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Salma Yeasmin

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**EFFECTIVENESS OF GROWTH MINDSET INTERVENTION
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BY

SALMA YEASMIN

B.A. in Linguistics, University of Dhaka, 2008

M.A. in Linguistics, University of Dhaka, 2010

THESIS

Submitted in Partial Fulfillment of the
Requirements for the Degree of

**Master of Arts
Elementary Education**

The University of New Mexico
Albuquerque, New Mexico

December, 2021

DEDICATION

My loving parents

AND

My husband, Mamun and my sunshine, Scion Sanjin

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ABSTRACT

The lack of academic success of the U.S. adolescents and wide achievement gap have become a persistent problem of the United States. Therefore, several educational reforms have been made to increase U.S. students' academic performance as well as close achievement gap. However, despite the various reforms and efforts that have been enacted in educational sectors, U.S. students' academic performance seemed not enough. Therefore, psychological factors were considered in the educational reform strategy, in which promoting growth mindset among students has become a way to accelerate students' academic performance as well as reduce the achievement gap. Since then, numerous growth mindset interventions have been conducted throughout the world to increase students' academic performance. However, some growth mindset interventions have been found are effective to increase students' academic performance, while others are not. Therefore, with the inconsistent findings of intervention's effectiveness, there is a need to have a comprehensive synthesise of all current studies on mindset interventions to find the overall effectiveness. Therefore, this study intends to examine if the growth mindset

interventions are effective to increase academic performance of elementary students using systematic review analysis procedure. This study collected data from extant studies that implemented growth mindset intervention in educational settings and measured at least one academic outcome post-intervention. This study found that growth mindset interventions on average can improve academic performance of the students. This study also utilized Pearson pairwise correlations between the effect size of interventions on students' academic performance and the variables (a) location of intervention, (b) school resource level, and (c) intervention duration. This study found a negative relationship between the variables and effect size of the growth mindset intervention. However, none of the pairwise correlations were statistically significant. Therefore, this study suggests that further study is needed to increase intervention's effectiveness as well as to yield more insight into the factors that could influence an intervention's efficacy.

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Table of Contents

<i>Chapter 1 Introduction</i>	<i>1</i>
1.1 Introduction.....	1
1.2 Purpose of the study	6
1.3 Research question	7
1.4 Significance of the study	7
<i>Chapter 2 Literature Review.....</i>	<i>9</i>
2.1 Theories influencing growth mindset	12
2.1.1 Self-efficacy theory	12
2.1.2 Attribution theory	14
2.1.3 Achievement goal theory.....	15
2.1.4 Implicit theories of intelligence.....	18
2.2 Mindset theory.....	20
2.2.1 Growth mindset and fixed mindset	21
2.2.2 Beliefs associated with growth mindset	22
2.3 Impact of growth mindset	25
2.4 Growth mindset intervention	26
2.5 Growth mindset instrumentation.....	29
2.6 Summary	30
<i>Chapter 3 Methodology</i>	<i>32</i>
3.1 Study selection and abstraction.....	32

3.2	Information sources and search strategy	34
3.3	Study searching and selection result	34
3.4	Characteristics of the studies	35
3.4.1	Participants	36
3.4.2	Growth mindset interventions	36
3.5	Coding of variables	37
3.5.1	Location of intervention	37
3.5.2	Schools' resource	38
3.5.3	Duration of intervention	39
3.6	Effect size measure	39
3.7	Data analysis.....	40
Chapter 4	<i>Findings and Analysis</i>	42
4.1	Descriptive statistics	43
4.2	Correlational analysis between variables and effect sizes.....	44
4.2.1	Location of intervention	44
4.2.2	Type of school.....	45
4.2.3	Duration of intervention	45
Chapter 5	<i>Discussion and Conclusion</i>	46
5.1	Discussion	46
5.1.1	Location of intervention	47
5.1.2	Type of school.....	47
5.1.3	Duration of intervention	48

5.2	Conclusion	48
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Chapter 1

Introduction

1.1 Introduction

The lack of academic success by U.S. adolescents has been a persistent problem for many decades (Saunders, 2013). Several educational reforms have been made to increase adolescents' academic achievement. Some of these reforms include Goals 2020, No Child Left Behind, Race to the Top, and most recently State Standard Curriculum (Wilkins, 2014). The purpose of each reform and effort is to place the United States on a trajectory to increase adolescents' academic success as well as to compete with other nations by illustrating that the United States has outperforming students in all academic disciplines (Wilkins, 2014).

Despite the various reforms and efforts that have been enacted in educational sectors, high high school dropout rates, low levels of literacy, low classroom grades, and low levels of achievement on state, national, and international assessments have remained evident (Saunders, 2013). Studies have revealed that only 20% of students in the United States could not complete high school on time (Yeager et al., 2019). The National Center for Education Statistics (NCES) recently published the results of the TIMSS 2019 report. TIMSS (Trends in International Mathematics and Science Studies) provides data every 4

years on the mathematics and science achievement of U.S. students compared to that of students in other education systems around the world. In the 2019 TIMSS (IEA, 2019), the United States ranked 15th for mathematics and 8th for science at Grade 4 among 64 participating education systems. At Grade 8, the United States ranked 11th in average score for both subjects among 46 education systems. The United States' score did not change significantly between the 2011 and 2019 rounds of TIMSS. Moreover, according to the Program for International Student's Assessment (PISA), the United States has not performed well, especially in the fields of math and science (Wilkins, 2014).

According to the 2018 PISA report, the United States scored 505 for reading, 502 for science, and 478 for mathematics, far below China's first-place score of 590 (Schleicher, 2019). PISA is a triennial survey of 15-year-old students around the world (Peña-López, 2019) that examines students' performance in math, science, and reading (Schleicher, 2019). Consistently PISA results place the United States in the middle of the global pack. There has been no significant change in U.S. performance since the last PISA assessment. In the 2015 PISA assessment, the United States scored 497 for reading skills, 496 for science, and a below-average 478 in mathematics (Gurria, 2016). These results are in spite of the fact that each year the United States spends \$599 billion on education—more than on any other service except health care (Saunders, 2013).

Recently Common Core State Standards (CCSS) have been adopted to equip all students, regardless of who are they and where they live, with the knowledge and skills that will help them to be successful in college, career, and life. The Brown Center on Education Policy at Brookings (date) has done an extensive study on academic results in

states that have implemented CCSS and found a small impact on the academic results of the fourth-grade reading (Witney, 2016). .

With these varying degrees of effectiveness of efforts at reform, students' academic success seems low. The achievement gap between certain groups of students in the United States has largely remained (Darling-Hammond, 2014). Studies have found that minority students are on average 2 years behind their White peers (Saunders, 2013). Researchers have found educational reforms a limited piece and urged for a more holistic reform strategy that addresses other factors as well, such as psychological issues that inhibit students' ability to reach their potentials (Witney, 2016). Researchers have identified three levels of factors that could affect students' academic achievement: school, classroom, and individual (Carrol, 1963; Darling-Hammond, 2000). While school-related factors (e.g., curriculum and learning environment) represent 13% of the overall influence on students' academic achievement and classroom-related factors (e.g., instructional and classroom management strategies) represent 7%, individual-related factors (e.g., students' motivation and demographic characteristics) represent around 80% (Saunders, 2013). Among the individual-related factors, motivation has a large impact on achievement, and studies have found motivation to be an area that can be modified and enhanced to accelerate students' academic achievement (Saunders, 2013). Thus, enhancing students' motivation can play a role in promoting students' academic success.

Social psychologist Lewin (1952) found that some psychological forces impact on an individual's motivation and willingness to persist when difficulty in work increases (Witney, 2016). Some forces motivate individuals to make a decision—a force toward change—while others simply reduce resistance to change (Witney, 2016). Numerous

studies have found that interventions targeted to reduce the negative impacts of forces on motivation have shown powerful promise (Binning & Browman, 2020). These interventions could motivate students toward learning by helping them realize their potentials. Therefore, psychological interventions should be considered a part of comprehensive educational reforms to accelerate American adolescents' academic performance. Yeager and Walton (2011) studied 13 different interventions conducted on middle school, high school, and college students and found strong evidence that psychological interventions can positively affect students' academic performance by reducing the effects of psychological factors affecting their learning (Witney, 2016). Among the psychological interventions, mindset intervention targeted to foster a growth mindset in students has been shown to have numerous positive effects on students' academic performance. A mindset intervention has the potential to increase students' academic performance by shaping their belief in their ability and intelligence and influencing their motivation and willingness to persist when tasks increase in difficulty (Witney, 2016).

For 30 years, Professor Carol Dweck (2007) has researched beliefs that individuals hold about their intelligence and ability, and she found two distinctive mindsets to be prevalent: growth mindset and fixed mindset. Dweck first coined these terms to describe an individual's underlying beliefs about intelligence and ability (Saunders, 2013). Her theory of mindset is known as the implicit theory of intelligence. Students with a fixed mindset—also known as entity theory—tend to believe that efforts do not pay off because they are born with a fixed amount of capability that does not change (Dweck, 2007). These students demonstrate less resilience, avoid hard work, put forth less effort when tasks

become challenging, and consequently underperform academically. They view mistakes as failure and avoid challenges out of fear of appearing unintelligent (Cancelliere, 2016; Dweck, 2006). Unlike students with a fixed mindset, students with a growth mindset believe that intelligence is malleable and can be developed. They believe in the power of effort and see challenges as learning opportunities; therefore, they stretch themselves instead of giving up, and they develop new strategies. Students with a growth mindset can thrive against any challenges they face in educational settings, which in turn leads them to academic excellence. Researchers have found that students with a growth mindset have a higher level of academic achievement (Trapani et al. 2020).

Since researchers have hypothesized that growth mindset is a predictor of students' academic success, to date a great deal of research has been done globally on mindset and how to promote growth mindset in students to accelerate academic performance. A growing number of studies indicate that interventions hold promise for instilling growth mindset in students. Mindset interventions address adolescents' beliefs about their intelligence and lead students to see their intellectual ability not as fixed but as capable of growth in response to dedicated effort, trying new strategies, and seeking help when appropriate (Porter et al., 2020; Schmidt et al., 2017; Yeager et al., 2019).

In recent decades, numerous mindset interventions have been conducted throughout the world in an effort to promote students' academic success by shaping their beliefs about their intelligence and ability, and growth mindset interventions have been shown to have a positive impact on students' academic success (Bettinger et al., 2018; Porter et al., 2020; Yeager et al., 2019). Evidence of this positive impact has been found in Ireland (Fitzgerald, 2015), Peru (Outes-Leon et al., 2020), and the United States (Yeager et al., 2019). While

many studies have found mindset interventions highly effective in boosting students' academic performance, some studies have found these interventions have mixed or no effects. For example, both Porter et al. (2020) and Baker (2017) found mixed effects from mindset interventions on students of different grades. De Carvalho and Skipper (2020) found moderate but transitory effects from mindset interventions. Ganimian (2020), Johnson et. al. (2020), Glerum (2019), Wilkins (2017), and Allen (2018) all found no effect from mindset intervention on students' academic performance. Such inconsistent findings on mindset intervention's effectiveness indicate a need for a comprehensive synthesis of all current studies on mindset interventions to determine the overall effectiveness of growth mindset interventions. This study examines the current state of research on fostering growth mindset through intervention.

1.2 Purpose of the study

This study aimed to investigate the effectiveness of growth mindset intervention on academic achievement of elementary (K to 5th grade) students using a systematic review analysis. Therefore, this review included studies that implemented growth mindset intervention in an elementary school setting and measured students' pre- and post-intervention academic performance in terms of course grade, overall GPA, standardized test scores, and reading and writing test scores. Eligible studies were identified through the University of New Mexico Libraries database, ProQuest, Google Scholar, and other electronic databases. Systematic review guidelines were followed step-by-step to select the studies (e.g., searching databases to get all relevant studies, then examining and selecting the studies; (Storey, 2020). Information was collected from the selected studies to calculate the effect sizes of the interventions in order to find the overall effectiveness of each

intervention on students' academic performance. Further, this study analyzed whether the effect size of the growth mindset intervention was influenced by different variables (e.g., study location, school resources, and duration of intervention). Some of the included literature on growth mindset intervention indicated that certain variables—for example, context, culture, resources in the environment, and duration of intervention,—could impact the effect size of the interventions (Ganimian, 2020; Glerum, 2019; Kim et al., 2020). Therefore, 3 variables have been selected including duration and location of the intervention, and school's resource and data were collected from the studies regarding the variables. A correlation analysis investigated the pairwise relationship between these variables and the effect size of the interventions.

1.3 Research question

Specifically, this study addressed the following question: is the growth mindset intervention effective to increase academic performance of elementary grades students?

1.4 Significance of the study

Within the last 30 years, fostering a growth mindset has been highly prioritized, and mindset interventions to increase growth mindset have been implemented in educational settings around the world with varying degrees of effectiveness. Current need exists for a synthesis of the literature in the form of a systematic review analysis to clarify aggregated data for academics and practitioners. The contributions of this study are manifold. First, this study presents data on participants, types, durations, and locations of growth mindset interventions. These data can help education leaders and policymakers understand the best tools and conditions to implement mindset interventions efficiently and effectively. Second, the findings of this study indicate for whom and in what contexts

growth mindset interventions are effective and could help administrators and policymakers plan interventions. Since the review studies by Costa and Faria (2018) and Sisk et al. (2018), no review study has been conducted to synthesize subsequent studies on mindset interventions from 2018 to 2021. This study contributes updated and robust insights by reviewing the most current and comprehensive literature on growth mindset.

Chapter 2

Literature Review

The lack of academic success by U.S. adolescents has been a persistent problem for many decades (Saunders, 2013). In acknowledgment of this problem, educational reforms have aimed to accelerate U.S. adolescents' academic performance nationally and internationally. Despite various reform initiatives, adolescents' academic performance has not fared well, especially for students living in poverty and students from ethnic and racial minorities (Wilkins, 2014). This has been a topic of grave concern among educational leaders and researchers for many decades. To improve U.S. adolescents' academic performance, regardless of who they are and where they are from, major changes in educational reforms and policies have been made, including adopting CCSS.

The Brown Center on Education Policy at Brookings conducted an extensive study on academic results in states that have implemented CCSS, and researchers found that CCSS had little impact on students' academic achievement (Witney, 2016). Moreover, educational reforms entail rigorous academic expectations, which in turn stress many students to meet the expectations. Studies have found that elevated expectations motivate some U.S. students (Witney, 2016), yet a substantial number of American students still struggle academically (Saunders, 2013). These mixed results leave educational leaders and researchers wondering why not all children can succeed in school despite dedicating a

substantial number of resources and efforts in educational sectors. Therefore, focusing solely on academics by raising expectations or requiring mandatory high-stakes testing does not seem to be enough.

Researchers have found that students miss out on the effects of educational reforms due to a number of psychological factors that affect their performance and effort-seeking behavior, or the need for students to succeed and persist when work becomes difficult (Witney, 2016). These researchers have suggested taking a more holistic reform strategy in which psychological factors are also considered to accelerate U.S. students' academic performance. Many researchers have found that psychological and behavioral factors predict student success in school (Wilkins, 2014).

A growing body of research suggests implementing psychological interventions in order to address factors that inhibit students' academic performance (Allen, 2018; Blackwell et al., 2007; Wilkins, 2014; Witney, 2016). In a study of over 5,000 middle school students, Casillas et al. (2012) found that psychological and behavioral factors contribute to students' academic performance and success. These researchers recommended developing interventions to eliminate the negative impacts of students' psychological and behavioral factors on their academic performance. In particular, the researchers suggested an intervention that targets students' mindsets about intelligence and ability (Allen, 2018; Blackwell et al., 2007; Brougham & Kashubeck-West, 2017; Costa & Faria, 2018; Wilkins, 2014; Witney, 2016).

Studies have determined students' mindsets to be a key psychological reason that some students demonstrate resilience and persist while others give up when task difficulty increases (Witney, 2016). Pajeres and Schunk (2002) noted that

many students have difficulty in school, not because they are incapable of performing successfully, but because they are incapable of believing they can perform successfully. They have learned to see themselves as incapable of handling academic work or see the work as irrelevant to their life. (p. 22)

According to Dweck and Leggett (1988), two kinds of beliefs are prevalent among individuals: growth mindset and fixed mindset. Students with a fixed mindset believe that talent and intelligence are fixed traits; this is also known as entity theory. Because of having this belief, these students give less effort and avoid hard work when task difficulty increases. In contrast, students with a growth mindset see intelligence as malleable; this is also known as incremental belief. They seek more difficult tasks and exhibit greater resilience when encountering obstacles in a task. Studies have found that compared to students with a fixed mindset, students with a growth mindset have higher grades in mathematics and language disciplines, as well as in general GPA (Sarrasin et al., 2018). In the era of high stakes testing, fostering a growth mindset in students seems most important to meet elevated standards and improve students' academic performance.

Within recent decades, numerous mindset interventions have been conducted throughout the world in an effort to promote students' academic performance by shaping their beliefs about intelligence and ability. This study aimed to find whether growth mindset interventions can increase students' academic performance. Before investigating the effectiveness of growth mindset interventions on students' academic performance, it is important to understand what the mindsets are and how mindsets impact students' academic performance. Therefore, this chapter presents how growth mindset theory evolved over the time, characteristics of mindsets, and other beliefs associated with

mindsets, followed by a brief description of how mindsets and related beliefs impact individuals and their academic performance.

2.1 Theories influencing growth mindset

Self-efficacy theory, attribution theory, achievement goal theory, and implicit intelligence theory are the fundamental theories that growth mindset theory arose from. To understand growth mindset theory and mindsets that influence students' academic performance, it is important to understand their foundational theories. Each is addressed in turn in the following sections.

2.1.1 Self-efficacy theory

Building upon social learning theory, Stanford professor and psychologist Albert Bandura proposed self-efficacy theory. Self-efficacy is considered the precursor of mindset theory (Trapani et al., 2020; Wilkins, 2014). The concept of self-efficacy is derived from one's perceived capabilities (Wilkins, 2014). Bandura (1986) defined perceived capabilities as "types of outcomes people anticipate that depend largely on their judgment of how well they will be able to perform in a given situation" (p. 392). According to Bandura (1994), students who have a high sense of efficacy consider difficult tasks as challenges to be mastered rather than as threats to be avoided. Based on individuals' reactions when they encounter difficult tasks, researchers have identified two different types of responses: adaptive responses and maladaptive responses. Students who have high self-efficacy demonstrate adaptive responses, which entail seeking challenges, considering mistakes as learning opportunities, and persisting in the face of difficulties. Students with low self-efficacy demonstrate maladaptive responses, such as avoiding and giving up on challenging tasks and exhibiting low persistence when task difficulty increases.

Studies have found that students with a fixed mindset demonstrate maladaptive responses in the face of difficulties because they think that the task is mismatched with their capabilities. On the other hand, students with a growth mindset demonstrate adaptive responses in the face of difficulties (Glerum, 2019). There is a slight difference between Dweck's mindset theory and Bandura's self-efficacy theory. Dweck's mindset theory centered on an individual's perceived abilities and resulting level of confidence while Bandura's self-efficacy theory emphasized confidence in one's capabilities to master new skills. As Wilkins (2014) described, "comparing academic self-efficacy to theories of intelligence would be similar to one student that might say, 'I am confident I can master the skills if I try' (academic self-efficacy), versus the student that might say, 'I can never be good at this because my brain is not wired that way' (theories of intelligence)" (p. 33). Bandura emphasized that "people's cognitive beliefs about their own capabilities guided their thoughts, choices, actions, and reaction" (Trapani et al. 2020, p. 36).

Research about self-efficacy indicates that self-efficacy is a strong predictor of academic success (Britner & Pajares, 2006; Usher & Pajares, 2008). Research also suggests that students who have high self-efficacy in a content area perform better than the students with lower self-efficacy but the same ability (Wilkins, 2014). Students with high self-efficacy show greater resilience when problems are challenging. Individuals develop their beliefs about self-efficacy based on their previous experiences with success and failure. These beliefs then guide individuals to choose tasks they think match their capabilities and to avoid the tasks in which they feel less capable.

2.1.2 Attribution theory

Austrian psychologist Fritz Heider is considered the father of attribution theory (Witney, 2016). Heider proposed this theory in the early 20th century based on the idea that people want to find an explanation for their failure and success and that their explanation shapes their reactions. This theory was further developed by Harold Kelley and Bernard Weiner (Glerum, 2019). According to their updated theory, individuals attribute their success or failure to one of the following causes: effort, luck, task, difficulty, or ability (Saunders, 2013). When individuals attribute their failure to a lack of ability, they demonstrate a "helplessness response," which means they accept their failure and do not put forth effort to change it. On the other hand, when people attribute their failure to lack of effort, they demonstrate a "mastery-oriented response," which means they do not accept their failure and take action to change it (Glerum, 2019). These aspects of attribution theory—helplessness response and mastery-oriented response—contributed to the development of mindset theory.

Dweck (1975), in an effort to know how students explain failure and effort and to understand attributes of children who persisted versus children who gave up after a mistake or failure, conducted a study on 12 students in 1975. She found all 12 of the students demonstrated helplessness response after making mistakes. She intervened with the participants in order to reduce their helplessness response. After 25 sessions of intensive attribution retraining, the children's perception of helplessness changed, resulting in improved motivation and performance (Dweck, 1975). Dweck later conducted another study with fifth- and sixth-grade students to further understand these two aspects of attribution. She gave problems of varying levels of difficulty to participants and found two

different responses emerged as they faced difficulty in the problem. Some students persisted in mastery-oriented response, and some gave up in a helplessness response (Diener & Dweck, 1978). Researchers of mindset theory have found that students with a growth mindset demonstrate a mastery-oriented response, meaning they don't give up but persist in the face of difficulties. In contrast, students with a fixed mindset demonstrate helplessness response; they do not take action when difficulty appears in the task. Dweck (1986) noted that students' helplessness responses can be modified (Dweck, 1986). Attribution theorists postulate that if students believe they are academically successful because of factors they can control, they become more motivated and achieve a higher level of success than students who feel they do not have control over their own abilities (Saunders, 2013). Attribution theorists have suggested that with the help of teachers, students can develop a sense of control over the factors that contribute to their academic success. This is especially important for students who experience failures and when tasks become difficult and complex.

2.1.3 Achievement goal theory

Closely related to implicit beliefs, achievement goal theory has become one of the most popular theories applied in this context (Kremer et al., 2011). In order to understand the cognitive approach to motivation, psychologists proposed this theory to explain what causes individuals to engage or not engage in certain activities. Achievement goal theorists have found that people have different purposes when they engage in a task; these purposes are known as goals or goal orientations in the theory (Saunders, 2013). Achievement theorists have found two different purposes among learners when they engage in tasks: to develop a skill or to demonstrate a skill. Learners' desire to develop a skill is known as

learning goal orientation, and learners' desire to demonstrate a skill is known as performance goal orientation (Koorn, 2019). Students with learning goal orientation (also known as mastery goals) want to engage in a task to learn new things or master the material; they show greater resilience when they face difficulties and have greater academic achievement (Blackwell et al., 2007; Saunders, 2013). On the other hand, students who have performance goals want to outperform their peers and be perceived as successful at tasks; they avoid tasks when they face difficulties because of the fear of appearing incompetent compared to their peers (Dweck, 2007; Saunders, 2013; Wigfield & Wagner, 2007).

Researchers investigating the origins of achievement goal orientation found that how children or students are praised contributes to the development of their learning goal orientation. According to Mueller and Dweck (1998), when children are praised for effort (e.g., “You did a good job; you must be working hard”) they develop mastery goal orientation. In contrast, when children are praised for their ability (e.g., “You did a good job; you must be very intelligent”) they develop performance goal orientation (Mueller & Dweck, 1998). Receiving praise for being smart led students to hear praise for doing a good job, which in turn led them to avoid risks when they thought they did not have the innate ability for a given task (Wilkins, 2014). Dweck and Leggett (1998) examined the impact of praising on ability and effort. In their study, the researchers asked students to solve a series of puzzles that ranged in difficulty from low to high. As students solved the puzzles, they were praised for either their effort or ability. As the puzzles’ difficulty increased, Dweck and Leggett found that students who were praised for their ability or intelligence began to give up, while the students who were praised for their effort persisted, even when

they no longer found the puzzles easy. In the end, some of the students wanted to take the puzzles home. Dweck and Leggett's study illustrated the detrimental impact of praising for ability and intelligence.

Dweck (1986) noted that learning goal orientation is associated with increment theory or growth mindset, while performance goal orientation is associated with entity theory or fixed mindset. Koorn (2019) also mentioned that students with a growth mindset are more likely to pursue mastery goals. They desire to improve their ability by learning and improving their skills and competencies. When they face challenges, they develop new strategies, and instead of avoiding tasks, they develop intrinsic motivation and thereby enjoy learning. On the other hand, students who believe intelligence is unchangeable are more likely to pursue performance goals (Koorn, 2019). They are eager to look good in others' eyes, have the desire to prove their ability by outperforming peers or matching their peer's success with less effort, and avoid situations in which they are unable to learn (Dweck & Leggett, 1988; Koorn, 2019). Studies have found evidence that adopting a growth mindset fosters mastery-oriented learning goals, which promote motivated learning and lead to greater academic achievement. (Blackwell et al., 2007; Cury et al., 2006; Koorn, 2019). In a meta-analysis study, Burnette et al. (2013) found that growth mindset positively related to mastery goals and negatively related to performance goals.

Researchers have found a relationship between achievement goal theory and attribution theory and have noted that individuals choose different achievement goals based on their different attributions for failure (Glerum, 2019). For example, when individuals attribute failure to their lack of effort, they exhibit mastery-oriented responses and choose learning goals. Individuals who attribute failure to their lack of ability, in contrast,

demonstrate helplessness response and prefer performance goals (Dweck & Leggett, 1988). These different attributions for failure may explain why some students demonstrate greater resilience in the face of difficulties and as a result are able to achieve a higher level of academic success than their peers.

2.1.4 Implicit theories of intelligence

Emerging from attribution and achievement goal theories are implicit theories of intelligence, which have changed traditional beliefs about intelligence and academic achievement (Jones et al., 2020). In social and developmental psychology, implicit theories of intelligence refer to individuals' underlying fundamental beliefs about their intelligence and abilities (Dweck & Leggett, 1988). Implicit theories of intelligence have centered on understanding whether individual's beliefs about their intelligence have an impact on their achievement and motivation.

Carol Dweck pioneered research on implicit theories of intelligence (Jones et al., 2020). Ellen Leggett, a psychologist known for her work on motivation and personality, also did early work on implicit theories of intelligence, which inspired Dweck to explore how individuals implicitly assess their own intelligence and abilities. Dweck and Leggett (1988) assumed that assessments made by individuals about their own intelligence and ability influenced their goals, motivation, and behaviors. These researchers looked at students who were and were not highly motivated to achieve. They found that highly motivated students thrived in the face of difficulties, while those who were not highly motivated gave up their work. They also noticed that intelligence did not predict whether a student was highly motivated or not (Diener & Dweck, 1978). Rather, they found that

students held two different beliefs about their intelligence which were reflected in entity and incremental theories and that those beliefs could affect their performance at school and impact their choices, actions, and motivation (Dweck & Leggett, 1988). Dweck and her colleagues' body of research on individuals' underlying fundamental beliefs about intelligence and ability are known as implicit theories of intelligence, or self-theories. Yeager and Dweck (2012) described implicit theories as "their core assumptions of the malleability of personal qualities" (Yeager & Dweck, 2012).

According to implicit theories of intelligence, two different beliefs regarding intelligence have been found: entity theory of intelligence and incremental theory of intelligence. The entity theory of intelligence proposes that intelligence and ability are fixed traits. Those who exhibit the entity theory of intelligence demonstrate helplessness response (i.e., accept their failure and do not put forth effort to change it); they pursue performance goals and their perceived ability is low (Glerum, 2019). On the other hand, incremental theory of intelligence suggests that intelligence and ability are malleable traits that can be improved with effort and hard work. Those who exhibit the incremental theory of intelligence demonstrate mastery-oriented response (i.e., do not accept their failure and put forth effort to correct it); they pursue learning goals (Glerum, 2019). Individuals who fall along the spectrum described by the incremental theory of intelligence do not believe that intellectual ability is something that is predestined; rather, they believe it can be improved through hard work and learning the right strategies. Individuals' general beliefs about intelligence are revealed in the face of challenges. Costa and Faria (2018) defined implicit theories of intelligence and noted some individuals "perceive intelligence as more of a fixed or unchanging characteristic while others consider it as malleable and prone to

development' (Costa & Faria, 2018). Dweck et al. (1995) found that the two theories of intelligence directed people to choose different goals (learning or performance) and demonstrate different responses (mastery-oriented or helplessness). Individuals with incremental-based views believed in effort and put effort into learning goals, while individuals with entity views preferred performance goals (Dweck et al., 1995). Blackwell et al. (2007) also found the same pattern of goals and responses among the students in the control group of their experimental study. Further, they found that incremental views of intelligence predicted who would be successful and have a higher academic achievement (Blackwell et al., 2007). Implicit theories of intelligence have been extended and validated in empirical research studies across demographics, cultures, and developmental stages. More recently, concepts of entity and incremental beliefs about intelligence were renamed as fixed and growth mindsets (Glerum, 2019).

2.2 Mindset theory

Implicit theories of intelligence eventually led to the development of mindset theory (Jones et al., 2020). Mindset theory is the culmination of Dweck's extensive research on understanding how self-beliefs of intelligence influence an individual's goals, motivation, and academic achievement. In order to understand the relationship between motivation and academic achievement, Dweck and Leggett (1998) developed a theoretical framework in which they proposed that mindsets play a crucial role in both motivation and academic achievement (Dweck & Leggett, 1988; Sarasin et al., 2018); this framework later became known as mindset theory. Dweck's (2006) *Mindset: The New Psychology of Success* made the concept of mindset a popular and groundbreaking idea among educational psychologists and other people.

The concept of mindsets emerged from the idea that intelligence is either malleable (incremental theory) or fixed (entity theory). After decades of research, Dweck found that individuals are oriented toward either a fixed mindset or a growth mindset. People who believe that ability and talent are static and their success is based on their innate ability are said to have a fixed mindset (entity theory of intelligence). On the other hand, people who believe that ability and intelligence are malleable and can be changed through hard work are said to have a growth mindset (incremental theory of intelligence). People with a growth mindset see their success as a result of their hard work, dedication, and determination. People may not be aware of their own mindset, but in the face of difficulty and failure, their mindsets become evident. Studies have found that an individual can develop either of these two mindsets from infancy under the influence of parents and the environment where they grow up (Glerum, 2019; Miller, 2019).

2.2.1 Growth mindset and fixed mindset

Dweck's original work on mindset and the idea of the malleability of intelligence has been implemented in different fields, including sports, arts, work, and school, to promote motivation and achievement. In educational settings, students' mindsets become evident in how they respond when learning becomes challenging (Blackwell et al., 2007; Wilkins, 2014). Students who believe they are born with a certain amount of intelligence that cannot be changed or improved fall into the category of fixed mindset. They agree with the statements like, "If individuals have a lot of intelligence, then they are in good shape. However, if they don't, there is not really anything they can do about it" (Saunders, 2013, p. 53). Conversely, students who believe that intelligence is a trait that can be changed and improved through hard work and learning fall into the category of growth

mindset. Students with growth mindset support the statement, “The more effort they put in, the more they will learn and the better their ability will be” (Saunders, 2013, p. 53). Dweck and her colleagues mentioned that students with fixed mindset are more likely to give up when facing obstacles or challenges. In contrast, students with growth mindset see the challenge, failure, and mistakes as learning opportunities and react positively when they encounter them (Sarrasin et al., 2018). They are thus highly motivated at school compared to students with fixed mindsets, and they demonstrate a greater level of perseverance when they face academic challenges; this in turn leads them to higher academic achievement (Dweck, 2006; Dweck & Leggett, 1988; Sarrasin et al., 2018).

2.2.2 Beliefs associated with growth mindset

Belief about ability is the key point of mindset theory. In particular, to what extent individuals exert effort depends on whether or not they think they have the ability to be successful and whether they believe that ability is malleable (Schmidt et al., 2017). In the vast literature on mindset theory, it is evident that an individual’s belief in the malleability of ability points to a host of other beliefs considered to promote students’ academic engagement and achievement. In the following section, beliefs related to growth mindset will be discussed to understand how growth mindset beliefs promote students’ academic achievement.

2.2.2.1 Learning goal orientation

Mindsets have been shown to be connected with achievement goal orientation (Robins & Pals, 2002; Saunders, 2013; Schmidt et al., 2017). According to achievement goal theory, individuals may have two types of learning goals: mastery-oriented achievement goals and performance-oriented achievement goals. Students who embody

entity views of ability tend to adopt performance-oriented achievement goals— goals that are focused on demonstrating rather than developing abilities (Blackwell et al., 2007; Dweck & Leggett, 1988; Mueller & Dweck, 1998; Sarrasin et al., 2018; Schmidt et al., 2017). On the other hand, students who evidence an incremental view of ability are more likely to adhere to mastery-orientated achievement goals aiming at developing new skills, increasing their ability, and improving understanding. (Sarrasin et al., 2018; Saunders, 2013; Schmidt et al., 2017)—all of which are crucial for students and especially at-risk and low-performing students to overcome the academic challenges to succeed academically.

2.2.2.2 Effort belief

Beliefs about effort are another central component of mindset theory. Studies have shown that students with more incremental views of ability demonstrate positive effort belief (Wilkins, 2014). They place a high value on effort as a principal means of improving themselves (Schmidt et al., 2017). On the other hand, students with more fixed views show negative effort belief (Wilkins, 2014). They see having to put in more effort as proof of low ability and thus want to minimize their effort in schoolwork; they want to do well in an attempt to be seen as smart (Schmidt et al., 2017). Hong et al. (1999) conducted a study in which Chinese college students were asked if they wanted to enroll in a course to develop their English language fluency. The students who had positive effort beliefs, who were also identified as having growth mindset, enrolled in the course. Conversely, the students who had negative effort beliefs and were identified as having fixed mindset chose not to enroll (Hong et al., 1999; Saunders, 2013). The findings of this study suggest that students with positive effort belief want to take the opportunity to improve their existing skills or learn new skills, while students with negative effort belief pursue the skills that match their

current ability. In addition, the latter avoid pursuing skills that require them to put forth more effort because they believe that putting forth effort is a sign they are not smart enough. Student success largely depends on positive effort belief, and researchers have agreed that effort is as essential as intelligence. Thus, it is important to foster positive effort belief among students so they become more resilient and persevere in the face of academic difficulties.

2.2.2.3 Attribution to success and failure

Research has found that mindset is related to how students attribute their success and failure (Schmidt et al., 2017). Students who hold a more incremental view of ability and intelligence believe their success and failure mostly depend on how much effort they put into a given task. In the face of difficulties, these students demonstrate mastery-oriented response (put forth more effort and develop new strategies) so they can overcome their difficulties and become successful. Conversely, students who hold a more fixed view of intelligence and ability believe that no amount of effort will help them overcome challenges since their ability is fixed. When these students face challenges in academic tasks, they demonstrate helplessness response (give up the tasks or seek help from others). Studies have found that students with growth mindset were more likely to attribute their success to effort, while students with fixed mindset were more likely to attribute their success to ability (Saunders, 2013). Moreover, this study found that fixed mindset students believed poor performance was a result of poor ability rather than a lack of effort (Saunders, 2013). Many students, especially those who are at-risk or embody entity theory, have been found to struggle at schools because of their underlying beliefs about effort and ability.

2.3 Impact of growth mindset

Mindsets and related general beliefs, described above, have a tremendous impact on students' academic achievement. Students' beliefs about their intelligence and ability affect (a) their goals—whether they are interested in looking smart or learning; (b) their beliefs in the usefulness of effort—whether they feel putting in effort works in learning; and (c) the ways students think about their failure and success—whether they see failure as resulting from lack of ability or lack of effort (Saunders, 2013). Schmidt et al. (2017) found that

one's underlying beliefs about the nature of ability as fixed or incremental is accompanied by a fairly predictable set of general beliefs about achievement goals, effort, and attribution, which may, in turn, shape the way students interact with specific academic content on a daily basis, which ultimately affects academic outcomes. (p. 2)

In a quasi-experimental study, Schmidt et al. (2017) examined whether students' mindset beliefs influence their academic behaviors and everyday learning activities. The researchers collected students' subjective reports of their experiences over the school year and found that students with growth mindset had stronger mastery orientation goals, valued effort, and attributed causes of failure to controllable factors. Their academic performance was better than the students with fixed mindset. In a longitudinal study, Blackwell et al. (2007) found that students who held growth mindset had higher grades in mathematics than their peers who held fixed mindset. Romero (2015) conducted a study of achievement scores from 10th graders who demonstrated either a growth mindset or fixed mindset. This study found that students who had a more incremental view were three times more likely

to score in the top 20% on the test, while students who had a more entity view about ability were four times more likely to score in the bottom 20% (Romero, 2015; Trapani et al., 2020).

Further, researchers have found that students with a more incremental view of ability not only exhibit growth mindset but also hold other non-cognitive factors. Duckworth used the term *non-cognitive* to refer to cognitive functions that do not require thinking and reasoning (Jones et al., 2020). Non-cognitive factors that students with growth mindset exhibit are grit, resilience, self-efficacy, effort, and perseverance, which are considered reliable predictors of academic achievement. Even though a correlation has been found between growth mindset and these non-cognitive factors, it is not clear whether non-cognitive factors contribute to the development of growth mindset or growth mindset contributes to developing non-cognitive factors.

2.4 Growth mindset intervention

Empirical studies on mindset establish that students with growth mindset can perform better academically because they cultivate a set of beliefs and goals which are highly linked to and required for academic achievement. Consequently, developing a growth mindset has become one of the most popular research topics in education. Convincing evidence exists indicating students with fixed mindset can develop growth mindset despite having a fixed mindset for years (Witney, 2016). Since mindsets can be changed over time with targeted intervention and because of the impact of growth mindset on academic achievement, numerous interventions have been conducted to instill and cultivate growth mindset among students, and the result of the interventions seems promising. According to Porter et al. (2020) and Yeager et al. (2019), mindset intervention

increased grade points by 0.11 standard deviations in high school students in the United States. Interventions promoting growth mindset address students' beliefs about intelligence and lead them to see intellectual ability not as fixed but as able to grow and improve through effort and trying new strategies.

Interventions fostering growth mindset began with Dweck and Leggett's (1988) puzzle experiment, in which students were praised for either their hard work or their ability (Glerum, 2019). The puzzle experiment found that a growth mindset could be induced in students by praising their effort for a given task (Diener & Dweck, 1978; Mueller & Dweck, 1998). This intervention was small in scale and delivered in person by the researchers. After that, Blackwell et al. (2007) took the next step to enhance the mindset intervention. They started classroom interventions to teach students about the malleability of the brain and to instill growth mindset (Glerum, 2019). Subsequently, Dweck et al. advanced a mindset intervention called Brainology that added interactive animations to classroom activities (Glerum, 2019). This program induced growth mindset by teaching students about the malleability of the brain. To that date, all mindset interventions were delivered in person. As time went on and mindset intervention became more popular, a larger intervention was required. Therefore, Paunesku et al. (2015) developed an online intervention that could be implemented at a larger scale (Glerum, 2019; Paunesku et al., 2015). Like Dweck et al.'s (2017) intervention program, this program also taught students about the malleability of the brain by having them read articles describing the ability of the brain to grow. Participants were then asked to write a summary of the articles as well as a letter advising a friend who thought of themselves as not smart. The purpose of the writing activities was stimulating students to internalize the messages of the articles (Glerum,

2019). Paunesku et al.'s intervention built on the existing Dweck et al. and colleagues Brainology program but differed in that it was larger in scale and online so it could serve many students at a time. This original Paunesku et al. intervention was later updated by (Yeager et al., 2016).

To date, numerous programs have been developed with the intention to promote growth mindset including Growing Early Mindset for elementary grades, Brainology for middle grades and high school, and MindsetMaker for teachers, which can be delivered online (Trapani et al., 2020). Many books about mindsets are currently available and have become popular among teachers, including Dweck's (2006) *Mindset: The New Psychology of Success*, Duckworth's (2016) *Grit: The Power of Passion and Perseverance*, Hildrew's (2018) *Becoming a Growth Mindset School*, and Brock and Hundley's (2016) *The Growth Mindset Coach*. As there are different ways to promote growth mindset in students, Yeager and Dweck (2012) suggested customizing interventions to the age and context of student groups to increase their effects.

All the interventions described above (small-scale, classroom, and online) share the concept of neuroplasticity, or the capacity of the brain to modify its neural connections through learning (Sarrasin et al., 2018). They each follow a structure which is designed to help students internalize the concept of neuroplasticity (Glerum, 2019). Many neuroscience studies support the idea that during learning, new interneuronal synapses can be created, disused synapses can be eliminated, and existing synapses can be modified (Sarrasin et al., 2018). Students who participate in growth mindset interventions receive the instructional metaphor that the brain is like a muscle that grows stronger and smarter when it undergoes rigorous learning experiences (Yeager et al., 2019). When students grasp the core idea of

the metaphor, they become motivated to strengthen their brains through schoolwork. Inducing a growth mindset with the concept of neuroplasticity can thus be justified, according to Sarrasin et al. (2018). These researchers conducted a meta-analysis of peer-reviewed studies that teach neuroplasticity to promote growth mindset and wanted to see the effects of introducing neuroplasticity to induce growth mindset on academic achievement. They found that inducing growth mindset by teaching neuroplasticity has a positive impact on students' motivation and academic performance (Sarrasin et al., 2018).

2.5 Growth mindset instrumentation

Growth mindset interventions have been implemented throughout the world in an attempt to accelerate students' academic achievement and close achievement gaps. Measurement scales have been developed to measure students' mindsets before and after intervention and to distinguish treatment and control groups in experimental studies. Most of the measurement scales are survey-based. They elicit students' self-ratings about the malleability of intelligence and their attitudes toward mistakes and hard work to determine their level of growth mindset (Jones et al., 2020). The measurement scales used to measure mindsets and related competencies are the Dweck Mindset Instrument, Dweck's Growth Mindset Scale (3-item), Mindset Works's Mindset Assessment Profile (MAP), Implicit Theories of Intelligence Scale for Children (ITIS), Patterns of Adaptive Learning (PALS), and Duckworth's Grit Scale.

Although growth mindset intervention seems promising for positively impacting students' academic success (Bettinger et al., 2018; Porter et al., 2020; Yeager et al., 2019), results have been inconsistent regarding the impact of these interventions on students' academic success. For example, Blackwell et al. (2007) found a positive impact of the

intervention on at-risk 7th-grade students. Studies by Porter et al. (2020) and Baker (2017) found mixed effects from mindset intervention on students of different grades (Baker, 2017; Porter et al., 2020). De Carvalho and Skipper (2020) found a moderate but transitory effect of mindset intervention. Ganimian (2020), Johnson et al. (2020), Glerum (2019), Wilkins (2017), and Allen (2018) did not find any effect of mindset intervention on students' academic success. With these varying degrees of effectiveness, need exists to comprehensively synthesize all current studies on mindset intervention. This study examines the current state of research on fostering growth mindset to find out to what extent growth mindset interventions are effective in promoting students' academic performance.

2.6 Summary

U.S. adolescents' trailing academic success in comparison to that of their international peers has been a concern for many decades (Saunders, 2013). Educational reforms have been made to accelerate U.S. adolescents' academic performance nationally and internationally. Despite various reform initiatives, adolescents' academic performance has not improved. In particular, students living in poverty and students from ethnic and racial minorities are not performing well (Wilkins, 2014). Researchers have suggested a more holistic reform strategy in which psychological factors are considered. Studies show that students' mindset about their ability and intelligence is a key psychological factor with a tremendous impact on academic performance. Carol Dweck is the pioneer of mindset theory and her research on mindsets yielded findings that individuals hold either an entity view (fixed mindset) or an incremental view (growth mindset) about their intelligence and ability. Students with a fixed mindset believe that intelligence is something that cannot be

changed or improved, while students with a growth mindset believe that intelligence is malleable. Dweck first coined the terms growth mindset and fixed mindset to describe an individual's underlying beliefs about their intellectual ability. Dweck was influenced by other motivational theories when developing mindset theory, including self-efficacy theory, attribution theory, achievement goal theory, and the implicit theory of intelligence.

A growing body of research has confirmed the basis of Dweck's mindset theory and found that growth mindset is closely related to several motivational variables. These include links to learning goals rather than performance goals, belief in the efficacy of effort, and mastery-oriented responses to failure (Sarrasin et al., 2018), all of which lead a student to succeed academically. As growth mindset is a predictor of higher academic performance, interventions have been implemented at schools to promote growth mindset in students in an effort to increase students' academic performance. This study examines the current state of research on fostering growth mindset to find out to what extent growth mindset interventions are effective in promoting students' academic performance. Given this purpose, data were collected for this study from studies centered on growth mindset interventions. The next chapter presents the procedures and methodology of this data collection.

Chapter 3

Methodology

The lack of academic performance by U.S. adolescents has been a persistent problem for many decades (Saunders, 2013). Since studies found that growth mindset is a predictor of students' academic performance, numerous growth mindset interventions have been conducted within recent decades with varying degrees of effectiveness. The current study aimed to evaluate the effectiveness of growth mindset interventions on students' academic performance. Growth mindset interventions were considered effective if students' academic performance increased after the intervention. This study was conducted in accordance with systematic review guidelines (Storey, 2020). Systematic review guidelines include searching and selecting all relevant studies and extracting information from those studies to get evidence-based results (Creswell & Guetterman, 2019). After going through systematic study search and selection procedures, 10 studies were selected for the analysis. In the following sections, study searching and selection procedures, basic characteristics of the studies (including participants, study location, and outcome variable), and data analysis procedure are discussed.

3.1 Study selection and abstraction

The purpose of this study was to know the effectiveness of growth mindset interventions on elementary students' academic performance. In other words, this study intended to know whether growth mindset interventions were able to increase elementary

students' academic performance. Studies have been selected that implemented a growth mindset intervention with the elementary students and measured or compared students' post-intervention academic performance in terms of grade, GPA, standardized test score, and national test score relating to any academic content in order to determine the gain score. Participants in the studies were elementary school students, and the studies took place in schools. Included studies reported findings quantitatively and provided enough information to compute effect size. All studies were written in English. Both journal articles and dissertations were eligible for review in this study. If any study measured other outcomes, such as students' engagement, interest, perseverance, or grit, only information related to academic performance, such as students' pre- and post-intervention grades, scores, or GPA in different courses were extracted for this study.

Studies were ineligible if they (a) measured other outcomes (e.g., students' engagement, interest, perseverance, self-efficacy, motivation, resilience, and grit) instead of academic performance; (b) combined growth mindset intervention with other intervention (e.g., reading and stereotype intervention), making it impossible to isolate the effect of growth mindset intervention alone; or (c) implemented the intervention on mono-gender groups (e.g., only male or female students) or any other specific group (e.g., gifted students or students with disabilities), failing to reflect the entire population and introducing sources of bias. Studies that did not have enough information, such as reports and snapshots, were not selected. Finally, secondary studies, such as literature review and meta-analysis were excluded, as they draw on original studies and their inclusion would pose a repetition.

3.2 Information sources and search strategy

Eligible studies were identified through the University of New Mexico Libraries databases, ProQuest, and Google Scholar. Both journal articles and dissertations were eligible for this study. An advanced search option reduced the high volume of non-relevant articles. The following key terms were used in the search: *effectiveness of growth mindset intervention, elementary to high school, grade, growth mindset intervention, and academic performance*. The search strategy was not limited to a language, country, or publisher. The search included studies published from 2010 to 2020. In every search, citation-only results were excluded. The studies were searched several times, and during each search, studies were primarily reviewed by title and abstract. Twelve studies unavailable through the University of New Mexico were requested and received through Inter-Library Loan. Study searching yielded 561 documents, and a database was created to organize the initially selected studies.

3.3 Study searching and selection result

A total of 561 studies were initially identified for this study. All study titles and abstracts were reviewed to match the selection criteria. After title and abstract reviewing, 305 studies were removed on the basis of relevancy. These studies were irrelevant because they centered on other issues, such as the effect of voting, socio-emotional skills for the labor market, how cognitive and poverty biases impact decisions and actions. Then, the rest of the studies ($N = 256$) were further examined, and 114 studies were removed. Among the removed 114 studies, 8 were literature reviews, 3 were not reported in English, 8 were found in books, 3 were executive summaries of reports, 6 were on mono-gender or focused on a special group of students, 22 examined teachers' and parents' roles and perspectives

toward growth mindset, 48 studied middle, high, college, and graduate students, 10 focused on how to design growth mindset intervention, and 6 combined growth mindset intervention with other intervention (e.g., reading and stereotype intervention). Full-text review was conducted on the remaining 142 studies. Of these, 124 studies were removed because (a) they did not measure the impacts of growth mindset intervention on students' academic performance in terms of grades, standardized test, courses exam, and GPA, (b) they tested growth mindset intervention for improving non-cognitive factors such as self-efficacy, resilience, motivation, and perseverance, (c) they examined to what extent and to whom growth mindset intervention was effective, or (d) they examined best ways to promote growth mindset in students. After this review, 18 studies were found to meet the selection criteria. However, 8 of these were removed during coding because they did not measure post-intervention academic outcome. Finally, 10 ($N = 10$) studies were selected for this study.

3.4 Characteristics of the studies

Information was collected from the studies to identify the characteristics of the studies, participants, and interventions. Of the 10 studies, 1 was journal article and 9 were dissertations. All of the studies were reported between 2013 and 2020. Included studies measured students' academic performance by comparing their pre- and post- intervention grades, GPA, standardized tests, assessment scores, national test scores, and trimester grades. Of the 10 studies, 9 took place in the United States, and 1 took place other country, Peru. Sample sizes in these studies varied widely, ranging from 20 to 50,000 students.

3.4.1 Participants

Students of elementary schools (K to 5th grade) were the participants of all included studies. The number of participants in the studies ranged from 20 to 50,000. Participants were diverse and of differing socioeconomic status. Their academic performance was average to low. Participants attended demographically diverse schools, and the schools' performances were average to low. Participants in study that took place outside the United States spoke languages other than English, and participants in the U.S. studies were primarily English speakers and bilingual.

3.4.2 Growth mindset interventions

The growth mindset interventions implemented in the included studies were of differing durations and were comprised of varying activities. The goals of the interventions were teaching participants how brains grow and why people are able to grow their intellectual abilities (Wilkins, 2014). For this purpose, the interventions incorporated interactive videos and texts about how the brain works and grows, as well as writing exercises to reinforce and internalize the messages of the videos and texts. The interventions' materials and activities were delivered to treatment groups while control groups (if the study used a control group) learned about different parts of the brain. Participants received intervention materials via computer or direct instruction. Prior to the interventions, researchers gave consent forms to the participants and collected the signed forms. Only participants who completed the consent form and returned it to the researchers could participate in a study. Researchers also collected participants' prior academic results or assessed participants' baseline academic performance before the intervention. Post-intervention, the researchers again assessed participants' academic progress. Interventions'

effectiveness was determined by comparing students' pre- and post-interventions' academic performance or comparing the treatment and control groups' academic performance post-intervention. Students' post-intervention academic growth was measured by test scores in different subjects (math, reading, writing, and social studies), national test scores, and GPA the following academic year. All interventions were conducted by teachers or researchers in the schools during or after school hours. Durations of the interventions varied widely, ranging from a single session to everyday for a semester. Researchers implementing intervention outside the United States adjusted their materials and procedures based on the context.

3.5 Coding of variables

Information has been collected about the following variables for this study: (a) school's resources; (b) location of the intervention, and (c) intervention duration. These variables were chosen because the vast literature on growth mindset intervention highlighted that these variables could impact the effect size of the interventions (Ganimian, 2020; Glerum, 2019; Kim et al., 2020). How the variables were selected and defined are discussed below.

3.5.1 Location of intervention

Location of intervention means in which country the intervention was implemented. Location of intervention has been defined based on the researcher's given information. It has been found that among the 10 studies, 9 took place in the United States (Griffin, 2020; Lee, 2018; Saunders, 2013b; Witney, 2016). The remaining 1 study took place in Peru (Outes-Leon et al., 2020). Because the study locations varied, one dummy variable was created for the correlational analysis: the United States ($USA = 1$ if the study

took place in the United States, and $USA = 0$, if the study took place outside the United States). This variable was selected to investigate whether a relationship exists between the effect size of growth mindset intervention on students' academic performance and the location of the intervention.

3.5.2 Schools' resource

Schools' resource means human and material resources that are necessary to implement the intervention effectively (Educate a Child, 2021). Human resource includes trained teachers, support staff, administrators, and mentors etc. Material resource includes basic materials such as reading and writing materials, teacher support materials, and supplementary learning aids. Both the availability and quality of the resources could be a barrier to implement intervention effectively. Data collected from the selected studies showed that growth mindset interventions have been implemented in schools with varying levels of resources. Thus, one dummy variable was created for the correlational analysis: low-resource school (*low-resource school* = 1 if the school had limited resources to carry out the interventions, and *low-resource school* = 0 if the school had resources). Schools have been considered low-resourceful school if the researcher directly reported the school as low resourceful school, or the school was a Title I school, or high poverty school. Title I schools have been considered as low-resourceful school as they are subjected to request funds to purchase resources, and sometimes funds are so stringent that schools cannot buy resources what they need to enhance academic excellence (Bachemin, 2020). Moreover, the schools with high poverty have been considered as low-resourceful school as they usually have less experienced teacher and lower level of state and local spending on instructors and instructional materials (The Commonwealth Institute, 2021). On the other

hand, schools are categorized as resourceful if the researchers directly reported about the schools resource, or not a Title I school, or the researcher did not explicitly mentioned anything about school's resource.

3.5.3 Duration of intervention

Duration of intervention refers the frequency of the session to implement the intervention. In other words, duration of intervention means the number of sessions that the researcher needed to implement the intervention. Then, the duration of intervention was categorized as long and short based on the number of sessions that were needed to complete the intervention. Long interventions lasted for more than 5 sessions, and short interventions lasted for 5 or less than 5 sessions. Data collected from the selected studies showed that the duration of interventions varied widely, ranging from a single session to everyday for a semester. As the intervention's duration varied widely, a dummy variable was created for the correlational analysis: long intervention (*long intervention* = 1 if the intervention lasted for more than 5 sessions, and *long intervention* = 0, when the intervention lasted for 5 sessions or fewer).

3.6 Effect size measure

Information was extracted from all 10 studies to find the average effect size of the mindset interventions. Information needed to calculate the effect size of each study was gathered from the main text of the studies, as well as supplementary tables and additional information included in the studies. Growth mindset interventions were determined to be effective, ineffective, or mixed depending on how the study authors reported their results. For example, if a study author reported that students' academic performance improved after participating in the intervention, their study was considered effective. If a study author

reported that students' academic performance did not improve or change after attending the intervention, their study was considered ineffective. If a study author found mixed effects from the intervention, their study was considered to have mixed effect.

Effect size (ES) was 0 if a study reported that students' academic performance did not improve post-intervention. Among the 10 studies, 6 studies reported that students' academic performance did not improve after the growth mindset intervention. Therefore, the effect size of these studies was 0. Interventions in 4 studies were found to be effective because students' academic performance increased after attending the interventions.

Effect size of the studies considered effective was calculated in percentage based on the methodology used in each study. Baker (2017) and Harper (2014) reported their gain scores using the difference-in-difference (DID) method. The effect sizes of these studies were calculated by first estimating the gain score between pre- and post-intervention of both treatment and control groups and then taking the second difference of the gain scores between the treatment and control groups. Bennett (2019) did not consider a control group. Difference between pre- and post-intervention score was considered effect size for this study. Outes-León et al. (2020) reported the effect size of their study directly.

3.7 Data analysis

This study aimed to estimate the average effect size of growth mindset interventions on students' academic outcomes. However, the interventions varied widely by location of the study, duration of the intervention, and type of intervention. Average effect size would not be representative if the differences among the variables could impact the effect size of the interventions (Yeager et al., 2019). Thus, a pairwise correlation between effect size of the interventions on students' academic performance and the variables was used, including

(a) location of intervention, (b) school type, and (c) intervention duration. Data analysis results are presented in the following chapter.

Chapter 4

Findings and Analysis

This study intended to determine the effectiveness of growth mindset interventions on academic performance of elementary (K to 5th grade) students. Growth mindset intervention was considered effective if students' academic performance improved in post-intervention assessments, including GPA, grades, national test scores, and standardized test score in core courses. Given this purpose, studies that implemented growth mindset intervention in an attempt to increase students' academic performance were the focus of this study. Systematic review guidelines were followed in selecting studies to include. Ten studies were selected. Data were extracted from the 10 studies to calculate an average effect size. The growth mindset interventions examined varied widely in location of the study, school's resources, and duration of the intervention. Therefore, the average effect size was not representative of the heterogeneity of individual effect sizes, as differences in the variables could impact the effect size of the interventions (Yeager et al., 2019). Thus, variables that could affect the impact of the interventions were identified. The vast literature on growth mindset intervention highlighted that some variables—for example, school environment, resource level of the school, and duration of intervention,—could impact the effect size of the studies (Ganimian, 2020; Glerum, 2019; Kim et al., 2020). Therefore, these variables were identified: (a) school type, (b) location of the intervention, and (c) intervention duration. Pearson pairwise correlation analysis was conducted to

determine the relationships between each variable and effect size. The following sections present findings and analysis.

4.1 Descriptive statistics

The data set consisted of 10 studies that implemented growth mindset intervention with the students of elementary grades to increase students' academic performance. Table 1 shows that average effect size of the 10 interventions is 8 % (mean = 0.08029, SD = .1399886). Among the 10 studies, 4 reported that growth mindset interventions were effective in improving students' academic performance. The average effect size of these 4 studies is 20 % (SD = .1629662).

Table 2 shows that 9 interventions were conducted in the United States and 1 interventions was conducted outside of the United States. Two interventions took place at low-resource schools, and 8 interventions took place at medium- to high-resource schools. Five interventions were long, lasting for more than 5 sessions, and 5 interventions were short, lasting for 5 or fewer sessions.

Table 1: average effect size of growth mindset intervention on academic performance

Variable	Observations	Mean	SD	Min	Max
Effectiveness of intervention (all studies)	10	.08029	.1399886	0	.438
Effectiveness of intervention (only effective studies)	4	.20072	.1629662	.07	.438

Table 2: Descriptive results

Variables	Description	Frequency if 0	Frequency if 1	Total
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USA	USA = 1, if the intervention was conducted in USA; 0 otherwise	1	9	10
Low resource	low-resource school = 1, if the schools have limited resources; 0 otherwise	8	2	10
Long session	long intervention = 1, if the interventions lasted for more than 5 sessions; 0 otherwise	5	5	10

4.2 Correlational analysis between variables and effect sizes

A correlation analysis examined whether any pairwise relationship existed between the effect size of the interventions on students' academic achievement and the variables (a) location of intervention, (b) school type, and (c) intervention duration. Pearson pairwise correlation analysis results are shown in Table 3. Pearson p values are shown in parenthesis. Table 3 shows that none of the pairwise correlations are statistically significant at a 10% level of significance. All pairwise correlational results are presented below.

4.2.1 Location of intervention

Table 3 shows that a negative relationship exists between the location of intervention and the effect size of the intervention on students' academic performance, which is - 0.1248 with a p value of 0.7313). Interventions that took place in U.S. schools were less effective than interventions that took place in other countries. Studies have found that educational, national, and cultural differences could impact the outcomes of an intervention (Glerum, 2019). However, this relationship is not statically significant, as p value is greater than 0.1 at (0.7313).

4.2.2 School's resource

Table 3 shows that there is a negative relationship between the variable of schools' resources and the effect size of the interventions targeted to increase students' academic performance. This means that interventions conducted in low-resource schools are less effective than interventions in resourceful schools. Studies have shown that school context is related to the success of an intervention (Kim et al., 2020). However, this relationship is not statically significant, as p value is greater than 0.1 at (0.6377).

4.2.3 Duration of intervention

A negative relationship exists between the effect size of growth mindset interventions' effectiveness and the duration of intervention. This means that short growth mindset interventions lasting 5 or fewer sessions are more effective in improving students' academic performance than long interventions lasting more than 5 sessions. However, this relationship is not statically significant, as p value is greater than 0.1 at (0.3466).

Table 3: Correlation between the variables and the effect sizes

Variable	Effect AA	Location (USA)	School type (low resourceful school)	Intervention duration (long session)
Effect size AA (Academic Achievement)	1.0000			
Location (USA)	- 0.1248 (0.7313)	1.0000		
School type (low-resource school)	- 0.1705 (0.6377)	0.1667 (0.6454)	1.0000	
Intervention duration (long session)	- 0.3562 (0.3123)	- 0.3333 (0.3466)	0.0000 1.000	1.0000

Chapter 5

Discussion and Conclusion

5.1 Discussion

Since researchers have claimed that growth mindset intervention can increase students' academic performance (Bettinger et al., 2018; Porter et al., 2020; Yeager et al., 2019), numerous interventions have been implemented throughout the world with varying degrees of effectiveness. This study aimed to investigate the effectiveness of growth mindset intervention on elementary students' academic performance using a systematic review analysis procedure. This study collected data from extant studies that implemented growth mindset intervention in educational settings and measured at least one academic outcome post-intervention: course grade, overall GPA, standardized test performance, and/or reading and writing test score. This study found that growth mindset interventions on average can improve the academic performance of 4 % of students. This study utilized Pearson pairwise correlations between the effect size of interventions on students' academic performance and the variables (a) location of intervention, (b) school resource level, and (c) intervention duration. This study found a negative relationship between the variables and effect size of the growth mindset intervention. However, none of the pairwise correlations were statistically significant at a 10% level of significance. Due to this finding, relationships among variables can be explained through a practical perspective without emphasizing the magnitude of the relationships (Vogt & Johnson, 2015). Practitioners and

policymakers should use caution and conduct further analysis when interpreting the results presented here.

5.1.1 Location of intervention

Results indicated that growth mindset interventions were not effective when implemented in the United States, though this relationship was not statistically significant. Previous studies have found that fixed mindset is more widespread in individualistic societies like the United States, while in collective societies (most Asian and some European countries), growth mindset is prominent (Glerum, 2019). Also, studies have found that growth mindset interventions are more beneficial for fixed-mindset or underperforming students (Bettinger et al., 2018). Because the baseline growth mindset of U.S. students is low, some learning curve effect might result in higher performance of growth mindset intervention.

5.1.2 School's resource

This study found that growth mindset interventions conducted in low-resource schools are less effective than interventions in resourceful schools, though this relationship was not statistically significant. It is possible that implementing growth mindset intervention in low-resource schools is challenging and sometimes ineffective due to lack of resources like computers, internet access, and trained teachers. Porter et al. (2020) experienced significant technical challenges in implementing growth mindset intervention in a low-resource setting, including lags in internet connectivity. Any kind of disruption during intervention could dilute its efficacy. In addition, a lack of trained teachers could result in students failing to perceive the main message of the intervention; that is, that intelligence and ability are not static but rather are susceptible to improvement through

hard work. For this reason, Dweck advised care in crafting and implementing growth mindset intervention (Young, 2019). The implication of this finding is crucial, as it aids researchers in understanding which kinds of schools' growth mindset interventions are more effective in.

5.1.3 Duration of intervention

This study found that short-duration growth mindset interventions more effectively improve students' academic performance than long-duration interventions. This finding may be confusing because both kinds of interventions have been found to be effective in improving students' academic performance. Outes-León et al. (2020) conducted growth mindset interventions that lasted for less than 1 hour and 1.5 hours. Post-intervention, they found that students' math and science scores increased. On the other hand, (Castiglione, 2019) implemented a growth mindset intervention that lasted for a semester, and the intervention increased the math scores of participants, third grade students. If a short-duration intervention, which could be cost-effective, could improve students' academic performance, what would be the point of investing money in a long-duration intervention? Therefore, more research should be done to determine the duration of intervention that could be less time consuming and cost effective.

5.2 Conclusion

This study intended to determine whether growth mindset interventions are effective in improving academic performance of elementary students. Based on the descriptive result, it was found that on average growth mindset interventions do increase elementary students' academic performance. Further research is necessary to yield more insight into factors that could influence an intervention's efficacy, as this study did not find

any statistically significant relationships between the variables and the effect sizes of interventions. While the literature on growth mindset intervention highlights its potential benefits in educational settings, more research in the field of growth mindset intervention is necessary to maximize intervention effectiveness.

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