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Adopting a Growth Mindset Approach to Interventions for Self-Regulation

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ADOPTING A GROWTH MINDSET APPROACH TO INTERVENTIONS FOR SELF-REGULATION

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DISSERTATION APPROVAL

This is to certify that the thesis presented to us by Kelly Larson on the 23rd day of March, 2023, in partial fulfillment of the requirements for the degree of Doctor of Psychology, has been examined and is acceptable in both scholarship and literary quality.

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ABSTRACT

Research continues to demonstrate self-regulation's significance in almost all aspects of life, including but not limited to academic success and school adjustment. Incorporating a growth mindset into self-regulation may be a potential missing motivational component in school-based interventions. This pilot study assessed trends in survey results of whether a group of high school students who receive special education with noted difficulties in emotional regulation, organization, and consistent/timely work completion. The survey assessed whether they held a more fixed or growth mindset of self-regulation prior to intervention and whether those students' mindset of self-regulation moved towards a growth mindset of self-regulation after receiving a standardized executive functioning curriculum that included an added lesson on the growth mindset of self-regulation. The baseline survey responses suggest that more students identify with a fixed mindset of intelligence, time management, academic motivation, all-or-nothing thinking, goal setting, attention regulation, and interest in challenging tasks, but not emotional regulation, planning/organization, and autonomy of learning. Post-intervention data indicate that the intervention had the greatest impact on increasing the students' beliefs around the malleability of intelligence but that more research is needed regarding growth mindset of self-regulation, potential interventions targeting a growth mindset of self-regulation, and the potential impact on students who struggle academically and receive special education services.

CHAPTER 1: INTRODUCTION

Self-regulation has emerged as a critical factor in understanding the learning process. Recent research has demonstrated that self-regulation is essential for academic success and achieving one's learning goals. Interestingly, students who adopt a growth mindset (i.e. believing that intelligence is malleable) show increases in self-regulatory processes and academic achievement, especially those students who are considered at-risk. Together, this suggests that incorporating a growth mindset of self-regulation could potentially increase student motivation and assist students in becoming self-regulated, successful learners. Although developing a growth mindset of self-regulation is a promising concept, there is a significant lack of literature on this relationship and the effects of having a growth mindset of self-regulation, and on interventions to induce a growth mindset of self-regulation.

Statement of the Problem

The Importance of Self-Regulation

The ability to self-regulate can influence and affect many aspects of one's life, whether academically, socially, behaviorally, mentally, and/or physically. Research is accumulating, demonstrating that strong executive functioning and self-regulation place children at an advantage that begins at school entry and is continued throughout one's entire education and life (Blair, 2002; Diamond & Ling, 2016; Micalizzi et al., 2019). Montroy and colleagues (2016) highlight that past research has suggested that children's varying levels of self-regulation skills during early childhood consistently predict a multitude of short- and long-term outcomes, such as "school readiness, academic achievement throughout primary school, adult educational attainment, feelings

of higher self-worth, a better ability to cope with stress, as well as less substance use and less law-breaking, even among individuals at risk of maladjustment" (p.1744).

Self-regulation is a significant component in a student's ability to succeed within and outside the classroom setting. Academic self-regulation, or using self-control in order to achieve academic goals (Brier, 2010), has significant implications on one's future endeavors and the success of those endeavors. As Donker and colleagues (2014) suggest, not all students naturally master learning strategies. Students often require additional instruction on how to use learning strategies to become self-regulated learners. While many interventions that attempt to facilitate self-regulated learning have shown some success, some students still need to develop or demonstrate the targeted skills. Self-regulated learning interventions often target components of motivation. Still, many fail to include or incorporate the motivational elements that can come with growth mindset beliefs and, more specifically, a growth mindset of self-regulation. If students do not believe that their self-regulation can be changed, why would they have any buy-in for a self-regulation intervention or be motivated to change their self-regulation skills?

Growth Mindset As An Intervention Technique

While the importance of self-regulation is evident, attempts at improvement have not always been successful. The thesis of the current study proposes that if students can be taught a growth mindset belief and orientation to self-regulation alongside current self-regulation interventions, the impact and effectiveness of these interventions can be improved.

Where a person falls on the growth mindset continuum can have significant ramifications in multiple areas of one's life. A person's mindset can alter which type of

goals they orient themselves to, their reactions to social adversities, and their overall worldviews (Yeager & Dweck, 2012). The fixed mindset creates a worldview that all things measure one's ability; therefore, challenges, setbacks, and effort are measurements of ability. In comparison, a growth mindset worldview is about learning and growth—challenges, setbacks, and effort are of the utmost importance to a person's development. A growth mindset not only changes a person's beliefs on effort, but as Yeager and Dweck (2012) suggest, a growth mindset shapes one's goals (performance versus learning goals), attributions (i.e., need to work harder, change strategies, or they are *dumb*), and learning strategies (i.e., work harder or give up/cheat/become defensive). In addition, fixed mindsets of personal traits significantly correlate with and predict higher depression and anxiety in youths, particularly adolescents (Romero et al., 2014; Schleider et al., 2015; Schleider & Weisz, 2016a). The influence and implications of mindsets can have long-lasting effects that have been demonstrated in children as young as preschool-aged and continues throughout adulthood (Smiley & Dweck, 1994; Dweck, 2006).

Growth mindset intervention research is currently gaining an understanding of where and when a growth mindset intervention is effective regarding academic achievement. The trend of low-achieving students from low-achieving schools, especially those that support a growth mindset message, is when a growth mindset intervention has been most influential on academic achievement. Unfortunately, the effects of a growth mindset intervention on psychological distress and self-regulation do not have the same clarity and evidence behind them. Growth mindset intervention research is beginning to show promise in psychological distress and self-regulation. However, there is still much

to be assessed and determined before one can say a growth mindset intervention is effective within these areas.

Growth Mindset of Self-Regulation

In incorporating self-regulation and growth mindset concepts, Mrazek and colleagues (2018) presented a strong case for the beneficial effects of having a growth mindset of self-regulation and interventions that address/induce a growth mindset of self-regulation. The most significant limitation of their studies is that all five studies were conducted with adults, significantly reducing the study's generalizability to school-aged students. The lack of previous literature intertwining self-regulated learning and growth mindset is troublesome. Schools' interventions to increase student self-regulation may be missing a critical yet easy-to-administer component. According to previous growth mindset research, at-risk student populations (e.g., struggling academically or economically disadvantaged) should be the primary target of a growth mindset of a self-regulation intervention. There is also limited research on the growth mindset of self-regulation in students with disabilities, such as learning disabilities, emotional disabilities (e.g., anxiety and depression), and those with Attention Deficit Hyperactivity Disorder (ADHD). Future research should also examine the effects of a growth mindset of self-regulation on students who engage and hold work avoidance goals rather than mastery or performance goals.

Purpose of the Study

The purpose of the current study was multifaceted as there are still many unanswered questions regarding a growth mindset of self-regulation, including its effects on school-aged students, with students who are in special education, as well as the effects of a self-regulated learning/executive functioning intervention on the growth mindset of self-regulation. The first goal was to see if students who currently have an Individualized Education Plan (IEP) and have noted difficulties with emotional regulation, organization, and consistent and timely work completion have a more fixed or growth mindset of self-regulation prior to intervention. The second goal was to see if those students' mindset about self-regulation would move towards a growth mindset of self-regulation after receiving a standardized executive functioning curriculum that includes an added lesson on the growth mindset of self-regulation within an emotional support course at the high school level.

Research Questions

The current study was guided by two research questions.

Question Number One: Mindsets and Self-Regulation

The first research question asked about the level of growth mindset beliefs concerning self-regulation for high school students with IEPs. Specifically, it was hypothesized that high school students who struggle with emotional regulation, organization, and work completion would report low levels of a growth mindset of self-regulation.

Question Number Two: Effectiveness of the Intervention

The study's second research question examined whether a classroom-based intervention aimed at increasing students' beliefs about their ability to improve their self-regulation skills could be successful in doing so. Students were evaluated both pre and post-intervention concerning their growth mindset beliefs, and changes over time were examined.

CHAPTER 2: REVIEW OF THE LITERATURE

Self-Regulation

The ability to self-regulate can influence and affect many aspects of one's life. However, this can often be difficult to study since there are varying definitions of what exactly is meant by the term self-regulation. McClelland, Ponitz, Messersmith, and Tominey (2010) note that definitions of self-regulation often include components of emotional regulation, cognition, and observed behaviors. For the purposes of this paper, self-regulation will be defined and discussed through an educational psychology and an executive function lens to ultimately describe what it means to be a *self-regulated learner*. This paper will then discuss a more recently studied topic of the growth mindset of self-regulation ability.

To clarify the concept of self-regulation, it is necessary to distinguish it from emotional regulation and cognitive self-regulation. Self-regulation is an 'umbrella' term encompassing the inner workings of multiple working processes and areas. These processes are distinctive yet intertwined and occur within the brain. Emotional regulation encompasses the motivational and affective aspects of self-regulation, whereas cognitive self-regulation is described as the processes involved in planning, decision-making, and problem-solving (Bodrova & Leong, 2006; Zelazo & Muller, 2002, as cited in McClelland et al., 2010). The general definition of self-regulation can be interpreted as the "ability to direct one's attention, thoughts, moods, and behavior in line with one's personal goals" (Mrazek et al., 2018, p.1.)

Self-Regulation: Through the Executive Function Lens

When examining the construct of self-regulation, one would be remiss in reviewing self-regulation without first presenting the larger construct of executive function(s). Much of the research conducted in recent years has assessed self-regulation through an executive function lens (McClelland et al., 2010).

The concept of executive function is also reviewed because interventions branded as *executive function interventions* often have a significant overlay with self-regulation and self-regulated learning interventions. The intervention included in this current study is considered an *executive function curriculum* that addresses multiple areas of being a self-regulated learner. Attention, working memory, flexibility, metacognition, and inhibitory control are most often incorporated into the construct of executive function and are integrated within self-regulation (Diamond, 2013; McClelland, 2010; Diamond & Ling, 2016). These skills and processes are necessary for a student to navigate the school and classroom setting and be successful within the classroom setting (McClelland et al., 2010). Research is accumulating, demonstrating that having strong executive function skills and abilities places children at an advantage beginning at school entry that continues throughout one's entire education and life (Blair, 2002; Diamond & Ling, 2016; Micalizzi et al., 2019).

In attempting to present a definition of executive function, it quickly becomes apparent that there is a lack of consensus in the literature of what the term 'executive function' entails. Baggetta and Alexander (2016) conducted a meta-analysis of previous literature's definitions of *executive function*. In their attempt to synthesize the definitions of executive function, the researchers were presented with less cohesion and, instead,

more confusion. Their review found that no consistent researcher was the main source. Instead, over 60 different sources were referenced, and no single reference was cited more than five times.

Baggetta and Alexander (2016) then surveyed *attributes* and *spheres of influence* within the executive function definitions. Through their analysis, Baggetta and Alexander (2016) found 25 different attributes for executive function. Sixteen articles included the words *cognitive processes*, and 10 had *higher-order cognitive processes*. Almost all the attributes were only referenced once, with some examples including online processes, self-regulatory processes, hypothetical processes, psychological processes, and behavioral skills. In looking at the *spheres of influence*, 24 different spheres of influence were found, with the largest category (57%) defining executive function as "performing some type of goal-oriented, goal-directed, or future-oriented action, behavior, or response" (p. 13). Executive function was also noted to involve deliberate problem solving, planning, impulse control, and working memory.

The Baggetta and Alexander (2016) review was presented to show the varying conceptions of executive function and why research in this area can often be complex. Overall, the construct of *executive function* appears to describe the cognitive processing aspects that go into one's ability to plan, organize, and complete tasks (McClelland et al., 2010). McClelland and colleagues (2010) highlight that the "term *executive* is appropriate for self-regulation as it tends to be *deliberate and managerial"* (p. 489). For this paper, self-regulation is presented through an executive function and educational psychology lens in understanding that the two concepts are often interchangeable and are vital components of each other, but with the focus primarily being on self-regulation.

Defining a Self-Regulated Learner

Effective self-regulation in the classroom requires the student to coordinate multiple components simultaneously, such as remembering multistep directions amid distractions. Remembering multi-step directions in a classroom involves “attention, working memory, and inhibitory control, along with motor or verbal functions to produce overt behaviors" (Cameron Ponitz et al., 2008; McClelland et al., 2007 as cited in Montroy et al., 2016).

As with executive function, self-regulated learning (SRL) has different lenses and descriptions. For starters, self-regulated learning is frequently nestled within the social cognitive perspective of self-regulation. The social-cognitive view of self-regulation focuses on regulation that is more *deliberate* or *intentional* regulation and incorporates motivation and cognitive strategies to achieve goals (McClelland et al., 2010). As discussed in Norman Brier’s (2010) book, *Self-Regulated Learning: Practical Interventions for Struggling Teens*, academic self-regulation is defined as “a student’s ability to exert and maintain self-control while attempting to achieve academic goals" (p. 5). As highlighted by Brier, the main components of academic self-regulation are planning, problem-solving, and self-evaluation.

Similarly, Doll, Brehm, and Zucker (2014) highlight in their book *Resilient Classrooms: Creating Healthy Environments for Learning* that academic efficacy, academic self-determination, and behavioral self-control help students succeed by promoting autonomy and, ultimately, student success. Zimmerman's (2000) three-phase model includes forethought, performance, and self-reflection phases. These phases work within a personal feedback loop that leads to a student becoming a successful self-

regulated learner (Zimmerman & Moyer, 2009). Overall, a student's ability to be self-determined, plan, problem-solve, self-evaluate, and possess academic efficacy and motivation are all intertwined to help a student succeed academically and to be a self-regulated learner (Brier, 2010; Doll et al., 2014; Hofmann et al., 2012; Illkowska & Engle, 2010; Matheson, 2015).

Self-Determination

According to Doll, Brehm, and Zucker (2014), students are considered self-determined when they initiate personal goals for their own learning and can recognize, evaluate, and assess barriers they need to overcome to fulfill those academic goals. Being self-determined, as Doll, Brehm, and Zucker (2014) define it, aligns closely with Zimmerman's (2000) *forethought phase*, in which students are thinking about their goals, setting their goals, and assessing beliefs about their goals. Self-determined learners are those students that make time to plan and also take action and responsibility for their progress toward their goals. Students who have high self-determination were found to be more curious, prefer challenging tasks, independently pursue new skills, have higher self-efficacy, and believe themselves to be more competent (Doll et al., 2014). Self-determined learners are also shown to have higher performance and academic endurance when working toward valued instructional goals (Assor et al., 2002; Brophy, 2004; Pajares & Schunk, 2001, 2002 as cited in Doll et al., 2014). The importance of choice in self-determination, especially regarding goal setting, is a primary focus of one of Brier's (2010) chapters. Brier argues that in order for students to become academically self-regulated, they must have a choice in selecting goals. Those choices allow for a sense of

control, which can lead to increased motivation, greater feelings of independence, and academic achievement (Grolnick et al., 1991; Chapman et al., 1990).

Behavioral Self-Control

Another integral part of SRL is behavioral self-control. Doll, Brehm, and Zucker (2014) define *behavioral self-control* as the "degree to which a student's conduct is appropriate and self-regulated" (p. 11). The concept of behavioral control once again aligns with Zimmerman's (2000) model during the *performance phase*, when students are working on a task and monitoring their progress throughout the task. If students do not learn to monitor their behavior and make positive decisions to act appropriately, their chances of academic progress and setting and achieving goals will be greatly diminished. (Bear, 2010; Bear et al., 2005; McDermott, Mordell, & Stoltzfus, 2001, as cited in Doll et al., 2014). Further indicated by Brier (2010), behavioral self-control serves as a direct connection between social and academic self-efficacy and goal setting.

Students' academic achievement can be undermined when students lack behavioral self-control. Without behavioral self-control, academic failures can perpetuate problem behaviors and increase overall disengagement within the classroom. The lack of behavioral control reduces the time allocated for instruction and decreases academic success (Doll et al., 2014). For instance, if a student cannot effectively direct their behaviors in a way that is consistent with their values, then the student can create academic and life goals but will most likely not make progress towards those goals. Students also must become aware of how mood and anxiety can influence their ability to maintain behavioral self-control and self-regulation (Brier, 2010). Overall, academic self-regulation skills cannot be utilized without behavioral self-control.

Efficacy

Directly related to academic self-determination and behavioral self-control is the concept of academic self-efficacy. Academic efficacy self-beliefs that students hold about their ability to learn and be academically successful (Doll et al., 2014). Zimmerman (2000) included a phase of *self-reflection*, where a student assesses their own self-judgments and reactions. The focus of academic self-efficacy is the student's perception of their skill ability and ability to obtain specific skills to succeed academically. Academic self-efficacy drives problem-solving and help-seeking behaviors because students believe their actions and effort will have significant and positive educational outcomes.

As further suggested by Doll, Brehm, and Zucker (2014), students who expect to be academically successful will take the necessary steps to make their success likely to occur. In comparison, students who feel that they will fail and that their effort will not lead to success will behave in maladaptive ways, making failure more likely to occur. Brier (2010) adds that a student's academic self-efficacy creates a framework that students use to interpret and organize academic experiences that later guide and motivate a student's actions and the amount of effort the student will put forth when it comes to academic tasks.

In addition, academic efficacy also supports students' social and emotional adjustment. Students with a strong sense of efficacy are less vulnerable in the face of failure (Bandura, 1993, 1997, as cited in Doll et al., 2014). Matheson (2015) defines *self-regulatory efficacy* as "an individual's confidence in their ability to self-regulate" (p. 71). Matheson further suggests similar results with self-regulatory efficacy regarding

academic self-efficacy. Those students who likely were successful in the past with a particular subject area will likely have higher self-regulatory efficacy because those students will believe that they have the skills and ability to achieve success again. Overall, efficacious students are more likely to set goals, monitor those goals and their approaches to learning, as well as self-evaluate their own performance (Doll et al., 2014).

Self-Regulated Learning Intervention Meta-Analyses

As highlighted above, self-regulated learning is a broad and multifaceted concept. Yet, as Cleary, Platten, and Nelson (2008) indicate, much of the previous SRL intervention literature has been narrow in scope. Cleary and colleagues (2008) suggest that many of the earlier interventions assessing self-regulated learning have focused on one or two self-regulation processes or focused on the impact of the intervention on a specific academic skill (i.e., number of math problems solved correctly). Researchers suggest that motivation or strategy instruction alone is often not as effective as when combined with metacognitive or regulatory training suggesting that SRL studies and interventions must be more encompassing (Cleary & Platten, 2013; Dignath & Büettner, 2008; Montague et al., 2014). Meta-analyses of previous SRL research provide a more comprehensive scope on where and how an SRL intervention can be effective, with the bonus of helping to make the definitions and constructs behind SRL more succinct.

SRL Meta-Analysis with Adults

Researchers in the late 1980s and 1990s began running meta-analyses in order to evaluate SRL interventions (Chiu, 1998; Haller et al., 1988; Hattie et al., 1996). There has since been a more recent wave of SRL intervention meta-analyses (Boer et al., 2018;

Dignath & Buettner, 2008; Donker et al., 2014; Sitzmann & Ely, 2011). Sitzmann and Ely (2011) conducted a meta-analysis on previous SRL research, more specifically with how adults regulate their learning of work-related knowledge and skills. Although this meta-analysis focuses on adults, the information and data presented are helpful to consider when working with students and to the larger theoretical concept of SRL. Sitzmann and Ely's (2011) meta-analysis examined the following regulatory mechanisms often incorporated in self-regulation: planning, monitoring, metacognition, attention, learning strategies, persistence, time management, environmental structuring, help-seeking, motivation, emotional control, and effort. The following regulatory appraisals of self-regulation were also examined: self-evaluation, attributions, and self-efficacy. Through their research, Sitzmann and Ely found that the strongest relationship was between metacognition and learning strategies (0.83). Metacognition and learning strategies had similar associations with other self-regulatory processes, backing up previous literature claims that they are distinct but highly intertwined concepts. This finding further emphasizes the need for broader scoped SRL interventions. There was a strong relationship between attention and time management (0.78); there were also six other correlations that were 0.70 or greater. All correlations that were 0.70 or greater were for the examined regulatory mechanisms. Out of the 116 correlations reviewed, 35 were 0.50 or greater. Many weak correlations were with help-seeking, effort, and pre-training efficacy. The researchers note concern with the variance in study populations and that all measures were self-report and therefore less objective.

In examining effect sizes, Sitzmann and Ely (2011) found that the regulatory agents had the most significant effect on learning with a moderate to strong effect size.

Both regulatory and appraisals had effect sizes ranging from weak to moderate. The self-regulatory constructs with the strongest corrected relationships with learning were goal level (0.44), self-efficacy (0.35), effort (0.28), and persistence (0.27). The weakest effect sizes on learning were with help-seeking (0.08), emotional control (0.08), and pre-training motivation (0.10). After assessing effect sizes, the researchers conducted moderator analyses. Their findings suggest that self-regulation and learning were influenced by five moderators: study population, length of the training course, publication status, research design, and year of publication. The researchers note that the impact of the study population, length, research design, and year were minimal. Length of the training course was significant only for goal level, in that the participant's goal level had a more substantial effect on learning in shorter than longer courses.

Overall, Sitzmann and Ely (2011) suggest that there be a parsimonious framework to self-regulation that focuses on nine self-regulatory processes. The researchers delineated the nine processes by those factors that were significant with learning and others that met three criteria laid out by the examiners. The first two with moderate to strong effects on learning are goal level and self-efficacy. The other seven include effort, metacognitive strategies (includes metacognition and learning strategies), attention, time management, environmental structuring, motivation, and attributions.

SRL Meta-Analyses with School-Aged Children

Assessing SRL literature with children and adolescents, Dignath and Buettner (2008) conducted a meta-analysis on the impact of self-regulation strategy training programs at both the elementary and secondary levels. Previous meta-analyses have suggested that self-regulation strategies can be effectively taught as early as elementary

school, and there have been larger effect sizes for self-regulation programs geared towards elementary and lower secondary students than for older students (Dignath et al., 2008; Hattie et al., 1996). Previous meta-analyses have also suggested that researcher-directed interventions have demonstrated more improvement than those administered by teachers. In their meta-analysis, Dignath and Buettner (2008) assessed the following as potential moderators: age difference in acquiring self-regulation competence, which type of strategy is most effective, instruction in cognitive strategies, instruction of metacognitive strategies, promoting metacognitive reflection, instruction of motivation strategies, the possible influence of students' cooperative learning on training effects, and how should instruction be delivered.

Dignath and Buettner (2008) found 74 studies published between 1992 to 2006 that met their inclusion criteria. The meta-analysis was able to extract three hundred fifty-seven effect sizes and grouped into three outcome categories: academic performance (136 effect sizes), cognitive and metacognitive strategy use (167 effect sizes), and motivational aspects (54 effect sizes). In looking at instruction method, thirty-three studies used group work, and almost half of the interventions were conducted by researchers. The number of training sessions ranged by two to 90 sessions per intervention, with 20 sessions being the average. The interventions took place in the domain/context of math instruction (28 interventions), reading/writing instruction (26 interventions), or other subjects (20 interventions). Overall, the average effect sizes were considered strong, with the unweighted average being 0.73 and the weighted being 0.69. Looking specifically at each school level's overall mean effect size, the elementary school average was 0.68 and 0.71 for secondary school.

In assessing the results by outcome categories, academic performance effect sizes were 0.61 for elementary and 0.54 for secondary. There were interesting patterns of effect sizes on academic subjects and grade level. Mathematics performance yielded a mean effect size of 0.96 at primary school and 0.23 at secondary school, while for reading performance, the average was 0.44 at primary and 0.92 at secondary school. For other subjects, rather than reading and math, the average effect size was 0.64 at the elementary school level and 0.05 at the secondary level. The secondary school level average effect size was based on six single effect sizes and should be considered with caution. With cognitive and metacognitive strategy use outcomes data, the mean effect size was 0.72 at the elementary level and 0.88 at the secondary level. For motivational outcomes, the mean effect size at the elementary level was 0.75 and 0.17 at the secondary level. For the secondary mean effect size of motivational aspects, the average was based on six individual effect sizes and should once again be considered with caution, as warned by the examiners.

The examiners then describe the results found from their weighted multiple regression analyses. For overall academic performance at the elementary school level, the statistical model accounted for 29% of the primary school effect sizes' variability. For elementary academic performance, effect sizes were larger if the intervention was based on social-cognitive theories (B=0.33) rather than on metacognitive theories; in addition, interventions with a motivational background led to significantly smaller effect sizes (B=-.38). Furthermore, if social-cognitive interventions also included the instruction of metacognitive (B=0.39) or motivational strategies (B=0.36), there were larger effect sizes.

At the secondary level for overall academic performance, the statistical model accounted for 85% of the variability in the secondary school effect sizes of academic performance. Differing from the elementary school level findings, secondary level effect sizes were higher if the intervention was based in a metacognitive theoretical background (*B*=-.64) rather than on social-cognitive (*B*=-1.41) or motivational theories (*B*=-0.97). The effect sizes on academic performance were also higher if the intervention focused on metacognitive reflection (*B*=0.82) or motivation strategies (*B*=0.56) rather than on cognitive strategies but higher for interventions promoting cognitive rather than metacognitive strategies (*B*=-0.64). The academic performance effect sizes were also higher if: group work was used as a teaching method (*B*=0.56), the intervention was conducted by researchers (*B*=-0.80), and for interventions conducted in the context of math rather than in reading/writing (*B*=-1.00) or others (*B*=-0.92).

Dignath & Buettner (2008) then further analyzed the SRL intervention effects on math and reading. For effects on math performance at the elementary level, the statistical model suggests that 44% of the variation in effect sizes can be explained by the included variables. The effects sizes for math performance at the elementary level were higher for interventions on cognitive strategy rather than on metacognitive reflection (*B*=-1.08) and for interventions that had more amount of sessions (*B*=0.05). For effects on math performance at the secondary level, the model indicates that 94% of the variability can be attributed to the moderating variables included in the analysis. Effect sizes were noted to increase if the theoretical background of the interventions focused on motivational (*B*=0.55) rather than on metacognitive learning theories. No significant difference was found compared to social-cognitive theories. Effect sizes were larger if group work was

used and with an increasing number of training sessions (*B*=0.02). For reading at the elementary level, the statistical model accounted for 19% of the variation of the effect sizes. Effect sizes assessing reading/writing performance at the elementary level were higher based on a social-cognitive theoretical approach (*B*=0.38) rather than a metacognitive one. There were not enough effect sizes on reading/writing performance at the secondary level to run a meta-analytic regression analysis.

Next, the meta-analytic regression models were conducted for strategy use outcomes. At the elementary level, the statistical model accounted for 33% of the variability in the effect sizes of strategy use. Effect sizes for strategy use at the elementary level increased when the intervention was based on motivation (*B*=1.12) or on a social-cognitive theoretical background (*B*=0.68) rather than on a metacognitive one. Effect sizes also increased if the training focused on cognitive rather than on motivational strategy instruction (*B*=-0.45). No difference was found between cognitive and metacognitive strategy instruction. Effect sizes of strategy use at the elementary level also increased if: the intervention provided metacognitive reflection (*B*=0.22); if group work was not used as a teaching method (*B*=-0.53); if the training was conducted by researchers rather than teachers (*B*=-0.67), and for interventions in the math context rather than reading/writing (*B*=-0.34).

At the secondary level, the statistical model explained 59% of the variability for effect sizes on strategy use. Overall, the effect sizes measuring strategy use were higher at the secondary level. The secondary level effect sizes on strategy use were larger if the interventions were based on a metacognitive theoretical background rather than on a motivational (*B*=-1.83) or social-cognitive one (*B*=-1.67). Interventions were also more

successful when focusing on motivation strategies (*B*=0.88) and metacognitive reflection (*B*=1.45) rather than on cognitive strategy instruction, when researchers conducted the intervention rather than regular teachers (*B*=-0.64), and if the interventions were in the context of math instruction rather than in reading and writing (*B*=-0.79) or other subjects (*B*=-0.45).

The last outcome category assessed by Dignath and Buettner (2008) for the regression analyses was motivational outcomes. The motivational outcome category at the secondary level could not be assessed due to only one study reporting results for students' motivation. At the elementary level, 40% of the variability within the motivation effects sizes could be accounted for by the statistical model. The interventions saw greater success on motivational outcomes if group work was not used as a method of instruction (*B*=-0.77), if the training was conducted by researchers rather than by regular teachers (*B*=-0.78), if the training had a larger number of sessions (*B*=0.01), and for training programs that were conducted within the context of math instruction in comparison to reading (*B*=-0.52) or other subjects (*B*=-0.88).

In taking in all the findings from Dignath and Buettner's (2008) meta-analyses, the factors that make an SRL intervention more successful differ according to the school level that the intervention is targeting and what specific outcome is being considered. Group work, an intervention with a metacognitive theoretical background, and the use of motivational strategies appear to have a greater impact on secondary students' academic performance and strategy use, while elementary students find more success when the intervention does not include group work and draws from a social-cognitive theoretical background. Both elementary and secondary students tend to have more success with

interventions that include more sessions, that are delivered by researchers, and are within the context of math instruction.

In a more recent meta-analysis conducted by Donker and colleagues (2014), learning strategy instruction focused on improving self-regulated learning was analyzed in regard to increasing academic performance in elementary and secondary students. The meta-analysis included 58 studies (95 interventions and 180 effect sizes) published between January 2000 to January 2012. The interventions included both elementary and secondary students and were aimed at improving cognitive, metacognitive, and management strategy skills, in addition to motivational aspects and metacognitive knowledge. The meta-analysis found significant effects in the areas of writing, science, mathematics, and reading. The most effective strategies used differed with domains; however, metacognitive knowledge instruction proved to be important in all domains assessed. Interestingly, effects were higher when self-developed tests were used in comparison to intervention-independent measures.

Prior to beginning the discussion on the meta-analyses' findings, Donker and colleagues (2014) describe and define the incorporated learning strategies while then breaking learning strategies down into three different types: cognitive, metacognitive, and management strategies. Using Pressley, Goodchild, Fleet & Zajchowski (1989) definition of learning strategies, Donker and colleagues (2014) define learning strategies as “processes (or sequences of processes) that, when matched to the requirements of tasks, facilitate performance" (p. 2).

Within the larger scope of learning strategies, cognitive strategies are used to increase one's understanding/information learned in a certain domain. Donker and

colleagues (2014) describes the three main subcategories of cognitive strategies: rehearsal, elaboration, and organization strategies. Rehearsal is a common study strategy that involves repeating material to facilitate learning or remembering (e.g., learning vocabulary, idioms). Elaboration strategies involve helping students store information into their long-term memory by building internal connections between new knowledge and old knowledge (e.g., paraphrasing, summarizing). Organizational strategies assist students through graphs or pictures to select the needed information and then establish connections between the pieces of information.

Metacognitive strategies are described as those that regulate students' thoughts/cognitions by activating relevant cognitive approaches and are often noted as higher-order strategies. Similar to cognitive strategies, metacognitive strategies can also be broken down into three subcategories. Donker and colleagues (2014) include planning, monitoring, and evaluation. Planning strategies include the initial components of a learning session and involve sub processes such as goal setting and gathering resources (e.g., making a plan, deciding upon the amount of time to spend on an activity, and choosing what to do first). Monitoring strategies are used for checking one's comprehension and conducting self-assessments on one's learning and/or strategy use (e.g., self-questioning, changing the approach to a specific learning task if necessary). As planning strategies assist students at the beginning of the learning process, and monitoring strategies keep students on task towards their learning, evaluation strategies are those that can be used after the learning process. Evaluation strategies allow a student to analyze their own performance and evaluate the effectiveness of the learning strategies used.

Just as the name suggests, management strategies help students to "manage the aspects in the context which directly influence the learning process" (p. 3). Management strategies can also be classified into three subcategories: management of effort, management of peers and others (e.g., teachers), and management of the environment. Effort management strategies work to maintain work effort and motivation to complete one's study goals even amid possible difficulties or distractions. The last two areas that Donker and colleagues (2014) discuss are motivation and metacognitive knowledge (self-reflection), also noting that learning strategy instruction/training often focuses on these two components in addition to teaching the above-mentioned learning strategies.

Within their analyses, Donker and colleagues (2014) set out to address multiple research questions, including which strategies were the most effective in improving academic performance, did the strategy effects change with different types of students, and did the measurement instrument that was used influence the effect sizes.

In examining the interventions that were included within the meta-analyses, most of the interventions took place within the context of math (n=44), followed by reading (n=23), writing (n=16), and science (n=9). Metacognitive approaches with focus on planning and monitoring were the strategies most frequently addressed in the interventions. Regarding cognitive strategies, elaboration was the most common sub-strategy included in the trainings. Management strategies were included somewhat less, and motivational aspects were included the least. In addition to the metacognitive strategies, metacognitive knowledge was explicitly taught in about half of the interventions. The metacognitive knowledge most often addressed was the *where* and *why* of using learning strategies, and the metacognitive knowledge taught was often

tailored to individual students' needs. Regarding student population, most interventions were conducted in schools with regular education students. The instruments utilized to assess the interventions' effectiveness were more likely to be self-developed and aligned with the specific intervention.

Donker and colleagues (2014) first ran a meta-regression model analyzing the effects of each learning strategy on student performance separately. The results found significant positive effects with interventions that included general metacognitive knowledge (B=0.31, p <.01), the learning strategies of rehearsal (B=0.42, p < .01) and planning (B=0.20, p < .05), and the motivational component of task value (B=0.94, p < .01). There was also a significant negative effect found for goal orientation (B=-0.35, p < .05), suggesting that the inclusion of goal orientation has a negative impact on the effectiveness of the interventions. The researchers then conducted a meta-regression model where the effects of the significant learning strategies were assessed together. From that model, the researchers found that the cognitive strategy of rehearsal was no longer significant (B=.01), while the other factors were.

One of Donker and colleagues' (2014) goals was to examine the effectiveness of the learning strategies within different academic domains. With interventions that occurred within the context of reading, metacognitive knowledge significantly improved student performance (B=0.27, p < .05). The sub-strategies of elaboration (B=-0.48, p < .01) and management of peers (B=-0.27, p < .01) demonstrated potential detrimental effects on the interventions. Interventions that were based on sub-strategies of planning (B=0.15) and effort management (B=0.07) had slightly favorable results but compared with the other strategies, the effects were not significant. Within the context of reading,

the strategies of rehearsal (B=0.08), management of the environment (B=0.04), and self-efficacy (B=0.10) showed positive, although non-significant, effects on student performance. The researchers warn that these results are based on a small number of interventions, and therefore the non-significant results should be considered with caution.

In the area of writing, only evaluation (B=0.60, $p < .05$) and metacognitive knowledge (B=0.78, $p < .01$) were significantly more effective or beneficial than the other strategies. It should be noted that within the context of writing, no significant negative effects were found, suggesting that any of the learning strategies included within an intervention could potentially benefit a student's progress in the area of writing. In writing, the combination of metacognitive knowledge and evaluation was (B=0.75) and (B=0.57), respectively ($p < .05$), suggesting that SRL interventions that include both strategies were the most effective.

In regard to math, elaboration (B=0.21, $p < .05$) was the only sub-strategy to improve student performance significantly more than the other strategies. There were no significant negative relationships found. With science, there were no significant negative or positive effects found for any learning strategy.

Another goal for Donker and colleagues (2014) was to see if the learning strategy interventions were more successful for regular education or special education students. The analysis found that even though it appears that the special education population benefited more from the interventions, the result was not significant (B= 0.23, p = .58). There was also no significant relationship found between the effects of the interventions on student performance and students' age (B=-0.01, p = .55).

Another research question for Donker and colleagues (2014) was to see if there was a difference in outcomes when the instruments used were self-developed versus intervention independent assessments. Similar to Dignath and Buettner's (2008) findings, Donker and colleagues (2014) found that there was an average effect size of *g* .78 for self-developed tests and an average effect size of *g* .45 for independent tests. The difference between the two types of tests was significant ($p < .01$). The researchers found assessment type differences for each domain assessed. Within the context of reading, 70% of interventions utilized an intervention independent measure, while within the context of math and writing, only 10% and 11% of interventions used an intervention independent assessment. For science, 29% of intervention assessments were independent. Donker and colleagues (2014) then analyzed the effect of the measurement instrument for each subject domain separately. From those results, reading was the only domain in which interventions that used intervention independent tests had a significantly lower effect than self-developed tests. In comparison, the difference in effect size of the two assessment types was not significant in writing, math, or science.

After seeing significant effects demonstrated on student academic performance following metacognitive strategy instruction, as demonstrated in both Dignath & Buettner (2008) and Donker and colleagues (2014) meta-analyses, Boer and colleagues (2018) set out to evaluate the long-term effects of metacognitive strategy and/or knowledge instruction. They examined the long-term effects of 48 metacognitive strategy instruction interventions and their effect on students' academic performance. All the interventions included in the meta-analysis were published between January 2000 and January 2017. Overall, the results from the meta-analysis found a small increase in the effect on student

performance at follow-up (Hedges *g*= 0.63) compared to the posttest effects (Hedges *g*=0.50). Although the increase is minimal, the results suggest that the metacognitive strategy intervention effects were at the least maintained at follow-up. Both the average effect sizes at posttest and follow-up are considered to be moderately large/strong.

In obtaining more detail about the interventions included within the meta-analysis, Boer and colleagues (2018) describe that the average follow-up test was 21.6 weeks (SD=23.5), with 3 weeks being the shortest wait time and the longest period being 108 weeks. The average duration of intervention was 19.8 weeks (*SD*= 21.9). To further examine the differences between student performance at posttest versus follow-up, the examiners obtained the effect sizes of the differences for each intervention. When considering the effect size difference between posttest and follow-up, the average (weighted) effect size of the difference was small but significant (Hedges' $g = 0.12$, $p = .001$). From these results, Boer and colleagues (2018) suggest that strategy instruction interventions have a sustained effect on student performance.

Boer and colleagues (2018) then further analyzed their results by running moderator analyses. Some of the factors that were investigated included the type of instrument used for measuring student performance, specific learning strategies taught, and student characteristics of the sample. Half of the studies utilized standardized tests to assess student academic performance. When standardized tests were used, there was an increase in performance from posttest to follow-up (Hedges' $g = 0.17$, $p < 0.01$); whereas when unstandardized tests were used, the result remained consistent (Hedges' $g = .07$, $p = .27$). The findings between the standardized versus non-standardized assessments were not statistically significant ($p = .17$). In comparing the results for different domains

through a meta-ANOVA, there were small differences found but none that were statistically significant. From the post hoc analysis, there was a significant difference found between science and math ($p = .02$), with instruction occurring during science having significantly lower results.

The next factor that Boer and colleagues (2018) analyzed was the possible moderating effects of intervention duration and time between posttest and follow-up. Both factors did not have a significant moderating effect on the follow-up results. With previous meta-analyses showing a significant moderator effect on whom the implementer of the intervention was (researcher/other vs. Teacher), Boer and colleagues wanted to repeat that same analysis. Thirty-three of the interventions were implemented by teachers and had a Hedges' $g = 0.12$ ($p < .01$), while the 15 interventions that were run by researchers/others had a similar result with a Hedges' $g = .11$ ($p = .13$). The results of the meta-ANOVA for implementers found the difference to be non-significant. The researchers assessed the possible influence of cooperative learning on the follow-up effects and found that the group differences were not significantly different ($p = .90$).

In looking specifically at student characteristics, the meta-analysis evaluated 36 interventions with regular education student populations, four studies with low SES populations, and eight studies with special education populations. The average follow-up effect was .10 ($p = .02$) for regular education populations, 0.35 ($p < .01$) for low SES populations, and 0.04 ($p = .75$) for special education populations. The between-groups difference was not statistically significant, but post hoc analyses found a significant difference between low SES populations and regular education populations ($p = .03$). The last component of their moderator analysis was to assess the specific learning strategies

taught and their possible change on the follow-up results. The only strategy that was statistically different was rehearsal (Hedges' g = -0.23, p = .003), the results suggest that interventions that included rehearsal had lower follow-up effects than the interventions that did not include the rehearsal strategy.

With multiple meta-analyses evaluating the effectiveness of SRL interventions highlighting overall positive and moderately large effect sizes on student academic performance, it is appropriate to then transition to examining specific SRL interventions. Investigating specific SRL interventions will allow for a more thorough representation of what a possible SRL intervention entails and how a possible growth mindset of self-regulation could be incorporated into this type of intervention.

Specific Examples of SRL Interventions

In order to demonstrate what a potential Self-Regulated Learner intervention may look like and their effectiveness, the Self-Regulation Empowerment Program (SREP) and the Student Skills Success Program (SSS) will be reviewed.

Self-Regulation Empowerment Program Intervention

An intervention program that was created to address the various components of being a self-regulated learner is called the Self-Regulation Empowerment Program (SREP). SREP is a psycho-educational school-based SRL intervention program designed to assist at-risk middle school and high school students in developing "effective strategic and regulatory patterns of thinking and action to overcome low motivation, poor self-awareness, deficient strategic skills, and below-average academic performance" (Cleary et al., 2017, p. 30). SREP was developed utilizing mostly social-cognitive principles, which align with Zimmerman's (2000) feedback loop of forethought, performance, and

self-reflection. The SREP can be administered as a Tier 2 intervention. SREP was designed through a small group model that follows a flexible or semi-structured protocol/curriculum, and the course of the intervention is usually 3-4 months. The intervention groups typically meet multiple times a week. The intervention design encompasses in the moment coaching, modeling, guided practice, and feedback to help the students increase their self-regulation skills. The SREP coaches also devote time to enhance and restructure maladaptive beliefs following failures and poor self-efficacy.

Even though the SREP appears to hold much promise in being a successful intervention, there have been limited studies that have assessed SREP's effectiveness on increasing students' self-regulated learning. In two different studies, ninth grade high school students in urban schools who had the academic skills but were failing or near failing in their Biology classes were administered the SREP intervention (Cleary et al., 2008; Cleary & Platten, 2013). These two studies yielded promising results, but their interval validity was questionable due to a lack of randomization of participants, small number of participants, case study analyses, and inadequate comparison groups.

Cleary and colleagues (2008) found that the SREP group (n= 5) demonstrated higher intervention biology test scores (M=83.3) in comparison to the class average (M= 80.6). The average gain score on tests taken during the intervention compared to baseline for those in the SREP group was 13 points. The average test gain from baseline for the comparison group was 3 points. Cleary and colleagues (2008) also assessed pre and posttest differences in the intervention group's use of self-regulation strategies and motivational beliefs with both self and teacher reports on multiple measures. With the self-regulation strategy ratings, there was a significant rate of change with the following

subscales: managing environment and behavior ($p < .01$), seeking and learning ($p < .05$), and maladaptive regulatory behaviors ($p < .05$). With motivational beliefs, there was a significant rate of change for self-efficacy ratings ($p < .05$) and self-efficacy/interest in biology outcomes ($p < .01$). The data from the ratings scales was only from three students.

In comparison to the prior two SREP studies, Cleary, Velardi, and Schaidman (2017) ran a more thorough study with two conditions that included 42 students in the same seventh grade Algebra course. The goal of their study was to answer the following questions:

> "1. Do SREP students exhibit more adaptive self-efficacy, self-reported use of SRL strategies, casual attributions, adaptive inferences, and test preparation tactics at posttest and a 2-month follow up than students receiving an existing school-based, mathematics remedial program called What I Need (WIN)?
>
> 2. Is the pattern of mathematics achievement scores exhibited by SREP students across two years of middle school similar to that of the comparison group?
>
> 3. Do SREP students and coaches convey positive perceptions of SREP regarding its acceptability of procedures and importance of effects?" (p. 31)

To assess these questions, Cleary and colleagues (2017) used multiple methods to measure the results, including student self-report questionnaires (Self-Regulation Strategy Inventory-Self-Report; Self-efficacy for self-regulated learning scale; social validity/student perception of the intervention) , a free-response hypothetical scenario (placed in the situation of preparing for a math class exam), free-response SRL microanalytic questions (microanalytic attributions and microanalytic inferences), and

their mathematics achievement (classroom exams and assessments). The importance of using multiple methods of measurement for SRL was discussed by the researchers, who warned that a specific SRL measure might only assess one part or one aspect of SRL, and therefore multiple measures should be combined to better assess the intervention's results on SRL skills.

During the intervention phase, Cleary and colleagues (2017) had four different coaches administer the SREP intervention to groups of five to six students. The sessions lasted about 25 minutes each. It was noted that 20% of SREP instructional time was used for mathematics content. The coaches were guided with pre-established modules and instructional formats to assist in running the sessions. The first four to five sessions focused predominantly on introducing key SRL processes to the students. These include but are not limited to attributions, goal-setting, task analysis, and adaptive mindsets such as "success in school is a controllable phenomenon" and that "developing one's repertoire and skills in using strategies will lead to progress and improvement." (p. 35). After the foundational modules, the coaches then began using Review, Analysis, Practice, Practice, Plan, Self-Direction (RAPPS).

The RAPPS section of the SREP intervention involves frequent modeling and guided practice of learning and regulatory strategies. The Review component occurred at each week's first session and included a review/check-in regarding any challenges the students may have experienced when using the strategies during the prior week or any other difficulties or challenges that may have emerged. The next part of the intervention, Analysis, was facilitated with discussions of upcoming content/activities/tests in the target math course and any other specific concerns that the students had that they wanted

to address in the upcoming week. The Review and Analysis components usually took about 5-8 minutes while the majority of the instruction occurred during the Practice section. The Practice section had the SREP coaches working with the students by discussing, modeling, and then providing students with practice opportunities to use specific strategies to address challenges that they encountered. During the last 5 minutes of each intervention session, the students would be prompted by their coaches to make a specific plan regarding what strategies or tactics would be used and practiced at home before the next SREP session. The Self-Direction phase occurred independently without the presence of the SREP coaches. The Self-Direction phase involved the students enacting their strategic plans while also self-monitoring their behavior/progress.

The SREP coaches facilitated the process of weekly planning, practice, and reflection until the students received feedback about their grade on a unit mathematics exam. Once the students received the exam feedback, the coaches then started the self-reflection module. The goal of the self-reflection module was to help the students uncover their own perceptions of how they performed, the reasons why they performed that way, and the things that might need to change or be adapted prior to the next test. The main instructional tool used in this module is the Self-Regulation Graph, in which students learn to evaluate their performance in terms of personal goals or prior tests grades and to develop empowering and adaptive ways to think about their performance, even in the face of failure or struggle. The graph becomes a platform in which the coaches can assist students in linking their progress to variables that are controllable.

Students completed the SRSI-MRB subscale, self-efficacy measure, microanalytic attributions, and microanalytic adaptive inferences at pre-test, post-test, and at a 2-month

follow-up. Students were administered the hypothetical situation and social validity assessment at post-test and at the 2-month follow-up. The examiners also gathered quarterly exam data for the students' seventh and eigth grade years. Once all data was completed and analyzed, the examiners found no significant group differences between the SREP intervention group or the control condition regarding self-efficacy or maladaptive regulatory behaviors. The non-significant findings remained at the 2-month follow-up.

In looking at the students' responses from the hypothetical test situation, there were statistically significant different responses in microanalytic adaptive inferences, attributions, and test prep scenario that were maintained at the 2-month follow-up. These results suggest that the students in the SREP intervention group were more likely to have greater strategy use in their judgments and see the need to make changes in their study approaches when needed. The students in the SREP intervention group were also able to generate more comprehensive strategic plans for test prep, but those results did not hold at a 2-month follow-up.

The researchers then examined the students' mathematics achievement over time. There was a significant interaction of Treatment X Time in that the pattern of achievement scores across seventh and eigth grade for the SREP group was significantly different than the WIN group. Upon further analysis, the only time that the groups were significantly different from one another was at the eigth grade, first quarter exam data. Cleary and colleagues (2017) then conducted within group analyses and found a statistically significant effect for the SREP group that had a medium level of effect. Through descriptive analyses, the SREP quarterly exam data revealed a shift towards the

overall classroom's average by the end of seventh grade and then saw above average performances across all eigth grade data points. In comparison, the WIN group did not have any within group statistically significant findings, and there was a consistent level of below average math achievement for five of the six data points.

The last component of the data analysis was the social validity of the SREP intervention. Overall, the students' perceptions of the program were highly positive regarding the acceptability and value of the instructional procedures, in addition to the overall importance of program effects. These results were maintained at the 2-month follow-up. The SREP coaches also completed the teacher version of the social validity scale at post-test. There was little variability seen across the coaches' responses, and all responses had highly positive perceptions of the SREP intervention, specifically with its ability to improve students' functioning and acceptability of the procedures.

Student Success Skills (SSS) Intervention Program

In looking at another intervention program that addresses many components of being an SRL, the Student Success Skills (SSS) program was reviewed. The SSS program is a school counselor led intervention that has the goal of improving student academic achievement and school success behavior in middle and high school students. The SSS curriculum and subsequent studies were developed from previous research demonstrating improved academic achievement and social competence in younger students when teachers utilized the Ready to Learn curriculum (Brigman et al., 1994; Brigman et al., 1999; Brigman & Webb, 2003 as cited in Brigman et al., 2007). The study conducted by Brigman and Campbell (2003) assessed SSS within a group counseling and classroom guidance lessons model with students in grade 5, 6, 8, and 9.

The focus of SSS and its curriculum is on three particular skill sets: cognitive/metacognitive (e.g., goal setting, progress monitoring, memory skills), social (e.g., interpersonal skills, social problem solving, listening teamwork skills), and self-management skills (e.g., managing attention, motivation, and anger). Through review of previous research, these three skills sets were shown to be powerful predictors of long-term school success and often differentiated high achievers from low achievers. According to Wang and colleagues (1994) meta-analysis and noted by Brigman and Campbell (2003), the instruction model for teaching learning skills that was found to be most successful was "Ask, Tell, Show, Do, Feedback method" (p. 93). Brigman and Campbell set out to find if school counselor-led interventions could impact student achievement and behavior and if school counselor conducted group counseling and classroom guidance could have a positive impact on student achievement and school success behaviors.

The interventions were conducted in three elementary, one middle, and two high schools in the state of Florida. The study included a total of 180 students (30 from each school) that were randomly selected from students scoring between the 25th and 50th percentile in reading on the Norm Reference Test (NRT) Florida Comprehensive Assessment Test (FCAT). The examiners note that the school district leaders were specifically concerned about this student population as they were performing in the Below Average range but were most likely not receiving services. Comparison students were also selected randomly from the same pool of students at the same grade levels as the participants. The comparison students were in nontreatment schools that were matched with the treatment schools for geography, race, and socio-economic data. The

comparison schools were not aware of the study. Ten school counselors participated and conducted the group sessions and classroom guidance lessons using the SSS curriculum.

In order to examine the intervention's effectiveness, a pretest-posttest comparison group design was used for the study. The students' teachers completed rating scales on the student's classroom behavior in addition to student's math and reading scores on the FCAT. At pre-test (September) and post-test (April), the teachers of the students in the treatment group completed the School Social Behavior Scale (SSBS) (Merrell, 1993, as cited in Brigman and Campbell, 2003). The students in the nontreatment group were not rated on any behavior rating scales.

Prior to the intervention, the counselors received a 3-day training in August, in addition to three half-day sessions in October, January, and March. Throughout the year, the counselors also met in small groups for half-day peer coaching sessions (September, November, and February). These sessions involved three to five counselors participating in structured feedback sessions, with each session having the counselors present videotapes of themselves leading an SSS group session. The group counseling intervention involved eight weekly, 45-minute sessions that were followed by four booster sessions (each spaced a month apart). The group sessions began during the first week in October, and the weekly sessions ended the first week in December. The group curriculum used was *Academic and Social Support: Student Success Skills* (Brigman & Goodman, 2001). The sessions followed a structured format that focused on goal setting, progress monitoring, and active learning through various activities. The group sessions were broken down into three sections: beginning, middle, and end.

The beginning phase consisted of four tasks: 1) temperature check on feelings/energy, 2) review of past session, 3) focus on goals and progress associated with those goals, 4) previewing the current meeting agenda and providing a what's in it for me (WIIFM) rationale/benefit statement. The goal and progress monitoring task involved a goal-setting progress monitoring chart (SSS self-monitoring tool) being developed and the students reporting their progress made on applying the lessons learned in group to their lives. During the middle phase, the main activity for that week was introduced and explored. This is where the counselors were to utilize the *Ask, Tell, Show, Do, Feedback* method. The middle phase also involved a peer coaching model throughout the activities. Similar to the beginning of the session, the ending phase also included four tasks: a) review what was covered in the session, b) process/discuss thoughts and feelings students had while participating in the activities, c) set a goal(s), d) preview what is to come in the next session. When choosing a goal, the students were directed to reflect on what is most meaningful and then decide how they would use it during the next week in order to reach their goal. The goal-setting process has four specific subparts: (a) thinking/reflecting and picking out one specific thing they learned or found useful, (b) writing down what they commit to do this next week, (c) sharing their goal with a peer partner and having to listen to their partner's goal, and (d) student volunteers sharing their goal with the entire group. Along with the small group sessions, there are also classroom guidance lessons that are conducted as well. The classroom guidance lessons also involved a classroom curriculum that is meant to be run in a four-part format similar to the small group intervention.

The researchers implemented a monitoring system in order to assess the treatment validity of the study. The monitoring system included five components which were met for five out of the six schools: "(a) counselor attendance at training sessions, (b) counselor attendance at peer coaching sessions, (c) counselor use of prescribed group materials, (d) student attendance at the 8 weekly group sessions and four booster sessions, (e) counselor conducting at least three classroom guidance lessons on student success skills in each targeted grade level." (p. 95-96)

In examining the results of Brigman and Campbell's (2003) study, there was an average of a 22-percentile amount of improvement on the School Social Behavior Scale (SSBS). Unfortunately, the comparison group was not rated, and therefore a proper comparison/analysis could not be provided/conducted. In regard to specific domains, 82% of students showed an improvement in math, and 61% showed an improvement in reading. Brigman and Campbell (2003) then ran a one-way analysis of covariance to compare the performance between the treatment and comparison groups for the reading and math FCAT achievement tests. The researchers found a significant difference between the treatment and comparison groups in both reading (p=.003) and in math (p=.000).

In order to provide replication for the SSS intervention, Campbell and Brigman (2005) and Webb, Brigman, and Campbell (2005) ran studies examining the effects of the SSS intervention specifically with fifth and sixth grade students. These interventions also utilized an updated SSS curriculum/manual (Brigman et al., 2004). For Campbell and Brigman's (2005) study, 25 school counselors were trained, and 240 students participated in the intervention. There were significant differences found between the treatment and

comparison groups for both reading (p =.051) and math (p = .002) on the FCAT. The examiners once again used the SSBS rating scale with only the treatment group; therefore, a true comparison between the two groups on behavior could not be provided. From the teachers' ratings on the SSBS, 69% of students' performance improved with the average improvement of 18 percentile points.

Webb, Brigman, and Campbell's (2005) study involved 418 fifth and sixth grade students from 20 different schools throughout Florida. The study and intervention were run similarly to the previous SSS studies (Brigman & Campbell, 2003; Campbell & Brigman, 2005). From the FCAT results, ANCOVA analyses found a significant difference between the intervention group and the comparison group for math ($p < .002$), but not for reading (p = .144). In math, 85% of students in the treatment group improved their math scores on the FCAT by an average of 27 scaled points, while 73% of students in the comparison group improved their math scores by an average of 11 scaled points. With reading, the treatment group did see an average improvement of 16.2 percentage points. There was an average improvement of 12.9 percentage points for the comparison group. Further assessing trends within the FCAT reading data and specifically with students who showed improvement, 75% of the students in the treatment group improved their reading scores by an average of 26 scaled points, whereas 73% of the comparison group improved an average of 13 scaled points. Consistent with the previous studies assessing the SSS intervention, 72% of students in the treatment group saw an average improvement of 19 percentile points on the teacher rated SSBS.

Brigman, Webb, and Campbell (2007) conducted a study involving 12 schools (220 students), with students in 6 schools receiving the treatment. Similar to the Brigman

& Campbell (2003) study, students in grades 5, 6, 8, and 9 received the intervention. In looking at participant demographics, 54% of the students were female, 52% identified as Black/African American, 29% as White/Caucasian, and 18% as Latino/Hispanic. The students were once again chosen because they scored between the 25 to 50 percentiles on the FCAT. The examiners once again utilized the SSBS rating scale in order to assess student behavior and FCAT scores to assess students' academic achievement in the areas of reading and math. The intervention followed the same format as described above (Brigman & Campbell, 2003).

In regard to academic achievement outcomes, the researchers found a significant difference between the treatment and comparison group in math scores (p=.003) on the FCAT, but there was once again no significant result found in the area of reading (p=.250). The effect size for the math change scores was in the moderate range (d=.45). Sixty percent of students receiving the intervention had improved behavior ratings on the SSBS rating scale with the average increase of 18 percentile points. Once again, the comparison group was not rated on the SSBS and therefore, a true comparison could not be provided or examined.

Academic Motivation

Researchers in the field of self-regulation and SRL are advocating for the need to not only teach students regulatory strategies, but to also address the areas of academic motivation, effort appraisals, self-efficacy, and self-evaluation in order for SRL/self-regulation interventions to be successful, generalized, and maintained (Mrazek, et al., 2018; Zimmerman and Moylan, 2009). The question then becomes, are all components of academic motivation being effectively addressed in SRL interventions, and are SRL

interventions able to answer the following questions: Do students who are failing academically hold the belief that their intelligence and self-regulation ability are *fixed*, or do they believe that those abilities can be developed over time? Does the belief that self-regulation is malleable affect students' motivation to complete and participate in self-regulatory tasks and strategies? Does the malleability of self-regulatory beliefs need to be addressed when training students to be self-regulated learners?

In an attempt to better understand student motivation, Seifert (2004) reviews four main theories of student motivation and then combines the theories to provide a comprehensive view of student motivation. The first theory described was self-efficacy, which is a person's belief that they are capable of performing a certain task. Seifert further highlights that students who have higher levels of self-efficacy are more likely to be self-regulating, strategic, and metacognitive. Self-efficacy has previously been correlated with cognitive processing, achievement performance, motivation, self-worth, and choice of activities (Bandura 1977, 1993, as cited in Seifert, 2004). Students who do not believe that they can complete a task may begin avoiding tasks that are seen as challenging or difficult. Students who are efficacious are more likely to display adaptive, mastery behavior and face difficult or challenging problems that also allows them to exercise control over stresses that may be anxiety provoking (Bandura, 1993; Dweck, 1986, as cited in Seifert, 2004).

The next motivational theory that Seifert reviews is attribution theory. As Seifert (2004) notes an attribution is what one believes is the cause or explanation for an outcome. Often student attributions include: "effort, skills, knowledge, strategies, ability, luck, the teacher's mood or mistakes by the teacher" (p. 138). Theories developed by

Weiner (1984, 1985, as cited in Seifert, 2004) indicate that how an outcome or event is perceived creates emotions and those emotions then generate motivation or lack of motivation for future behavior. For example, if a student frequently receives failing grades on math tests and is to fail another test, that student may assume an attribute of inability. In comparison, a student who usually does well on math tests may attribute a failed math test to a lack of studying. One's level of self-efficacy can have an impact on one's attributions in that highly efficacious students are more likely to attribute a situation to personal agency instead of inability (Bandura, 1993, as cited in Seifert, 2004). One's perceptions on the attributes can also be influenced by one's mindset (fixed vs. growth) and if that person believes that they change or increase the skill/characteristic that is creating the situation (i.e., intelligence, academic ability).

Seifert (2004) then examines the self-worth theory of achievement motivation. In the context of achievement motivation, the self-worth theory suggests that students are motivated by maintaining or enhancing their self-worth (Covington, 1984 as cited by Seifert, 2004), and therefore students' behaviors are driven by protecting their self-worth. Seifert (2004) defines the concept of self-worth as "the judgment one makes about one's sense of worth and dignity as a person. A person who has a sense of self-worth knows that he or she is loved and respected by others and is valued as a person." (p. 140). Having a sense of self-worth is positively associated with well-being and is suggested to be essential to human functioning. Covington (1984, as cited in Seifert, 2004) makes the argument that in Western culture, there is a belief that self-worth is intertwined with performance. If a person can do something well with little effort, then that person will have a high level of self-worth. If a student is struggling to do well and has the belief that

their self-worth stems from performing a task easily with little effort, then that student will begin to engage in failure avoiding strategies to protect their self-worth. A student who has low self-worth in their academic ability will be more likely to engage in failure avoiding strategies to escape having to show that a high amount of effort was put into a task. The student will also try to escape the possibility of the high amount of effort leading to failure, which in turn can lead to feelings of shame and humiliation. As noted by Seifert, Covington (1984) suggests that given the choice between feeling guilty by not working and feeling shamed by working hard and failing, students would rather feel guilty than feel ashamed. The failure avoiding behaviors can include not trying, procrastination, being disorganized, setting goals too high, setting goals too low, cheating or asking for help. When students engage in these types of failure avoiding behaviors, they have an excuse other than inability of why they were not successful.

The last motivational theory that Seifert (2004) reviewed is achievement goal theory which insists that academic motivation is all about students' attempting to achieve goals. Students' behaviors are therefore a function of desires to achieve particular goals: learning (also called mastery, task) versus performance goals. Learning/mastery goals have been associated with a growth mindset and self-regulated learning. Setting mastery-oriented goals helps students to reframe and view effort as the cause of success and that intelligence/ability are malleable. A student with a learning goal is task and learning orientated, assesses tasks and situations as challenges to overcome, and is more likely to engage in strategy use. In comparison, a student who is performance goal oriented, is likely to be more focused with ability and in comparing their performance to others and how they will be perceived by others. The student with performance goals is more likely

have fixed-mindset views and to assume that intelligence/ability cannot be changed and view difficult problems as failures. This type of student will only engage in adaptive problem solving if they feel confident in their ability for that particular task (Dweck, 1986).

As described above, a self-regulated learner needs to have self-determination, behavioral self-control, and academic self-efficacy. One part that appears to be missing or not always fully accounted for in SRL interventions is a student's academic motivation. In addition, Mrazek and colleagues (2018) discuss recent research highlighting the importance of responses and experiences of effort with self-regulation. Mrazek and colleagues (2018) indicate that there are two well-established features of a growth mindset that are particularly important in regard to self-regulation, which include attributions of effort and the amount of effort put in.

As Mrazek and colleagues (2018) further point out, growth mindsets allow for a person to view effort as something positive and something that is needed instead of a potential weakness (Hone et al., 1999; Miele et al., 2011; Miele & Molden, 2010, as cited in Mrazek et al., 2018). The second important feature of growth mindset, in terms of self-regulation, is the favorable view of effort and one's willingness to exert effort (Mrazek et al., 2018). Growth mindset theory and interventions address the multiple components of academic motivation as described by Seifert (2004) and go one step further by facilitating the means to reinterpret effort to allow for continued motivation when pursuing one’s goal(s). With self-regulated learning interventions being fairly intensive and time consuming, it is advantageous to assess if SRL interventions can be enhanced or made more efficient. One approach is to possibly incorporate a growth mindset of self-

regulation into SRL interventions. Before diving into the current research of a growth mindset of self-regulation, the theory of a growth versus fixed mindset will first be reviewed.

Growth Mindset

Through multiple decades of research, that initially came out of attribution theory and learned helplessness research, Carol Dweck, her colleagues, and teams of researchers have developed the theory of *entity* versus *incremental* implicit theories that were later termed as *fixed* versus *growth mindset* (Dweck & Yeager, 2019). A *growth mindset* is defined as "the belief that human capacities are not fixed but can be developed over time, and mindset research examines the power of such beliefs to influence human behavior" (p. 481). Vast amount of research was then conducted to define and refine the implications of a growth mindset in varying fields, especially in schools and academics. Research into growth mindset interventions followed and continues to this day. The current literature is beginning to pinpoint for whom and under what circumstances a growth mindset intervention is effective. Common growth mindset interventions will be described as well as trends that have been presenting with the results. It should also be noted that for the purposes of this paper, entity and incremental implicit theory will be used interchangeably with fixed and growth mindset.

In reviewing growth mindset, Dweck (2015) describes that individuals hold varying mindsets across a range of attributes and abilities. These held mindsets are on a continuum of fixed versus growth and are rarely one or the other. Where one falls on the mindset continuum can have significant ramifications in multiple areas of one's life. For example, which type of goals one orients themselves to, reactions to social adversities, as

well as their overall worldview can be altered by one's mindset (Yeager & Dweck, 2012). The fixed mindset creates a worldview that all things are measuring one's ability and therefore challenges, setbacks, effort, etc. are measuring one's ability. Whereas a growth mindset worldview is about learning and growth—challenges, setbacks, effort, etc. are viewed as helpful to learn and grow. A growth mindset not only changes a person's beliefs on effort, but as Yeager and Dweck suggest that a growth mindset shapes one's goals (performance versus learning goals), attributions (i.e. need to work harder, change strategies or he/she is "dumb"), and learning strategies (i.e. work harder or give up/cheat/become defensive). In addition, fixed mindsets of personal traits significantly correlate with and predict higher depression and anxiety in youths, particularly adolescents (Romero et al., 2014; Schleider et al., 2015; Schleider & Weisz, 2016a). Furthermore, the influence and implications of mindsets can have long lasting effects and have been demonstrated in children as young as preschool age and continuing throughout adulthood (Smiley & Dweck, 1994; Dweck, 2006).

Growth Mindset Interventions and Strategies in the Classroom

What does a growth mindset intervention look like? What do the principles of growth mindset look like in the classroom? How can parents and teachers effectively instill a growth mindset in their children and students? Haimovitz and Dweck (2017) argue that passing on a growth mindset to children is not as simple as teachers or parents possessing one; instead, research is now suggesting that there are certain practices that adults can do to help develop a growth mindset in children and adolescents (Hooper et al., 2016; Sun, 2015). Haimovitz and Dweck (2017) suggest that adults' behavior towards children/adolescents is influenced by the adults' theories of how to motivate children

rather than their own personal mindsets. This review will first look at growth mindset strategies and their effectiveness before turning towards specific growth mindset interventions and their effectiveness.

Growth Mindset Strategies

Following the self-esteem movement, emphasis began on studying the effects of praise on children and students, especially regarding praise of children's intelligence and abilities. Research then began to demonstrate that types of praise by parents and teachers were later predicting children's mindset (Gunderson et al., 2013; Park et al., 2016; Pomerantz & Kempner, 2013; Sun, 2015). Mueller and Dweck (1998) hypothesized that praising ability or intelligence when children succeed may indicate to them that intelligence is fixed and could increase the likelihood of a fixed mindset approach especially when children faced difficult tasks/challenges. Instead, Mueller and Dweck suggested that praising the child's process that led to the success (i.e. work or strategies) would lead to better likelihood of the child adopting a growth mindset view of intelligence. Mueller and Dweck tested their hypothesis across six studies with fifth grade children and found that when the participants were provided with process praise versus person praise, the student was more likely to accept the challenge of the hard task that provided the potential for learning instead of an easier task that posed no threat to skill. Kamins and Dweck (1999) found similar results in kindergarten students and research has continued to demonstrate similar patterns in responses to specific types of praise that spans from preschool age through young adulthood (e.g., Brummelman et al., 2013; Cimpian et al., 2007; Corpus & Lepper, 2007; Haimovitz & Corpus, 2011; Skipper & Douglas, 2012; Zentall & Morris, 2010). The findings were generalized to praise

provided by parents, in that parents that had frequent use of person praise predicted children later having a fixed mindset (Gunderson et al., 2013; Pomerantz & Kempner, 2013). Mueller and Dweck (2017) warn that process praise is not simply all about praising the effort and forgetting about the outcome, but that connecting the process/use of strategies to an outcome (learning or goal attainment) can promote a growth mindset.

Just as praise is influential and inevitable in both teaching and parenting, so too is having to provide feedback and criticism to children and students. Kamins and Dweck (1999) found that providing person-focused critical feedback (expressing disappointment in the child) or process-focused critical feedback (discussing the strategy used) through role play with 5- and 6-year old participants led to changes in mindsets, resilient coping, level of positive self-assessment, and persistence. Haimovitz and Dweck (2016) also observed that parents' belief about failure (as either motivating or demotivating), in addition to their responses to their children's failure, predicted their children's mindsets rather than the parents' personal growth or fixed mindset. Going a step further, Haimovitz and Dweck, through a series of studies, demonstrated that parents' beliefs about failure are significantly related to different parental practices, which are then suggested to foster different intelligence mindsets in their children.

Focusing on teacher practices and pedagogical strategies, Sun (2015) found that it was the type of teachers' practices (learning/process-oriented vs. performance/person oriented) that predicted their students' mindsets instead of the teachers' personal mindsets. Sun surveyed and observed middle school math teachers along with over 3,100 of their students and found that teachers who promoted a growth mindset engaged in certain practices that focused on students' learning. Sun observed the following practices:

teaching for understanding; asking students to explain their thinking process (even if the answer was right or wrong); providing student feedback that deepened the student's understanding of the topic; evaluating and praising the students' learning process, explanations for their thinking, and progress towards learning goals; students were given chances to revise their work to show their deepened understanding; explicitly explain the importance of mistakes and struggles as part of the learning process.

Hooper and colleagues (2016) set out to investigate what teachers do to create a classroom culture of a growth mindset by asking math teachers how they would respond to a struggling student and an excelling student through open-ended responses. Through their analyses of the teachers' responses, Hooper and colleagues found that teachers who created a growth mindset classroom responded by framing struggle, effort, and negative emotions (like frustration) as natural and useful parts of the learning process, in addition to discussing why they are useful. The growth mindset classroom teachers also discussed having students work together and structuring the classroom in a way that shares accountability for students' success as a group effort. Furthermore, Bonne and Johnston (2016) noted the following teaching practices to instill growth mindset into classroom:

> "Share achievable and specific learning goals with students and refer to these when giving them feedback about their learning; Draw students' attention to the specific skills they have developed; Have students keep a record of their learning; Prompt students to attribute poor performance to insufficient effort and encourage them to try harder (where appropriate); Provide a 'coping model' for students—model and make explicit the strategies that can help us cope with mistakes/failures; Use 'similar peers' (i.e., similar in ability or learning needs) as

models (rather than teacher models) wherever possible, to help students see that they can master the material." (p. 22)

Haimovitz and Dweck (2017) then note literature that goes beyond setting up a growth mindset classroom to then setting up a school culture model that embraces and cultivates a growth mindset in its students. The education model is called expeditionary learning and there are more than 150 schools across 30 states in the United States who have adapted this model (Berger et al., 2014, as cited in Haimovitz & Dweck, 2017). The school wide growth mindset model sounds promising, but, unfortunately has limited research in its overall effectiveness. In the next section, specific growth mindset interventions and research of effectiveness will be reviewed.

Specific Growth Mindset Interventions

Many of the interventions created with the goal of increasing a student's growth mindset have been through workshops, adaptations to the computer based Brainology curriculum, or through short online interventions (one to two sessions). Assessing the effectiveness of mindset interventions has mainly been through pre and post participant surveys, in which students report their beliefs about achievement goal orientation, attributions, mindset, and the value of effort before and after an intervention (Schmidt et al., 2017). There have been mixed results on the effectiveness of growth mindset interventions, but the results do present areas, pathways, and populations in which to focus growth mindset interventions in the future especially within the realm of academia.

Workshops

In her book, *Mindset: The New Psychology of Success* (2006), Dweck discusses the success she had with an 8-session mindset workshop for adolescence in which the

students in the mindset workshop saw a significant increase in their math grades at the end of the year. The students in the other workshop, did not see such an increase. As part of the initial growth mindset intervention studies, Aronson and colleagues (2002) had college-aged students participate in a 3-session in-person pen pal program in which the participants were taught a growth mindset and then were asked to write a letter of what they learned in order to mentor struggling middle school students. African American college students who received the growth-mindset intervention went on to earn higher grades, reported greater enjoyment of the academic process, and greater academic engagement than their counterparts in two control groups. Shortly after, two additional studies were conducted looking at growth mindset intervention workshops with adolescents (Good et al., 2003; Blackwell et al., 2007).

For example, Good and colleagues (2003) used college mentors to teach seventh graders about growth mindset. The college mentors met with each student twice once in Mid-November and then in January, with each session lasting 90 minutes each. The examiners had the students in the experimental group internalize the experiment's message by creating their own web page that advocated for growth mindsets. The students in the experimental condition earned significantly higher reading standardized test scores than those in the control condition. This type of growth mindset intervention in which, first, the participants learn the scientific information about the brain and its plasticity/malleability and then, second, the intervention involves a creative way for the participants to internalize and reflect upon the idea of a growth mindset, became the template for future growth mindset interventions to come (Dweck & Yeager, 2019).

Parent/Teacher Focused Interventions

As noted above, teachers and parents play a significant role in whether children develop a growth or fixed mindset especially when faced with adversity. As Fraser (2018) indicates, in order for a growth mindset intervention to be successful in encouraging learners to adopt a growth mindset, great consideration needs to be taken with increasing pedagogical and parenting practices that can help support longer-term improvements and maintenance of a growth mindset and its ideals. Studies on interventions specifically addressing parent and teacher skills/behaviors are unfortunately limited, but as Shumow and Schmidt (2013) found students in classrooms where the teacher adopted more growth mindset teaching strategies felt that the overall student growth mindset intervention (Brainology) was more successful.

Bonne & Johnston (2016) had teachers incorporate micro-interventions during math instruction, in the form of pedagogical strategies, to students aged 7-9 in suburban primary schools in New Zealand (Intervention N=41; Control N=50). These strategies aligned with a growth mindset philosophy and focused on making students' progress explicit and increasing students' mathematics self-efficacy. Students completed measures of math achievement, math self-efficacy, and theory of intelligence on three occasions: pre-intervention (start of school year), mid intervention (mid school year), and post intervention (beginning of the following school year). The teachers involved in the intervention group attended three mathematics self-efficacy intervention workshops throughout the school year.

In looking at the results, Bonne & Johnston (2016) found more significant results for the control group than those in the intervention group. A significant effect for

mathematics self-efficacy by time and group in that both the intervention group and control group increased in self-efficacy as the year progressed. It should be noted that there was a significant difference between the two groups at pre-intervention with the control group having significantly higher levels of self-efficacy than the intervention group. Post-intervention there was no longer a significant difference between the two groups, suggesting that the intervention had a positive impact on the intervention group's self-efficacy. The control group had significantly higher levels of reported growth mindset and increases in math achievement scores throughout the intervention. In looking at correlational data, mathematics achievement and self-efficacy were consistently correlated, but no significant correlation was found for mathematics achievement and growth mindset.

Dowey (2017) compared growth mindset intervention effectiveness at a small group intensive level as well as at the whole school level for Year 9 students at a school in Northeast England. The small group intervention is discussed in the section below. A major component of the whole school growth mindset approach was staff professional development and growth mindset displays on hallways and on staff/teacher computer login pages. Initial staff training was delivered to the entire staff in a 90-minute professional development session during the beginning of the school year. The staff were also expected to participate in three self-chosen courses from a selection of 16 that all involved the concept of growth mindset. Another training session was provided to all staff in October regarding growth mindset instruction and professional development on growth mindset was scheduled throughout the entire school year. In the fall term, five out of seven student assemblies addressed growth mindset and the growth mindset message

continued throughout the rest of the school year's assemblies. The students also had a growth mindset section provided in their daily planners. The 20 students in the control group who only received the whole school intervention did not have a significant increase in self-rated growth mindset scores or in teacher rated effort in English and Mathematics.

Rienzo, Rolfe, and Wilkinson (2015) also found that the students who were only provided the intervention of their teachers receiving growth mindset professional development made no significant progress in math and made less progress in English than the control group. These findings suggest that students may need to be explicitly taught about growth mindset and that teacher interventions in the form of professional development are limited in efficacy.

Brainology

Probably the most well-known growth mindset intervention is known as Brainology. Brainology was created with the help of Carol Dweck, along with advice from educational experts, brain experts, and media experts (Dweck, 2006). Brainology is an online computer-based program intended to teach students (fourth through seventh grade) how to develop a growth mindset (Mindset Works, 2020). Brainology allows the students to progress through the computer lessons independently and there is one online session for every four classroom lessons. The program incorporates the students watching characters as they complete five instructional units. Through a multimedia format, each unit teaches and reviews with the students how their brains are constantly changing, and that practice and learning change the brain through the growth and strengthening of neural connections (Schmidt et al., 2017). The units also present information on brain structure, function, and learning, as well as detailing how emotions, nutrition, and sleep

can influence one's brain. The program also provides activities, strategies, and lifestyle choices that assist in applying growth mindset theory. Throughout the units, the students are required to participate in intermittent games, puzzles, and quizzes (Schmidt et al., 2017). Through these structured activities, students are prompted to identify personal challenges with attention, organization, nutrition, and stress as well as reflect upon the effectiveness of the strategies they attempted.

The computer-based instruction is divided into five sections for a total of 2.5 hours of instructional time. The first unit is a short introduction unit and the following four units are instructional units lasting approximately 30-40 minutes each (Mindset Works, 2020). The program explains what a growth and fixed mindset are and provides connections and examples of beliefs, attitudes, and behaviors that are often associated with each mindset. (Brainology, 2010; Schmidit et al., 2017). Brainology also offers student workbooks and up to 10 hours of supplementary materials focusing on growth mindset (Snipes et al., 2012, as cited in Rhew, 2018). To assist in the Brainology intervention, teachers are given an implementation guide for administering the intervention in addition to a 90-minute online orientation video which explains the Brainology program and research about growth mindset (Wilkins, 2014). Educators can go a step further and participate in the Mindset Maker professional development that assists educators in applying growth mindset throughout the school building (Mindset Works, 2020).

Along with Dweck and Blackwell, Mindset Works has also developed the Applied Brainology curriculum that is similar to Brainology but is geared towards students in seventh through 12th grade. For younger students, Mindset Works has

developed Growing Early Mindsets also known as GEM. GEM is a literacy-based program that blends growth mindset, social emotional learning, and mindfulness into the classroom curriculum. GEM is designed for children ages 3 to 9. Due to Applied Brainology and GEM: Growing Early Mindsets being recently developed, there is limited literature at this time demonstrating its possible effectiveness.

Multiple studies have endeavored to assess the effectiveness of Brainology on various academic factors with mixed results found (i.e. Wilkins, 2014). Unfortunately, many of the studies conducted involving Brainology have had smaller participant populations which can lead to these studies having less power, in addition to adaptions being made to the original curriculum. The studies assessing the effectiveness of Brainology have involved students in elementary, middle, and high school. These studies have also highlighted areas of potential change and growth for the intervention to be more effective and engaging with students.

Middle School/High School. Comparing the effects of Brainology on middle school versus high school students, Schmidt, Shumow, and Cam (2017) analyzed the Brainology intervention on seventh and ninth grade students during their science instruction. Twenty-nine science classrooms in two middle schools and one high school participated in the study with 16 classrooms receiving the Brainology intervention (369 students). The intervention program was facilitated by the research team member over a 6-week period. One full class period per week was devoted to the program (approximately 50 minutes). Brief homework assignments or additional class activities were provided by classroom teachers on the other days, these activities were chosen from the Brainology teacher's manual. For most components, the structure of the intervention

adhered to suggestions made by Mindset Works (2020). First, the participants engaged in an opening activity (typically a discussion) that was led by one of the researchers, which was followed by a computer module (each student completed independently), once the students completed the module, they were directed to reflect on what they learned in a e-journal that was embedded into the module. Once completing the journal entry, the students were given a follow-up activity (usually a worksheet) to complete. Participants provided self-reports on multiple aspects of daily classroom experience 11 times throughout the school year. Schmidt, Shumow, and Cam (2017) found that both seventh and ninth graders in the control condition showed declines in perceived control skills, interest, and learning. In comparison, ninth graders in the mindset intervention reported increased control ($p < .001$) and interest ($p < .05$) and maintained constant levels in skill ($p < .05$) and learning ($p < .001$). Interestingly, the seventh graders in the mindset intervention experienced declines in control and skills that were comparable to the seventh grade students in the control group. The seventh graders in the mindset intervention saw steeper declines in learning and interest than their comparison control group.

Wilkins (2014) also assessed seventh graders (Intervention N=539; Control N=149) using the Brainology curriculum within science classes. Wilkin's (2014) examined Brainology's effect on mindset beliefs, effort beliefs, academic self-efficacy, interest and engagement in science, effort in the science classroom, motivation in the science classroom, and use of effective study skill strategies in seven middle schools within one school district in North Carolina, United States. Almost half of the population was eligible for Free and Reduced Lunch. Wilkins (2014) found no significant changes in

students' mindsets, effort beliefs, academic self-efficacy, or use of study skills strategies for learning, but found that the treatment group showed a positive increase in science engagement and motivation. Whorrall (2018) examined the outcome of Brainology on middle school, low achieving Latino/a students who also held a fixed mindset prior to the intervention. Both the treatment and control groups consisted of 10 participants (N=20). Whorrall (2018) did not find a significant increase in grade point average (GPA) but saw a significant difference in pre and post motivation ratings and an increase or change in growth mindset ratings.

In Scotland, Donohoe, Topping, and Hannah (2012) investigated Brainology's impact on 33 secondary-school students. Donohoe, Topping, and Hannah's results suggest that the students in the mindset intervention group had significantly higher growth mindset ratings at post-test versus pre-test, but unfortunately the significant increase in growth mindset did not withstand at a one-year follow-up.

In Northeast England, 22 Year 9 students participated in a small group Brainology intervention that was run in congruence with a whole school growth mindset approach (Dowey, 2017). All students attended a weekly one-hour class known as *Life Lessons*, those in the control group continued in this course while those in the intervention group received the Brainology intervention for the 12-week study. Dowey (2017) describes how the Brainology workbooks had to be adapted to assist in engaging various students' learning needs. For students with lower reading levels, Dowey had to break down the workbooks into multiple parts in order to assist the students in being able to respond to workbook questions. On the other end of the spectrum, the researcher included video clips, more opportunities for group work, independent research, and class discussions to

help engage those students with a more advanced reading level. The structure and length of the intervention also had to be altered in order to fit within the hour time slot that was built into the students' schedules. In looking at the results of Dowey's (2017) study, there were no significant differences found between the intervention and controls groups regarding mindset scores or teachers' ratings of effort at both post-intervention and follow-up.

Although the results of the intervention were not significant, Dowey (2017) highlights two trends that were present among the students' answers on questionnaires. Dowey found a consistent theme of an increase in understanding of the malleability of intelligence, how the brain works, and how increased effort is related to achievement. Another theme that emerged was that the intervention either solidified the need for the amount of effort being put in or made other students put more effort into their work. The students also provided reviews of the program and noted that they enjoyed the computer component of the intervention but found the workbooks to be the least enjoyable aspect. The students found the workbook unenjoyable due to the length of reading and writing that was involved. Multiple students highlighted that learning effective study skills was the best part of the intervention. The students also indicated wanting the program to be more interactive and be made to be more fun and enjoyable. Student suggestions included: increase opportunities for group work and *independent learning*, and to change the workbook to reduce its length and make it easier to follow.

Dufort (2019) described nine 10th graders perceptions of a Growth Mindset Unit intervention. Dufort pulled ideas/activities from Brainology (MindsetWorks, 2020), LearnStorm 2018 (Khan Academy, 2018, as cited in Dufort, 2019), TrainUgly.com

(Ragan, 2018, as cited in Dufort, 2019), and The Growth Mindset Coach (Brock & Hundley, 2016, as cited in Dufort, 2019). Dufort (2019) found an overall increase in the average growth mindset for the students and the participants perceived the idea of growth mindset as valuable to the school system. The participants also suggested that there should be changes to the Growth Mindset Unit to make it more engaging for students.

Elementary. Todd (2013) and Boley (2016) conducted case study analysis of Brainology's effects on elementary school students with reading difficulties and emotional and behavioral concerns. Todd (2013) investigated the effects of Brainology on behavior and academics for three upper elementary students with emotional behavioral disorders. Behavioral improvement was shown for one student but not the others, but an observed increase in task effort was shown for all three students. Academic improvement was not seen for any of the students. Boley (2016) examined Brainology's effectiveness on five elementary school students who struggled with reading. The five students were administered 570 minutes of direct reading instruction in addition to 150 minutes of Brainology curriculum through 12 1-hour long sessions. Through pre and post individual interviews, Boley found that the students understood themselves as learners in that they could develop their intelligence, control their emotions, and physically strengthen their brains.

In examining another case study, Hartmann (2013) presented and assessed an adaptation of Brainology and its impact on four students (two in fourth grade and two in fifth grade) with specific learning disabilities who also hold a fixed mindset. The students participated in the Brainology curriculum for eight 30-minute sessions that occurred one to two times a week during the students' afternoon study periods. The students received

the intervention in the school's resource room and the students either worked through the intervention individually or in groups of two. The intervention took a total of 5-6 hours over the course of a 6-week period towards the end of the school year (March to May). Hartmann adapted the Brainology curriculum to be offline and to be broken down into six teaching units. The lesson plans included PowerPoints and printable activities that are made available to educators who enroll in a trial demo account. Each session began with an introduction to the new material in addition recalling previously learned material.

All four students were provided with accommodations to assist with their needs stemming from their specific learning disabilities. The students completed the growth mindset questionnaire prior to the intervention and post-intervention. Three of the four students moved from a fixed or borderline mindset at pre-intervention to a growth mindset at post-intervention (Hartmann, 2013). The other student remained at a fixed mindset. In looking at pre and post confidence in their intelligence, there were mixed results with two students increasing their confidence in intelligence, one decreasing in confidence, and one minimally increasing in confidence. The last measure assessed the students' degree of personality confidence during social situations. All participants saw an increase in the degree of personality confidence in social situations at post-intervention with increases varying significantly between the four participants.

Brief Online Interventions

In an attempt to make the growth mindset workshop approach (i.e. Aronson et al., 2002; Blackwell et al., 2007) more readily available to students and have to rely less on staffing and taking away valued classroom instruction, Paunesku and colleagues (2015) set out to make the mindset intervention more scalable. Thirteen high schools from

eastern, western, and southwestern United States participated in the study. The schools varied widely on socioeconomic status with six of the schools having at least half of their student population receiving free and reduced lunch. Overall, 1,549 high school students participated in the study. The Paunesku and colleagues (2015) intervention included two 45-minute sessions administered in school computer labs about 2 weeks apart. The students were randomly assigned to a control condition or to one of three intervention conditions: growth mindset intervention, sense of purpose intervention, or a combination of the two.

Paunesku and colleagues (2015) adapted the previously utilized intervention designs by Aronson and colleagues (2002), Blackwell and colleagues (2007), and Good and colleagues (2003) to fit into one 45-minute online session. The students in the growth mindset condition read an article describing the brain's plasticity to grow through hard work and strategy use on challenging tasks, in addition to highlighting that struggles and setbacks provide opportunities to learn. The article's message was then reinforced through two writing activities. For the first activity, the students had to summarize the articles findings. Then in the next activity, the participants were asked to advise a hypothetical student who was becoming discouraged and beginning to think of themself as not smart enough to do well in school. The control condition had students read and complete similar tasks to the growth mindset condition, although the material lacked the message of neural plasticity.

All the students in the study completed a belief about malleability of intelligence scale at the start of the first session and at the end of the second session. The students also completed a meaningfulness of schoolwork task that assessed the students' view of

schoolwork as low or high in relevance to learning growth. The examiners also received access to the students' academic transcripts. The examiners calculated each student's end of the semester GPA in core academic classes in the fall (preintervention) and in the spring semester (postintervention).

Preintervention GPA did not differ between the intervention and control groups. While controlling for preintervention GPA, race, gender, and school, the examiners collapsed all interventions into one intervention group and compared it to the control condition and found that the intervention effect on GPA was significant for at-risk students, but not for all other students. The three intervention conditions produced similar results for at-risk students: (mean change in GPA—control=0.04; growth mindset=0.15; sense of purpose=0.18; combined interventions=0.13). The interventions' effects among at-risk students were not moderated by race or gender. In further analysis of their data, Paunesku and colleagues (2015) found at-risk students in the intervention groups were significantly more likely to earn satisfactory grades in core academic classes after the intervention and showed a significant increase in satisfactory completion rates that led to them earning satisfactory grades in 87 more courses than would be expected on the basis of the control group rates.

Burnette and colleagues (2017) provided 222 10th grade adolescents girls from four rural, low income high schools in the Southeastern United States one online growth mindset module (approximately 45 minutes). Burnette and colleagues had the girls complete a growth mindset questionnaire, a five-item learning motivation scale, a three-item learning efficacy scale, a seven-item school belongingness scale at pre-intervention, post-intervention, and at a 4-month follow-up, in addition to receiving the students' grade

for their ninth and 10th grade year. The module had a four-part structure: a) presented research related to growth mindsets, b) gave the growth mindset message typically incorporated in growth mindset interventions, c) incorporated a role model of an undergraduate student who delivered a tip for success, d) completing a writing exercise to emphasize the *saying-is-believing* component of the intervention. The control condition received a sexual education health module. Burnette and colleagues found that those in the intervention group reported stronger growth mindsets than the girls in the control group. Analyses at post-test found no significant intervention effect on self-reported learning motivation, learning efficacy, or school belongingness.

The examiners then assessed the indirect effects to see if a growth mindset mediated the association between condition and academic attitude outcomes. Growth mindsets significantly predicted post-test learning motivation and post-test learning efficacy, but not school belongingness. At the 4-month follow up, the intervention continued to significantly predict growth mindsets, but not learning motivation, learning efficacy, or school belongingness. The indirect effects at the 4-month follow up remained consistent in that growth mindset significantly predicted learning motivation and learning efficacy, but not school belongingness. Unlike Paunesku and colleagues (2015) and Yeager et al., (2016) studies' results, Burnette and colleagues (2017) did not see a significant intervention impact on classroom grades, but a growth mindset significantly predicted final 10th grade average grades.

Taking Paunesku and colleagues (2015) research one step further, Yeager and colleagues (2016) conducted a pilot study from which feedback was used to revise the growth mindset intervention. The revised growth mindset intervention was then analyzed

in two different studies. The pilot study had no intentional sampling and no demographic information was collected. The examiners used informal qualitative data (focus groups, 1:1 interviews) and quantitative data (rapid A/B design was used with college aged and older adults). The participants in the piloting sessions received the *original* mindset intervention which was similar to what was used in the Paunesku and colleagues (2015) study. Suggestions were taken from those in the piloting program that included:

> "Quotes from admired adults and celebrities; to include more diverse writing exercises; to weave purposes for why one should grow one's brain together with statements that one could grow one's brain; to use bullet points instead of paragraphs; to reduce the amount of information on each page; to show actual data from past scientific research in figures rather than summarize them generically (because it felt more respectful); to change examples that appear less relevant to high school students (e.g., replacing a study about rats growing their brains with a summary of science about teenagers' brains), and more" (p. 8)

One of the first questions assessed in the pilot studies, was whether it was more effective to directly frame the mindset intervention by telling the participants that the intervention was designed to help them or by indirectly framing the intervention by asking the participants to help a future ninth grade student. Through their A/B study design, the examiners found that the indirect framing had greater effectiveness than direct framing and was therefore used in the revised intervention for study one and two. The examiners also found that deliberately refuting the fixed mindset message had lower effectiveness than not doing so; specifically, in that those who held a fixed mindset at pre intervention seemed to hold a stronger fixed mindset belief at post intervention. The

examiners also assessed the effectiveness of using well-known or successful adults as role models of a growth mindset and found that there was an increased adoption of a growth mindset when well-known and successful adults were used as role models.

The revised intervention also included the following components, although these were not specifically addressed in the A/B design pilot studies. The revised intervention had greater emphasis for the need to change strategies or ask adults for advice on how to improve strategies instead of simply emphasizing *hard work.* The revised intervention also included more *prosocial, beyond-the-self motives* to emphasize the need for community. The intervention also included aligned norms to examples of older peers utilizing a growth mindset, using *adolescent reactance* as an asset, and increased the number of opportunities for the participants to write their own opinions and stories to increase the probability of self-persuasion (Yeager et al., 2016).

For study 1, Yeager and colleagues (2016) had a total of 7,501 ninth grade students from high schools in Canada and the United States complete two online sessions 1 to 4 weeks apart in computer labs. For the first study, the examiners wanted to know if the revised growth mindset intervention would outperform the existing or "original" intervention in terms of performance avoidance goals, challenge seeking behavior, and person versus process-focused attributions for difficulty. The first session involved baseline survey items, a randomized mindset intervention, some fidelity measures, and brief demographics. The second session involved a second round of content for the revised mindset intervention and control exercises for the original mindset condition. All participants completed the same survey items at the end of the second session. The participants prior achievement was measured by self-report.

The participants also completed the *make a math worksheet* activity, in which they were directed to create their own math worksheet and if there was time at the end of the survey, there was an opportunity to answer the selected math problems. The participants were also presented with a challenge seeking hypothetical scenario:

> "Imagine that, later today or tomorrow, your math teacher hands out two extra credit assignments. You get to choose which one to do. You get the same number of points for trying either one. One choice is an easy review—it has math problems you already know how to solve, and you will probably get most of the answers right without having to think very much. It takes 30 minutes. The other choice is a hard challenge—it has math problems you don't know how to solve, and you will probably get most of the problems wrong, but you might learn something new. It also takes 30 minutes. If you had to pick right now, which would you pick?" (p. 13).

In assessing the results of Study 1 (Yeager, et al., 2016), the revised mindset intervention was significantly more effective at reducing reports of a fixed mindset in comparison to the *original* mindset intervention. Moderation analyses found that students who already had more of a growth mindset at baseline had less of a change at post intervention. There was no intervention and prior achievement interaction, which the examiners suggest is indicative of the intervention being effective in changing mindsets across all levels of achievement. In comparison to the *original* mindset intervention, the revised intervention significantly reduced the tendency of the participants to choose more easy than hard math problems as measured by the make a math worksheet activity. There was no significant moderation found for prior achievement or pre-intervention fixed mindset. For the hypothetical challenge seeking scenario, the revised mindset intervention significantly reduced the number of students saying that they would choose

the *easy* math homework assignment. This effect was once again not moderated by prior achievement or pre-intervention fixed mindset. In assessing attributions and goals, the revised intervention significantly reduced fixed-trait, person focused attributions as well as performance avoidance goals.

For Study 2, the examiners wanted to assess if the revised growth mindset intervention would improve academic grades among ninth graders just beginning high school, while also attempting to replicate their findings from Study 1. Study 2 included 10 high schools in the United States (convenience sample from Texas, Virginia, North Carolina, California, and New York), and the study was conducted by an outside third-party research firm. The high schools were selected with the following criterion: public high school, ninth grade enrollment between 100 and 600 students, within the medium range for poverty indicators (e.g. percentage of students who receive free or reduced price lunch), and moderate representation of students of color (Hispanic/Latino or Black/African American. Similar to Study 1, the students participated in the two one-period online sessions occurring 1-4 weeks apart, occurring within the first 10 weeks of school. Sessions consisted of survey questions and either the intervention or control condition.

The examiners received the students' ninth grade GPA, unweighted average eighth grade GPA, and eighth grade state test scores, in addition to all the same measures that were included in Study 1. The results of Study 2 suggest that both conditions saw an increase in growth mindset at pre and post intervention, although the intervention increase was significantly higher than the control group. Moderator analyses suggest that previously higher achieving students, and to a much lesser extent, students who held

more of a fixed mindset at baseline, changed more in the direction of a growth mindset. Looking specifically at the effects of the intervention on ninth grade GPA, moderated by prior achievement, there was a significant intervention and prior achievement interaction in that students who were –1 standard deviation of prior performance showed an estimated intervention benefit of 0.13 grade points (p =.003) and those students at +1 standard deviation saw no significant treatment benefit (p =.33). There was also a significant overall main effect of the intervention on a reduced rate of poor performance (D or F average; p = .003). For predicting poor performance through a logistic regression model, there was a significant Intervention X Prior Achievement interaction in that students at –1 standard deviation of prior achievement, the intervention effect was estimated to be seven percentage points (p < .001), while at +1 standard deviation, there was a non-significant difference of 0.7 percentage points (p = .67).

The results from the hypothetical challenge seeking task found that the mindset intervention reduced the proportion of students saying that they would choose the *easy* math homework from 54% to 45%. The intervention effect was slightly larger for previously higher-achieving students (p = .008) and was not moderated by pre-intervention fixed mindset. In comparing the results from grades and the challenge seeking task, it appears that the intervention assists lower achieving students in receiving better grades, while it assists higher achieving students in making challenge-seeking choices. Finally, the growth mindset intervention reduced both fixed mindset attributions and performance avoidance goals (p < .001).

Similar to Paunesku, and colleagues (2015) and Burnette and colleagues (2017) studies, Burgoyne and colleagues (2018) assessed the effects of a one-time online growth

mindset intervention. Burgoyne, and colleagues focused their study on 488 emerging adults (age range 17-24, M =21.9). In addition to the three-item mindset questionnaire, eigth-item grit scale, 28-item locus of control scale, and make-a-math worksheet, the participants also completed measures of crystallized intelligence and fluid reasoning (Shipley-2 Vocabulary and Shipley-2 Block Design). The participants were presented with a lay person *scientific review* article that included graphics, compelling stories, and celebrity quotes. After reading the article, the participants were asked to write a summary of the article and rate the extent to which the article was easy to read, credible, and persuasive, and how they agreed with the article's points. The control condition differed from the growth mindset intervention with the specific content that was presented.

Through their analyses, Burgoyne, and colleagues (2018) found no significant main effect for the intervention on self-determination, locus of control, and grit. There was a significant interaction between phase and condition in that participants in the growth mindset condition reported greater self-determination at posttest compared to pre-test, while participants in the control condition reported less self-determination at posttest. The examiners found a significant main effect on mindset with the participants in the growth mindset condition reporting more of a growth mindset at posttest and the control condition having no change. In regard to grit, both groups saw an increase in grit at posttest. With the factor of locus of control, the interaction of phase and condition was significant, suggesting that the participants in the growth mindset intervention reported more locus of control at posttest compared to the control group. Similar to Yeager and colleagues (2016) findings, Burgoyne and colleagues (2018) found that participants in the growth mindset intervention demonstrated more challenge approach motivation at

posttest on the make-a-math worksheet task. There were no significant findings regarding the intervention and the fluid reasoning task or crystallized ability task.

As Burgoyne and colleagues (2018) assessed a brief online growth mindset intervention on young adults, Broda and colleagues (2018) examined the effects on incoming freshmen students at a large midwestern university with special consideration of the intervention's effect on Latino/a and African American students. As part of their 2-day summer freshmen orientation, freshmen students were randomized into one of three intervention conditions: mindset intervention, social belongingness intervention, or control condition (discussed components of how to get around campus). The roughly 25-minute mindset intervention included the students reading a short scientific article on *Building the Brain* and then asking the students multiple reflective questions in which the students were encouraged to identify moments in their own lives when they may have (or have not) adopted a growth mindset. The participants were encouraged to write open-length responses to each reflective question, including writing advice for a future first year college student that included information from the article. The examiners collected the students' fall and spring semester GPAs, cumulative GPA for their freshmen year, and amount of course credits attempted. The participants also completed a pre-intervention survey that included four questions on the prospective belonging uncertainty scale and three questions assessing growth mindset.

Broda and colleagues (2018) found that Latino/a students in the mindset treatment group had significantly higher GPAs for both the fall and spring semesters, as well as higher cumulative GPA after their first year of classes. No significant differences in academic outcomes were found for African American or for white students. There were

no significant academic findings for the belongingness intervention. Within the regression analysis, the results suggest that relative to Latino/a students in the control condition, Latino/a students in the growth mindset condition earned higher GPAs during both the fall and spring semesters in addition to higher cumulative GPAs. No significant effects were found for the number of courses enrolled/completed. For African American students, the growth mindset intervention did not have a significant impact on course credits or GPA. The growth mindset also had no significant impact for white students. The belongingness intervention had no significant effects across all three subgroups. Broda, and colleagues (2018) also conducted moderator analyses and found that for Latino/a students, high school GPA and ACT scores were a negative and significant moderator of the relationship between treatment assignment and GPA. For African American students, initial levels of growth mindset interacted with treatment assignment when predicting fall semester GPA as well as cumulative GPA. These results suggest, in accordance with other study results (e.g. Yeager et al., 2016), that the growth mindset intervention may be less beneficial for students with higher baseline growth mindset beliefs. No significant moderators were found for the white student sample.

Researchers within the growth mindset field (i.e. Paunesku et al., 2015; Yeager et al., 2016) then set out to see if a short, direct to student, online growth mindset intervention program could provide any significant changes and/or positive intervention effects in grades with randomized trials including tens of thousands of students (Dweck & Yeager, 2019). The program created by the National Study of Learning Mindsets created a program that could be administered in two 25-minute sessions and was developed for those students beginning ninth grade. Effects from the program are small to

moderate, but they typically appear for students with higher levels of risk for academic underperformance (Bettinger et al., 2018; Paunesku et al., 2015; Yeager et al., 2019; Yeager et al., 2016) and college students who belong to underrepresented or stereotyped groups (Broda et al., 2018; Yeager et al., 2016).

Yeager and a team of researchers (2019) conducted a national experiment with 12,490 ninth grade students that reflected the diversity of youth in the United States in order to assess and examine the effects of a growth mindset intervention that was administered in two 25-minute sessions (as noted in the paragraph above). Yeager and his colleagues created a subgroup of low achieving students (n=6,320) from the overall study population as this is the population that received the most benefit from growth mindset interventions in past literature (i.e. Sarrasin et al., 2018). The intervention condition included two self-administered online sessions and occurred roughly 20 days apart. The first session covered the basic ideas of a growth mindset, while the second session invited students to deepen their understanding of the growth mindset idea and its application to their lives. The control condition was similar to the intervention condition, but the focus was on brain functions and it did not address beliefs about intelligence.

Lower-achieving adolescents, who received the growth mindset intervention, significantly reduced the rate of fixed mindset beliefs in comparison to the control group. The lower-achieving students also had a greater increase in GPA at the end of their ninth grade year in comparison to the control group. The GPA finding also held when specifically assessing math and science course GPAs. Similar to inconsistent results that have been found in previous growth mindset intervention studies, when the researchers

looked at the overall effect of the intervention on students' GPAs, there was not a significant increase in GPA overall.

As part of their experiment, the participant completed a behavior challenge seeking task that was used as measure of peer norms within a particular school. The researchers found that when a low-achieving or medium-achieving school had peer norms that supported the growth mindset message, the intervention had even greater success. These findings suggest that the growth mindset interventions are the most effective with lower achieving students from low-achieving and medium-achieving schools that have a school climate that supports a growth mindset message. The difference in findings when looking at the low-achieving students versus the group as a whole may be why Sisk and colleagues' (2018) meta-analyses found non-significant results.

Sisk and colleagues (2018) conducted two meta-analyses to examine the strength of the relationship between growth mindset and academic achievement and potential moderating factors (Meta-Analysis 1) and to examine the effectiveness of growth mindset interventions and academic achievement and potential moderating factors (Meta-Analysis 2). The moderator variables included the following: developmental stage, academic risk status, socioeconomic status, type of academic achievement measure, and GPA. For meta-analysis 1, 157 effect sizes were included and the overall average correlation between mindset and academic achievement was weak. Fifty-eight percent of the effect sizes were not significantly different from zero. Another 6% had a negative effect size/relationship with academic achievement. Thirty-seven percent were significantly different from zero and had a positive relationship with academic achievement. The

developmental stage of the students was a significant moderator with the strongest relationship (although moderate) between mindset and academic achievement occurring for children, then adolescents, and a weak relationship for adults. Academic risk status, socioeconomic status, academic achievement measures were not significant moderators. The examiners note that there was a high degree of heterogeneity as noted with Yeager, and colleagues (2019).

Growth Mindset Beyond Academic Interventions

Much of the initial research looking at a growth mindset was looking specifically at intellectual ability and the idea that intellectual ability can be developed. Growing research is suggesting that the differing mindsets (growth vs. fixed) can be demonstrated and manipulated in myriad of fields, such as in academics, mental health (i.e. anxiety), physical/sports domains, and personality (Burnette et al., 2010; Dweck, 2006; Schroder et al., 2017; Yeager et al., 2016). Interventions have not only assessed the growth mindset of intellectual ability, but also the growth mindset of personality, emotions, anxiety/depression, and self-regulation among others. Prior to 2006, there were only two published studies conducted that specifically assessed the effectiveness of growth mindset interventions (Aronson et al., 2002; Good et al., 2003, as cited in Dweck & Yeager, 2019). Multiple meta-analyses have been run to assess the effectiveness of growth mindset interventions especially due to many studies finding inconsistent results (Burnette et al., 2013; Burnette et al., 2020; Sarrasin et al., 2018; Sisk et al., 2018). The meta-analyses attempt to provide synthesis and trends in addition to finding possible moderators and if a particular subgroup is more likely to benefit from this type of intervention. Large scale studies have also been conducted to provide further clarity on

where and with whom the growth mindset interventions have been effective (Yeager et al., 2019).

Growth Mindset and Psychological Distress

As studies continue to establish, schooling and academic success is not limited to academic achievement and encompasses behavioral, social, and emotional components as well (WestEd, 2003; Zins et al., 2004). As the Substance Abuse and Mental Health Services Administration (2005) argues there are approximately 2.2 million adolescents who reported a major depressive episode within the past year and nearly 60% did not receive treatment. With the dropout rate for students with severe emotional and behavioral needs being estimated to be twice as high in comparison to other students, it would be imperative to assess if a growth mindset intervention could be beneficial for these students (Lehr et al., 2004). With many youths dropping out of treatment prematurely and fewer than 20% receiving empirically supported interventions, the possibility of a brief and easy to administer intervention is much needed (Harpaz-Rotem et al., 2004; Bernstein et al., 2015, as cited in Schleider and Weisz, 2016a). It has also previously been highlighted that mindsets are more important on behavior during contexts that are challenging (Dweck & Leggett, 1988). Unfortunately, research on the relationship between growth mindset interventions and psychological distress is still in its infancy.

Growth Mindset Interventions and Psychological Distress

Yeager and colleagues (2014) set out to see if a brief intervention could impact ninth graders academic achievement, health, and stress levels. The students' Algebra I teachers prefaced the intervention during the firth week of school by providing an

overview about how the brain changes and learns. About 2 weeks later, the researchers handed out envelopes either containing an intervention or control activity with both only taking 25 minutes to complete. The experimental condition provided information in support of the idea that people have the potential to change and that therefore "(a) if you are excluded or victimized, it is not due to a fixed, personal deficiency on your part, and (b) people who exclude or victimize you are not fixed, bad people but instead have complicated motivations that are subject to change" (p. 874). The students then read a brief article summarizing neuroscience research reporting that behaviors are controlled by thoughts and feelings in the brain and these pathways can be changed. The participants then read three quotes and testimonials that were reportedly written by upperclassmen who had previously read the same article. The upperclassmen's writing discussed how they used the information from the article when they had encountered a peer conflict. Similar to the previous growth mindset interventions, the researchers then had the participants write their own narrative for future ninth graders to read. The participants in the intervention group reported significantly lower global stress scores 8 months after the intervention in addition to improved reports of health at the end of the year. The significant findings were then replicated in a low-income public school.

Multiple studies have used the intervention method as noted above (Yeager et al., 2014) and have found significant results. Miu and Yeager (2015) used a single session growth personality mindset intervention that led to decreases in self-reported depressive symptoms in adolescents. The intervention included a reading and writing activity that was similar to Yeager and colleagues (2014) method. Yeager, Lee, and Jamieson (2016) also used a single session growth mindset intervention that led to cognitive and

physiological improvements for adolescents' responses to laboratory based social stressors suggesting better coping skills. Calvete and colleagues (2019) also utilized the same intervention method as Yeager and his colleagues (2014) to also assess depressive symptoms. Unlike Miu and Yeager's (2015) results, Calvete and researchers' (2019) study found mixed and surprising results. In their sample of 503 adolescents from Spain, the eighth grade adolescents who received the growth mindset intervention had a greater decrease in depressive symptoms, and those with high depression scores decreased by almost 18%, whereas the control group increased by 37%. Unexpectedly, the results for the ninth grade adolescents were in the opposite direction, with the depression scores increasing for those that received the intervention.

There have also been studies that have shown promising results from self-administered, computer-based, single session interventions used with adolescent populations to address components of psychological distress (i.e. anxiety, depression). Schleider and Weisz (2016b) used a self-administered single session intervention (20-30 minutes in length) that was designed to teach a growth mindset of personality to high-risk youth. The youth self-reported improvements in perceived behavioral and emotional control and recovered over three times as quickly from a laboratory-based social stressor as the control group. Schleider and Weisz (2018) then conducted a 9-month follow up with those participants by using both parent and youth reports of internalizing symptoms, in addition to looking at effective coping with setbacks. The intervention significantly reduced parent and youth reported depression and anxiety and perceived primary control (coping with setbacks) at the 9-month follow-up.

Burnette and colleagues (2020) conducted a meta-analysis on previous literature to better understand the link between growth mindsets and psychological distress. Burnette and colleagues defined psychological distress as symptoms of anxiety, depression, psychological stress, or absence of well-being. They also examined the possible relationships between mindsets and value placed on seeking treatment and active coping. The researchers noted that although there is much promising research with growth mindsets and psychological distress, there are conflicting or mixed findings that lead to the need for a large-scale meta-analysis.

The meta-analysis included moderators to have a more succinct representation of the relationships within the data. The moderators included domains of mindset (i.e. emotion, personality, intelligence), assessment of mindset (i.e. measured or manipulated), time of assessment of outcome (i.e. immediate or longitudinal), psychological distress operationalization (i.e. anxiety, depression, stress), and three sample level characteristics. The three sample level characteristics were developmental stage (adolescence: 12-17 years, emerging adults--18-25 years, and adults--beyond 25), diagnostic criteria (undiagnosed versus diagnosed), and minority status of sample. Overall, 72 articles/samples were included in the meta-analysis.

In looking at the moderators included in the analysis, the most highly studied domain was the growth mindset of emotions (54% of articles), followed by intelligence (25%) and person mindsets (25%). The assessment method most commonly used was self-report (89%) and 19% of the studies used experimental practices or interventions to manipulate mindsets. In regard to assessment timing, 93% of the studies reported cross sectional effects and 28% assessed effects over time with a range of 13 days to 18 months

and a median of 4 months in terms of time between assessments. The types of psychological distress analyzed were depression (56%), anxiety (38%), lack of well-being (33%), psychological distress (11%), and other distress related outcomes (11%). The percentage of samples that included adult samples was 45% with 29% of the studies assessing emerging adults. Most of the individuals included in the samples were not identified has meeting criteria for a disorder (79%). The majority of studies were from the United States with the percentage of white versus non-white participants ranging from 0% to 97% white.

Consistent with their hypotheses, Burnette and colleagues found a moderately negative association of growth mindsets with psychological distress (*r*=-.220, 95% [CI -.257, -184]) and a weak to moderate positive relationship between growth mindsets and treatment value (*r*=.137, 95% CI [.08, .192]) and active coping (*r*=.207, 95% CI [.015, .264]). In regard to the moderators that were included in the analysis, the researchers found that emotion-based mindsets were the most strongly related to psychological distress (*r*=-.291, 95% CI [-.333, -.249]). The relationship of the other mindset domains in comparison to psychological distress were as follows: intelligence mindsets (*r* = - .108, 95% CI –[.172, -.044]); people mindsets (*r* = -.143, 95% CI [-.214, -.072]); attribute specific mindsets (*r* = -.180, 95% CI [-.252, -.107]). Studies that utilized self-reports (r = -.240, 95% CI [-.275, -.205]) had a stronger relationship between mindsets and psychological distress in comparison to when mindsets were manipulated (r = -.05, 95% CI [-.134, .034]). For treatment value, there was not a significant moderation found between assessment types and there were not enough studies to run a comparison for active coping outcomes. With outcomes assessment timing, the researchers were only

able to examine growth mindset to distress and coping, but not treatment value. Cross-sectional effects for psychological distress (r = -.242, 95% CI [-.280, -.203]) were slightly larger than longitudinal effects (r = -.150, 95% CI [-.221, -.080]). There was not a significant moderation for assessment timing for coping. The factor of psychological distress assessment type had comparable results with growth mindsets regardless of how distress was operationalized (e.g. anxiety, depression, stress, absence of well-being). There were no significant moderating effects found for distress, treatment value, or coping when assessing sample developmental levels, diagnoses, and race/ethnicities. Overall, the meta-analysis indicated that there is a moderate negative relationship between growth mindsets and psychological distress, but the need to assess the effectiveness of growth mindset interventions with mental health is still in need of study.

Growth Mindset and Self-Regulation

Growth mindset research has increasingly been looking at the concept of self-regulation and there is mounting research that suggests that self-regulation is a foundational skill for one to be academically successful (Duckworth & Seligman, 2005; Mrazek et al., 2018). Burnette and colleagues (2013) conducted a meta-analysis of previous literature to assess the relationship between a growth mindset/implicit theory and self-regulatory processes, more specifically goal setting, goal operating, and goal monitoring. Burnette and colleagues discussed that it is often hypothesized that those who hold a growth mindset will be more likely to set learning goals, utilize mastery-oriented strategies, and report greater confidence and expectations when evaluating the potential goal success. In comparison to those who hold a growth mindset, those who

hold a fixed mindset or are entity theorists will set performance-based goals, turn to helpless-oriented strategies when faced with challenges during goal pursuits, and when evaluating performance they will experience more vulnerability and anxiety.

The meta-analysis also included moderational analyses. The moderational analyses assessed whether approach/avoidance moderated any of the four aspects of goal setting, the links of growth mindset with both performance and learning goals, links of both types of goals with goal achievement, and whether there was a presence or absence of an ego threat moderated any of the associations of growth mindset with any of the six self-regulatory processes. The researchers also analyzed to see if the relationship between growth mindset and self-regulatory strategies was stronger in settings outside of academia and if the type of implicit theory assessment (self-report or experimentally induced) moderated any of the associations.

Burnette and collaborators (2013) outlined five inclusion criteria for their meta-analysis that included articles published from 1988 to October 2010. The inclusion criteria were as follows: a) sufficient information for computing a bivariate association in order to calculate an effect size b) each effect size must have reflected a unique sample c) a minimum number of included studies (*k*) of three d) articles written in English, excluded only 4% of the initial 236 articles e) implicit theories in a quantifiable form (e.g., assessed with a self-report instrument, experimentally induced) and at least one of the six self-regulatory processes or an achievement outcome must have been included. Overall, 85 studies met inclusion criteria and were included in the final analysis.

Consistent with the study's hypotheses, holding incremental/growth beliefs/mindsets were positively related to creating learning goals (r=.187), utilizing

mastery strategies (*r*=.227), and with positive expectations in goal monitoring (*r*=.157). In line with these results, there was a negative relationship found between incremental beliefs and creating performance-based goals (*r*= -.151), use of helpless-oriented strategies (*r*= -.238), and negative emotions within goal monitoring (*r*= -.233).

Both associations between types of goals set and incremental theories were significantly different. The relationship between incremental theories and performance goals was slightly smaller than the association of incremental theories and learning goals. In looking at strategies used, both associations were significantly different with the association of incremental theories with helpless-oriented strategies being slightly smaller than the association of incremental theories with mastery-oriented strategies. With goal monitoring, the relationships found were not significantly different (incremental theories and negative emotions; incremental theories and expectations).

The dependent variables were then compared to overall goal achievement. There was a positive relationship that is small in magnitude for incremental theories and achievement (*r*=.095). With goal setting, the negative relationship found between performance goals and achievement was not significant (*r*= -.022). Learning goals were positively associated with achievement but the relationship was once again not significant (*r*= .032). For goal strategies, the results found a non-significant negative relationship between helpless oriented strategies and achievement (*r*= -.102). In comparison, there was a positive and significant relationship between mastery-oriented strategies and achievement (*r*= .314). In regard to goal monitoring, negative emotions had a negative and significant relationship with achievement (*r*= -.324) and expectation evaluations had a positive and significant relationship with achievement (*r*= .406).

With goal setting, Burnette and colleagues (2013) assessed the possible moderating effect of approach-oriented goals versus avoidant-oriented goals in both performance and learning goals. An approach-oriented performance goal "involves students reporting that doing better than other students in school was important to them and would make them feel successful" (p. 659). As their names suggest, approach-oriented goals are focused on acquiring a desirable outcome whereas avoidant-oriented goals are focused on avoiding undesirable outcomes (Elliot, 1999, as cited in Burnette et al., 2013). The results of the meta-analysis suggest that the approach and avoidance distinction significantly moderated the association of incremental theories with performance goals (B= -.130, p <.001). Consistent with the study's hypotheses, the incremental theories exhibited a stronger negative association with performance avoidance goals than with performance approach goals. Expected results were also found when assessing the approach and avoidance distinction in terms of incremental beliefs and learning goals. Approach/avoidance significantly moderated the relationship between incremental beliefs and learning goals (B= -.144, p <. 001). Further exemplifying the study's hypotheses, incremental theories had a stronger positive relationship association with learning approach goals than learning avoidance goals.

Burnette and colleagues (2013) also wanted to assess the possible moderating effects of ego threat on the 6 self-regulatory variables. Ego threat refers to "any event or communication having unfavorable implications about the self" (p. 663, Baumeister et al., 1993, as cited in Burnette et al., 2013). With goal setting, ego threat significantly moderated the relationship between incremental theories and performance goals (B= -.104, p < .05) and incremental theories and learning goals (B= .100, p <.001). With goal

operation, ego threat was once again found to be a significant moderator in the relationship between incremental theories and helpless-oriented strategies (B= -.096, p < .01) and incremental theories and mastery-oriented strategies (B= .138, p < .001). Due to a disconnect between the experimenters' theoretical analysis and the associations available in the meta-analysis, the moderating effects of ego threat could not be assessed with the goal monitoring components.

The experimenters then conducted moderational analyses on setting (academic vs. nonacademic) and method of assessment (naturally occurring vs. experimentally induced). Regarding setting, three of the six effects were significant. The negative associations of incremental theories with helpless-oriented strategies and negative emotions in addition to the positive association of incremental theories with mastery-oriented strategies was stronger in the non-academic setting. Once again, three of the six effects were significant when interpreting the method of assessment. The negative associations of incremental theories with performance goal orientation and negative emotions, in addition to the positive association of incremental theories with mastery-oriented strategies were stronger in studies that experimentally induced implicit theories.

The Growth Mindset of Self-Regulation

While Burnette and colleagues' (2013) literature review assessed previous research examining the effect of a growth mindset intervention on self-regulation skills and found multiple studies, research specifically assessing a growth mindset of self-regulation is in its early beginnings. More recently, Mrazek and colleagues (2018) conducted 5 different studies assessing the growth mindset of self-regulation through mostly brief computer-based laboratory interventions. The overall goal of the five studies was to examine the impact of a growth mindset of self-regulation and positive appraisals of fatigue on one's self-regulation ability, more specifically persistence, inhibition, and self-control in daily life.

The first study included 75 participants from a midwestern university and local community who participated in quasi-randomized active control (controlled for age, gender, and GPA) intervention (46 female; mean age=22.8; age range=18-43). The study was described as an investigation of personal development and well-being in which participants would take a 6-week course on either self-regulation or relationships. Both the treatment and control conditions consisted of 12 90-minute sessions administered twice a week for 6 weeks, with approximately 12 participants in each group. The participants received $90 for their participation in the study. The two conditions were designed to be nearly identical in structure with the only difference being in content provided. For the self-regulation group, the topic of growth mindset was taught on the first day by using a mix of slides, descriptions of scientific studies, and discussion about how to develop a growth mindset of self-regulation. The growth mindset topic was reviewed at all of the remaining workshops. The participants in the self-regulation

condition were also taught concrete self-regulation strategies all derived from previous empirical literature. On the other hand, the relationship group was taught strategies to improve their communication, broaden their social network, and deepen existing relationships (all of which were evidence based).

Before and after the intervention, the participants completed a series of measures assessing their self-regulation and interpersonal relationships. These measures included: (a) self-report questions assessing growth mindset and beliefs about mental fatigue, (b) persistence as measured by time dedicated to an impossible anagram task, (c) inhibition as measured by time dedicated to an impossible anagram task, (d) self-control experiences in daily life as measured by experience sampling methods. The participants also completed evaluations of their instructors, which was especially important since the instructors were aware of the study's hypothesis. The participants completed an adapted version of the eight-item scale on lay theories of intelligence (Dweck, 1999), but instead of *intelligence*, the participants saw the words *self-regulation* and *self-control*.

Participants attended an average of 10.6 sessions of the 12 sessions and attendance did not differ from the two groups. The conditions did not significantly differ from each other in regard to participant experience (instructor evaluation). There was no significant difference in participants' mindsets regarding self-regulation at baseline. In line with the study's hypothesis, participants in the self-regulation training group viewed self-regulation as significantly more malleable by the end of the program in comparison to the relationship training group. The participants in the self-regulation group also showed that they were internalizing the growth mindset concept with a significant main

effect of condition on post-testing lay theories of self-regulation controlling for pre-testing (p=0.003).

Persistence was measured by comparing time spent on the impossible anagram task at pre- and post-intervention. There was a significant main effect on anagram persistence at post testing (p=0.01) with participants in the self-regulation group persisting significantly longer than the relationship condition group. The participants in the self-regulation condition were also more likely to appraise their fatigue as a signal of expansion at post-testing, controlling for appraisal at pre-testing (p=0.001). When both mindset and appraisal of fatigue were included in a regression predicting change in persistence, change in appraisal of fatigue predicted change in persistence (p=0.02) as well as mindset (p=0.01). A mediational analysis revealed that appraisal of mental fatigue as a signal of expansion partially explained the effect of self-regulation training on increased persistence (B=0.17, SE=0.10).

In looking at self-control experiences in daily life, the examiners found multiple condition and time interactions. The participants in the self-regulation group did not change in noticing the need for self-regulation, while the participants' in the relationship group dropped markedly. Participants in the self-regulation group did not change in their frequency of attempts and did not change in their frequency of success, while both frequency of attempts and successes dropped significantly for the relationship condition. There was no significant interaction for efficiency rate of how successfully participants exerted self-control when they perceived an opportunity to do so. There was a significant interaction for experiences of effort when attempting to resist desires. More specifically participants in the relationship condition reported using significantly more effort at post-

testing compared to pre-testing, while participants in the self-regulation condition reported exerting similar amounts of effort across time. There were no significant interactions between condition and time for strength of impulse or motivation to resist impulses.

The goals of the second study were to more directly examine whether appraisals of fatigue are directly affected by a more narrowly focused growth mindset intervention and to replicate the indirect effect of appraisals on increased persistence. For this study, the examiners measured the effect of a growth versus a fixed mindset on persistence after participants had completed either a relatively easy or effortful math task (sequential task paradigm). 112 undergraduate students (51 female; mean age=18.9, age range=18-22) participated in the study in exchange for course credit. The participants were randomly assigned to read an article either describing self-regulation as an innate skill that was largely unchangeable (fixed mindset) or as a skill that can develop and strengthen with practice (growth mindset). The articles were identical in terms of length, complexity, interest, and references to scientific research. The articles used the term *mental control* instead of the term *self-regulation*. After reading the article, the participants were then required to summarize the findings and describe how their life experiences aligned with the article's message. The participants were then randomly assigned to complete as many either relatively easy (e.g. 7 + 6 + 4) or effortful (e.g. 11 + 96 + 77) numerical equations as possible within 5 minutes. After completing the numerical equations, all participants completed the same impossible anagram task as in study 1 and answered the same questions that examined appraisals of fatigue. Participants also reported the degree of perceived effort and fatigue they experienced during the anagram task. Participants

answered questionnaires about their experience in the study and additional beliefs regarding self-regulation. An attention check was embedded into the questionnaires to make sure the respondents were paying adequate attention (e.g. "*Because I am paying attention, I will select disagree"*).

The results from the second study found that mindsets of self-regulation can be at least temporarily changed from a brief intervention. Those in the growth condition reported viewing self-regulation as more malleable than those in the fixed condition ($p < 0.001$). Consistent with study 1, there was a significant main effect of mindset condition on persistence ($p = 0.02$). There was no effect of math condition on anagram persistence. Those in the growth mindset condition were more likely than the fixed condition to appraise their fatigue as a signal that their self-regulation was expanding ($p < .001$). Consistent with their first study, there was no effect of mindset condition on degree of experienced effort or degree of experienced fatigue. Through a mediational analysis, the examiners found a significant indirect effect of the growth mindset manipulation on anagram persistence through appraisal of fatigue as a signal of expansion ($B = 0.12$, $SE = 0.09$, 95% CI [0.05, 0.41]).

Study 3 examined whether growth mindset and appraisal of fatigue would influence performance on an attention regulation task (a mindful breathing task). Eighty-two undergraduate students (51 female; mean age = 19.6, age range = 18-23) participated in the study for a course credit. Participants read similar articles as in study 2 with a few modifications made to the articles. After the manipulation, all participants completed a 10-minute breath awareness task that instructed people to focus their attention on the sensations of their breathing. Fifteen thought probes (audible chines) were embedded into

the task to periodically query participants. When the participants heard the chimes, they were to press the spacebar if their attention had been on their breath when they heard the chime or to press nothing if their attention had been elsewhere. Once finishing the breathing task, the participants completed the attributions of mental fatigue scale and perceived effort scale from study 2. The scales once again had attention checks embedded within them. The results from Study 3 were similar to those from studies 1 and 2 in that the participants from the growth mindset condition were more likely to appraise fatigue as a sign of expansion in comparison the fixed mindset participants (p = .02). There was no main effect found for mindset condition on the breathing task and performance on the breathing task was not significantly correlated to appraisal of mental fatigue.

Mrazek and researchers' (2018) fourth study had brief growth mindset interventions administered prior to a behavioral test of effort avoidance. The examiners hypothesized that the growth mindset interventions would reduce the effort avoidance experienced by the participants, and therefore buffering against the usual tendency to choose easy rather than difficult problems. Effort avoidance, as the name suggests, is the tendency to choose or pursue the least physically and/or cognitively demanding option available and the demand selection task is often used as a measure of effort avoidance. Ninety undergraduate psychology students were recruited to participate, data on age and gender was not collected, and participants received course credit for their participation. Participants were randomly assigned to one of the three conditions. The growth and fixed mindset articles were slightly modified from earlier studies to increase the relevance to the math task. A third condition presented a neutral article that discussed *déjà vu* and did not mention mental control or self-regulation. Similar to studies 2 and 3, the participants

were asked to summarize the articles' findings and to describe the most compelling piece of evidence from the article. After summarizing the article, the participants then had to complete a computerized demand selection task, in which the participants had to repeatedly (200 trials) choose between easy or difficult subtraction problems. For each trial, the participant had to click on either a red or a blue deck of cards on the screen. The two decks were not labeled as being more difficult or easy, but the participant had to learn that on their own. The participants also completed questionnaires that assessed the following: participants' attitudes about self-regulation and math, whether the participants noticed a difference in difficulty between the decks, learning/performance goal orientation, explicit growth mindset beliefs, and participants' hypotheses about the study's objective.

In examining the fourth study's results, the researchers found that the participants demonstrated a tendency toward effort avoidance, choosing difficult problems 34% of the time and significantly less than expected by chance. Upon closer examination of the subjects in the growth mindset condition, the data demonstrates that no effort avoidance was displayed. The proportion of difficult problems chosen was not significantly different from chance like it was in the fixed and neutral conditions. The examiners then ran a Kruskal-Wallis test and found a significant difference in the proportion of difficult (vs. easy) problems chosen by participants in each condition with post hoc Dunn tests demonstrating that participants in the growth mindset condition chose significantly more difficult problems than the participants in both the fixed ($p = .01$) and neutral conditions ($p = .04$).

The fifth and last study conducted by Mrazek and colleagues (2018) was a replication of the fourth study in addition to examining the relationship between behavioral effort avoidance and appraisal of mental fatigue. Ninety-nine psychology undergraduate students (data on age and gender were not collected) participated and received course credit for their participation. Participants were randomly assigned into three conditions (growth mindset, fixed mindset, neutral) and followed the same procedure as outlined in study 4. The participants then completed a 150-problem version of the demand selection task from study 4 and answered the same follow-up questions. The participants then reported the degree of perceived effort they experienced during the task (as in studies 2 and 3), the degree to which they felt mental fatigue was a sign of expansion (as in studies 1-3), in addition to completing other questionnaires.

Similar to study 4, effort avoidance was observed by the fixed and neutral conditions, but not the growth mindset condition. Participants in the growth mindset condition chose the difficult problem 43% of the time, while those in the fixed and neutral conditions both chose the difficult problem 28% of the time. A Kruskal-Wallis test was once again ran and found a significant difference in the proportion of difficult problems chosen by participants in each group, with the Post hoc Dunn tests demonstrating that participants in the growth mindset condition chose significantly more difficult problems than the fixed ($p = .02$) and neutral conditions ($p = .03$). The examiners then assessed whether the growth mindset manipulation affected their interpretation of fatigue. There was a significant group difference in the appraisal of fatigue as a sign of expansion, $F(2, 96) = 15.89$, $p < .01$, with Post hoc LSD tests showing that participants in the growth mindset condition scored higher than the other two conditions. There was

no correlation found between interpretation of fatigue and effort avoidance. In addition, no significant group differences were found for subjective effort or subjective fatigue.

Mrazek and colleagues (2018) make the suggestion that the use of targeted instruction in how to acquire and grow a growth mindset, specifically about self-regulation, can help more people achieve their personal goals. Mrazek and colleagues (2018) further highlight that the interventions used in their studies show much promise, especially with the effects that were shown on appraisal and exertion of effort. As previously noted above and reiterated by Mrazek and colleagues, accomplishing goals often relies on consistent effort and perseverance, while also having to battle with constant distractions and temptations. The evidence presented by Mrazek and colleagues (2018) reinforces the notion that effort is crucial in self-regulation, in addition to presenting an approach that can be easily used by individuals in order to assist in achieving their personal goals. While the evidence of the five studies provides much promise for the concept of the growth mindset of self-regulation, the limitations must also be duly noted.

Gaps in Current Literature

Growth mindset intervention research is showing promise within the areas of psychological distress and self-regulation, but there is still much to be assessed and determined before one can say a growth mindset intervention is effective within these areas.

In each construct presented within this paper, there are gaps within the literature and the need for more research that remain. With self-regulation and executive function, the consensus on definitions remains a quarrelsome topic. In the area of executive

function, Diamond and Ling (2016) presented a meta-analysis and indicated multiple areas for future research in order to assess the many gaps that remain specifically with interventions to improve executive function. There are still many questions yet to be answered in both the growth mindset and self-regulation intervention domains as well.

The significant gap that remains within the growth mindset domain is the relationship and effects of having a growth mindset of self-regulation ability. The 2018 research conducted by Mrazek and colleagues presented a strong case for the beneficial effects of having a growth mindset of self-regulation and for interventions that address this need. The biggest limitation of the Mrazek and colleagues' (2018) study is that all five parts were conducted with adults, significantly reducing its generalizability to school-aged students.

There is also limited research on the growth mindset of self-regulation with students with disabilities, such as learning disabilities and those with Attention Deficit Hyperactivity Disorder (ADHD). There have been contradictory results on the relationship between students with learning disabilities and their level of growth mindset or self-regulatory efficacy (Klassen, 2002, 2010; Matheson, 2015). One of the greatest deficits with ADHD is the ability to self-regulate (Antshel et al., 2014), suggesting that one may hypothesize that a student with ADHD could have a lower growth mindset of self-regulation, but there has not been enough research to back this claim.

In looking at all the research presented, it appears that:

a) self-regulation and executive function are major factors in being successful, especially within the school environment

b) a student having a growth mindset has been shown to increase academic achievement and self-regulatory processes, especially for students who are considered at-risk

c) that incorporating a growth mindset of self-regulation could potentially assist students to become self-regulated learners and help to make current self-regulation interventions much stronger and more effective, especially for those who are considered at-risk students.

CHAPTER 3: METHOD

This is a pilot study utilizing an existing dataset. A pilot study is often conducted when a new program or intervention is developed, but no large-scale evaluation study has been conducted. It can be the first step of a program of research and is a smaller-sized study, allowing for insights about the program to prepare for a larger, randomized-control study (Eldridge et al., 2016). Because of the small sample size, descriptive data are presented in preparation for inferential analysis of a larger, randomized controlled study.

Participants were high school students who receive special education services and were enrolled in an elective course designed to improve emotional regulation. The school decided to add a growth mindset component to their curriculum in an effort to improve motivation and thus improve the impact of the standard intervention. Archival data from this new component was examined for this study. It examined whether students' responses to the questions about growth mindset and self-regulation change as a result of taking this elective that now includes growth mindset lessons.

Participants

The participants in the current study were ninth through 12th grade students in a special education elective course at a high school located in the suburbs of Philadelphia, PA. All the students had an Individualized Education Plan (IEP), and their IEP team felt that the current course was appropriate due to concerns with emotional regulation, timely work completion, organization/planning, and/or study skills. The students were found eligible for an IEP under the disability categories of Specific Learning Disability, Emotional Disturbance, and/or Other Health Impairment.

Description of the Sample

A total of 15 students (10 males; five females) were enrolled in the elective course at the beginning of the fall 2021 semester and completed the baseline survey. Most of the students were in the ninth grade (n=8). Regarding race/ethnicity of the sample, 13 out of 15 of the students identify as caucasian, and 2 out of 15 identify as multi-racial.

There were a total of 11 students (2 female; 9 male) enrolled in the course throughout the fall 2021 semester who completed both the baseline and post-intervention surveys. There were other students who either enrolled later into the course or who transferred out of the course that were not included in the second part of the study's data. Most of the students were once again in the ninth grade (n=8) when the post-intervention data were collected. Of the 11 students in the post-intervention sample, two out of 11 identified as multi-racial, and nine out of 11 identify as Caucasian.

The Elective Course

The special education elective course is described as follows in the high school's course catalog:

> *"This course provides support for students who have emotional and behavioral needs that impede academic success in the classroom. Students will learn new behavioral strategies to help them find success in the classroom, school, and community. In addition to the affective and behavioral curriculum, students will be provided support with coursework from their other academic and elective environments."*

Measures

Prior to the beginning of the intervention, the students completed an 18-item questionnaire. The questionnaire was created specifically for this study and was adapted from two existing questionnaires: (1) the eight-item scale on the theory of intelligence originally created and used by Carol Dweck (1999), and (2) the theory of self-regulation questionnaire used by Mrazek and colleagues (2018). See the Appendix for a copy of the questionnaire.

Due to the students' age and possible misunderstanding, the terms *self-regulation* or *self-control* were not used in the survey. The baseline survey included 18 questions that assessed the student's mindset with intelligence, planning/organization, emotional regulation, creating/meeting goals, time management, academic motivation, task initiation, and attention regulation. The students had to respond to each question with agree, not sure, or disagree. Some examples of the survey questions included: "With enough time and effort, I can get better at planning and organization," "To be honest, I don't think I will ever be able to manage my time," and "I can work at getting better at controlling my emotions." The baseline survey included a question about whether the students had ever been taught about a growth mindset before.

The students were then asked to complete the same survey again 2 weeks after the end of the intervention. This survey included 17 questions and was identical to the baseline survey except for the question about whether the students had learned about a growth mindset before.

Procedures

Once a week throughout the 2021 fall semester, the school psychologist and itinerant support special education teacher pushed into the above-mentioned elective course and provided lessons and instruction from the SMARTS Secondary Curriculum. SMARTS Secondary Curriculum is described as "a comprehensive EF (Executive Functions) curriculum spanning the full academic year. It teaches middle and high school students essential executive function strategies that promote academic and life success" (SMARTS, 2022). Each lesson plan is delivered within a 60-minute class time frame. The curriculum comes with the following for each lesson: a comprehensive lesson plan, a PowerPoint presentation, a student handout packet, instructional videos, student surveys, and reflection activities to boost students' metacognition (SMARTS, 2022).

The high school where the study was conducted has block scheduling in which each class period is an hour and six minutes. The fall semester runs from September until January. The intervention was provided to two course offerings of the same elective. For the first lesson, a PowerPoint mini-lesson (about 20 minutes) was provided on what a growth mindset is, with a particular emphasis on self-regulation. The rest of the classes followed the lesson plans and activities as outlined by the SMARTS curriculum. The units within the SMARTS curriculum include the following: Unit 1: Introduction to Executive Function Strategies, Unit 2: Goal Setting, Unit 3: Thinking Flexibly, Unit 4: Organizing and Prioritizing Materials and Time, Unit 5: Organizing and Prioritizing Information, Unit 6: Remembering (memorizing), and Unit 7: Self-monitoring and Self-checking. Within each unit, there are multiple lessons included.

CHAPTER 4: RESULTS

Because this is a pilot study with a small sample size, much of the data will be presented as descriptive results. Where possible, effect sizes will be calculated so that they may be used in future power analysis calculations to determine appropriate sample sizes for more comprehensive, experimentally controlled studies.

Research Question #1

The first research question asks about the level of growth mindset beliefs concerning self-regulation for high school students with IEPs. Specifically, it is hypothesized that high school students who struggle with emotional regulation, organization, and work completion will report low levels of a growth mindset of self-regulation.

Table 1

Frequency of Responses to Questions Assessing Growth Mindset of Intelligence and Growth Mindset of Planning/Organizing

Question	Disagree	Not Sure	Agree	Total
My intelligence is something about me that I personally can't change.	4	8	3	15
With enough time and effort, I can get better at planning and organization.	0	1	14	15

At baseline, many students within the sample were either unsure or agreed with a fixed mindset belief of intelligence. As shown by Table 1, only four of the 15 students agreed with a growth mindset belief of intelligence. Almost all of the students within the

sample agreed with a growth mindset belief of being able to increase one's planning and organizational skills with enough time and effort at the beginning of the study.

Questions Assessing Traditional Growth Mindset Beliefs

The following questions were included in the survey as a way to measure the students' beliefs about the main components of the traditional growth mindset theory of intelligence at the beginning of the study.

Table 2

Questions Assessing Traditional Growth Mindset Beliefs

Question	Disagree	Not Sure	Agree	Total
My intelligence is something about me that I personally can't change.	4	8	3	15
I try hard because I want to be successful.	4	0	11	15
I can create and meet goals that I set for myself.	3	3	9	15
I believe that you are either good or bad at something.	6	2	7	15
People who are smart don't have to work hard.	13	0	2	15
Challenging tasks are interesting to me.	7	2	6	15
I am in charge of what I am able to learn.	1	3	11	15

In looking specifically at Questions 1 and 6, a majority of the students at baseline endorsed responses that align with or lead towards ("unsure") a fixed mindset of intelligence that includes all or nothing thinking. Question 17 was included in the survey

as another way to assess/gauge the students' mindset beliefs. As depicted in Table 2, a majority of the students at baseline agreed with a growth mindset approach to learning (11 out of 15 students), but there were four students who were unsure of or disagreed with having control and/or autonomy of their own learning.

In looking at other components of growth mindset theory, setting and achieving goals are incremental in not only growth mindset theory but in self-regulation theory as well. Six out of the 15 students within the sample either believed they cannot set and meet goals for themselves or were unsure that they could. Question 12 assesses an essential component of the growth mindset of intelligence theory that includes seeing the positive with putting in effort. The responses to this question suggest that a majority of the students at baseline (13 out of 15) agreed with a growth mindset of intelligence view of effort. On Question 4, a majority of the students (11 out of 15) agreed with the belief that they try hard because they want to be successful. In comparison to the responses on Questions 4 and 12, when the students were asked if they find challenging tasks interesting (Question 13), nine out of the 15 students were either unsure or agreed with a fixed mindset view/belief at baseline, suggesting that while many of the students believe that effort should be seen positively, many of the students may not find motivation/interest in tasks that require greater effort that could lead to them being successful.

Questions Assessing Planning and Organization Beliefs

The following questions were included in the baseline survey to assess the students' beliefs about planning and organization, which are two main components of being a self-regulated learner.

Table 3

Questions Assessing Planning and Organizational Beliefs

Question	Disagree	Not Sure	Agree	Total
With enough time and effort, I can get better at planning and organization.	0	1	14	15
No matter how much time and effort I put in, I will not be able to hand in my assignments on time.	9	2	4	15

The baseline results of Question 2 suggest that almost all of the students at baseline agreed that with time and effort, they can get better at planning and organization, but almost half are unsure or agree that with time and effort they will not be able to hand in their assignments on time as indicated by the results of Question 14. These results as shown in Table 3 suggest that the students may not see a connection between their planning/organization and timely assignment completion.

Questions Assessing Time Management Beliefs

The following questions were included in the baseline survey in order to assess the students' beliefs surrounding procrastination and time management. Both avoiding procrastination and increasing time management skills are seen as essential in being a self-regulated learner.

Table 4

Questions Assessing Time Management Beliefs

Question	Disagree	Not Sure	Agree	Total
To be honest, I don't think I will ever be able to manage my time.	7	6	2	15
I will never be able to stop procrastinating my work.	5	8	2	15
No matter how much time and effort I put in, I will not be able to hand in my assignments on time.	9	2	4	15
I can begin a task or project when I should.	5	1	9	15

In evaluating the baseline trends around time management beliefs, there appears to be ambivalence with almost half of the students surrounding their beliefs of being able to increase time management skills. As shown in Table 4, Question 7, 8 out of the 15 students were unsure of or agreed that they cannot manage their time. With Question 10, 8 of the 15 students were unsure if they would ever be able to stop procrastinating their work and with Question 14, there were four students who believed that they would not be able to hand in their assignments on time and another two students who were unsure. The baseline responses to question 16 are once again similar to the other questions addressing mindset beliefs around time management and procrastination with a majority of the students believing in a growth mindset of time management skills, but a solid portion (six out of 15 students) being unsure of or believing a fixed mindset belief of time management skills. The uncertainty about being able to increase their time management skills appears to be an area in need of intervention as this could significantly impact the students' motivation to engage in time management strategies and interventions.

Questions Assessing Attention Regulation Beliefs

The following questions were included in the survey to assess the students' beliefs about their ability to increase their attention and focus at baseline. Increasing and maintaining attention and focus are areas in which many of these students struggle with in the classroom, but are needed in order to be successful academically.

Table 5

Questions Assessing Attention Regulation Beliefs

Question	Disagree	Not Sure	Agree	Total
I believe that I can always get better at paying attention in class.	4	2	9	15
To be honest, I don't think I can get better at paying attention in class or on my schoolwork.	10	3	2	15

According to the baseline responses for Question 9, a majority of the students (nine out of 15) believed that they could get better at paying attention in class, while six students were unsure or disagreed. As depicted in Table 5, the baseline responses to question 15 are similar to Question 9 in that a majority of the students at baseline believe in a growth mindset view of being able to increase one's attention regulation skills, but that there is still a subportion that is unsure of or leans towards a fixed mindset view of attention regulation (five out of 15 students). It should be noted that many of the students in the sample have been identified with behavioral/attention regulation concerns as one of the primary reasons for special education and specially designed instruction.

Questions Assessing Emotional Control Beliefs

The questions below were included in the survey to assess the students' beliefs about their ability to increase their emotional control at the beginning of the course. Emotional control is an area in which many of these students struggle in and yet is essential in being a self-regulated learner.

Table 6

Questions Assessing Emotional Control Beliefs

Question	Disagree	Not Sure	Agree	Total
I can control my feelings and emotions.	2	2	11	15
I can work at getting better at controlling my emotions and feelings.	1	1	13	15

According to the students' baseline responses on Question 3 as demonstrated in Table 6, 11 out of the 15 students agreed that they have control over their feelings and emotions, while the rest of the students were either unsure of or felt that they cannot control their emotions and feelings. Similar to the responses on Question 3, many of the students at baseline (13 out of 15) believed that they can work at/increase their emotional regulation skills. It should be noted that many of the students within the sample have been identified with emotional and behavioral needs/concerns as their primary reason for special education and specially designed instruction.

Questions Assessing School and Academic Motivation Beliefs

The following questions were included in an attempt to assess the students' beliefs surrounding academic motivation at baseline. Academic motivation is another

essential factor in being a self-regulated learner yet is an area in which many of the students within the study struggle with.

Table 7

Questions Assessing School and Academic Motivation Beliefs

Question	Disagree	Not Sure	Agree	Total
I try hard because I want to be successful.	4	0	11	15
I can always increase my motivation for school.	4	5	6	15

Questions 4 and 8 were included in the survey in an attempt to assess where the students' level of academic motivation was. According to the baseline responses on Question 8 as depicted in Table 7, 9 out of 15 students were unsure or disagreed with the belief that they can increase their motivation for school, but a majority of the students believe that they try hard because they want to be successful (Question 4: 11 out of 15 students). The responses to question 8 suggest that many of the students potentially held a fixed mindset of academic motivation at baseline, but that many of the students hold motivational beliefs in wanting to be successful.

Question Assessing Goal Setting Beliefs

Goal setting is a major component in both growth mindset and self-regulated learning theory. The following question was included to assess the students' beliefs with goal setting at baseline.

Table 8

Questions Assessing Goal Setting Beliefs

Question	Disagree	Not Sure	Agree	Total
I can create and meet goals that I set for myself.	3	3	9	15

In assessing goal setting and achieving goals, which are both foundational components of growth mindset and self-regulation theory, a majority of the students agreed that they can set and meet goals for themselves (nine out of 15 students). In comparison, as shown in Table 8, a solid portion of the students (six out of 15) were unsure of or agreed with not being able to create and meet goals that they set for themselves. Goal setting and meeting goals appears to be an area in need of intervention.

Question Assessing Previous Growth Mindset Theory Knowledge

This particular question was included in the baseline survey to attempt to get an understanding of how many of the students had been taught about a growth mindset before.

Table 9

Questions Assessing Previous Growth Mindset Theory Knowledge

Question	Yes	Not Sure	No	Total
Have you been taught about a growth mindset before?	9	4	2	15

While nine students remember learning about growth mindset, if we look at the responses to Question 1 as shown in Table 9, only four of the 15 students agreed with a

growth mindset of intelligence statement at baseline and another eight students were unsure. These results suggest that although students are being taught about growth mindset, the beliefs may not being truly instilled into students or is not being maintained over time.

Research Question #2

The study's second research question was to examine whether a classroom-based intervention aimed at increasing students' beliefs about their ability to improve their self-regulation skills can be successful in doing so. Students were evaluated both pre and post-intervention concerning their growth mindset beliefs.

Reading/Interpreting the Following Charts

The numbers in the total sections along the horizontal axis are the number of students who selected that response on the post-intervention survey. The numbers in the total sections along the vertical axis are the number of students who selected that response on the pre-intervention/baseline survey. Diagonally, one can see where the responses changed from the baseline survey to the post-intervention survey.

Table 10

Pre- and Post-Test Responses with Traditional Growth Mindset Statement

		Disagree	Not Sure	Agree	Total
My intelligence is something about me that I personally can't change.	Disagree	3	1	0	4
	Not Sure	6	1	0	7
	Agree	0	0	1	1
Total		9	2	1	12

The goal of including this question in the survey was to gain a better understanding of where the students' beliefs were with a traditional intelligence growth versus fixed mindset. Seven students at baseline were unsure if they believed that intelligence was malleable and one student believed that intelligence is not malleable. Interestingly at the end of the study, five students as depicted in Table 10 changed their response from not sure to the response suggesting that they believe their intelligence is malleable. Overall by the end of the study, nine out of 12 students provided responses suggesting that they now hold a growth mindset of intelligence.

Table 11

Pre- and Post-test Responses with Questions on Planning/Organizing

		Not Sure	Agree	Total
With enough time and effort, I can get better at planning and organization.	Not Sure	0	1	1
	Agree	2	9	11
Total		2	10	12

Planning and organization are significant components of executive functioning and self-regulation within the school setting. This question was used to gauge where students beliefs were about the malleability of their planning and organizational skills. Almost all of the students believed that they could work at increasing their planning/organizational skills at baseline, suggesting that this was a pre-exisiting belief. One student became more unsure about their belief with planning/organization at post-test, which suggests that the intervention had the opposite of the intended results for that student. As demonstrated with Table 11, the intervention was mostly able to maintain the pre-existing growth mindset beliefs around planning and organization.

Questions Assessing Traditional Growth Mindset Beliefs

Table 12

Pre- and Post-Test Responses Assessing Traditional Growth Mindset Beliefs

		Disagree	Not Sure	Agree	Total
My intelligence is something about me that I personally can't change.	Disagree	3	1	0	4
	Not Sure	6	1	0	7
	Agree	0	0	1	1
Total		9	2	1	12

		Disagree	Not Sure	Agree	Total
I try hard because I want to be successful.	Disagree	1	1	1	3
	Agree	0	4	5	9
Total		1	5	6	12

		Disagree	Not Sure	Agree	Total
I can create and meet goals that I set for myself.	Disagree	1	0	1	2
	Not Sure	0	1	2	3
	Agree	0	3	4	7
Total		1	4	7	12

		Disagree	Not Sure	Agree	Total
I believe that you are either good or bad at something.	Disagree	3	2	1	6
	Not Sure	0	1	0	1
	Agree	0	0	5	5
Total		3	3	6	12

		Disagree	Not Sure	Agree
People who are smart don't have to work hard.	Disagree	8	3	11
	Agree	0	1	1
Total		8	4	12

		Disagree	Not Sure	Agree	Total
Challenging tasks are interesting to me.	Disagree	2	2	0	4
	Not Sure	0	1	1	2
	Agree	0	0	6	6
Total		2	3	7	12

		Disagree	Not Sure	Agree	Total
I am in charge of what I am able to learn.	Disagree	0	0	1	1
	Not Sure	0	1	1	2
	Agree	2	0	7	9
Total		2	1	9	12

Although there was movement in the direction towards a growth mindset of intelligence as evidenced by the results of Question 1 as shown in Table 12, there was limited change/movement or movement in opposite direction with questions investigating other components that are often associated with holding a growth mindset of intelligence. With six of the seven questions that looked at components of an intelligence growth mindset, many of the students at baseline had pre-existing beliefs that align with holding a growth mindset of intelligence. With three of the questions (Questions 6, 12, and 17),

there was movement from a growth mindset of intelligence to a more fixed mindset of intelligence suggesting that the intervention had the opposite of the intended effects. With the other four questions, the intervention appeared to maintain the pre-exisitng growth mindset of intelligence beliefs for most if not all of the students.

Questions Assessing Planning/Organization Beliefs

Table 13

Pre- and Post-Test Responses Assessing Planning/Organizational Beliefs

		Not Sure	Agree	Total
With enough time and effort, I can get better at planning and organization.	Not Sure	0	1	1
	Agree	2	9	11
Total		2	10	12

		Disagree	Not Sure	Total
No matter how much time and effort I put in, I will not be able to hand in my assignments on time.	Disagree	6	1	7
	Not Sure	1	1	2
	Agree	1	2	3
Total		8	4	12

With both questions designed to gauge beliefs around the malleability of planning/organizational skills as depicted in Table 13, there were many students who held the pre-existing belief that they could change/improve their planning/organizational skills. The intervention was for the most part able to help maintain those growth mindset beliefs at post-test and with question 14 was able to move three students towards a growth mindset view of planning/organizational skills.

Questions Assessing Time Management Beliefs

Table 14

Pre- and Post-test Responses on Questions Assessing Time Management Beliefs

		Disagree	Not Sure	Agree	Total
To be honest, I don't think I will ever be able to manage my time.	Disagree	4	1	0	5
	Not Sure	2	4	0	6
	Agree	0	0	1	1
Total		6	5	1	12

		Disagree	Not Sure	Agree	Total
I will never be able to stop procrastinating my work.	Disagree	2	1	1	4
	Not Sure	3	3	1	7
	Agree	0	1	0	1
Total		5	5	2	12

		Disagree	Not Sure	Total
No matter how much time and effort I put in, I will not be able to hand in my assignments on time.	Disagree	6	1	7
	Not Sure	1	1	2
	Agree	1	2	3
Total		8	4	12

		Disagree	Not Sure	Agree	Total
I can begin a task or project when I should.	Disagree	1	2	1	4
	Not Sure	0	0	1	1
	Agree	3	1	3	7
Total		4	3	5	12

In reviewing the survey questions assessing the students' beliefs about the malleability of their time management skills, it appears that many of the students were evenly distributed on a growth versus fixed mindset of time management skills at both baseline and post-test. As shown in Table 14, the questions involving procrastination and task initiation appear to be where the students views were the most across the board as well as the intervention having limited or no movement towards a growth mindset of time management skills at post-test. Interestingly, most of the students held a growth mindset belief around planning/organization skills at post-test but this did not generalize to time management beliefs. The pattern of responding indicates that the students may not see a connection between increasing their planning/organizational skills and increased timely work completion.

Questions Assessing Attention Regulation Beliefs

Table 15

Pre- and Post-Test Responses on Questions Assessing Attention Regulation Beliefs

		Disagree	Not Sure	Agree	Total
I believe that I can always get better at paying attention in class.	Disagree	1	1	1	3
	Not Sure	0	0	2	2
	Agree	0	1	6	7
Total		1	2	9	12

		Disagree	Not Sure	Agree	Total
To be honest, I don't think I can get better at paying attention in class or on my schoolwork.	Disagree	7	1	1	9
	Not Sure	1	1	0	2
	Agree	1	0	0	1
Total		9	2	1	12

In review of the survey questions involving mindset beliefs about attention regulation as shown in Table 15, most of the students had pre-existing growth mindset beliefs about the malleability of their attention regulation skills that were maintained at

post-test. With Question 9, there was also movement of two students towards a growth mindset of attention regulation at post-test.

Questions Assessing Emotional Control Beliefs

Table 16

Pre- and Post-test Responses on Questions Assessing Emotional Control Beliefs

		Disagree	Not Sure	Agree	Total
I can control my feelings and emotions.	Disagree	2	0	0	2
	Not Sure	1	0	0	1
	Agree	0	1	8	9
Total		3	1	8	12

		Disagree	Not Sure	Agree	Total
I can work at getting better at controlling my emotions and feelings.	Disagree	0	1	0	1
	Not Sure	0	0	1	1
	Agree	3	1	6	10
Total		3	2	7	12

The responses as shown in Table 16 suggest that many of the students had pre-exisiting growth mindset beliefs about their emotional regulation at baseline that was mostly maintained at post-test. There was slight movement in the direction towards a

fixed mindset of emotional control at post-test with two to three student responses moving in that direction.

Questions Assessing School/Academic Motivation

Table 17

Pre- and Post-Test Responses on Questions Assessing Academic Motivation

		Disagree	Not Sure	Agree	Total
I try hard because I want to be successful.	Disagree	1	1	1	3
	Agree	0	4	5	9
Total		1	5	6	12

		Disagree	Not Sure	Agree	Total
I can always increase my motivation for school.	Disagree	2	0	0	2
	Not Sure	0	2	3	5
	Agree	0	2	3	5
Total		2	4	6	12

Questions involving students' beliefs about academic motivation suggest that a majority of the students held more of a growth mindset of academic motivation at baseline that was not necessarily maintained at post-test especially when involving views

of trying hard and wanting to be successful. When the question specifically states motivation for school as depicted in Table 17, there was minimal movement towards a growth mindset of academic motivation at post-test with variance across the growth versus fixed mindset scale. These results suggest that the intervention had minimal effect on the students' beliefs around academic motivation.

Questions Assessing Goal Setting

Table 18

Pre- and Post-Test Responses on Questions Assessing Goal Setting

		Disagree	Not Sure	Agree	Total
I can create and meet goals that I set for myself.	Disagree	1	0	1	2
	Not Sure	0	1	2	3
	Agree	0	3	4	7
Total		1	4	7	12

A majority of the students held pre-exisiting beliefs that they can create and meet goals for themselves that was maintained at post-test as shown in Table 18. There was also movement of one student's responses towards the not sure/middle part of the growth versus fixed spectrum.

CHAPTER 5: DISCUSSION

Summary of Findings, Trends, and Interpretations

This current study involved a pilot study with a small sample size leading to the data and findings being presented as descriptive results that can assist in developing future research.

Baseline Survey Trends

The study's first research question asked about the level of growth mindset beliefs concerning self-regulation for high school students with IEPs. Specifically, it was hypothesized that high school students who struggle with emotional regulation, organization, and work completion would report low levels of a growth mindset of self-regulation. For the first research question, 15 students (10 males; five females) were enrolled in the course at the beginning of the fall 2021 semester and completed the baseline survey. Most of the students were in the ninth grade (n=8).

In examining the baseline trends in growth mindset of intelligence beliefs, most students were unsure or endorsed fixed mindset beliefs about intelligence. This was especially surprising in that almost all of the students had affirmed that they had previously been taught about growth mindset theory. In looking at particular tenets of growth mindset theory, the majority of students endorsed positive appraisals of effort and having autonomy over what they can learn. While many of the students seem to understand the importance of effort, most of them indicated that they do not find challenging tasks interesting, potentially demonstrating an area where the students' beliefs could interfere with their motivation. In assessing goal setting and achieving goals, which are both foundational components of growth mindset and self-regulation

theory, a solid portion of the students were unsure or agreed with not being able to create and meet goals that they set for themselves, suggesting another area in need of intervention.

The questions assessing mindset beliefs around planning and organization showed an interesting trend. Almost all of the students believed that, with time and effort, they could increase their planning and organizational skills. However, nearly half of the students endorsed (or were unsure) if they would ever get better at handing assignments in on time, even when putting more time and effort into this skill. This response pattern suggests that these students do not see a connection between planning and organization skills, and increased timely assignment completion. This potential lack of association could significantly impact students' motivation and interest in learning planning and organization strategies.

When evaluating the trends in baseline responses around time management beliefs, there appears to be variance in beliefs regarding increasing time management skills. Eight out of 15 students were unsure of or agreed that they could not manage their time. The baseline survey responses suggest that many students believe a person can improve planning and organization with enough time and effort. Still, most students are unsure about their own ability to increase their time management skills. At baseline, beliefs surrounding increasing time management skills and decreasing procrastination (Questions 7 and 10) appear to be where many of the students in the sample are unsure of or disagree that they can get better at. These areas should be targets of future interventions.

A majority of the students endorsed the idea of being able to increase one's attention regulation. However, there was a subportion that was unsure of or leaned towards a fixed mindset view of attention regulation. Similar to the responses around time management, the baseline results suggest that the students understand that a person can increase their attention regulation skills but lack the confidence that they themselves can improve their ability to pay attention. This may be another intervention point where students with behavioral and emotional regulation concerns need to see the connection between using interventions/strategies and increased attention regulation. Turning towards emotional regulation, most students at baseline felt they could control their emotions/feelings and work at and improve their emotional regulation skills. These results suggest an area where students potentially see a connection between using strategies/interventions and increased emotional regulation skills.

Questions 4 and 8 were included in the survey to assess where the students' level of academic motivation was at baseline. Academic motivation is integral in all components of being academically successful. According to the baseline responses, most students were unsure of or disagreed with the belief that they could increase their motivation for school. In comparison, most of the students agreed that they try hard because they want to be successful. This pattern of responses indicates a contradictory approach in that the students have a view of trying hard to be successful but do not believe they can increase their own academic motivation. The students may not be identifying how motivation ties into putting in effort and being successful. Increasing academic motivation should be addressed within future interventions.

Overall, the baseline survey results and trends aligned with the study's first hypothesis, with more students identifying with a fixed mindset of intelligence, time management, academic motivation, all-or-nothing thinking, goal setting, attention regulation, and interest in challenging tasks. The baseline survey results did not align with the study's first hypothesis in the areas of emotional regulation, planning/organization, and autonomy of learning, where a majority of the students had pre-existing growth mindset beliefs.

Post-Intervention Survey Trends

The study's second research question examined whether a classroom-based intervention aimed at increasing students' beliefs about their ability to improve their self-regulation skills would be successful in doing so. Students were evaluated both at pre and post-intervention concerning their growth mindset beliefs and change over time. In order to answer the second research question, 11 students (two female; nine male) were enrolled in the course throughout the fall 2021 semester and completed both the baseline and post-intervention surveys. There were other students who either enrolled later in the course or transferred out of the course that were not included in the second part of the study's data. Most of the students were again in the ninth grade (n=8).

In reviewing the survey questions aimed at evaluating the students' beliefs regarding intelligence growth versus fixed mindset, the study found some favorable as well as unfavorable trends for the current intervention. At the end of the study, five students changed their response from not sure to a response that suggests they now agree that intelligence is malleable. Overall by the end of the study, nine out of the 12 students provided responses suggesting that they hold a growth mindset of intelligence. Although

there was movement towards a growth mindset of intelligence, as evidenced by the results of Question 1, there was limited change/movement or movement in the opposite direction, with questions investigating other components often associated with holding a growth mindset of intelligence. With six of the seven questions that looked at components of an intelligence growth mindset, many of the students at baseline had pre-existing beliefs that aligned with a growth mindset of intelligence. With three of the questions, there was movement from a growth mindset of intelligence to a more fixed mindset of intelligence, suggesting that the intervention had the opposite of the intended effects (autonomy of learning, being either good or bad at something, and being smart and working hard). With the remaining four questions, the intervention appeared to maintain most students' pre-exisitng growth mindset of intelligence beliefs.

With both questions designed to gauge beliefs about the malleability of planning/organizational skills, many students held the pre-existing belief that they could change/improve their planning/organizational skills. The intervention was, for the most part, able to help maintain those growth mindset beliefs at post-test and move three students to agree that timely work completion can be improved with more time and effort.

The ambivalence and variance found in the baseline responses around time management appeared to continue at post-test, with many of the responses being evenly distributed on a growth versus a fixed mindset of time management skills. The questions involving procrastination and task initiation seem to be where the students' views were the most across the board, and the intervention has limited or no movement towards a growth mindset of time management skills. The areas of time management, task

initiation, and procrastination are areas in which future interventions should target to have more success with the type of student in question.

Turning towards emotional and behavioral regulation, the pre-existing growth mindset views around attention regulation, emotional regulation, and goal setting were mostly maintained at post-test. There was a slight movement in the growth mindset direction for attention regulation and goal setting, but a slight movement in the fixed mindset direction for emotional regulation beliefs.

In comparison, the responses involving students' beliefs about academic motivation were not maintained at post-test, especially when involving views of trying hard and wanting to be successful. More students at post-test responded that they do not try hard because they want to be successful compared to pre-test. When the question specifically states motivation for school, there was minimal movement towards a growth mindset of academic motivation and variance across the growth versus fixed mindset scale. Academic motivation continues to be an area that requires improvement, and how motivation is being addressed within interventions needs to continue to be assessed.

With the second research question, it appears that the intervention had the greatest impact on increasing the students' beliefs about the malleability of intelligence. The pre-existing growth mindset beliefs with planning and organization were maintained at post-test. There was slight movement in the direction of growth mindset beliefs for attention regulation and goal setting. There was minimal movement in either direction for time management and task initiation. There was slight movement in the direction of fixed mindset beliefs for academic motivation and emotional regulation.

Limitations

Some limitations to the current study include not being able to measure academic outcome measures, limitations provided by the COVID-19 pandemic, wording of survey questions, not being able to present all curriculum units to the participants, small sample size, and absenteeism.

Do Increased Beliefs Equate to Increased Self-Regulatory Actions?

While the current study provides possible trends in growth mindset beliefs regarding self-regulation, the study was not able to assess if the beliefs equated to increased self-regulated learner actions. With the previous school year being in a hybrid model (due to the COVID-19 pandemic), there was no appropriate baseline to utilize in order to assess skill acquisition, such as timely work completion, attendance, test performance, and grades. The difference in which the curriculum was provided for the 2020-2021 school year versus the 2021-2022 school year was considered to be too much of a factor and would not provide valid or reliable data related to the current study/intervention.

COVID-19

The implications of the school closures and hybrid educational models that were utilized due to the COVID-19 pandemic are ones that the education system is still attempting to sort out, grapple with, and move forward from. This current intervention occurred during the first semester, when the entire school district returned to full-time in-person learning. It is hypothesized that students across the country not only fell behind with reading and math skills but also significantly impacted their executive functioning and social-emotional skills. It is further hypothesized that students who had pre-existing

disabilities and students from low socioeconomic backgrounds had the most significant educational loss. Therefore, the pandemic's impact should be considered when interpreting the trends found within this current study.

Furthermore, most of the students in this intervention were ninth graders, which suggests that most of their middle school education was disrupted or not standardized due to the pandemic. The middle school years are often when students are taught and begin to develop their executive functioning skills, especially concerning planning, time management, and organization. Many students within the high school setting of the intervention had difficulty managing assignment completion and deadlines when transitioning back to full-time in-person learning. The mental health and emotional regulation components that were felt from the isolation that the pandemic brought with it may also be significant factors in the results of the current study.

Wording of Survey Questions

In creating the survey questions, the use of all-or-nothing questioning and questions involving double negatives were used, which could result in question confusion and misinterpretation by the students. In the future, the survey questions should be more straightforward to avoid any possible false results/misinterpretations.

Missing Unit 7

Unfortunately, due to scheduling issues and the pre-exisitng course curriculum, the intervention did not include the last unit of the SMARTS Secondary Curriculum that involved self-monitoring and self-checking. Self-monitoring is incremental to being a self-regulated learner and completing goals. Not being able to cover unit 7 within the course timeframe is a substantial limitation to the current study and could be where the

students failed to make the connections between the intervention/strategies and increased self-regulatory skills.

Absenteeism

Due to students' absences, not all students in the study received all the lessons of the current intervention. All students who completed the post-intervention survey and who also completed the pre-intervention survey were included regardless of how many lessons the students may have missed. All students included in the results did receive the growth mindset of self-regulation mini-lesson. Missing lessons of the intervention can have significant implications on the post-test survey results, and these factors should be considered when interpreting the survey trends.

Sample Size

With the small sample size of the current study, there are significant limitations of only providing trends and descriptive results compared to a larger sample size in which effect sizes and statistically significant change can be analysed.

Future Directions

Although this study could not provide statistical analysis, it does showcase areas in which executive functioning and self-regulated learner interventions should address and make connections for high school students who receive special education services. This study provided possible trends but has yet to answer many questions. There still needs to be a component of motivation that is most likely not being tapped into for the high school special education population. With school being back in a more standardized way, there is an opportunity to collect data that assesses self-regulated learning actions

before and after the intervention. Overall, growth mindset of self-regulation should be recognized and should continue to be studied within educational systems.

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APPENDIX

Study's Questionnaire

1. My intelligence is something about me that I personally can't change.

    a. Disagree
    b. Not Sure
    c. Agree

2. With enough time and effort, I can get better at planning and organization.

    a. Disagree
    b. Not Sure
    c. Agree

3. I can control my feelings and emotions.

    a. Disagree
    b. Not Sure
    c. Agree

4. I try hard because I want to be successful.

    a. Disagree
    b. Not Sure
    c. Agree

5. I can create and meet goals that I set for myself.

    a. Disagree
    b. Not Sure
    c. Agree

6. I believe that you are either good or bad something.

    a. Disagree
    b. Not sure
    c. Agree

7. To be honest, I don't think I will ever be able to manage my time.

    a. Disagree
    b. Not Sure
    c. Agree

8. I can always increase my motivation for school.

    a. Disagree
    b. Not Sure
    c. Agree

9. I believe that I can always get better at paying attention in class.

    a. Disagree
    b. Not Sure
    c. Agree

10. I will never be able to stop procrastinating my work.

    a. Disagree
    b. Not Sure
    c. Agree

11. I can work at getting better at controlling my emotions and feelings.

    a. Disagree
    b. Not Sure
    c. Agree

12. People who are smart don't have to work hard.

    a. Disagree
    b. Not Sure
    c. Agree

13. Challenging tasks are interesting to me.

    a. Disagree
    b. Not Sure
    c. Agree

14. No matter how much time and effort I put in, I will not be able to hand in my assignments on time.

    a. Disagree
    b. Not Sure
    c. Agree

15. To be honest, I don't think I can get better at paying attention in class or on my schoolwork.

a. Disagree
b. Not Sure
c. Agree

16. I can begin a task or project when I should.

a. Disagree
b. Not Sure
c. Agree

17. I am in charge of what I am able to learn.

a. Disagree
b. Not Sure
c. Agree

18. Have you been taught about growth before?

a. Yes
b. No
c. Not Sure