramount. There is support for the idea that there are three prominent stakeholders in student learning; the student, the parent, and the teacher play a significant role in learning and in achievement. When feelings of responsibility for the learning process and for

academic outcomes are demonstrated by all groups, student success is assured. Students themselves view parent involvement as pivotal to academic achievement. In a study by Peterson et al., (2011), three student focus groups were conducted and all groups identified the role of parents as a necessity for student success, specifically outlining encouragement, support, and drive as important contributing variables. It has been petitioned that teachers and social workers be trained in evaluating their own perceptions about children's academic ability. It has also been suggested that parental perceptions of students as young as kindergarten should be evaluated, because parents play such a dominant role in influencing student performance and achievement. This becomes especially important for children who face greater adversity (Gut, Reinmann, & Grob, 2013).

Parental training and support will aid in impeding the negative consequences that have been rendered as a result of negative perceptions of children's competency. Parent training programs that teach families how to model, will promote, and reinforce a growth mindset culture within their homes that is pivotal when working with early-school aged children, specifically, with kindergarten students. Targeting these concepts at an early age will help children to internalize these ways of thinking and integrate these into their learning and into their lives (Elish-Piper, 2014). Although the correlation between mothers' mindsets and children's mindsets was studied (Pomerantz & Dong, 2006), participants included fourth through sixth grade students; the assessment measure used to ascertain mothers' mindsets outlined various levels of agreement with statements aligning with a fixed mindset rather than including both fixed and growth mindset statements. Enhancing understanding of the relationship between parents' mindsets and their young

children's mindsets that tap both growth and fixed mindset statements will help to inform intervention training programs.

There is literature that examines parental factors associated with children's achievement and functioning in school. Despite this, the examination of the association between the parent's mindset and the child's mindset is a specific area in which there is a paucity of literature. It is hypothesized that a strong association will exist between parents with a growth mindset and kindergarten students with a growth mindset and that a strong association will also be found between parents endorsing a fixed mindset and kindergarten students holding a fixed mindset.

Aforementioned studies have also underscored the important link between parents' mindsets and children's behavioral functioning. It is therefore also hypothesized that a strong association will exist between parents with a growth mindset and students with high levels of engagement, positive verbalizations, no anxiety-related behavior, and the presence of guessing behavior. It is further predicted that parents with a fixed mindset will be associated with students with low levels of engagement, negative verbalizations, anxiety-related behavior, and the absence of guessing behavior.

Teaching the Growth Mindset

The neuroscience behind the growth mindset. The ideas behind the growth mindset are grounded in neuroscience, specifically as they relate to neuroplasticity and the strengthening of neuronal connections throughout the learning process. Contrary to previous beliefs, brains have the potential to develop well into adulthood. In fact, human brains are largely plastic and capable of change. Brains adapt to environments. This adaptation leads to physical changes in the infrastructure of the brain. A specific example

of this can be found in research on cab drivers in London. These cab drivers' hippocampuses changed in size, the result of constant navigation of the city. This brain-based adaptation is important for cab drivers who need strong spatial memory skills that are housed primarily within the hippocampus. The idea of brain plasticity, or capacity for change, reveals a brain that is flexible, malleable, and possessing a limitless potential. Similar to plasticity, the idea of experience-dependent synaptogenesis provides explanations on how neuronal connections are solidified by learning experiences. These important neuroscientific ideas are valuable contributors to research on learning and education and form the conceptual foundation upon which the growth mindset is built (Wilson, Conyers, & Rose, 2015; Blakemore & Frith, 2005).

Aside from the ideology that founds the growth mindset, other inter-related areas in psychology, education, and even business management are integrating neuroscientific elements such as plasticity and synaptogenesis into practice. In discussing theories of intelligence within a nature vs. nurture framework, psychologist Robert Sternberg has asserted that although genetics plays an important role in the development of intelligence, the environment exerts extremely strong influences in this development (Sternberg & Williams, 2010). Psychology Professor K. Anders Ericsson purports that in order to truly become an expert at something, committing anywhere from 5,000-10,000 hours of practice to the field of interest is essential. This supports the idea that cultivating expertise is more important than relying on innate ability (Ericsson, 1996). The same neuroscience driving the ideas behind the growth mindset is also referred to when looking at honing creativity in the workplace. In fact, organizational psychologists have used Dweck's growth mindset research to target ways of developing both group and

individual creativity and innovation. Allowing employees to have a mental and physical space to execute autonomy and engage in novel approaches and experimentation is vital to empower employees and invigorate them to succeed (Spitzer, 2013). It is clear then that the teachings of the growth mindset are able to be generalized to other populations and to other fields of work.

Changing mindsets in adolescence. Although neuroscience is heavily impacting fields outside of education, it is especially relevant to bridge the gap between science and educational practices that are inherent to learning. Armed with the knowledge of how the two mindsets are defined, how they are influenced and the reasons why they matter, the most pressing and natural inquiry concerns whether or not one's mindset can be altered. Existing research that focused primarily on adolescent samples has been promising, showing that it is possible to teach a growth mindset to students and therefore, alter one's mindset. Research that has emerged over the last decade has begun to inculcate neuroscientific underpinnings into the field of education, possibly aiding in the validation of various brain-based techniques applied to learning. The notion of how students learn and what changes occur in the brain during learning has set the stage for various methods of educating, in particular, teaching students the growth mindset.

Promising research has shown that mindsets can be changed and that a host of benefits have been engendered resultant from teaching students a growth mindset (Blackwell, Trzesniewski, & Dweck, 2007; Elish-Piper, 2014; Wilson et al., 2015). In a seminal study on teaching the growth mindset directly to students, Blackwell Trzesniewski & Dweck (2007) divided seventh grade students into two groups; both groups received an eight-week workshop on study skills but only one of the groups also

received lessons on the growth mindset and how they could essentially grow their intelligence. Results showed that by the end of the semester, the growth-mindset group showed significant gains in their math grades, compared with their counterparts who did not show progress and continued to drop in performance. In this direct teaching of the growth mindset, students learned that the harder they tried and the more they learned about new concepts, the more neural connections were formed and the more brain growth would take place (Dweck, 2007). After students read an article about developing the brain like a muscle, they began to shift their attitudes towards their New York junior high school. Formerly being viewed as a place where judgement occurred, students began to view their school as a place that was rich in learning experiences that needed to be activated (Dweck, 2008).

Based on of these findings, Brainology® was created. Brainology® is an interactive, computer-based program that contains six modules. These modules incorporate lessons about the brain and have students visit virtual brain labs and conduct virtual brain experiments; they view the process involved when the brain changes with learning, and learn ways to optimize their brains and grow their intelligence. Preliminary studies in which Brainology® was piloted in twenty different New York schools showed that almost all students who were polled reported positive differences in their approaches to school, in their study habits, and motivation, as a result of learning about the growth mindset. Teachers concomitantly reported positive changes in students, citing that their work ethics, study habits, note-taking skills, and attention levels had increased (Blackwell, Trzesniewski & Dweck, 2007; Dweck, 2008). It is worth mentioning that a salient component of Brainology® is the direct teaching of the growth mindset through

lessons about the brain, ways to grow the brain, and neuroplasticity. Another important piece, however, is the teaching of strategies. In addition to teaching students that they can grow their intelligence, it is important to equip them with tools for doing so.

Mindset Works® is a company founded on the research by Carol D weck & Lisa Blackwell, who are the program's cofounders. In an effort to scale Brainology®, Mindset Works® started to provide six to twelve hours of online and physically-taught training on the growth mindset, over a five to twelve week period for fifth-ninth grade students. This program is similar to the original version of Brainology®; students are taught about their brains and how to make them grow. They are also given various strategies that they can utilize when encountering challenging issues. Approximately 600 schools are utilizing this particular program across the nation. Brainology® has also been incorporated into Scholastic's Inc.'s Math 180 curriculum and serves as a necessary two-week prerequisite program that sixth-twelfth grade students have to complete before beginning to learn math content (Sparks, 2013).

Although Dweck's research on directly teaching students to have a growth mindset has been discussed, there are other strategies and approaches that can help to instill a growth mindset culture in students and in classrooms. One practical way of engendering such a milieu is to create learning experiences that encourage intrinsic motivation to seek out answers, explore problems, and be stimulated by curiosity. These components serve to develop "intellectual learners" rather than "academic learners", who are more concerned with gaining knowledge in order to demonstrate it within a short-term time frame (Williams, Friesen, & Milton, 2009). The notion of learning for the joy of learning rather than to demonstrate knowledge gained for the sole purpose of earning a

numerical grade is what Csikszentmihalyi (1990) refers to as *flow*. The growth mindset is a way to promote flow.

Another practical way of crafting a growth mindset in classrooms involves teachers welcoming and inviting students to engage in risk-taking. As previously asserted, students engaged in a fixed mindset may avoid challenges and limit risk-taking, whereas students who endorse a growth mindset may welcome challenges and engage in risk-taking in learning. By praising students for strategies and processes enacted while problem solving, teachers can help to highlight the malleable quality of strategy use rather than praise students for being intelligent, implying a fixed quality which is less prone to change. In New Orleans, three schools are part of the Collegiate Academies charter network that hires teachers based on their demonstration of a growth mindset. Multiple classroom interviews, in addition to observations, are used in the hiring process. Teachers are observed and given feedback and then are made to teach another lesson a few weeks later. The teachers, who return to teach another lesson, and who use the feedback from the first observation in a productive way, evidence commitment to the growth mindset (Sparks, 2013). SciAcademy, the first of the three Collegiate Academy charter schools, has also shifted the way that they recruited students for advanced placement (AP) courses in order to seek out students who espoused a growth mindset. Formerly, AP classes were formed by placing students in these classes, by virtue of having earned the highest grades in classes involved in teaching similar subjects. When encountering failure in these rigorous courses, however, students often grew frustrated and were hesitant to take on challenging work. SciAcademy then began to offer participation in AP courses to everyone, but notified students that the courses would be

extremely difficult and demanding, but that they would also be the best learning experiences for them. Students in the AP courses do not now believe that entry into the courses resulted from fixed smartness; rather, it was due to a commitment to hard work and persistence (Sparks, 2013).

Yet another approach to promoting the growth mindset involves highlighting challenges over successes. For students who swiftly weave through academic tasks with extreme facility, notions of a fixed mindset may trickle down into a student's belief system. The message that is translated from these experiences may be that if a student is truly intelligent, only minimal effort should have to be exerted. To combat this tendency, students should continue to be challenged. Modified assignments that promote higher-order thinking should be generated for students who may attain academic success more easily than others. Braiding neuroscience into these challenges will be helpful in teaching students that the brain grows more with challenging work and less with mundane or boring work. Educational psychologists have shown that neuroscience training sessions are able to boost academic achievement and to transform students' attitudes from a fixed mindset to a growth mindset (Fitzakerley, Michlin, Paton, & Dubinsky, 2013). Providing students with intermittent progress reports, having students write letters explaining the growth mindset to other students who are struggling, and grading for growth over time may also be helpful to embed principles of the growth mindset in students (Dweck, 2010).

The majority of research conducted on fixed and growth mindsets has been centered on the adolescent population. Although previous research purported the difficulties in addressing the concept of mindset with early school-aged children (Dweck

& Elliot, 1983; Nicholls, 1978; Burhans & Dweck, 1995), more recent research has overturned these antiquated notions with the realization that necessary adjustments simply need to be made in working with this younger age group (Dweck, 1999; Cain & Dweck, 1995; Pomerantz & Ruble, 1997; Bempechat, London, & Dweck, 1991; Kinlaw & Kurtz-Costes, 2007). By first grade, and to some degree by kindergarten, children's perceptions of their academic competence in school begin to influence their general feelings about school. Therefore, as early as kindergarten, children that do not believe in their competence begin to lack motivation, which in turn can stifle learning as well as future academic outcomes (Valeski & Stipek, 2001).

Teaching mindset in early childhood. Young children's beliefs about intelligence are reliable, yet are able to be changed (Cain & Dweck, 1995; Mueller & Dweck, 1998). In fact, a high degree of brain plasticity is present in early childhood, offering optimal developmental windows for early intervention (Bradshaw, Goldweber, Fishbein, & Greenberg, 2012). Despite this, minimal research has been done examining mindsets in children as young as kindergarten age (Kamins & Dweck, 1999). A gap in the literature exists in analyzing the degree to which young children's beliefs about intelligence are able to be changed, including the factors that contribute to those changes (Kinlaw & Kurtz-Costes, 2007). Although it has been suggested that future research study contextual factors that contribute to children's beliefs about intelligence, such as classroom management or teacher's style, another helpful avenue of research may be on a short-term classroom intervention (Fitzakerley et. al., 2013; Marshall & Comalli, 2013). Although neuroscience -based, classroom studies have been limited, it is important to review some of these studies that have been done with early school-aged children.

Emerging research in the field of developmental neuroscience has presented limitless opportunities to translate research findings into applicable practice in an effort to optimize young children's academic and social-emotional functioning (Bradshaw et al., 2012) The neuroscience community at the University of Minnesota, in association with The Brain Awareness campaign (BA), sought to evaluate a Brain Awareness classroom visit program that had been running for a long period of time. The presentation covered four broad neuroscience concepts including: (1) structural and (2) functional relationships of major brain areas, (3) the concepts of electrical and chemical communication, and (4) the idea that learning alters the connections in the brain. Researchers also wanted to learn about the ability to shift student attitudes regarding the ability to learn through a one-hour presentation, targeting fourth-sixth grade classrooms. Results showed that the Brain Awareness presentations yielded positive effects on student attitudes toward science and on enhanced agreement with statements correlating to a growth mindset (Fitzakerley et. al., 2013). Another study looking at bridging the gap between neuroscience and education showed that teaching lessons on sensory perception and the brain to first grade students in a single 20-minute session yielded significant retention of comprehension of various brain functions three weeks postintervention (Marshall & Comalli, 2013). Although recent research has pointed to the potential for neurodevelopmentally informed prevention programming leading to the development of universal and evidence-based interventions, there is limited research on how to improve student performance using such models (Bradshaw et al., 2012). Translating neuroscience research to classrooms can be especially advantageous for vulnerable populations that are exposed to environmental stressors impacting brain development, such as living in high-poverty

neighborhoods (Bradshaw et al., 2012). There is a push in the field for developmentally and neuroscientifically informed school-based, preventive research to translate to real-world educational settings (Bradshaw et al., 2012). The third research question inquired about the impact of a classroom-based intervention designed to teach children about the brain and about the growth mindset. Many important elements must be considered when formulating a developmentally-appropriate classroom intervention to teach children the growth mindset.

Implementing neuroscience in the form of teaching children about the characteristics and functions of the brain is an important element involved in intervention planning. Another consideration when formulating a short-term classroom intervention lies in the modalities utilized to transmit lessons on mindset and brain functioning. Teaching young children lessons through stories and songs increases motivation, positive affective responses and creativity. Songs and stories captivate children and using these modalities promotes brain growth in young children in and of themselves (Cooper, 2010). Social-learning environments are also fostered through singing and storytelling, promoting a supportive milieu for learning to take place. Learning and socialization, two important early processes for young children, are also stimulated (Cooper, 2010). Adults are often encouraged to tap into the repetitive nature, rhyming schemes, and melodic structures of songs and books to aid children to better encode information and to help them to be active participants in the learning process (Cooper, 2010). Emphasizing illustrations in books and repeating stories helps children to augment vocabulary, build language skills, and become engaged (Birckmayer, Kennedy, & Stonehouse, 2008; Jalongo, 2004). In addition to using stories and songs, ingraining movement in an

intervention is especially useful for young children. Kara Morrissette, previously a kindergarten teacher, had taught her class about brain plasticity by emphasizing the message that each of her students had an “amazingly brilliant brain that changes every time something is learned”. Imitating their teacher repetitively, students began to kiss their fingertips and then touch their heads, essentially “kissing their brains” each time that they learned something new (Wilson et al., 2015).

It is vital that the invaluable teachings of brain awareness and the growth mindset that have proven effective with adolescent populations be tailored in a developmentally friendly way to reach kindergarten children. With this in mind, a growth mindset classroom intervention was implemented for a kindergarten classroom. The intervention tapped modalities mentioned previously to invigorate learning and motivation in the best way possible through stories, movement, and songs, in order to reach this young audience. The timing of the short-term classroom intervention was an important consideration. The pilot study by Blackwell, Trzesniewski, & Dweck, (2007), showed that students improved academic performance and changed mindsets after learning about how the brain learns; the neuroscience intervention was delivered to students once a week over an eight-week span. A similar timeline for this intervention (ten sessions) was implemented. Dweck (1999; 2006) has suggested throughout her research that the following concepts should be synthesized when teaching young students about mindset: (1) emphasis on learning, challenge and persistence, (2) embracing things that are difficult, (3) finding payoff in achievement through hard work, (4) searching for new strategies, and (5) learning from mistakes. These elements were inculcated in the kindergarten classroom intervention in developmentally appropriate ways. As can be

garnered from the literature review, teachers play an important role in instilling a growth mindset culture in the classroom. Therefore the teacher was involved in this classroom intervention to model growth mindset behaviors and statements for children and also to reward students for demonstrating these characteristics through a class-wide intervention.

If a growth mindset can be taught to adolescents, can a growth mindset also be taught to kindergarten children? It is hypothesized that kindergarten students can learn knowledge about the brain and also maintain or learn a growth mindset through a ten-session classroom intervention as measured by a pretest/posttest analysis.

Summary and Conclusions

First, because much of the extant research centers on adolescent populations, many studies have examined the influence that the teacher's mindset has on students. When considering kindergarten students, however, it is essential to explore further the influence that the parent's mindset has on students because parents are essential stakeholders in young children's lives.

Although the growth and fixed mindsets are clearly characterized amongst the adolescent population, research exploring facets of the mindsets in early school-aged children, specifically kindergarteners, is limited. Because of the developmental discrepancies between the two populations, the way that mindset is measured will need to be modified in early school-aged populations, with a focus on identifying observable behavioral markers that may serve as foundational attributes for either mindset. Based on the literature review, the following behaviors were observed in kindergarten students: (1) level of engagement, (2) self-verbalizations, (3) anxiety-related behavior, and (4) guessing behavior.

In looking at the influence of parents' mindsets on students' behavior, it is hypothesized that a strong association will exist between parents with a growth mindset and students with high levels of engagement, positive verbalizations, no anxiety-related behavior, and the presence of guessing behavior. It is further predicted that parents with a fixed mindset will be associated with students with low levels of engagement, negative verbalizations, anxiety-related behavior, and the absence of guessing behavior. When looking at the relationship between parents' mindsets and children's mindsets, it is hypothesized that a strong association will exist between parents with a growth mindset and kindergarten students with a growth mindset and that a strong association will also be found between parents endorsing a fixed mindset and students holding a fixed mindset. Both parents' mindsets and students' mindsets were measured through brief mindset surveys.

When examining the association between children's mindsets and children's behavior, it is hypothesized that children who are fully engaged, who exhibit positive verbalizations, demonstrate an absence of anxiety-related behavior, and demonstrate guessing behavior will be positively associated with endorsement of a growth mindset.

Because mindset research centers primarily on adolescents, so too does intervention programming. Brainology® is an intervention that was generated to teach students a growth mindset directly, but the earliest grade for which it has been scaled is fifth grade. Short-term classroom interventions have been successful for students at promoting knowledge about the brain and in teaching the growth mindset. A ten-session classroom intervention was designed and implemented for a kindergarten class to teach children directly about the brain and about the growth mindset, through the use of

developmentally appropriate modalities. It is hypothesized that kindergarten students can learn knowledge about the brain and also maintain or learn a growth mindset through a ten-session classroom intervention as measured by a pretest/posttest analysis.

Chapter 3: Methods

Overview

The present research used archival data collected from kindergarten students and their parents from a kindergarten to eighth grade, bilingual charter school located in a major urban area. This charter school is part of a larger school district located in Pennsylvania. Three research questions about kindergarten students and the growth mindset were examined through three interrelated hypotheses. This Methods section is organized by these three research questions.

Inclusion/Exclusion Criteria

Research Question 1 required that student participants had to: (a) be incoming kindergarten students for the 2015-2016 academic school year and (b) be turning age five before or on September 1st, 2015. Research Questions 2 and 3 required the same criteria to be met as well as necessitating those students: (c) be part of the only *flip* kindergarten classroom model where children would be receiving 80% instruction in English and 20% instruction in Spanish. The other three kindergarten classrooms received 80% instruction in Spanish and 20% instruction in English. The children in the flip classroom received a growth mindset intervention. Parents participating in the study had to self-identify as a primary caregiver of the child in order to complete a parent mindset survey. Student participants were excluded from the study for Research Question 1 if they: (a) were not entering kindergarten for the 2015-2016 academic school year or (b) were not turning age five before or on September 1st, 2015. Students were excluded from Research Questions 2 and 3 if they did not meet these previously noted criteria or if they: (c) were not in the

flip kindergarten classroom receiving instruction primarily in English. Parent participants were excluded if they did not identify as a primary caregiver of the child.

Participants

Research question 1. A total of 75 incoming kindergarten students (43 girls, 32 boys) were screened by the school psychologist to aid in informing placement decisions. The racial or ethnical composition of the sample was approximately 95% Hispanic, 4% Multiracial, and 1% Caucasian. Children ranged in age from 4 years 9 months to 5 years 9 months (*M* =5 years, 3 months *SD* =3.48). All 75 students were included to address Research Question 1. One parent for each student was asked to complete a parent mindset survey. Fifty-eight parents of the 75 students completed a parent mindset survey.

Research questions 2 and 3. Twenty of the 75 students mentioned were assigned to the flip kindergarten classroom and therefore comprised the intervention-group who received the growth mindset intervention. These students were also administered a student mindset survey. Due to a change in placement, one of the 20 students in the intervention-group was unable to participate in the intervention, which left 19 students remaining in this group. This intervention-group was composed of 19 children, 12 girls and 7 boys. The students ranged in age from 4 years 10 months to 5 years 9 months (*M* =5 years, 4 months *SD* =3.66). In this sample, 95% of children were of Hispanic descent and 5% of children were identified as Caucasian. This smaller subgroup of 19 students in the intervention-group was used to address Research Questions 2 and 3.

Procedures

All incoming kindergarten students for the 2015-2016 academic school year who submitted their application packets on time were called by the school psychologist in the

months of June and July (2015) to schedule a day and a time for the students' parents to bring them to the school. Once at school, the student was screened by the school psychologist as part of the universal screening program to aid in informing placement decisions. A flip kindergarten classroom was being piloted; in this classroom children would receive 80% instruction in English and 20% instruction in Spanish. This is in contrast to the other three classrooms where children receive 80% instruction in Spanish and 20% instruction in English, which is traditionally how kindergarten students receive instruction at this school. Students were screened between the months of June to September (2015). Students were brought in by their parents and parents sat at a nearby table while the school psychologist sat with the child at a small table in the center of the room. Children were administered various screeners. While these screenings were being administered, the school psychologist concomitantly observed and recorded the behaviors found on the behavioral observation coding system (further discussed under the Measures section). Parents were then asked if they would like to complete a brief survey. This survey measured whether or not parents held a growth mindset or a fixed mindset. Upon completion of the survey, parents and students left the school.

In September 2015, the support services team, including the school psychologist, support services coordinator, speech language pathologist and the English as a Second Language (ELL) program coordinator met to review all screening results (the students were also screened by the speech language pathologist and the ELL coordinator). Students were then divided into four different kindergarten classrooms in an attempt to counterbalance the levels of functioning of students between classrooms. After finalizing the placement of students in each classroom, the students in the flip English class were

selected to participate in a ten-session growth mindset classroom intervention implemented by the school psychologist. These intervention sessions were based on research done by the school psychologist on the growth mindset in early school-aged children. Intervention sessions took place from September - October 2015 and occurred approximately once per week. Prior to the start of intervention sessions, the school psychologist administered a pretest/survey to all students participating in the classroom intervention. A posttest survey was administered to the same students upon completion of the ten-session classroom intervention. The type of mindset that children held (fixed or growth) as well as children's knowledge of the brain and its functions were gauged through this test/survey. Students, accompanied by the school psychologist, were sent individually to the school psychologist's office when both pretests and posttests were administered. Students sat at a small table while the school psychologist read each question of the test aloud for the student and then awaited a response. Some of the items read aloud also had accompanying visuals in an effort to make the question more child-friendly and understandable. A description of the content covered in each intervention session follows.

Intervention session 1. Children were introduced to the word *brain.* A brain-shaped Jell-O® mold was presented to the children so that they could feel what a real brain feels like. Children were shown a white plastic mold of a brain so that they could see the real size and shape of the brain. Children were shown where the brain is located by being instructed to point to their temples. Picture cards of the brain working during the day and during the night were reviewed, so that children learned that the brain was working "all the time". Worksheets with various animals and their brains were shown to

the children and the fact that “everyone has a brain, even animals!” was reviewed. Children were then given the option to choose which animal brain picture they wanted to color. At the end of the session, children were asked to point to where their brain is located, give an example of an animal that has a brain, and state when the brain is working.

Intervention session 2. The lessons learned in Intervention Session 1 were reviewed. Five senses cards were reviewed one by one with students to introduce students to the five senses, with the emphasis that each sense is controlled by the brain. Five *senses stations* were set up around the classroom with materials at each station for the children to smell, hear, see, touch, or taste. Children were split into small groups. They then rotated around each station, actively engaging with the materials and talking about what their brains were doing.

Intervention session 3. A review of the five senses was completed by having each child complete a sensory worksheet which displayed five squares, each with a nose, ear, eye, hand, and mouth pictured on the page. The students were instructed to draw a picture of something that they smelled, heard, saw, touched, or tasted during Intervention Session 2. After this review, pages 1-6 from the book *Your Fantastic Elastic Brain*: *Stretch It Shape it* (Deak, 2010) were read to the children as they sat in a group on the rug. It is important to note that this book was modified when being read to the children to simplify the vocabulary used and to translate messages from the book in an easily comprehensible way for kindergarten students. Towards the end of the session, a video called *It’s Your Brain* (Littman, 2011) was played on the computer, as students danced on the rug.

Intervention session 4. To recapitulate Intervention Sessions 2 and 3, children were asked to raise their hands and to volunteer to name the five senses. The video, *It's Your Brain* (Littman, 2011), was played again and the children were instructed to dance and to jump every time that they heard the word *brain*, in order to keep them engaged and listening to the content of the video. The school psychologist also discussed other functions of the brain, in addition to that of controlling the five senses; this was done by holding up picture cards and having the children repeat the actions depicted on the cards; these included: learning things, moving, playing, remembering things, thinking about things, and talking. After this, children were given worksheets and were instructed to draw a function of the brain and then to raise their hands to share what they had drawn.

Intervention session 5. Popsicle® sticks were dispersed to all students. Each Popsicle® stick had white tape on one end and blue tape on the other end. Numerous statements (some true and some false) from Intervention Sessions 1-4 were stated to the class. Students were instructed to hold up the blue side of the stick if the statement was true and to hold up the white side of the stick if the statement was false. Specifically, students were told, "Hold up blue if it's true and white if it's not right!" After this review, pages 7-12 of the book *Your Fantastic Elastic Brain*: *Stretch it Shape it* (Deak, 2010) were read to the children as they sat on the rug. Again, content from the book was modified for easier understanding. A video on the computer entitled *Brain Jump with Ned the Neuron: Story* (Kizoom, Inc., 2013) was played for the children at the culmination of this session.

Intervention session 6. The remainder of the book *Your Fantastic Elastic Brain*: *Stretch it Shape it* (Deak, 2010) was read to the children as they sat on the rug. As the book was read, the children were asked questions about the book to check for understanding. At this point in the story, the concept of a neuron was introduced to the children. A large poster with an attached, realistic-looking brain cutout was shown to the children. Attached to the brain by Velcro® were numerous, colorful neurons. The concepts of building neurons, growing the brain, and making the brain stronger and smarter were introduced. A plush, stuffed neuron was also shown to the children so that they could see what a larger version of a neuron looked like. Each child then had a turn answering a review question about content learned from Intervention Sessions 1-5. After successfully answering a question, each child was encouraged to attach a neuron to the brain. This was done to symbolize the growth of neurons in the brain once something is learned. Children then colored a worksheet with a large brain displayed on it. They were encouraged to draw neurons in the brain. To ascertain the comprehension of material presented in this session, children were asked to recall the term *neuron*, name where neurons live, and answer the question of whether or not neurons could grow.

Intervention session 7. Children were again asked review questions about neurons. Two visuals were then presented to the children as they sat on the rug. The first visual showed three small pictures of a child: thinking hard, not giving up, and learning new things. Next to these small pictures was a larger picture of a growing brain getting stronger and smarter. Another visual was then presented to them and was also discussed. On one side of the page, a visual showed a child who was not thinking hard, not learning new things, and giving up. Pictured on the other side of the page was a tired, weak brain.

These visuals were again reviewed with the children. Children then sat in a circle on the rug as they played *Hot Neuron*, a modified version of the classic childhood game Hot Potato. During this game, the song *It's Your Brain* (Littman, 2011) was played loudly. Children then passed the stuffed, plush neuron around in the circle. The music was randomly paused and whoever had the neuron at this time was required to name one of the three ways in which he or she could grow his or her brain (i.e. thinking hard, learning new things, or not giving up).

Intervention session 8. The class reviewed the three ways that they could grow their brains and get smarter. The large poster with the attached realistic brain cutout and accompanying neurons was shown to the children again. A classroom intervention was then explained to them. During the next week, they were told that the teacher would be looking for students who were demonstrating any of the three behaviors needed to grow their brains (i.e. thinking hard, learning new things, and not giving up). During this week, the teacher was instructed to praise the student, name the behavior that the student engaged in, and then instruct the student to "pin a neuron on the brain". The visuals from Intervention Session 7 on how to grow your brain and how to not grow your brain were again reviewed with students. The book *The Girl Who Never Made Mistakes* (Pett & Rubenstein, 2011) was also read to students while they sat on the rug to emphasize the fact that it is okay for students to make mistakes and that they can in fact learn from their mistakes.

Intervention session 9. A game was played with students to review all content covered in Intervention Sessions 1-8.

Intervention session 10. Students were called on individually to describe the reasons why they were able to pin a neuron on the classroom brain during the previous week, because all the students had received an opportunity to do this. After doing this successfully, students were awarded with small, squishy brain toys.

Measures and Materials

Student behavior. A self-created behavioral observation coding system was utilized during the universal student screening process. Based on the literature review previously discussed, four prominent behaviors were targeted through this system. These behaviors were identified as: *engagement, self-verbalizations, anxiety-related behavior*, and *guessing behavior*, which measured academic risk-taking.

Engagement with a task was observed through a tabularized matrix behavioral coding system that examined eye contact and physical proximity. Eye contact was checked either as (1) *on target* or (2) *poor/limited*; physical proximity was checked either as (1) *neutral/extended towards task* or (2) *retracting.* Students exhibiting on-target eye contact and neutral/extending proximity were coded as *fully engaged.* Students who displayed poor/limited eye contact and retracting proximity, on-target eye contact, but retracting proximity, or poor/limited eye contact but neutral/extending proximity were coded as *not fully engaged.*

Spontaneous self-verbalizations were also studied through natural observation. In this way, verbalizations were not elicited but recorded if they occurred freely. Verbalizations were coded into one of three mutually exclusive and exhaustive

categories: (1) *positive*, (2) *negative*, or (3) *none. Positive* verbalizations included any statements expressing: positive affect, belief in one's ability to perform the task, self-encouragement to engage in strategies to complete the task, and positive self-monitoring statements. *Negative* verbalizations included any statements expressing: negative affect, disbelief in one's ability to perform the task, self-discouragement regarding strategies used to complete the task, and negative self-monitoring statements. If students made both positive and negative verbalizations, the type in which they engaged more frequently was coded. If verbalizations were neither positive nor negative and instead irrelevant or if an absence of self-verbalizations occurred altogether, they were coded as *none.*

Another observable behavior of interest that provided insight into specific affect and the endorsement of a growth or fixed mindset was the presence of anxiety-related behaviors. Anxiety-related behaviors were operationally defined as: nail-biting, nervous affect, minimal/limited responding, repetitive motoric behavior, quick /shallow breathing, excessive sweating, blushing, shakiness, and/or clinginess to caregiver. Students exhibiting any one of these behaviors were coded as having *anxious behavior*. Absence of these behaviors resulted in a coding of *calm behavior*.

In order to tap into children's tendencies to embrace challenges or to take on academic risks, children's *guessing* behavior was measured. In this study, any child who appeared uncertain of a response, communicated verbally (e.g., "I don't know") or gesturally (e.g. shrugging shoulders, head shaking back and forth); he or she was given one verbal prompt: "You can take a guess. Do you want to take your best guess?" The number of times that an uncertain response, as defined, occurred, it was recorded. Each time an uncertain response occurred and the examiner prompt was given, either one of

two mutually exclusive boxes were checked; it was recorded whether the child chose to take a (1) *guess* or to refrain from guessing, which was coded as (2) *no guess.* In addition to measuring risk taking behavior, decisions to take a guess or to not take a guess also revealed persistence with the task at hand.

Parent mindset. A parent mindset survey was developed, based on Dweck's (1999) Theories of Intelligence Scale. Four questions on the survey were posed and parents were asked to circle *agree* or *disagree* with the following statements: (1) your intelligence is something very basic about you that you can't change very much, (2) you can learn new things, but you can't really change how intelligent you are, (3) no matter how much intelligence you have, you can always change it quite a bit, and (4) you can always greatly change how intelligent you are. If parents disagreed with the first two fixed mindset statements and agreed with the last two growth mindset statements, they were coded as having a growth mindset. For any other pattern of responding, parents were coded as having a fixed mindset. Therefore, the way in which parents answered the survey would result in an endorsement of a growth mindset or of a fixed mindset.

Student mindset. Students' mindsets, which were measured as part of a pretest/posttest survey, also served as a data collection tool to measure the effectiveness of a ten-session classroom intervention. The development of the student mindset test/survey was based on research on the growth mindset and the concept of mindset as applied to early-school aged children. Five items gauged whether or not students endorsed a growth mindset or a fixed mindset. The first mindset item that was read aloud by the psychologist was: "Your brain is part of your body and it lives in your head. It tells you what to do. It tells you how to smell, hear, and talk. It helps you to remember things,

to think, and to move around and a lot of other things too! Do you think your brain: (a) stays about the same? or (b) grows stronger?" The second item read was: "Carlos is a student. He is in kindergarten. Carlos' teacher asked him to spell some words. Carlos spelled every word right. Do you think Carlos spelled every word right because: (a) Carlos is really smart? or (b) because Carlos worked hard practicing his letters?" The third item read was: "Sarah's class was learning about different fruits and vegetables. Some of them she had never even heard of before! Sarah's teacher held up a picture of an apple and asked the class 'What is this fruit called?' Sarah raised her hand and said, 'That's a tomato!' Sarah's teacher said, 'It's not a tomato. This is actually an apple.' Do you think: (a) It's okay that Sarah made a mistake because she is learning new things? or (b) Sarah is not very smart?" The fourth item read was: "The teacher held up a card with the number 4 on it and asked the class which number it was. Carlos raised his hand and said 'It's number 7'. The teacher said, 'No it's not number 7'. Then Carlos said 'It's number 9'. 'No' said the teacher, 'It's not number 9'. Do you think Carlos should: (a) keep thinking and taking guesses about what the number is? Or (b) give up because he is not good at numbers?" The fifth item read was: "Can you change how smart you are? Or does how smart you are stay the same?" These forced-choice items resulted in an endorsement of a fixed or of a growth mindset.

Research Question 1

In the first part of Research Question 1, parents' mindsets (n = 58*)* were analyzed with students' behavior (n = 58), as observed through the behavioral observation coding system. Each behavior was examined separately when analyzing the association between parent's mindsets and children's behaviors. In the second part of Research Question 1,

the association between parents' mindsets (*n = 19)* and students' mindsets (*n* = 19) was also studied. Parents completed a mindset survey to ascertain the type of mindset that they possessed. Parents' mindsets (growth or fixed) were analyzed with students' mindsets (growth or fixed). When analysis of parents' mindsets and children's mindsets took place, the results from the children's pretest/survey rather than the posttest/survey were used to identify the type of mindset that the student endorsed. Utilizing the child's mindset as established on the pretest/survey would allow for a truer representation of the child's mindset prior to having received any intervention.

Research Question 2

This question sought to understand the association between children's mindsets and the four different behavioral features suspected to characterize the fixed and growth mindsets in young children. A total of 19 students participated in the ten-session growth-mindset classroom intervention. These children's mindset surveys were analyzed along with each behavior (i.e. level of engagement, type of self -verbalizations, anxiety-related behavior, and guessing behavior) employed by these students, as recorded by the behavioral observation coding system.

Research Question 3

This question sought to determine the influence of a ten-session growth-mindset classroom intervention created to teach kindergarten students directly about their brains and about the growth mindset. Students participating in the intervention were administered a pretest/survey and posttest/survey to analyze knowledge gained about the brain and the endorsement of a growth mindset.

Research Design

A non-random sampling design took place because students who participated *(n =* 75) in Research Question 1 were part of the incoming kindergarten class for the 2015-2016 academic school year. A smaller subgroup of these students *(n=19)* were also chosen to participate specifically for Research Questions 2 and 3, because they were in the flip model English classroom and were selected to receive a classroom intervention on mindset.

For the first part of Research Question 1, parents' mindsets were analyzed with students' behavioral functioning through separate chi-square analyses. It was predicted that a strong association would exist between parents with a growth mindset and students with high levels of engagement, positive verbalizations, no anxiety-related behavior, and the presence of guessing behavior. It was further predicted that parents with a fixed mindset would be associated with students who had low levels of engagement, negative verbalizations, anxiety-related behavior, and the absence of guessing behavior.

For the second part of Research Question 1, a Cohen's κ analysis took place in which inter-rater agreement between parents' mindsets (growth or fixed) and students' mindsets (growth or fixed) was examined. It was predicted that a strong agreement would exist between parents who exhibited a growth mindset and students who exhibited a growth mindset and between parents who exhibited a fixed mindset and students who exhibited a fixed mindset.

Research Question 2 used separate chi-square analyses to study the association between students' mindsets (growth or fixed) and each behavior category recorded (i.e. level of engagement, type of self -verbalizations, anxiety-related behavior, and guessing

behavior). It was hypothesized that children who were fully engaged, who exhibited positive verbalizations, demonstrated an absence of anxiety-related behavior, and demonstrated guessing behavior would be strongly associated with endorsement of a growth mindset.

Research Question 3 examined pretest/surveys and posttest/surveys before and after students received the ten-session growth-mindset classroom intervention to teach them about the brain and the growth mindset. A paired-samples t-test and a chi-square analysis were performed when examining the number of brain functions a child could name before the intervention and after the intervention period and also when examining the number of children who had heard the word *brain* before the intervention and after the intervention, respectively. A chi-square analysis was also used when analyzing whether or not children's mindsets changed as a result of the intervention. It was predicted that students would gain knowledge of the brain and its functions as a result of the classroom intervention. It was further predicted that students who endorsed a growth mindset during the pretest/survey would maintain the growth mindset on the posttest/survey and that students who endorsed a fixed mindset during the pretest/survey would adopt a growth mindset on the posttest survey.

Summary

The following table summarizes the three research questions presented in this study, along with their corresponding hypotheses.

Research Question	Hypothesis
1. What parent beliefs are associated with children's mindset and children's behavioral performance?	1. In the first part of this research question, it is predicted that a strong association will exist between parents with a growth mindset and students with high levels of engagement, positive verbalizations, no anxiety-related behavior, and the presence of guessing behavior. It is further predicted that parents with a fixed mindset will be associated with students with low levels of engagement, negative verbalizations, anxiety-related behavior, and the absence of guessing behavior. In the second part of this research question, it is predicted that a strong association will exist between parents exhibiting a growth mindset and students exhibiting a growth mindset and between parents exhibiting a fixed mindset and students exhibiting a fixed mindset.
2. What are observable behavioral features of the growth and fixed mindsets in early school-aged children?	2. It is hypothesized that children who are fully engaged, who exhibit positive verbalizations, demonstrate an absence of anxiety-related behavior, and demonstrate guessing behavior will be strongly associated with endorsement of a growth mindset.
3. What is the impact of classroom-based interventions designed to teach children about the brain and the growth mindset	3. It is hypothesized that kindergarten students can learn knowledge about the brain and maintain or learn a growth mindset through a ten-session classroom intervention as measured by a pretest/posttest analysis.

Chapter 4: Results

Overview

To address the first part of Research Question 1, the relationship between parents' (*n = 58)* mindsets *(*growth or fixed) and children's behaviors associated with mindsets (i.e. level of engagement, type of self -verbalizations, anxiety-related behavior, and guessing behavior) was examined through conducting separate chi-square analyses. Significant effects were found between parents' mindsets and children's level of engagement and between parents' mindsets and children's anxiety-related behavior. There were no significant effects found between parents' mindsets and children's self-verbalizations or between parents' mindsets and children's guessing behavior. For the second part of Research Question 1, the association between parents' mindsets and children's mindsets was examined through Cohen's κ by looking at the subset of children (*n=19)* who participated in the classroom intervention and who were given the children's mindset survey. No significance was revealed.

To address Research Question 2, the relationship between children's mindsets (growth or fixed) and children's behaviors associated with mindsets (i.e. level of engagement, type of self -verbalizations, anxiety-related behavior, and guessing behavior) was examined using separate chi-square analyses. Results showed no significant effects for any of these behaviors.

Research Question 3 yielded significant effects when examining the increase in knowledge about the brain that children exhibited following the classroom intervention. A paired-samples t-test was used when examining the difference in the number of brain functions a child could name before the intervention and after the intervention period. A

chi-square analysis was used when examining the number of children who had heard the word *brain* before the intervention and after the intervention, which also showed significance. A chi-square analysis was also used when analyzing whether or not children's mindsets had changed as a result of the intervention. A significant relationship was also found when examining children's endorsement of a growth mindset postintervention.

Research Question 1

For the first part of this question, the relationship between parents' mindsets and children's behavior (i.e. level of engagement, type of self -verbalizations, anxiety-related behavior, and guessing behavior) was of primary interest. First, when looking at the relationship between parents' mindset (growth or fixed) and children's level of engagement (*fully engaged* or *not fully engaged*), a significant relationship was found X^2 (1) = 6.32, p = .012, as can be seen in Table 1.

Table 1

Crosstabulation of Parents' Mindsets and Children's Level of Engagement

Mindset	Engagement	
	Fully Engaged	Not Fully Engaged
Growth	37 (92.5%)	3 (7.5%)
Fixed	12 (66.7%)	6 (33.3%)

Note. χ^2 = *6.32, df = 1. Numbers in parentheses indicate column percentages.
*p < .05

In sum, 84.5% of children were fully engaged and 15.5% of children were not fully engaged during the observational session. Chi-square analyses indicated that parents

with a growth mindset were shown to have children that were more fully engaged (92.5%) than not fully engaged (7.5%), whereas if parents had a fixed mindset, their children was twice as likely to not be fully engaged.

Second, the relationship between parents' mindsets and children's self-talk, or self-verbalizations, was analyzed. As mentioned, only a small percentage of children actually engaged in self-talk. Because there were not enough participants distributed across coded categories, results do not appear to be clinically meaningful, as indicated in Table 2. There was no significance found between parents' mindsets and children's self-verbalizations (*positive*, *negative*, or *none*) X^2 (2) = 1.16, $p > .05$.

Table 2

Total Number of Children Engaging in Each Type of Self-Verbalization

Parent Mindset	Self-Verbalizations		
	None	Positive	Negative
Growth	*N=34*	*N=3*	*N=3*
Fixed	*N=14*	*N=3*	*N=1*

Note. X^2 (2) = 1.16, p > .05.

Third, the relationship between parents' mindsets and anxiety-related behavior was examined through chi-square analyses and revealed a significant association X^2 (1) = 12.00, $p = .001$. Table 3 depicts a total of 74.1% of children that showed anxiety symptoms, but 25.9% of children did not show anxiety symptoms. However, results showed that when parents held a growth mindset, 87.5% of children did not show anxiety symptoms and only 12.5% did. Conversely, if parents held a fixed mindset, children were

equally likely either not to show anxiety symptoms (44.4%) or to show anxiety symptoms (55.6%), with more children than not exhibiting anxiety symptoms.

Table 3

Crosstabulation of Parents' Mindsets and Children's Anxiety-Related Behavior

Mindset	Anxiety-Related Behavior	
	No Anxiety	Anxiety
Growth	35 (87.5%)	5 (12.5%)
Fixed	8 (44.4%)	10 (55.6%)

Note. χ^2 = **12.00, df = 1. Numbers in parentheses indicate column percentages.
**p < .01

Fourth, the relationship between parents' mindsets and children's guessing behavior was examined through chi-square analyses and revealed no significant relationship X^2 (1) = .725, p > .05., showing that the type of mindset endorsed by parent did not seem to have a significant effect on whether a child engaged in guessing behavior or did not. This finding is presented in Table 4.

Table 4

Crosstabulation of Parents' Mindsets and Children's Guessing Behavior

Mindset	Guessing Behavior	
	No Guessing	Guessing
Growth	6 (18.8%)	26 (81.3%)
Fixed	5 (29.4%)	12 (70.6%)

Note. X^2 (1) = .725, p > .05. Numbers in parentheses indicate column percentages.

The second part of Research Question 1 examined the relationship between children's mindsets (growth or fixed) and parents' mindsets (growth or fixed). Cohen's κ was performed to determine if there was agreement between children's mindsets and parents' mindsets. There was no significant agreement between the two mindsets, $\kappa = .232$, $p > .05$. Crosstabulation data are indicated in Table 5. Despite this result, an interesting finding was gleaned through the data presented. When looking at parents that held a fixed mindset, 85.7% of their children also held a fixed mindset. When looking at parents who held a growth mindset, children were equally likely to hold either a growth mindset (41.7%) or a fixed mindset (58.3%); therefore, children at least seem to have a chance for a growth mindset if their parents hold a growth mindset, but children whose parents hold a fixed mindset seem destined also to hold the same fixed mindset as their parents.

Table 5

Crosstabulation of Parents' Mindsets and Children's Mindsets

Parent Mindset	Children's Mindset	
	Growth	Fixed
Growth	5 (41.7%)	7 (58.3%)
Fixed	1 (14.3%)	6 (85.7%)

Note. $\kappa = .232$, $p > .05$. Numbers in parentheses indicate percentages of children falling within that category.

Hypothesis 1. In the first part of this research question, it was predicted that a strong association would exist between parents with a growth mindset and students with high levels of engagement, positive verbalizations, no anxiety-related behavior, and the

presence of guessing behaviors. It was further predicted that parents with a fixed mindset would be associated with students with low levels of engagement, negative verbalizations, anxiety-related behavior, and the absence of guessing behavior. In the second part of this research question, it was predicted that a strong association would exist between parents exhibiting a growth mindset and students exhibiting a growth mindset and between parents exhibiting a fixed mindset and students exhibiting a fixed mindset.

Some significance was yielded when looking at the first part of Research Question 1. A significant relationship was found between parents' mindsets and children's levels of engagement. A significant relationship was also found between parents' mindsets and whether or not children exhibited anxiety-related symptoms. There were no significant effects found between parents' mindsets and children's self-verbalizations or between parents' mindsets and children's guessing behavior. The second part of this research question that predicted a strong association between children's mindsets and parents' mindsets revealed no significance.

Research Question 2

The relationship between children's mindsets (growth or fixed) and behaviors associated with mindsets (i.e. level of engagement, type of self -verbalizations, anxiety-related behavior, and guessing behavior) were analyzed through separate chi-square analyses, with each analysis examining the relationship between children's mindset (as measured by the pretest survey) and one of the behavioral features listed previously. Although observational behavioral data were collected for 75 participants, children's mindsets were measured only for the intervention group (n =19). Therefore, the

relationship between children's mindset and each behavior could be examined for these 19 students only.

The first chi-square analysis examined the relationship between children's mindset (using results from the pretest/ mindset survey) and level of engagement (fully engaged or not fully engaged). Observations of children's mindset and level of engagement (*fully engaged* or *not fully engaged),* indicated that a significant relationship did not exist X^2 (1) = .903, $p > .05$.

When looking at the condition of self-verbalizations (*positive, negative,* or *none),* preliminary analyses revealed that 79% of students (n = 15) in the intervention group that were observed for behavior did not engage in self-verbalizations. A small number of students engaged in positive verbalizations (n = 2) and negative verbalizations (n = 2). This could possibly be due to the behavior observations taking place during the kindergarten students' first experiences in the school building during the routine screening process for incoming kindergarten students. Therefore, students may have been apprehensive and shy during this process, limiting their engagement in self-verbalization. It is also possible that due to their chronological age and early developmental stage, children are simply not engaging in extensive self-verbalizations. Nonetheless, there were not enough students distributed across conditions to derive meaningful data. Although chi-square analyses were conducted, there was no significance found X^2 (2) = 2.34, $p > .05$.

When looking at the relationship between the presence and absence of anxiety-related behavior (i.e. nail-biting, nervous affect, minimal/limited responding, repetitive motoric behavior, quick /shallow breathing, excessive sweating, blushing, shakiness,

and/or clinginess to caregiver) and children's mindset, at first glance it would appear that significance was found. Findings are presented in Table 6. There was a total of 36.8% of students who showed anxiety-related symptoms and 63.2% of students who did not show anxiety-related symptoms. However, 83.3% of those that held a growth mindset did not show anxiety symptoms, but 53.8% of those that held a fixed mindset did not exhibit anxiety symptoms. In looking at this analysis in a different way, there were fewer students who exhibited anxiety symptoms when holding a growth mindset (16.7%), compared with those showing anxiety symptoms that held a fixed mindset (46.2%). Despite the appearance of significance, chi-square analyses revealed no significant effects X^2 (1) = 1.54, $p > .05$. Due to the limited sample size, a loss of statistical power occurred and may have led to this lack of significance.

Table 6

Crosstabulation of Children's Mindsets and Children's Anxiety-Related Behavior

Mindset	Anxiety-Related Behavior	
	No Anxiety	Anxiety
Growth	5 (83.3%)	1 (16.7%)
Fixed	7 (53.8%)	6 (46.2%)

Note. X^2 (1) = 1.54, $p > .05$. Numbers in parentheses indicate column percentages.

The relationship between children's mindsets and guessing behavior was also found to show no significance and it was suspected that the low number of participants may have also played a role in this finding X^2 (1) = .071, $p > .05$.

Hypothesis 2. It was hypothesized that children who were fully engaged, who exhibited positive verbalizations, demonstrated an absence of anxiety-related behavior, and demonstrated guessing behavior would be strongly associated with endorsement of a growth mindset. Hypothesis 2 was not confirmed by the data. Although at first glance, chi-square analyses showed some promise of significant relationships, no significance was found between children's mindsets and behavioral features associated with mindset (i.e. level of engagement, type of self -verbalizations, anxiety-related behavior, and guessing behavior). Due to an extremely small sample size (n = 19), a loss of statistical power occurred, which may have affected the results.

Research Question 3

In order to examine the effectiveness of a ten-session growth mindset kindergarten classroom intervention that was aimed to teach children knowledge about the brain, a paired-samples t-test was conducted. Results of the paired-samples t-test, depicted in Table 7, showed that there was a significant difference in the mean number of brain functions that children could name before the intervention (M = .42, SD = .838) and after the intervention (M = 4.05, SD =1.393) at the .001 level of significance (t = -11.128, df = 18, n = 19, p< .001). Chi-square analyses were attempted to analyze the difference between the numbers of children who had not heard of the word *brain* prior to the intervention, with the number of children who had heard of the word *brain* post intervention. However, analyses could not be completed. Prior to the intervention, 11 (57%) students had not heard of the word *brain* and 8 (42%) students had heard of the word *brain*. Following the intervention, all students (100%) reported that they had heard of the word *brain*.

Table 7

Results of t-test and Descriptive Statistics for Number of Brain Functions Named by Children

	Before Intervention		After Intervention			95% CI for Mean Difference			
Number of Functions	M	SD	M	SD	n		r	t	df
	.42	.838	4.05	1.393	19	?	.266	**-11.128	18

**p<.01

In order to examine the effectiveness of a ten-session kindergarten classroom intervention that was aimed at helping children maintain or learn a growth mindset, chi-square analyses were attempted but could not be conducted. This was due to the strong significant effect that was found. Preintervention mindset surveys showed that 31.6% of children held a growth mindset and 68.4% of children held a fixed mindset. Postintervention mindset surveys revealed that 100% of children endorsed a growth mindset following the classroom intervention, showing extreme intervention effectiveness. Table 8 presents this finding.

Table 8

Crosstabulation of Children's Mindsets Preintervention and Postintervention

Mindset	Mindset	
	Preintervention	Postintervention
Growth	6 (31.6%)	19 (100%)
Fixed	13 (68.4%)	0 (0%)

Note. Numbers in parentheses indicate column percentages.

Hypothesis number 3. It was hypothesized that kindergarten students could acquire knowledge about the brain and maintain or learn a growth mindset through a ten-session classroom intervention, as measured by a pretest/posttest analysis. The results showed that students did evidence an increase in knowledge about the brain when comparing preintervention test/surveys with postintervention test/surveys; a significant change was found in the number of functions of the brain that students could identify. This finding is presented in Table X. During the preintervention test/survey, more than half of the students reported that they had not heard of the word *brain* before (n = 11). By the end of the intervention, all students (n = 19) reported to have heard of the word *brain.* Furthermore, a strong significant effect was found when examining whether or not children learned about growth mindset following the intervention. Whereas only 31% of children endorsed a growth mindset preintervention, 100% of children endorsed a growth mindset postintervention.

Chapter 5: Discussion

Summary of the Findings

Exploring the growth and fixed mindsets in kindergarten-age children and the variables that impact these mindsets were the prominent goals of this study. The first research question sought to uncover information regarding the relationship between parents' mindsets and observable behavioral markers associated with the mindsets that present in young children. Four behaviors were of primary interest: level of engagement, type of self -verbalizations, anxiety-related behavior, and guessing behavior. Also examined was the relationship between parents' mindsets and children's mindsets. The second research question explored the association between the aforementioned behavioral markers and children's mindsets. The third research question examined the effectiveness of a growth mindset classroom intervention.

Hypothesis 1. This hypothesis analyzed the relationship between parents' mindsets and children's level of engagement, type of self -verbalizations, anxiety-related behavior, and guessing behavior. Also examined was the relationship between children's mindsets and parents' mindsets. In the first part of this hypothesis, it was predicted that a strong association would exist between parents with a growth mindset and students with high levels of engagement, positive verbalizations, no anxiety-related behavior, and the presence of guessing behavior. It was further predicted that parents with a fixed mindset would be associated with students with low levels of engagement, negative verbalizations, anxiety-related behavior, and the absence of guessing behavior. In the second part of this hypothesis, it was predicted that a strong association would exist

between parents exhibiting a growth mindset and students exhibiting a growth mindset and between parents exhibiting a fixed mindset and students exhibiting a fixed mindset.

Mixed results were yielded when looking at the relationship between parents' mindsets and children's level of engagement, type of self -verbalizations, anxiety-related behavior, and guessing behavior. Although no significance was found between parents' mindsets and self-verbalizations or between parents' mindsets and guessing behavior, significant effects were found between parents' mindsets and level of engagement as well as between parents' mindsets and anxiety-related behavior. Parents with a growth mindset were shown to have more children that were fully engaged than not fully engaged, whereas parents with a fixed mindset were twice as likely to have a child that was not fully engaged. In addition, when parents held a growth mindset, most children did not show anxiety symptoms. Conversely, if parents held a fixed mindset, children were equally likely either to show anxiety symptoms or not show anxiety symptoms, with more children exhibiting anxiety symptoms than not.

Interestingly, parents' mindsets were shown to have significant effects on children's level of engagement as well as children's presentation of anxiety-related behavior. There was no established significance between parents' mindsets and children's verbalizations or between parents' mindsets and children's guessing behavior. Both level of engagement and the presence or absence of anxiety-related behavior share many commonalities with the concept of self-regulation, or the monitoring and managing of emotions, thoughts, and behaviors (Barkley, 2004; McClelland, Ponitz, Messersmith, & Tominey, 2010). There have been numerous studies conducted that show the strong predictive nature that self-regulation has on school readiness and future academic success

(McClelland et al., 2010; Shanker, 2010; Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009). A critical developmental window exists from birth to age five, during which a child carefully hones self-regulatory capacities (Galinsky, 2010). Because kindergarten children fit within this period, the relationship between parents' mindsets and kindergarten children's self-regulation alluded to in this study may warrant further, future research. In a meta-analytic study, it was established that implicit theories predict distinct self-regulatory processes, which, in turn, predict goal achievement. The age range in this meta-analysis was from ages 5-42. Therefore, a more narrowed examination of kindergarten children may provide more meaningful information regarding the role of parent mindset on young children's self-regulation capacities because emerging research on self-regulation has revealed what striking influence it has on learning and academic success (Shanker, 2010).

The relationship between parents' mindsets and children's mindsets was not found to be significant. An interesting finding that emerged, however, showed that parents with a fixed mindset invariably had a child with a fixed mindset, whereas parents with a growth mindset were equally likely to have a child with a fixed mindset or a growth mindset. It would therefore seem that children at least might have a chance for a growth mindset if their parents hold a growth mindset, but children whose parents hold a fixed mindset seem destined also to hold the same fixed mindset as their parents.

Previous research has shown that when looking at parents' perceptions of their children's abilities with a specific focus on the mindsets, the more highly mothers endorsed an entity view (fixed mindset), the more predictive were their perceptions of their children's abilities on their children's ensuing academic and emotional functioning.

Children who were assessed to have the lowest level of competency invariably showed the lowest levels of functioning when mothers held an entity view, in contrast to an incremental view (growth mindset) (Pomerantz & Dong, 2006). The finding of this current study parallels this idea, because the more highly that parents endorsed a fixed mindset, the more likely the child was to also have a fixed mindset. When parents hold a fixed mindset, variables influencing children, whether it be their functioning or their mindset, also seem to be restrictive and more solidified than when parents endorse a growth mindset.

Hypothesis 2. The association between children's mindsets and children's level of engagement, type of self -verbalizations, anxiety-related behavior, and guessing behavior was examined and it was predicted that children who were fully engaged, who exhibited positive verbalizations, demonstrated an absence of anxiety-related behavior, and demonstrated guessing behavior would be strongly associated with endorsement of a growth mindset. There was no significance found, however, when examining these associations.

A possible reason for which significance was not established between children's behavior and children's mindsets may lie in research by Pomerantz & Dong (2006); it was found that the main effects of mother's perceptions were moderated by their mindsets and were apparent only when mothers endorsed a fixed mindset. Specifically, when parents held negative perceptions of their child's competence and also endorsed a fixed mindset, more negative functioning in children was found. However, if parents held positive perceptions and a fixed mindset, more positive functioning in children was found. The lack of significance between children's behaviors and their mindsets may be

explained by a similar phenomenon taking place, with children's perceptions acting as a moderating effect. Because children's perceptions were not measured directly, it is not possible to substantiate this proposition in this study. Perhaps children who have a fixed mindset, but who also endorse positive perceptions about their abilities, have a protective mechanism that shields them from negative behavior, such as anxiety-related behavior or limited academic risk-taking behavior. Future research may want to explore further the interaction effects of children's mindsets and their perceptions of their abilities and the influence that these have on behavioral functioning.

It is also important to note that in this study, behaviors were observed in children in a naturalistic way. It is possible that if behaviors were measured through conditions that purposefully induced behaviors, rather than through passive observation, more clear-cut behavioral profiles may have presented. It would be interesting to conduct a similar study in the future that contained experimental manipulation that would encourage targeted behaviors to surface. This may allow for more robust behavioral data to be collected.

The lack of significance between children's behaviors and their mindsets established significance between some of children's behaviors and parents' mindsets; this is noteworthy because it may speak to the incredibly powerful influence that parents' perceptions have on young children. In previous studies, the impact of parents' perceptions regarding children's academic achievement were more strongly tied to children's self-views and expectations than were the children's actual historical performance in math (Parsons et al., 1982). Similarly, parents' views of their children's abilities and efforts also predicted children's self-views in math and in English and had a

stronger relation to children's self-views than their actual previous grades (Frome &Eccles, 1998). These findings underscore the idea that parents' views influenced their children more than the children's actual academic performance. Although parents' views on intelligence were not assessed specifically in regard to their own child, but in a general sense, this study showed that parents' views on mindset were more strongly tied to children's actual behavioral performance than were children's views on mindset.

Hypothesis 3. This hypothesis examined the effectiveness of a ten-session kindergarten classroom intervention on the growth mindset by measuring pretest/posttest data to gauge whether or not children gained knowledge about the brain and either maintained or learned a growth mindset after the intervention period. It was hypothesized that kindergarten students could learn knowledge about the brain and maintain or learn a growth mindset through a ten-session classroom intervention, as measured by a pretest/posttest analysis.

When examining the effectiveness of a ten-session classroom-based intervention on the growth mindset for kindergarten students, significant effects were found when examining pretest/posttest data. Kindergarten children evidenced significant knowledge gain about the brain. In addition, a large majority of children (69%) endorsed a fixed mindset prior to the intervention period. Following the intervention, however, all students (100%) in the sample endorsed a growth mindset, showing strong evidence that kindergarten students were able to learn a growth mindset successfully.

Preintervention mindset surveys showed that 31.6% of children held a growth mindset and 68.4% of children held a fixed mindset. Postintervention mindset surveys revealed that 100% of children endorsed a growth mindset following the classroom

intervention, showing extreme intervention effectiveness. Findings generated from this study support previous research indicating that individual differences have been found when looking at young children's endorsements of the fixed and growth mindsets. As can be seen in this study, more kindergarten children endorsed a fixed mindset over a growth mindset when given a developmentally tailored mindset survey that contained child-friendly anecdotes. It is therefore extremely imperative to use sensitive measures and procedures when working with young children in order to tap into mindset-related constructs within this population.

Implications for Future Practice

Educators are on a constant search to improve student achievement and success in school; therefore, cost-effective ways to boost grades and promote students' functioning are continually being sought out. An avenue that has been emphasized for achieving this end is teaching students a growth mindset. This has recently been elucidated in educational reform, with an emphasis on adolescents as the targeted population. Some research programs have been developed to teach the growth mindset at an earlier age, with fifth grade being the earliest grade to receive a scaled version of Brainology®, the most popular computer-based, interactive software program to teach students, directly, a growth mindset based on Dweck's mindset research (Blackwell, Trzesniewski & Dweck, 2007; Dweck, 2008). However, research is limited in applying the concepts of the growth mindset to early school-aged children, specifically, in kindergarten students. This study has shown that it is possible to teach kindergarten children fundamental concepts about the brain and to provide them with a conceptual foundation on which to build other brain-based knowledge upon. This knowledge is essential for comprehensive comprehension of

the mindsets. Something as simple as introducing children to the word *brain* and reviewing functions of the brain serves to provide the rudimentary building blocks of neuroscientific knowledge that will eventually accompany an extensive and sophisticated knowledge of brain-behavior relationships. This fundamental knowledge will be pivotal in aiding in the understanding of the growth mindset in later development. In addition to teaching children conceptual knowledge of the brain, findings indicate that it is possible to change children's mindsets from fixed to growth, as a result of receiving a classroom intervention.

This finding becomes crucial and especially important when considering the protective factors harnessed in teaching students a growth mindset in low-income areas where poverty, trauma, and exposure to other risk factors are more likely (Sektnan, McClelland, Acock, & Morrison, 2008). Research conducted with 10th-grade students in Chile found that low-income students with a growth mindset performed at the same level as high-income students who endorsed a fixed mindset, showing that mindset mediated income levels. Mindset was also found to be more predictive of achievement for low-socioeconomic groups. Students with high levels of growth mindset from the lowest-income quintile achieved grades as high as students from the highest-income quintile with low mindset (Claro & Paunesku, 2014).

Programs such as Tools of the Mind© (Bodrova & Leong, 2007), Second Step-Early Learning (Committee for Children, 2011), and Seeds of Empathy (Gordon, 2009) are programs designed to capitalize on young learners' early educational experiences. These programs look to build social-emotional learning and self-regulation skills in preschool-age and kindergarten students. By intervening early with kindergarten students

to build these skills, especially with underserved populations, associated risk factors are able to be mitigated. An early intervention program that incorporated the elements included in this growth mindset intervention design would also serve to buffer the negative effects encountered by high-risk youth. In the current study, participants resided in an area where the zip code was one of four zip codes within the larger city that had the lowest average family income, as census data from the years 2005-2009 indicated (Dowdall & Warner, 2012). The majority of students attending the K-8 school (88.9%) received free and reduced lunches. Despite working with students in a school located in one of the most impoverished areas of the city, students were able to transform their fixed mindsets to growth mindsets successfully. The intervention design implemented in this study can be used as a springboard for future intervention programming to target at-risk kindergarten children.

Limitations

One of the most prominent limitations of this study concerns the sample size (n = 19) utilized to answer Research Questions 2 and 3 (as well as the second part of Research Question 1). This small sample size decreased statistical power when performing analyses. This low sample size may also preclude the generalizability of findings to the population at large.

Some other identified limitations present potential threats to validity. The behavioral observation coding system and the children's pretest/posttest survey were self-designed instruments; it would, therefore, have been beneficial to obtain a group of expert judges to rate the pool of items included on these measures for appropriateness. This would have increased the construct validity of these measures. Additionally, having

a second examiner present to code the students' observable behavior as well as to administer the pretest/posttest survey to the students would have ensured greater standardization of the administration procedure. A second examiner would also have allowed for inter-rater reliability to be calculated. Although children's behaviors in this study were coded through natural observation in an attempt to measure spontaneously occurring stimuli, behaviors were observed in a contrived testing setting. Behaviors may have been more reflective of children's true presentations if observed in children's natural settings, such as the classroom or playground.

A selection bias may have occurred because there were systematic differences between groups before the intervention took place. The kindergarten class used in this pilot study was placed in the only flip model English class (learning 80% of instruction in English and 20% instruction in Spanish) and the other three kindergarten classrooms were taught instruction as outlined through the traditional bilingual model (learning 80% of instruction in Spanish and 20% instruction in English).

Because results from this research are yielded from a pilot study, the aforementioned limitations, as well as any other identified limitations, may be addressed in future research.

Future Directions

In conclusion, the strong role that parents' mindsets play in children's behavior underscores the need for early intervention parent training programs to help hone the growth mindset in young children. It has been demonstrated that kindergarten-age children are able to learn a growth mindset through direct classroom intervention when developmentally appropriate approaches are utilized. Additionally, children are able to

learn foundational neuroscience concepts that will aid in higher-level future teachings of the growth mindset. When it comes to examining and influencing variables affecting young children's mindsets as well as teaching children the fundamental building blocks of the growth mindset, "getting an early starts" proves pivotal.

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APPENDIX A
PARENT MINDSET SURVEY

Student's Name: _____

Parent's Name: _____

Read each statement and circle whether you agree or disagree.

1. Your intelligence is something very basic about you that you can't change very much.

Agree Disagree

2. You can learn new things, but you can't really change how intelligent you are.

Agree Disagree

3. No matter how much intelligence you have, you can always change it quite a bit.

Agree Disagree

4. You can always greatly change how intelligent you are.

Agree Disagree

APPENDIX B
BEHAVIORAL OBSERVATION CODING SYSTEM

1. Engagement

	On-target Eye Contact	Poor/Limited Eye Contact
Physical Proximity-Neutral/Extending	Fully engaged	Not fully engaged
Physical Proximity-Retracting	Not fully engaged	Not fully engaged

2. Self-Talk

Positive Verbalizations	Negative Verbalizations

3. Anxiety

Anxious behavior	Calm behavior
Nail-biting, nervous affect, minimal/limited responding, repetitive motoric behavior, quick /shallow breathing, excessive sweating, blushing, shakiness, clinginess to caregiver	Absence of anxiety-related behaviors

4. Uncertain response-communicated verbally (e.g., “I don’t know) or gesturally (e.g. shrugging shoulders, head shaking back and forth).

1 verbal prompt given- “You can take a guess, do you want to take your best guess?”

UR	**UR**	**UR**	**UR**	**UR**
Guess/No	Guess/No	Guess/No	Guess/No	Guess/No

APPENDIX C
KINDERGARTEN PRETEST/POSTTEST

1. "Have you ever heard of the word *brain?"* yes OR no

If yes, "Can you tell me what the brain does?"
If no, "Do you have any guesses about what the brain does?"
(0 functions named, 1 function named, 2 functions named, 3 or more functions named)

2. "Your brain is part of your body and it lives in your head. It tells you what to do. It tells you how to smell, hear, and talk. It helps you to remember things, to think, and to move around and a lot of other things too! Do you think your brain:"

"stays about the same" OR "grows stronger"

3. "Carlos is a student. He is in kindergarten. Carlos' teacher asked him to spell some words. Carlos spelled every word right. Do you think Carlos spelled every word right because:"
"Carlos is really smart?" OR "because Carlos worked hard practicing his letters?"

4. "Sarah's class was learning about different fruits and vegetables. Some of them she had never even heard of before! Sarah's teacher held up a picture of an apple and asked the class 'what is this fruit called?' Sarah raised her hand and said, 'That's a tomato!' Sarah's teacher said, 'It's not a tomato. This is actually an apple.' Do you think:"

"it's okay that Sarah made a mistake because she's learning new things" OR "Sarah is not very smart"

5. "The teacher held up a card with the number 4 on it and asked the class which number it was. Carlos raised his hand and said 'it's number 7'. The teacher said, 'no it's not number 7'. Then Carlos said 'its number 9'. 'No' said the teacher, 'it's not number 9'. Do you think Carlos should:"

"keep thinking and taking guesses about what the number is ?" OR "give up because he is not good at numbers"

6. "Can you change how smart you are OR does how smart you are stay the same?"