THE IMPACT OF GROWTH MINDSET INTERVENTION ON VOCABULARY, COMPREHENSION, PERSISTENCE, AND SELF-PERCEPTION

by

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A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in Literacy Studies

Middle Tennessee State University

September 2020

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This work is dedicated to my two grandmothers: my paternal grandmother, Cathreen White, who worked in the cotton fields of rural Arkansas for most her life, and my late maternal grandmother, Aretha P. Jones, who was the matriarch of our family. I don't think either of them could have imagined their love and guidance leading to an accomplishment such as this.

ACKNOWLEDGEMENTS

I must begin by giving thanks to God for giving me the strength, endurance, resources, and opportunity to complete this dissertation and this journey. It is by His grace that I was able to complete this work, especially during a global pandemic.

I would like to acknowledge the individuals on my dissertation committee for helping me to complete this dissertation. To Dr. Eric Oslund and Dr. Jwa Kim, thank you for taking the time to read, offer assistance, and offer encouragement along the way. Thank you for your guidance and excellent teaching during my time in the PhD program. To Dr. Amy Elleman, thank you for being an amazing advisor and committee chair. Your support throughout these 4.5 years has been invaluable. You have been a wonderful mentor, and your encouragement has meant so much to me. I feel blessed to have been able to work with you and learn so much from you.

I would like to acknowledge the members of my research team at MTSU. To Katie Myers, Jennifer Grow, Molly Risley, and Jasmine Jackson, thank you for cheering me on throughout this time and assisting me with things like testing, scoring, and listening to recorded lessons. Molly and Jen, you were such troopers for gathering children with and for me during the summer of 2019! I appreciate your time.

There are several people outside of MTSU whom I would like to acknowledge as well. To my family members, your love, support, and encouragement throughout this program has lifted me up and made me feel like I could keep going when things were tough. Thank you to my parents, who are such a large part of why I was able to finish this dissertation and this program. You instilled a love of learning (specifically reading) in me

from a very young age, and I am grateful for that. I couldn't have completed this without you both. Thank you to my sister Dana, who took on responsibilities of caring for our mother during her illness, so that I could focus on and finish school. I will always remember your sacrifice. To the members of WOC WAG, thank you for being a godsend in the final months. Your support was a special kind to me, and constantly gave me the push I needed during such difficult times.

Finally, I would like to thank my husband Chris. You have been by my side through all of my educational pursuits. You never stopped supporting me, in the midst of my never-ending work. Thank you for making life easier in all the small (and big) ways, so that I could focus on school and make it to the finish line.

ABSTRACT

One potential contributor to student achievement that has garnered recent attention is student mindset. A recent review of the literature on the effect of a growth mindset intervention on students' academic achievement has shown small effects, but limited research has been conducted with young students. Research on contextual analysis strategies has indicated effectiveness of instruction in context clues to improve word-learning skills and vocabulary development. There is, however, a gap in recent research focused on elementary students. This study investigated whether students who received a growth mindset intervention in addition to regular vocabulary instruction would make greater gains in vocabulary development, using contextual analysis strategies. Rising second and third graders ($N = 34$) were randomly assigned to two conditions providing vocabulary instruction, with one condition providing additional instruction in growth mindset. Data analysis using ANCOVA and ANOVA determined that there were no significant differences between treatment and control groups on outcomes of vocabulary knowledge, comprehension, persistence, or self-perception. The intervention did suggest a possible practical relationship between growth mindset and self-perception through moderate effect sizes.

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER I: INTRODUCTION

Background and Statement of Problem

According to Dweck (2006), growth mindset is the belief that an individual's abilities can be developed through learning, effort, and hard work. This type of mindset can be compared to a fixed mindset, which holds that intelligence and ability are set for an individual's life and cannot be changed. Dweck and others have researched how mindset is a factor in various fields such as business, athletics, education, and even personal relationships. Dweck's work is about fulfilling potential, indicating that the theory is meaningful for both children and adults alike (Dweck, 2006). Within the past few years, there has been a growing body of research focused on growth mindset and how this set of assumptions and beliefs impacts students (Sarrasin et al., 2018; Sisk et al., 2018; Yeager et al., 2016). Students range from early elementary age to undergraduate level. Researchers have even looked at the effect a growth mindset had on ten-month-old infants and their parents (Rowe & Leech, 2019).

Educators and researchers have presented the concept of a growth mindset to students through the use of interventions. During an intervention, students may be taught about the brain and how it learns new things, what happens when one makes mistakes, or how to use positive language when faced with challenges. The intervention may be used to boost student motivation (Baldridge, 2010; Burnette et al., 2018), to apply the growth mindset in subjects such as math or science (Bifulco, 2017; Castiglione, 2019; Lin-Siegler et al., 2016; Schmidt et al., 2015), or to improve overall academic achievement (Chao et al., 2017; Dixson et al., 2017; Vsetecka, 2018). There are online programs, such

as Brainology®, that are also being used to teach about growth mindset (Donohoe et al., 2012; Rhew et al., 2018; Saunders, 2013).

Some of the research that has taken a look at growth mindset and its effects may also involve other psychological theories of self-concept. Studies may involve concepts of incremental theory (Blackwell et al., 2007), stereotype threat (Good et al., 2003), or self-affirmation (Sherman et al., 2013). Incremental theory of intelligence is similar to growth mindset, being defined as intelligence that can be built through learning. An entity theory of intelligence aligns with a fixed mindset, assuming that the intelligence an individual possesses cannot change (Dweck, 2000). Stereotype threat refers to the risk an individual may feel of verifying a negative stereotype about their social, racial, or gender group (Steele & Aronson, 1995). Self-affirmation theory describes the idea that these threats can be reduced when individuals are reminded of their adequacy, core values, relationships with others, or even the triviality of particular stressors (Sherman et al., 2013). It is important to understand these concepts, as they are closely related to the concepts of fixed and growth mindset and are often a large part of the research involved.

The existing body of research primarily emphasizes the use of growth mindset in the fields of math and science, or its effect on overall academic achievement, or attitudes about learning. However, the body of research that focuses on growth mindset in reading achievement is much smaller. In addition, the majority of the research is in secondary or post-secondary classrooms (Aronson et al., 2002; Baldridge, 2010; Seals, 2018); there have been very few studies conducted with younger students. In order to understand more about how teaching growth mindset may help students in reading, more evidence is

needed in this area. Regarding specific reading skills, vocabulary development is one part of reading achievement that is important to consider. The amount of research on growth mindset and vocabulary development is almost nonexistent.

Growth Mindset and Academic Achievement

The effects of a growth mindset have become a major focal point in education. As educators seek out techniques and approaches to keep students motivated in the classroom, mindset is an area that may be beneficial to students. Dweck and Leggett (1988) found that underlying personality traits can manifest in motivational processes, which in turn create certain patterns of thinking, attitudes, and behavior towards reaching goals. Individuals also form beliefs based on past experiences, and those beliefs can drive motivation and behavior (Dweck & Yeager, 2019). Duco (2016) conducted a survey among high school students that indicated a positive correlation between a growth mindset and a positive effort belief, meaning that students believed putting forth effort would result in favorable outcomes. Furthermore, there is evidence that a growth mindset can predict academic achievement, across different socioeconomic status (Claro et al., 2016). Claro et al. (2016) found that for students living in poverty in Chile, having a growth mindset helped them to perform academically as high as students from much higher socioeconomic backgrounds who held fixed mindsets. The growth mindset may have helped to alleviate some of the effects of the economic disadvantage on academic achievement. In the same way, a fixed mindset may intensify these negative effects of poverty on achievement (Claro et al., 2016).

One facet of teaching students how to cultivate a growth mindset is the language used. Dweck (2006) teaches that fostering a growth mindset in a young person requires using language that praises effort rather than praising ability or intelligence. Children who are accustomed to being praised for their amount of intelligence, rather than the work they put in, are more likely to develop a fixed mindset (Dweck, 2006). This is evident when looking at levels of academic achievement. Mueller and Dweck (1998) found that fifth grade students who were praised for their intelligence cared more about performance than learning, and showed less persistence and enjoyment throughout a task given than did their peers who were praised for effort. Not only the mindset that is fostered, but the language as well, can have a profound impact on students' overall academic achievement. This study will seek to provide more insight on how to impact student achievement in reading by examining the potential relation of growth mindset and academic achievement,

Vocabulary Instruction

Vocabulary is an essential component of language development and reading comprehension. Early measures of vocabulary taken in preschool have been shown to predict reading comprehension into adolescence (e.g., Quinn et al., 2015). Vocabulary has also been associated with the development of many early literacy skills including irregular word learning and inference generation for young children (Cain et al., 2004; Ouellette, 2006; Ricketts et al., 2008).

Studies have found that teaching students vocabulary words is an effective method for improving comprehension of text that includes the taught words (Elleman et

al., 2009; NICHHD, 2000; Stahl & Fairbanks, 1986; Wright & Cervetti, 2016). Unfortunately, children enter school with different levels of word knowledge (Biemiller & Slonim, 2001). Additionally, despite the importance of vocabulary to early literacy skill development, observation studies demonstrate that very little instructional time is devoted to vocabulary development. Wanzek (2014) found that in some elementary schools and classrooms there was very little time spent each day on direct vocabulary instruction during literacy blocks. Specifically, less than 10% of classroom time and only 1% of reading intervention time was devoted to teaching vocabulary. This was especially problematic for struggling readers, as they did not receive any additional instructional support in vocabulary (Wanzek, 2014).

Vocabulary Instruction and Early Reading Skills

Studies show a differential impact of vocabulary and comprehension instruction between good readers and poor readers. Elleman et al. (2009) found that providing vocabulary instruction was effective for improving reading comprehension on custom measures, especially for struggling readers. For vocabulary outcomes, students with reading difficulties gained as much vocabulary knowledge as students without them. These results are in line with those of Oslund et al. (2018), who found that vocabulary was the best predictor of reading comprehension for typical readers, whereas, word identification was the best predictor for students with poorer comprehension skills. These studies suggest that the relationship between skills such as word-reading and comprehension may differ based on the reading ability of students.

The specific relationships among word-level skills, vocabulary, and comprehension are not clear. Ricketts et al. (2007) found that poor comprehenders read fewer irregular words correctly than their typical peers, while in another study they found no difference between how poor comprehenders and typical readers pronounced consistent nonwords and inconsistent nonwords (Ricketts et al., 2008). In another study examining depth and breadth of vocabulary, Ouellette (2006) found that for typically developing fourth graders, breadth of receptive vocabulary predicted decoding skills, while breadth of expressive vocabulary predicted word recognition (Ouellette, 2006). More research is needed to explore the relationships among early reading skills and outcomes related to vocabulary and comprehension.

Although vocabulary intervention research in the primary grades has been limited, the studies that have been conducted show promising results. For preschool students, Hagen et al. (2017) implemented an intervention involving vocabulary instruction that showed improvements in language comprehension. Gonzalez et al. (2014) investigated the effects of teacher talk on the vocabulary development of preschool students, associated with the shared reading experience. Results suggested a significant relationship between teacher talk after reading and expressive vocabulary skills, and a significant relationship between duration of question time and receptive vocabulary skills. In a first-grade study, Puhalla (2011) found that typically developing readers and students at risk of reading difficulties made vocabulary gains through instruction using storybook read-alouds. In a kindergarten and first grade study, Beck and McKeown (2007) found that extended vocabulary instruction (more frequent, longer amounts of

time) yielded gains that were twice as large as those from shorter amounts of instruction time. Similarly, Coyne et al. (2009) found that embedded instruction and extended instruction in vocabulary both yielded significantly higher word learning than incidental exposure to vocabulary words with kindergarten students. For third grade students, Fogarty et al. (2020) used a technological supplement to vocabulary instruction to improve vocabulary outcomes, through explicit instruction, repeated exposure, practice opportunities, and feedback.

Contextual Analysis

Most of the studies conducted with young students include extensive exposure to novel words in read-alouds or explicit instruction (Wright & Cervetti, 2016). Very few studies, however, have been implemented to examine the impact of teaching primary-grade students independent vocabulary learning strategies. Teaching strategies for inducing word meanings may be particularly useful for young students in vocabulary acquisition from independent reading and for improving comprehension. Metacognitive strategy instruction such as context clue instruction has been shown to be effective for older elementary and middle school students (Fukkink & de Glopper, 1998), but has not been examined with primary grade students. Contextual analysis will be the term used in this study to describe the strategy of determining a word's meaning by using the clues from the surrounding 'context' – the words in the sentence or passage around it, that contain the unknown word. In the primary and secondary classroom, this is often referred to as using "context clues."

As students learn what context clues are and how to use them while reading, there are multiple types of context clues that can be helpful to readers. Baumann et al. (2005) suggest at least five different kinds of context clues. The *definition* context clue provides the reader with a direct definition of the unknown word within the sentence ("*A harpsichord is a keyboard instrument similar to a piano.")*. When an author gives words or ideas that are examples of the unknown word, that is an *example* context clue (*"We were reading about marsupials in science, such as kangaroos, wallabies, and koala bears.")*. The *synonym* context clue occurs when an author uses other words or phrases that can be compared to the unknown word in meaning (*"I was having a mundane Saturday night. Similarly, nothing exciting was happening for my friend, either."*). When an author uses other words or phrases that are opposite in meaning to the unknown word, an *antonym* clue is being used (*"Much unlike her malicious stepsisters, Cinderella was kind and pleasant."*). The *general* context clue occurs when nonspecific clues to the meaning of the unknown word are used, typically over more than one sentence (*"John was reluctant to take the job of team captain. He was worried that the time it would take would hurt his grades. Chris, however, was eager for the chance to be captain."*).

It is important to also acknowledge that contextual analysis strategies do have limits. Unfortunately, context clues may not always be helpful to readers. Beck et al. (2002) describe two types of context clues that are unhelpful – the *misdirective* clue, which may lead the reader to an incorrect meaning of the unknown word and the *nondirective* clue, which simply offers no help in determining the word's meaning. Researchers have also created methods in which students can incorporate contextual

analysis as well as morphemic analysis (Baumann et al., 2003; Ruddell, 1999). Baumann et al. (2003) implemented the Vocabulary Rule in their study with middle-grade students, which was adapted from Ruddell (1999). Using this strategy, students would first use context clues (looking within sentences around the unknown word for clues to its meaning), followed by word-part clues (breaking the work into root, prefix, and/or suffix), and finally going back to context clues to ensure the meaning has been determined (Baumann et al., 2003). The Vocabulary Rule and its language can be beneficial in instructing primary grade students, as well, in using contextual analysis.

Purpose of the Current Study

Reading habits that begin early in life contribute to vocabulary development (Cain & Oakhill, 2011). Teaching flexible word-learning and self-monitoring strategies early may increase opportunities for students to learn more words over time (Wright & Cervetti, 2016). However, while teaching strategies to young readers that promote self-monitoring of understanding of word meaning may contribute to vocabulary development, young children have less metacognitive awareness than older children, and the strategies may be difficult for them to incorporate while reading. Therefore, growth mindset instruction on persevering through difficult tasks may support students' learning of context strategies for word learning.

This study therefore adapted the procedures used to teach context clue strategy instruction to older children used by Baumann et al. (2003) and İlter (2019) for rising second and third grade students. This study practiced using a cloze procedure similar to that used by Sampson et al. (1982), and direct instruction of vocabulary words through

read-alouds based on the work of Puhalla (2011) as well as Beck et al. (2002). The purpose of this study was to understand more about the effect that growth mindset instruction has on young students in addition to the vocabulary instruction they are receiving.

Significance of the Study

The data collected and analyzed in this study were used to build the amount of evidence on growth mindset and its impact on young readers regarding vocabulary acquisition and development. As the literature on growth mindset in the early elementary classroom was limited, this study provided more information in this area. Similarly, the body of research on contextual analysis strategy use was limited to upper elementary, middle, and high school age groups. This study will help to further research on younger age groups. To date, there have not been any studies conducted that examine the impact of growth mindset interventions on vocabulary development for elementary school students. To address this issue, this study aimed to further investigate the findings of previous research on growth mindset and reading achievement. The data will offer more knowledge in the areas of mindset and vocabulary and add to the body of research on reading skills and achievement. Specifically, the following research questions were asked.

Research Questions

1. Do elementary students who receive a growth mindset intervention in addition to contextual vocabulary instruction learn more new vocabulary words than students who do not receive such intervention?

2. Do students who receive a growth mindset intervention achieve better comprehension than students who do not receive such intervention?
3. Do elementary students who receive a growth mindset intervention significantly increase their perceptions of themselves as learners compared to the control group (as evidenced by scores on a mindset survey)?
4. Do elementary students who receive a growth mindset intervention significantly increase their persistence compared to the control group (as evidenced by working through difficult vocabulary tasks)?

CHAPTER II: LITERATURE REVIEW

As more and more research has been conducted during recent years on mindsets, there has been an increase in teacher implementation in the classroom. Schools that incorporate methods such as project-based learning, the Socratic method, and Social-Emotional Learning are already creating environments that align with and are supportive of growth mindset (Yeager, 2019). Mindset Works, Inc. (2017) has created programs such as curriculum for young learners, Growing Early Mindsets™, curriculum for older students, Brainology®, and an online professional development course for teachers, MindsetMaker™. The essential question that educators must ask is whether the instruction and use of growth mindset and its language are effective for student learning. National studies have been conducted to investigate the effectiveness of growth mindset instruction and interventions (Paunesku et al., 2015; Yeager et al., 2016; Yeager et al., 2019), as well as meta-analyses (Sisk et al., 2018). Even within the current body of research, there are specific areas remaining that need more attention and information.

Another commonly used tool in the classroom and highly discussed topic in literacy research is word-learning strategies. This second area calls for more information, specifically for different age groups. Most of the studies conducted with young students include extensive exposure to novel words in read-alouds or explicit instruction (Wright & Cervetti, 2016). Few studies, however, have been implemented to examine the impact of teaching primary-grade students independent vocabulary learning strategies. Teaching strategies for inducing word meanings may be particularly useful for young students in vocabulary acquisition from independent reading and for improving comprehension.

Metacognitive strategy instruction such as context clue instruction has been shown to be effective for older elementary and middle school students (Fukkink & de Glopper, 1998), but has not been examined very often, or recently, with primary grade students. This chapter will discuss a systematic literature review conducted on growth mindset interventions, followed by a second systematic literature review conducted on contextual analysis instruction.

Systematic Search of the Literature on Growth Mindset

A systematic search of the literature was conducted to locate all of the previous research on growth mindset interventions. Based on the gaps in the literature and the research questions identified, there were certain criteria used to include or exclude studies. All studies had to be peer-reviewed and involve an intervention of some kind. The target age group for this study was early elementary, so the age limit within the searches was high school. All studies involving college students or adults were excluded. Studies were also excluded if participants who were English Language Learners were involved (more than 10% of participants). The search was geared toward academic achievement, so studies involving sports, games, or other extracurricular activities were excluded. Finally, studies were excluded that focused on behavior or other psychological areas such as mental health. Research was not restricted to the United States and includes other countries as well.

The initial search was conducted in the databases PsycINFO and ERIC, using the search term *growth mindset intervention*. This search yielded 87 results, and 24 studies were collected. Twelve of these studies were dissertations. A second search was done,

using PsycINFO and ERIC again, with the terms *growth mindset* and *academic achievement*. This search yielded 166 results, and only three studies were collected. Finally, a third search was conducted using the terms *mindset intervention* and *academic achievement*. The search yielded 48 results, with one study collected. After these initial searches were completed, a reference search was completed as well, which yielded six additional studies. Three of the studies collected in these initial searches were reviews or meta-analyses. These were all searched for primary studies as well and yielded five studies. In total, 39 studies were collected and coded.

Growth Mindset Interventions

The systematic search revealed that many studies have been conducted that focused on how growth mindset interventions impacted math achievement. The majority of studies, 26 of them, targeted either middle school students or early high school students (9^{th} or 10^{th} grade). Six of the studies featured students in grade 5 or below, with one of them focusing on infants and parents. One meta-analysis targeted a wide range from seven years of age to adulthood. Ten of the studies collected had a math achievement focus, and three focused on student achievement in science. The studies that considered literacy outcomes will be discussed further. The overall results are mixed, but do reveal more studies that show significant, positive effects on student achievement or mindset than studies that show insignificant or ineffective results.

The search brought forth meta-analyses that were current and relevant. A recent study conducted by Sisk, Burgoyne, Sun, Butler, and Macnamara (2018) investigated the effectiveness of mindset interventions and the relationship between mindset and

academic achievement, through two meta-analyses. Results revealed small effects for growth mindset interventions on academic achievement for general education students. In the first meta-analysis, 129 studies were identified; thirty-one of those studies examined reading or language arts outcomes and only 11 studies considered the impact of mindset interventions for native-English-speaking primary-grade (Kindergarten through 6th) learners. Almost all of these studies were correlational. Researchers calculated 273 effect sizes and 157 of these were not significantly different from zero. The average correlation between growth mindset and academic achievement in the first meta-analysis was r = 0.10 (Sisk et al., 2018). The second meta-analysis identified 29 studies and contained only one late elementary-age (Year 5) study. It also consisted of 43 effect sizes, 37 of which were not significantly different from zero. The average standardized mean difference in academic achievement between the experimental group of students who received growth mindset interventions and the control group was d = 0.08. Both the low correlation and the extremely low effect size indicated the lack of relationship between growth mindset and academic achievement and effectiveness of growth mindset interventions for certain groups.

In another review, Sabatine (2019) used meta-analysis to evaluate 24 growth mindset and stereotype threat interventions. These were randomized controlled trials, looking at middle and high school students. The interventions had small but positive effects (overall estimate of d = 0.19) on student grade point averages (Sabatine, 2019). Both of these reviews revealed findings that were not very robust, as both present small effects for interventions across studies. Though these meta-analyses provide valuable

information about mindset interventions, there are still unanswered questions about younger students and students who are considered at-risk. The studies targeting primary children – meaning students younger than fifth grade – are limited in these reviews, as well as studies focused on literacy outcomes. The amount of studies in grades kindergarten through third are even more absent from the literature. The subsequent review of literature discusses studies conducted with participants at various developmental levels and across a wide variety of academic content. There are a limited amount of studies focusing on literacy outcomes, as many growth mindset studies investigate outcomes in math, science, or psychological factors.

Some of the literature in this area focused on more generalized outcomes such as overall academic achievement, attitudes towards learning, and motivation. Allen (2018) provided three growth mindset training sessions to ninth and tenth grade Southeast Asian students. While this study saw a positive correlation between growth mindset and grit, there was no significant increase in academic performance following the intervention. Baldridge (2010) used the Brainology® intervention for a group of twelve ninth grade students with learning disabilities. The exploratory study took place over eight weeks, but results did not indicate a strong pattern of positive motivational change. Project Growing Minds consisted of three online modules that taught about incremental theory and 'growing your brain' (Burnette et al., 2018). Burnette et al. (2018) provided this intervention for 222 female participants in tenth grade from rural, low-income schools. Although the growth mindset condition predicted a stronger growth mindset with

significance, the intervention showed no significant effect on learning motivation, learning efficacy, or school belonging (Burnette et al., 2018).

Good et al. (2003) researched how teaching seventh graders certain messages could help them cope with stereotype threat. Students were encouraged to consider intelligence as malleable, or to attribute challenges to the uniqueness of a different school setting. Female participants in the treatment conditions scored significantly higher in standardized math scores than those in the control group, and all participants in the treatment groups scored significantly higher in standardized reading scores. Sarrasin et al. (2018) found a positive effect on motivation, achievement, and brain activity when teaching neuroplasticity to prompt a growth mindset. This intervention saw the most benefit for at-risk students, and in math achievement.

Yeager et al. (2016) explored revising and scaling up previous mindset interventions. Their study with 3,676 ninth graders from ten different high schools across the country found significant effects for improving core class grades of students who were previously considered low achievers. Vsetecka (2018) administered growth mindset lessons to middle school students and found significant improvement in academic achievement, attendance, attitudes toward learning, and assumptions about intelligence. Effort was a significant predictor of academic achievement. Growth mindset lessons had a strong impact on student grades as well as attitude toward learning and mindset. Orosz et al. (2017) conducted a study that posed an important question of whether mindset can change back to the state it was in pre-intervention. Their results showed that IQ and beliefs about growth mindset were more incremental for the treatment group at three

weeks after the intervention. However, at a follow-up measurement taken at the end of the school semester, the changes were not sustained, leading the researchers to view mindset beliefs as malleable (Orosz et al., 2017).

A few studies that were reviewed did focus on elementary-age students in terms of overall mindset and achievement. Stipek and Gralinski (1996) designed a study to examine the relationship between academic achievement and beliefs held by upper elementary students (third through sixth grade) about intelligence and effort, goal orientations, and learning strategies. Their findings suggested that a fixed perspective of intelligence was associated with beliefs that performance does not change often and that intelligence influences performance. These types of beliefs had a negative relationship with academic achievement. Solotruk's (2013) dissertation study explored the effects of after-school programming on third and fourth grade students considered at-risk. The program included mentoring, as well as direct instruction and homework assistance. Reading fluency and mindset improved for participants from pretest to posttest; however, mindset was not a moderator of assessment performance. The Dweck Mindset Scale was used to measure mindset, as well as a state assessment of language arts and literacy to measure fluency (Solotruk, 2013).

Two of the studies focused on younger students, in third grade. Third grade teachers were trained in one intervention, which yielded positive effects on teacher mindsets and practices, as well as positive effects on student mindset (Castiglione, 2019). Chao et al. (2017) taught third grade students about the brain in their mindset intervention. Ten one-hour lessons were used to help elementary students understand that

neural connections are formed when new things are learned, and that mistakes or obstacles provide learning and growth. The purpose of the study was to improve performance of low-achieving students by teaching the importance of effort to their learning and mastery of content. A customized performance measure and persistence measure were used. While persistence did help participants in this intervention, Chao et al. (2017) found that it was only effective for students who were high performers before the intervention, not for students who were low performers before, and only when autonomy was present. Their findings led them to consider that a growth mindset intervention may not naturally encourage positive achievement outcomes.

Growth Mindset in Math and Science

Some of the literature on growth mindset interventions researched effects in science achievement, both math and science, or a combination of all core academic subjects. Yeager et al. (2016) conducted a large study in which 7,501 ninth grade students read a scientific article about intelligence, generated a personal example of learning and getting better at doing something after practice, and participating in a "saying-is-believing" activity. In this type of activity, participants wrote their own reasons for why the information about the brain was relevant, which would be beneficial for later recall. Participants practiced how to respond during a difficult task (also beneficial for later recall) and communicated the messages they received to others (Yeager et al., 2016). This intervention was successful in decreasing fixed mindset, as well as participants' tendency to choose easy problems over challenging ones in a math task. Results were statistically significant (Yeager et al., 2016).

Paunesku et al. (2015) also conducted a large online intervention study, with 1,594 students across thirteen different high schools. Participants received growth mindset interventions and sense-of-purpose interventions, which helped students understand how working hard can help one reach goals that are beyond oneself (helping the larger society, etc.). Both interventions raised grade point averages in core academic subjects for students who were at risk of dropping out of high school (Paunesku et al., 2015). These two larger studies inform the field about how to conduct these interventions on a larger scale and help researchers to make generalizations due to much greater sample sizes.

Bifulco (2017) chose to look at the impact a growth mindset would have in a math classroom, specifically looking at ninth grade students who had previously been performing below benchmark in math. Participants were given three 40-minute sessions in an online format; they were taught about the flexibility of the brain, fixed and growth mindsets, and how these beliefs affect success in math and other areas. One of the goals of this study was to change students' opinions about learning and mathematics, and the online intervention brought about a significant difference between the beliefs of participants in the treatment condition and those who did not receive the intervention (Bifulco, 2017).

Blackwell et al. (2007) used more of the language of the implicit theories of intelligence, emphasizing incremental and entity theories rather than fixed and growth mindset. These two studies looked closely at how much these theories influenced math achievement for seventh grade students. The first study followed students entering middle

school, measuring and assessing their theories of intelligence at the onset and their academic outcomes. An incremental theory of intelligence (growth mindset) anticipated an ascendant trajectory over time, while an entity theory (fixed mindset) predicted a flat trajectory. The second study involved an intervention that taught incremental theory and the ability to 'grow the brain,' which significantly improved math grades, classroom motivation, and led to higher achievement (Blackwell et al., 2007). As was seen with many other studies (Baldridge, 2010; Brougham, 2016; Carvalho & Skipper, 2019; Clevenger, 2018; Donohoe et al., 2012; Rowe & Leech, 2019), Blackwell, Trzesniewski, and Dweck (2007) used Dweck's (1999) Theories of Intelligence Scale to measure student beliefs.

The MindsetMaker™ professional development program created by Mindset Works, Inc. (2017) was examined for its effectiveness in a study involving 25 math teachers and over 1,600 students in grades 6 through 12 (Seals, 2018). This dissertation study used a pretest-posttest experimental design to determine whether an online growth mindset intervention geared towards teachers would affect teacher beliefs and practices, as well as student motivation. There were minimal effects on teacher beliefs and practices, but significant gains ($p < .01$) for students in the growth mindset condition in math interest and mastery (Seals, 2018). Tecker (2017) explored teacher and student perspectives of the effectiveness of four different growth mindset instructional strategies as well as results in achievement following a teacher-led intervention. Conducted in sixth grade math classrooms, this study did not find any improvements in student achievement on the benchmark assessment. However, student grade point average did improve

compared to student grades from the previous school year. Also, teachers and students did rate two of the four growth mindset strategies highly: celebrating mistakes and providing difficult math tasks (Tecker, 2017).

Another study used story-based instruction to expand science learning in ninth and tenth grade classes (Lin-Siegler et al., 2016). The stories focused on how prominent scientists struggled intellectually and overcame mistakes with effort, or experienced struggles in their personal lives. There were two different conditions for the story-based instruction, but within both of them, students' science learning increased as compared to students in the control group. This learning was notably more pronounced for low-performing students (Lin-Siegler et al., 2016).

Rienzo et al. (2015) conducted the Changing Mindsets project, which measured academic progress in English and math. The project included one six-session intervention for Year 5 students on malleability of intelligence, and a second intervention that trained teachers on how to cultivate and reinforce growth mindset in their instruction. Students who participated in the mindset workshop sessions showed progress that placed them two months ahead of school benchmarks in English and math, but these results were not statistically significant. For teachers who received the professional development intervention, their students did not show any additional progress in math compared to students in the control group. They showed less progress in English than students in the control group; however, these results were not statistically significant, either. Although academic progress was not a significant outcome in this study, students whose teachers participated in the professional development intervention gained more understanding of

the flexibility of intelligence (Rienzo et al., 2015). This was an outcome in other studies as well, in spite of a lack of academic gains (Brougham, 2016; Castiglione, 2019; Rhew et al., 2018).

As stated previously, newer programs such as Brainology® are becoming more popular in mindset studies. Wilkins (2014) implemented the Brainology® program in a mindset intervention, as seen in some of the other studies found in this literature search (Donohoe et al., 2012; Baldridge, 2010; Rhew et al., 2018; Saunders, 2013; Schmidt et al., 2015). The researcher found no significant difference in student mindset, beliefs about effort, academic self-efficacy, and use of study skill strategies. There were no significant effects for math grades, but there were significant effects for science grades.

Schmidt et al. (2015) conducted a six-week intervention using the Brainology® program to target growth mindset in the daily experience of science classrooms for seventh and ninth graders. Results revealed that ninth grade participants of the mindset intervention experienced an increase in interest and sustained constant levels in skill and learning. Seventh grade participants did not indicate similar effects (Schmidt et al., 2015).

Some research points to effects within more specific populations of students, in terms of ability. Carvalho and Skipper (2019) established an online growth mindset workshop with 18 students who had special educational needs and/or disabilities. The online workshops were embedded into a Personal, Social, and Health Education (PSHE) curriculum, and strategies adapted from Mindset Works, Inc. were used in English classrooms. During initial post-testing immediately following the intervention, there was some suggestion of increased student support of growth mindset, more academic

resilience, and more positive attitude toward disability. However, these moderate results were not sustained seven weeks after the intervention (Carvalho & Skipper, 2019).

Clevenger (2018) focused on high-ability students in their survey study. The researcher analyzed the relationship between the growth mindset and grit of high ability students and academic achievement, but looked at students in grades 4 through 8. Results revealed that growth mindset and grit did not correlate significantly with academic achievement. In addition, results showed a significant correlation between self-regulation and reading achievement. The implications of this study recommended that elementary school teachers promote self-regulation in the classroom, flexibility of math intelligence, and instruction about neuroplasticity (Clevenger, 2018).

Growth Mindset and Reading Achievement

The purpose of this study is to examine how a growth mindset intervention impacts reading achievement in the early elementary classroom, specifically targeting vocabulary development and comprehension. Previous research offers some studies that examine growth mindset and literacy. Guich (2007) investigated first grade student beliefs, as emergent readers, about ability and reading self-concept, and how this relates to reading achievement. The Peabody Picture Vocabulary Test-Third Edition was used to measure receptive vocabulary, and the Comprehensive Test of Phonological Processing was used to measure phonemic awareness. Reading achievement was measured with the Woodcock-Johnson Tests of Academic Achievement-III. A moderate but negative correlation between fixed concept of ability and reading achievement suggested that first graders who believed intelligence was invariable had lower reading scores. Results also

revealed that reading self-concept had a strong positive correlation with reading achievement, and reading achievement was best predicted by how students perceived the difficulty of developing reading skills (Guich, 2007).

Law (2009) used questionnaires and reading comprehension tests to measure intelligence and ability beliefs, motivation, awareness of reading strategies, and reading proficiency for fifth graders. Reading comprehension was measured through two researcher-created tasks: one that assessed inferential comprehension and another that assessed summarization skills. These beliefs, motivation, and metacognitive awareness were found to be associated with reading comprehension. This study in Hong Kong signaled that students who viewed intelligence as tractable were more likely to be motivated to learn and to use various strategies when reading and extracting meaning. This would lead to higher rates of comprehension (Law, 2009). A study in Italy focused on third graders who experienced reading challenges in decoding and comprehension, and explored metacognitive training (Pepi et al., 2004). Some participants held an incremental representation of intelligence, while others held an entity representation of intelligence. The text comprehension assessment and decoding test were both customized measures. Posttests indicated that for children with an incremental theory of intelligence, there was significantly more improvement in reading comprehension (Pepi et al., 2004).

Petscher et al. (2017) found what is referred to as a global factor of growth mindset, along general mindset and reading-specific mindset. Their study sample was 195 fourth grade students. The Woodcock-Johnson III Tests of Achievement, Gates-MacGinitie Reading Test, and Test of Silent Reading Efficiency and Comprehension

were used to assess reading skills. Survey results found that the global factor of growth mindset and the reading mindset predicted word reading and reading comprehension. Global factor of growth mindset showed higher association with reading comprehension for students with weaker reading comprehension skills, and reading mindset showed a stronger association with reading comprehension for students with stronger reading comprehension skills. These findings indicate the importance of looking closely at general and reading-specific mindset and how they relate to reading (Petscher et al., 2017). Solotruk's (2013) dissertation study explored the effects of after-school programming on third and fourth grade students considered at-risk. The program included mentoring, as well as direct instruction and homework assistance. Reading fluency and mindset improved for participants from pretest to posttest; however, mindset was not a moderator of assessment performance (Solotruk, 2013).

Schrodt et al. (2019) led an intervention with kindergarten students, providing mindset training within Writer's Workshop in the classroom. The intervention took place over ten weeks, for a total of 30 hours of instruction. Participants were introduced to two characters who each embodied a mindset – all of the characteristics of a fixed mindset and those of a growth mindset. Schrodt et al. (2019) created a Growth Mindset Scale that measured student self-perceptions of the mindset they held, and a Growth Mindset task that allowed participants to choose to do something challenging, something easy, or to stop altogether. Schrodt et al. (2019) found large and significant effects for growth in basic and conceptual writing for the kindergarteners. The group that received the mindset

training showed significant improvement in motivation and persistence for difficult writing tasks (Schrodt et al., 2019).

One recent study that observed growth mindset in reading achievement did not find positive results. Saunders (2013) conducted a study with at-risk adolescent students using the Brainology® program. Participants were 30 sixth grade students who were considered struggling readers. The purpose of Saunders' (2013) study was to learn more about the mindset of this group of students, and to evaluate the impact this online intervention had on their reading achievement. Measures used were a Mindset Questionnaire, an Elementary Reading Attitude Survey, and a Reading MAP Test. The intervention had no significant results for impact. A focus group component did reveal, however, that students in the treatment condition considered Brainology® to have had a positive effect on how they viewed their own intelligence.

Andersen and Nielsen (2016) focused their study on a parent intervention. This randomized, controlled trial included 1,587 second grade students. The treatment condition in this study involved parents being given information and access to an online video. The video emphasized growth mindset and taught the parents that their child's reading ability could be improved, regardless of their current ability or level. It encouraged the parents to engage with their children in reading and provided strategies for this. The video also encouraged parents to praise effort from their children rather than performance (Andersen & Nielsen, 2016). The children of these parents – those who received the intervention – experienced large effects on reading and writing skills. Effects were largest for children whose parents believed, before the intervention, that reading

ability was a fixed trait. Andersen and Nielsen (2016) found statistically significant differences between language, text comprehension, and decoding.

Rowe and Leech (2019) also involved parents in their intervention study on growth mindset, early gestures, and vocabulary development. The researchers provided a parent gesture intervention to 47 parents of 10-month-old infants that included a growth mindset component. The Pointing to Success training program consisted of video with growth mindset messages, instructions for play time and pointing with the infants, as well as follow-up home visits. The purpose of the study was to investigate whether the intervention would increase parent use of pointing as a gesture, infant use of pointing, and vocabulary growth for the children (Rowe & Leech, 2019). For parents in the intervention group, the use of pointing had increased by the time the infants had reached 12 months of age, more than that of the parents in the control group. There was a significant effect on infant pointing as well. The intervention had no main effect on vocabulary, however, which was measured by the McArthur Bates Communicative Development Inventory. For parents who held fixed mindsets at the outset of the intervention, the effects on pointing were stronger, and those infants did experience more vocabulary growth from 10 to 18 months (Rowe & Leech, 2019). These two interventions suggest that parent interventions may be beneficial in developing growth mindset for students.

There is a growing body of research on growth mindset and its impact on student learning. However, there is also a lack of information about specific age groups and learning groups. More research is needed to answer the question about young learners

and how growth mindset benefits them. More research is needed that focuses on struggling readers or learners considered to be at risk. This risk may be due to learning challenges or to lower socioeconomic status and fewer resources.

Systematic Search of the Literature on Contextual Analysis

A systematic search was also conducted to locate previous research on contextual analysis. The initial search used the database PsycINFO and the search term *context clues*. This search yielded 135 results, and nine studies were collected. Three of these studies were dissertations. A second search was conducted using the databases PsycINFO and ERIC, with the search terms *context clues* and *vocabulary development*. This search yielded 289 results, and only five studies were collected. One study was a dissertation. A third search used the databases PsycINFO and ERIC as well, with the terms *contextual analysis* and *vocabulary development*. This final search yielded 40 results, and five studies were collected, including one dissertation. A reference search yielded three additional studies. Overall, 21 studies were collected and coded for research on contextual analysis. The criteria remained the same for this topic as well; only peer-reviewed intervention studies were included. Any studies that were focused on participants older than high school age were excluded. Because there were many more studies focused on adolescent participants – those in middle and high school – than students in elementary school, the following review covers a wide range of grade levels. However, a few studies did target students as young as second, third, and fourth grade.

Contextual Analysis Instruction

This study not only sought to investigate the impact of growth mindset for elementary age learners, but also sought to provide instruction in contextual analysis. Previous research explains why contextual analysis is a skill that is beneficial to learners to improve vocabulary acquisition. Wright and Cervetti (2016) noted that the focus has shifted from a constant expectation of direct instruction in word meanings to supporting students in using word-solving strategies. This is, in part, due to the requirement to learn so many words in school texts. The ability to use word-solving strategies may promote improved text comprehension and acquisition of word knowledge (Wright & Cervetti, 2016).

Fukkink and de Glopper (1998) conducted a meta-analysis of 21 interventions that taught and reinforced the skill of acquiring word meaning from context. The meta-analysis revealed a moderate effect size ($d = 0.43$), and statistical analysis revealed that instruction of using the clues was more effective than other instruction types or practice. This type of metacognitive instruction is shown to be effective for older elementary and middle school students (Fukkink & de Glopper, 1998). Participants ranged from eight years old (middle grades) to 15 years old (tenth grade), with the exception of one study that involved older participants from 17 to 30 years old. Twelve of the studies involved elementary students, ages 8 to 10. The studies involved five different types of experimental instruction. Students were taught how to recognize and use different types of context clues to determine the meaning of a new word. Cloze instruction was used by administering cloze tests. Strategy instruction was used to allow participants the

opportunity to develop general strategies for inferring word meanings without explicitly using types of clues. Definition instruction was used for students to develop an understanding of the concept of definition. The fifth method used was a practice-only approach, in which students received no further instruction (Fukkink & de Glopper).

A decent amount of the research in contextual analysis focuses on adolescent students in middle and high school classrooms. Schatz and Baldwin (1986) conducted studies in which 10th and 11th graders experienced either a context or no-context condition in order to evaluate how much context helps students infer meanings of new words. The no-context condition required students to read words in isolation, while the context condition required reading the same words embedded in passages. These studies revealed no significant effects for students based on context. Diakidoy (1998) designed a study for sixth grade students to better understand how reading comprehension impacts how readers gain word meaning from context. This was compared to nearness and directness of the context clues. Statistical analyses suggested that reading comprehension and prior knowledge aided students in learning vocabulary from context. However, the presence or absence of helpful context clues did not make a significant difference (Diakidoy, 1998).

A group of adolescents, some with language impairments and some without, benefited from receiving direct instruction on how to use context clue strategies to better understand novel words within single sentences (Ward-Lonergan et al., 1996). Steele (2015) conducted a study with elementary-age students with language learning disability (LLD), matched with students of similar age and with similar vocabulary skills. The

study investigated the effect of context position, rate of word presentation, and part of speech on determining word meaning. A high rate of presentation benefited students with LLD in their word learning, but there was no effect for position of the context clues (Steele, 2015).

Wysocki and Jenkins (1987) tested fourth, sixth, and eighth graders on their ability to use both morphological and contextual analysis to infer meaning of novel words. Student success with this task was influenced by prior knowledge of related words as well as efficiency of nearby sentence context. Sixth and eighth grade students performed better in using both morphological and contextual clues than fourth grade students (Wysocki & Jenkins, 1987).

In a recent study, İlter (2019) found that instruction using context clues was effective for struggling middle school readers in improving their overall vocabulary development by learning through context. Sixth grade students participated in this study that compared the effectiveness of teaching contextual analysis as a strategy to that of broader reading practices. Students in the treatment group were trained, using direct instruction, on how to use contextual analysis to determine the meaning of an unknown word (İlter, 2019). Students were given an assessment that measured their comprehension of the word meanings in context, and it revealed that students who received the intervention displayed more improvement in the vocabulary knowledge than students in the control group (İlter, 2019).

As this review delves into studies with younger and younger samples, it is possible to note the effects on older students compared to those in elementary classrooms.

Griffin's (2008) dissertation study measured the impact of task variability, density, and personal relevance on context clue learning (as well as motivation and engagement) for African American students in fourth and fifth grade. Participants were taught how to use context clue skills via problem solving strategies. Variability of task improved context clue learning significantly (Griffin, 2008). One study in particular did examine use of these skills in a classroom below third grade. Wise (2019) conducted a study that focused on younger children's development of contextual analysis skills. Second graders received a vocabulary intervention that taught four types of context clues: antonym, synonym, definition, and picture. The intervention had positive effects on participants noticing unfamiliar words, within informational text. There was no significant difference, however, between the intervention group and control group in participant skill of inferring meaning of the unfamiliar words from context (Wise, 2019).

Szymborski (1995) conducted a two-week study with fourth graders to determine which approach to vocabulary acquisition would provide the best results on an assessment – definition or contextual analysis. After posttests were given to two groups, results showed no significant difference between scores. A study with fifth graders also considered which instructional approach would provide better results. Jenkins et al. (1989) examined two approaches to vocabulary instruction: teaching specific word meanings and teaching how to glean word meaning from context. Results indicated that instruction in individual word meaning was effective for learning specific word meaning, while instruction in inferring meaning from context improved student ability to infer

meaning. In addition, deriving word meaning was more effective with higher amounts of practice (Jenkins et al., 1989).

Curtis (2008) studied fifth grade teachers and their students as they engaged in two types of word-learning strategies: socially mediated strategies and contextually-minded strategies (contextual and morphemic analysis). When assessed by proximal measures of researcher-developed vocabulary assessments, students from both conditions showed significant gains in vocabulary. Furthermore, students who received contextual-based instruction showed the highest gains. The distal measure (Gates-MacGinitie assessment) showed that only students who received the socially-mediated strategies of semantic mapping made improvements (Curtis, 2008). This study helped to confirm that direct vocabulary instruction will improve vocabulary acquisition, and that teaching contextual analysis improves vocabulary when students are assessed on the words taught.

In another study of fifth graders, Baumann et al. (2003) used direct instruction to teach fifth graders different types of context clues and how to use contextual analysis strategies. Students in the treatment group who were taught to use contextual analysis strategies outperformed other students on delayed measures of vocabulary. Two customized vocabulary tests and a customized comprehension test were used as assessments. They were able to use the strategies to infer word meanings within new contexts (Baumann et al., 2003). Similarly, in a study of third graders, Sampson et al. (1982) found that practicing a cloze procedure positively impacted reading comprehension. In this study, researchers used a cloze instructional center as one of the reading centers in a classroom over the course of 15 weeks. The cloze procedure is a tool

used in reading to complete a sentence, but also encourages the reader to use context clues. It helps to strengthen vocabulary development as well as reading comprehension. Students in the intervention group had to choose a creative answer to fulfill contextual requirements (Sampson et al., 1982).

Cain et al. (2003) conducted a study that focused on the ability of seven and eight-year old students to determine the meaning of new vocabulary words using narrative context. Participants were children with typically developing reading comprehension skills and children struggling with comprehension skills. The children were asked to read short stories that held an unknown word and to create a meaning for that new word (Cain et al., 2003). The Gates-MacGinitie Primary Two Vocabulary Test and the Neale Analysis of Reading Ability were given to determine comprehension skills. Results revealed that children with the weaker comprehension skills were not able to pull together information within a text and infer meaning, as compared to their peers. This task was particularly difficult for weaker comprehenders when the context clues were farther away from the unknown word (Cain et al., 2003).

In a later study, Cain (2007) investigated how explanation may help young readers with contextual analysis. This study also involved children who were seven and eight years old. Similarly, they were asked to read a story and define a word; however, in this study there were three different types of intervention sessions. One group of students was asked to explain their definition and were then given feedback on accuracy. A second group was given feedback and had to explain how the researcher knew the correct answer. A third group was only given feedback (Cain, 2007). The practice in these

sessions helped all participants, and the children in the first two groups experienced the most improvement in accuracy of word meaning (Cain, 2007). As more research has been conducted in recent years, and with changes to specific factors such as feedback or practice, it is likely that the evidence will begin to point to a firmer answer regarding the effectiveness of contextual analysis.

The current study is an extension of a pilot study that was conducted a year earlier in a classroom setting. The pilot study involved a growth mindset intervention with 61 first grade students, who were academically advanced and predominantly White. Participants either received vocabulary instruction, vocabulary instruction combined with growth mindset instruction, or regular reading instruction. Results of that study did not reveal any significant impact of growth mindset intervention on vocabulary development, but did reveal moderate effects on reading comprehension. Although the current sample was smaller, the current study explored intervention effects with a more diverse group of participants.

Study Purpose

After delving into the body of research on growth mindset interventions, it is evident that there is a shortage of information focusing on the youngest students in the classroom. There is also an overwhelming number of studies focusing on interventions in math, science, or overall achievement, as compared to interventions in reading. There were no studies that specifically examined embedding mindset instruction within a reading intervention. This background of studies helped to inform the questions asked in this study. Previous mindset programs that had already been used, age groups that had

been targeted, and characteristics such as ethnicity and learning ability were all considered. Growth mindset instruction may be beneficial to young students when learning to apply new and sometimes challenging metacognitive strategies for improving comprehension. Better understanding the role of mindset in early reading acquisition may be useful for developing effective interventions that support students' short-term persistence through a task as well as more long-term motivation for learning and reading.

The literature on contextual analysis is also limited in the younger age groups. The majority of studies in this area are not from most recent years. There is a clear need for updated, recent evidence with various age groups. This presents an opportunity for new interventions. The current study will add valuable and new information on growth mindset and its impact on vocabulary development. Specifically, the vocabulary component will contribute valuable information to the current body of research on the effectiveness of contextual analysis instruction for younger elementary students.

CHAPTER III: METHODOLOGY

Research Design

This study used a pre- and post-test control group design to investigate the effects of a growth mindset intervention on vocabulary development, reading comprehension, and persistence. This randomized control trial was used to ensure that any changes that took place in the experimental group in addition to any changes that took place in the control group could be ascribed to the presence of the growth mindset intervention. These changes would be reflected in the post-testing (Gall et al., 2003).

Two conditions, an experimental group and a control group, were used to answer the four research questions: 1) Do elementary students who receive a growth mindset intervention in addition to contextual vocabulary instruction learn more new vocabulary words than students who do not receive such instruction? 2) Do students who receive a growth mindset intervention achieve better comprehension than students who do not receive such instruction? 3) Do elementary students who receive a growth mindset intervention increase their perceptions of themselves as learners (as evidenced by scores on a mindset survey)? 4) Do elementary students who receive a growth mindset intervention increase their persistence (as evidenced by working through difficult vocabulary tasks)?

The intervention took place during the summer at three different summer program sites in the Middle Tennessee area. The intervention was led by a trained researcher and teacher. Doctoral students assisted in administering pre-assessments and post-assessments, and were trained before the intervention. Instruction took place over four

weeks, for a total of 7.5 hours. Participants received 30 minutes of vocabulary instruction two to three days a week, resulting in one hour or 1.5 hours per week, depending on the allotted time given at each program site. Participants received 30 minutes of growth mindset instruction two days per week, resulting in no more than one hour per week. Holidays and other program scheduling required days without intervention during the four weeks. There was an additional week of pre-testing before the intervention began, and a week of post-testing after intervention lessons concluded. All lessons were recorded by the researcher.

Fidelity

Checklists were created in order for doctoral students or other researchers to listen to recorded lessons and ensure fidelity of implementation of the lessons, as well as assessment administration. Doctoral students listened to 25% of the recorded growth mindset lessons and vocabulary lessons, which were randomly selected. A fidelity checklist was used that contained all of the components deemed essential to conducting the intervention. A 100% agreement was found in lesson implementation. Doctoral students also listened to 25% of recorded pre-test assessments and post-test assessments, which were also randomly selected. A 100% agreement was found in the administration of pre-tests and post-tests as well.

Participants

This study took place during the summer months and included 34 participants from three different community organizations in Middle Tennessee holding summer enrichment programs. Forty-one participants were expected at the outset of the

intervention, but inconsistency in attendance caused some attrition. The researcher recruited participants from all three program sites and received IRB-approved consent forms from the parents of participants, and IRB-approved child assent forms from the participants. All participants were rising second and third graders, who attended public schools. Ages ranged from 6 years, 11 months to 8 years, 9 months. The sample represented a range of reading levels and abilities, with many students who were struggling readers. The sample also represented a range in ethnicity as well as socioeconomic status.

Measures

The researcher administered all assessments to participants. Doctoral students assisted with administering the assessments and were trained in each of the measures by the researcher.

Peabody Picture Vocabulary Test, Fourth Edition (PPVT-IV). The PPVT-IV was administered to all participants at pre-test, to gather descriptive information about the sample and to understand more about the receptive vocabulary skills of participants. The PPVT-IV is a standardized test of receptive vocabulary named for participant ages 2 years, 6 months to over 90 years. It is individually administered and contains 228 items per form. Participants are given increasingly difficult words and asked to choose the picture (out of four) that best represents the word. The split-half reliability is reported as .94 and .93 for ages 7 and 8, respectively, and $\alpha = .97$. (Dunn & Dunn, 2007).

Test of Word Reading Efficiency, Second Edition (TOWRE-2). TOWRE-2 was used to measure students' word recognition and decoding skills. This measure is

individually administered and consists of two subtests, one consisting of real words (Sight Word Efficiency) and the other consisting of non-words (Phoneme Decoding Efficiency). The test is normed for participants aged 6 to 24 years and the reliability is reported using alternate forms immediate administration (SWE = .91, PDE = .92, TWRE = .95), test-retest same forms (SWE = .91, PDE = .90, TWRE = .93), test-retest alternate forms (SWE = .87, PDE = .87, and TWRE = .92), and interscorer differences (.99 for all scores) (Torgesen et al., 2012). The TOWRE was administered to all participants at pre-test to gather more information about the word reading and decoding skills of the sample.

Woodcock Reading Mastery Tests, Third Edition (WRMT-III). The WRMT-III is an individual assessment of strengths and weaknesses in a variety of reading skills that can be used for children and adults. The WRMT-III has been normed for individuals of age 4 to 79 years, with average reliability at .97 for the Total Reading Cluster (Woodcock, 2011). For this study, the Passage Comprehension subtest was used to measure participant comprehension as a post-test. Constraints on time and resources did not allow for pre-testing. This subtest contains 38 questions total, but is divided into several sections, according to and ascending by grade level. For the beginning, lower level questions, participants are shown a picture, and asked to fill in the blank with a word that fits best, similar to a cloze task. As the levels increase and the questions become more advanced, pictures are no longer present, and participants must use clues from the passage to determine the word that fits best. Once the participant answers four consecutive questions incorrectly, the test is discontinued and the participant does not

move on to the next section. The split-half reliability coefficients reported for ages 7 and 8 years on the Passage Comprehension subtest are .92 and .85, respectively.

Adapted Gates-MacGinitie Reading Test, Fourth Edition, Level 2. The Gates-MacGinitie Reading Test is a group-administered, reading survey test. Test levels range from Pre-Reading (PR) and Beginning Reading (BR) up to Adult Reading (AR). For this study, the comprehension subtest of Level 2 was used as a post-test only (due to time constraints), intended for second grade. Because the participants were rising second and third graders, this single Level 2 test was used to test all participants, rather than using two different tests for students in two different grades. The subtest contains 39 questions. Each question contains a very short story (two to three sentences), for which participants are asked to select a matching picture. The purpose of the test was to assess changes in comprehension. The test was adapted to a listening comprehension measure to ensure participants' word reading abilities were controlled for in assessing their comprehension. Based on information from program directors before beginning the intervention, many participants were believed to be struggling readers. The researcher read each question aloud to the group while the participants read along on their recording sheets. The reliability coefficient for this subtest was reported as $\alpha = .90$ (MacGinitie et al., 2007).

Customized Vocabulary Assessment. A customized, researcher-created vocabulary assessment was used to assess the vocabulary words students learned during the intervention. It was given as a pre-test and post-test to all participants. This measure contained 30 open-ended items in which the administrator asked the student to tell everything they knew about a particular word. The items on the assessment were the

same words that were introduced and learned during the vocabulary lessons. The definitions established and used throughout the intervention were used as the metric for scoring. An correct response was scored as 1, and an incorrect answer was scored as 0. Participants were expected to know very few or none of the words selected before instruction was provided. The researcher selected 30 vocabulary words from the books that were central to meaning in the text, likely to be outside the students' vocabulary lexicons, and represented academic words with high utility across disciplines (e.g., Beck, McKeown, & Kucan, 2002). The internal consistency for this measure was determined using Cronbach's alpha, as $\alpha = .86$ for the pre-test and .92 for the post-test. See Appendix A for an example of this measure.

Growth Mindset Scale I. The Growth Mindset Scale I is a researcher-created, customized questionnaire that measured students' level of growth versus fixed mindset. It described two characters: Spikey, who has a growth mindset and Jack, who has a fixed mindset. The questionnaire posed eleven different scenarios in which each character displayed the type of mindset he holds. The students chose which character they are most like in each scenario, responding to each scenario with a 0 (fixed mindset) or 1 (growth mindset). The first five scenarios were focused on vocabulary strategies (Example: *When Spikey sees a tricky new word in a book, he skips the word and keeps reading. When Jack sees a tricky new word in a book, he uses a strategy and keeps practicing to figure out the word. Who are you most like?*) The second set of scenarios was focused on mindset in general (Example: *Jack is not afraid to make mistakes because he knows they help him learn. Spikey does not like to make mistakes and gets upset if he does. Who are you most*

like?) This scale was administered to all participants after the intervention period was complete, as a post-test. Because participants would be introduced to the two characters during the growth mindset intervention, a pre-test was not given, to prevent pre-test sensitization. The Growth Mindset Scale was modeled after a survey used in Schrodt et al. (2019), in which growth mindset was measured during kindergarteners' writing workshop (see Appendix B). The reliability was adequate for this sample as measured by Cronbach's alpha for internal consistency, $\alpha = .81$.

Growth Mindset Scale II. The Growth Mindset Scale II is a second researcher-created questionnaire that measured student mindset. It is based on Dweck's (2000) Theories of Intelligence Scale and the Goal Orientation Scales created by Midgley et al. (1998). These two scales are publicly available and were modified by changing some of the language to make it more child-friendly, and combined into one document.

Example: *You can learn new things, but you can't really change how smart you are.*

I do my work in school because I want to get better at it.

The questionnaire contained 20 questions, to which students responded on a scale from 1 (Very true) to 5 (Not true at all). A lower score represented a growth mindset, while a higher score represented a fixed mindset. Some of the items were reverse coded to reflect this. A minimum total score of 20 indicated that a student held a growth mindset, and a maximum score of 100 indicated a fixed mindset. The Growth Mindset Scale II was given during the pre-test session as well as during post-testing. The researcher administered this both times by reading aloud the directions and each of the questions to

the participant. The student responded by circling their choice (see Appendix C). Reliability was determined using Cronbach's alpha, $\alpha = .60$ for the pre-test and .68 for the post-test.

Growth Mindset Persistence Task. The researcher created a customized vocabulary task that incorporated the context strategies taught to students during the intervention. It measured student persistence through the task. The task involved using context clues to determine the meaning of a new vocabulary word. After the first task, students had the choice of completing a more challenging vocabulary task, or stopping the task altogether. If the student chose a more challenging vocabulary task to solve, he/she was given the choice to keep going or to stop after each one that was completed. Each time a student completed a task, one point was given. There were eight opportunities total, meaning that the minimum score for this task was 0 and the maximum score was 8.

> Example: *The air balloon was almost there, when SPLAAAAAASH! The basket* ***plunked*** *into the water. But it didn't sink. The balloon kept it afloat.* What does *plunked mean?*
>
> *Would you like a more challenging vocabulary word to figure out or would you like to stop?*

This task was administered to all participants as a pre-test and as a post-test, and was also modeled after a challenge task used in Schrodt et al. (2019) (see Appendix D). Reliability for this measure as determined using Cronbach's alpha as $\alpha = .86$ for the pre-test and .92 for the post-test.

Customized Listening Comprehension Assessment. The study used a customized, researcher-created measure to assess participants' listening comprehension of narrative and expository passages in which the taught vocabulary words were embedded and the students' ability to use context clues to determine the meaning of new vocabulary words. The measure contains 3 passages, ranging from 123 to 156 words each, with 10 to 12 sentences each. Each passage contains 5-7 vocabulary words, which were the same vocabulary words taught during the lessons. The passages were followed by a combination of literal open-ended questions as well as multiple-choice questions about the meaning of each vocabulary word in context. The researcher read these passages and questions aloud for participants. There were 18 items total; correct reponses were scored with a 1 and incorrect responses were scored with 0. A minimum score on this measure was 0, and a maximum score was 18. The metric for correct responses was taken directly from the passages provided.

> Example: *A very long time ago, in **ancient** Egypt, people were buried in something called a **sarcophagus**. It was like a coffin that we use today.*
>
> *What does the word **ancient** mean in this passage?*
>
> *What is a **sarcophagus**?*

Knowledge of the target words were essential to answering the questions.This measure was administered as a post-test only, due to constraints on time and resources (see Appendix E). Internal consistency for this measure was determined using Cronbach's alpha, as $\alpha = .86$.

Procedures

Participants were randomly assigned to two conditions: Vocabulary Only, which included all participants (n = 19), and Vocabulary + Growth Mindset (n = 15). Stratified assignment was used to randomly assign students at each site. The Vocabulary Only group received a vocabulary intervention two to three times a week over the course of four weeks, for a total of 4.5 total hours. The Vocabulary + Growth Mindset group received this same vocabulary instruction two to three times a week, but received additional instruction in growth mindset. The growth mindset intervention took place two times a week over a four-week period, for a total of 3 intervention hours. Both the treatment group and the control group were divided into smaller groups, for management purposes. Each treatment group and control group was no larger than 10 participants at a time.

Vocabulary Instruction

The vocabulary instruction was a 30-minute session that followed a similar structure each time, based on strategies used by Baumann et al. (2003) and Puhalla (2011). The teacher began the lesson with an introduction of three new vocabulary words and gave the definition for these words. Each word was pulled from a children's book that the teacher read aloud to the group, selected from Beck, McKeown, and Kucan's (2002) Text Talk Books and Vocabulary Words. The read-aloud books are *Amos and Boris* by William Steig (2013a), *Beware of the Bears* by Alan MacDonald (1998), and *Brave Irene* by William Steig (2013b). The target words are *miserable, immense, leisurely, launched, gleeful, astonished, insisted, coaxed,* and *cherish.* While reading, the

teacher modeled how to use context clues to determine the meaning of the vocabulary word. Based on language from the "Vocabulary Rule," (Baumann et al., 2003; Ruddell, 1999) the teacher taught students directly that when encountering a new word that they did not know the meaning of, they could look at words around the "tricky" word for clues to help them figure it out.

> ***Context Clues*** *help me figure out what new or tricky words mean by allowing me*
> *to use the other words in the sentence. The other words are helpful* ***clues!***

Example: *I notice that before the word miserable, the sentence says, "And Amos, after one…" and after the word, the sentence says, "day of seasickness." Also, before and after the word miserable, the story talks about the boat doing well in the sea and Amos being a good sailor. But I know that seasickness is NOT a good thing and you usually feel pretty bad or uncomfortable when you are sick. And he had it for one day, in the middle of a lot of good days. So, these clues help me to understand that the word miserable means very unhappy or uncomfortable.*

Afterwards, students practiced identifying unknown words and figuring out the meaning of the word by using context clues. This practice was led by the researcher, while all participants read the same chapter book together. Vocabulary words were taken from the children's books, *Magic Tree House: Mummies in the Morning* (Lexile 500L) by Mary Pope Osborne (1992), *Magic Tree House: Fact Tracker: Mummies and Pyramids* (Lexile 740L), by Mary Pope Osborne, Will Osborne, and Sal Murdocca (2012), and *The Time Warp Trio: Tut, Tut* (Lexile 690L) by Jon Scieszka (2004). The texts that were used, as well as the opportunities to practice using context clues, ranged

from easy to more challenging over the course of the intervention. Over the four weeks of intervention, the students read from three different books on the topic of Ancient Egypt, mummies, and pyramids. A scope and sequence, including an example lesson plan, are included in Appendices F and G.

Growth Mindset Intervention

The growth mindset interventions were 25-30 minute sessions. Based on Dweck's (2006) theory of mindset, lessons were developed by the researcher. Resources from Ricci's (2015) *Ready-to-Use Resources for Mindsets in the Classroom*, as well as *Lesson Plans for Growth Mindset* (The NED Show, 2013) were used to guide the selection of books to be read aloud and activities for participants. Visual aids for participants were used from these resources as well, such as a representation of neurons forming connections in the brain. The teacher began each of the lessons with a read-aloud of a book that reinforced ideas about the brain and having a fixed and/or growth mindset. This read-aloud was followed by a group discussion of some aspect of growth mindset, such as learning from one's mistakes and not being afraid to challenge one's self. Students learned about how the brain grows and gets stronger when a person learns and practices something new. Students also learned what a growth mindset is, and what kind of language and habits to use to develop it (e.g., Instead of saying, *I can't do this,* try *I can't do this YET*). Each lesson concluded with a group or independent activity that reinforced the ideas of growth mindset (see lesson example in Appendix H). The texts that were used are *Your Fantastic Elastic Brain* (Deak & Ackerley, 2010); *The Girl Who Never*

Made Mistakes (Pett & Rubinstein, 2011); and *A Perfectly Messed-Up Story* (McDonnell, 2014).

CHAPTER IV: RESULTS

This intervention study used randomization and a pre-test, post-test control group design to investigate the effects of growth mindset instruction on vocabulary acquisition of young elementary school readers. The experimental study was approached using four research questions: 1) Do elementary students who receive a growth mindset intervention in addition to contextual vocabulary instruction learn more new vocabulary words than students who do not receive such intervention? 2) Do students who receive a growth mindset intervention achieve better comprehension than students who do not receive such intervention? 3) Do elementary students who receive a growth mindset intervention significantly increase their perceptions of themselves as learners compared to the control group (as evidenced by scores on a mindset survey)? 4) Do elementary students who receive a growth mindset intervention significantly increase their persistence compared to the control group (as evidenced by working through difficult vocabulary tasks)?

Pre-test Differences and Descriptive Information

Demographic information for the participants can be found in Table 1. Descriptive information on participants' scores, including means and standard deviations for pre-testing and post-testing can be found in Table 2. During pre-testing, 47% of participants (n = 16) scored at or below the 25th percentile on the PPVT-IV. Thirty-eight percent (n = 13) of participants scored below the 25th percentile on the TOWRE-2. Standard scores were used for all standardized measures. Independent samples t-tests were conducted to ensure group equivalence at the outset of the intervention, and to identify any pre-test differences.

Table 1

Demographic Characteristics of Participants

	Treatment			Control		
Characteristic	*n*	%		*n*	%	
Gender						
Female	8	53		11	58	
Male	7	47		8	42	
Grade						
Rising 2nd	8	53		9	47	
Rising 3rd	7	47		10	53	
Ethnicity						
Black	13	87		16	84	
White	2	13		0	0	
Latinx	0	0		2	11	
Multiracial	0	0		1	5	
Pre-test Reading Scores	*n*	*M*	*SD*	*n*	*M*	*SD*
PPVT-IV	15	92.73	10.30	19	91.21	16.80
TOWRE-2	15	100.87	13.23	17	87.82	15.53

Note. $N = 34$ ($n = 15$ for treatment group, $n = 19$ for control group).

Table 2

Means and Standard Deviations by Condition

Variable	Treatment Group					Control Group				
		Pre-test		Post-test			Pre-test		Post-test	
	n	*M*	*SD*	*M*	*SD*	*n*	*M*	*SD*	*M*	*SD*
GMRT	15	-	-	428.00	28.29	19	-	-	429.16	34.14
WRMT	15	-	-	95.67	11.49	17	-	-	97.00	14.13
Growth Mindset Scale I	15	-	-	9.73	2.05	19	-	-	8.37	2.69
Growth Mindset Scale II	15	54.27	8.87	47.92	10.95	19	55.37	11.97	54.07	11.24
Growth Mindset Task	15	1.93	1.10	2.62	2.33	19	2.42	2.22	1.77	1.92
Vocabulary Assessment	15	1.73	2.09	5.25	5.42	19	1.63	3.06	5.85	7.09
Comprehension Measure	15	-	-	10.00	3.61	19	-	-	9.79	5.38

Note. Standard scores are used for the WRMT, according to age. Extended Scale Scores are used for the GMRT. Scores for the Growth Mindset Scale I range from 0 (fixed mindset) to 11 (growth mindset). Scores for Growth Mindset Scale II range from 20 (growth mindset) to 100 (fixed mindset). The scale for Growth Mindset Task is 1 to 8. The scale for Vocabulary Assessment is 0 to 30, and the scale for Comprehension Measure is 0 to 18.

Homogeneity of variance assumptions were met for all pre-test measures, based on Levene's test for equality of variances. For PPVT-IV scores, there was no significant difference of means between the Vocabulary + Growth Mindset group ($M = 92.73$, $SD = 10.30$) and the Vocabulary Only group ($M = 91.21$, $SD = 16.80$); $t(32) = -0.31$, $p = .760$. For Total Word Reading Efficiency scores on the TOWRE-2, there was a statistically significant difference in the means between the Vocabulary + Growth Mindset ($M = 100.87$, $SD = 13.23$) and the Vocabulary Only group ($M = 87.82$, $SD = 15.53$); $t(30) = -2.54$, $p = .017$. The Vocabulary Only group held two outlier scores, which were removed after testing was completed (during scoring and analysis) due to noted lack of response during test administration. This was the only data point removed; all other scores for these participants remained. There was no difference between the means of the

Vocabulary + Growth Mindset group (M = 1.73, SD = 2.09) and the Vocabulary Only group (M = 1.63, SD = 3.06) on the Vocabulary Assessment pre-test, $t(32) = -0.11$, p = .913. There was no significant difference between the Vocabulary Only group (M = 2.42, SD = 2.22) and Vocabulary + Growth Mindset (M = 1.93, SD = 1.10) group in means of scores on the Growth Mindset Task pre-test, $t(32) = 0.78$, p = .443. No significant difference between the Vocabulary Only group (M = 55.37, SD = 11.97) and the Vocabulary + Growth Mindset group (M = 54.27, SD = 8.87) was evident on the Growth Mindset Scale II pre-test, $t(32) = 0.30$, p = .768. Excluding TOWRE scores, the groups were assumed to be equivalent on pre-test scores.

Attrition

Results of the current study may have been affected by attrition of participants. While 41 students were expected to participate in all pre-testing, intervention lessons, and post-testing, seven students did not complete the study, leaving an attrition rate of 17%. Two students verbally notified the researcher that they no longer wanted to participate. Four students missed more than 50% of the intervention lessons and were absent during the week of post-testing. One student was removed from their summer program due to disruptive behavior.

Of these seven students, six of them had been randomly assigned to the treatment group, and only one of these participants had been randomly assigned to the control group at the outset of the intervention. An independent samples t-test for equality of means was conducted for all 41 participants, before any students were removed. The t-test compared the groups on PPVT scores, TOWRE scores, Vocabulary Assessment pre-

test scores, Growth Mindset Task pre-test scores, and Growth Mindset Scale II pre-test scores. Levene's test of equality of variances indicated that all assumptions were met. This analysis found no significant differences between means of the treatment group scores and control group scores on any of the pre-test measures.

Intervention Effects

To analyze the main effects of the growth mindset intervention on the variables vocabulary knowledge, comprehension, self-perception, and persistence, analyses of variance were used for each of these outcomes. The Gates-MacGinitie Test and the Customized Comprehension Measure both assessed listening comprehension, while the WRMT measured reading comprehension. Growth Mindset Scales I and II tested self-perception, and the Growth Mindset Task tested persistence. For measures on which there was a corresponding pre-test, ANCOVAs were conducted and the pre-test was used as the covariate. Because there were significant differences between the two groups in TOWRE scores, these scores were controlled for and used as a covariate during ANCOVA analysis of outcomes for which there were word reading components, which included the reading comprehension measure. For other measures that were only administered as a post-test, ANOVAs were used.

Research Question 1: Vocabulary Results

Customized Vocabulary Assessment. To determine the effect of Vocabulary + Growth Mindset instruction on the outcome of vocabulary development, an ANCOVA was used with the Vocabulary Assessment pre-test as the covariate. The analysis also controlled for PPVT scores, as this was another measure of vocabulary skill. Levene's

test of equality of error variances showed no statistically significant differences. The Vocabulary + Growth Mindset group (M = 5.25, SD = 5.42) and the Vocabulary Only group (M = 5.85, SD = 7.09) did not significantly differ from one another on the vocabulary post-test [$F(1, 30) = 0.34$, $p = .565$]. In this model, the vocabulary pre-test covariate had a significant effect on the outcome, $p < .001$, and the PPVT scores were a significant covariate as well, $p = .004$. An effect size was also calculated for this outcome to further determine the extent of any practical difference between the two groups, g = -0.09, representing the lower performance of the Vocabulary + Growth Mindset group. Hedge's g was used to calculate all effect sizes, to account for the difference in sample size between the two groups.

Research Question 2: Comprehension Results

Customized Listening Comprehension Measure. The homogeneity of variances was met before conducting an ANOVA for the comprehension outcome. The Vocabulary + Growth Mindset group (M = 10.00, SD = 3.61) and the Vocabulary Only group (M = 9.79, SD = 5.38) were not statistically significantly different from each other [$F(1, 32) = .02$, $p = .897$]. A small effect size for the comprehension outcome was found at $g = 0.04$, in favor of the higher performance of the Vocabulary + Growth Mindset Group.

Adapted Gates-MacGinitie. The Levene statistic confirmed that variances were equal for the Gates-MacGinitie scores. This measure was adapted as a listening comprehension measure also. ANOVA revealed that the Vocabulary + Growth Mindset group (M = 428.00, SD = 28.29) scores did not significantly differ from scores of the Vocabulary Only group (M = 429.16, SD = 34.14) on the Comprehension subtest of the

Gates-MacGinitie Reading Test, [$F(1, 32) = 0.01$, $p = .916$]. A small effect size was found, $g = -0.04$, representing the lower scores of the Vocabulary + Growth Mindset group.

WRMT, Passage Comprehension Subtest. This measure was used as a reading comprehension test. Participants' ability to read words (as done on the TOWRE) was considered to have an impact on performance during the WRMT administration, so TOWRE scores were used as the covariate. Levene's test indicated that equality of variances was met for this measure. The ANCOVA for the Passage Comprehension subtest of the Woodcock Reading Mastery Test showed no statistically significant difference between the Vocabulary + Growth Mindset group ($M = 95.67$, $SD = 11.49$) and the Vocabulary Only group ($M = 97.00$, $SD = 14.13$), [$F(1, 29) = 0.12$, $p = .731$]. The covariate for this measure was significant, however, at $p = .000$. This outcome produced an effect size of $g = -0.10$, indicating lower performance of the Vocabulary + Growth Mindset group.

Research Question 3: Self-Perception Measures

Growth Mindset Scale I. To learn more about the impact of the growth mindset intervention on the outcome of self-perception, the Growth Mindset Scale I scores were analyzed using ANOVA. This questionnaire measured participant mindset according to their self-identification as more similar to a character that held a fixed mindset or a character that held a growth mindset. On the Growth Mindset Scale I post-test, the Vocabulary + Growth Mindset group mean ($M = 9.73$, $SD = 2.05$) was higher than the mean of the control group ($M = 8.37$, $SD = 2.69$), but not significantly so [$F(1, 32) =$

2.64, $p = .114$]. An effect size was found for this outcome, $g = 0.55$, which reflects potential practical gains for the Vocabulary + Growth Mindset group.

Growth Mindset Scale II. ANCOVA was conducted to determine the difference between the two groups in terms of the self-perception outcome, using the pre-test as the covariate. Equality of variances were met according to Levene's test. There was no significant difference between the Vocabulary + Growth Mindset group ($M = 47.92$, $SD = 10.95$) and the Vocabulary Only group ($M = 54.07$, $SD = 11.24$), [$F(1, 31) = 3.29$, $p = .080$]. The effect size for this outcome was found at $g = 0.56$, which also reflects potential practical gains for the Vocabulary + Growth Mindset group.

Research Question 4: Persistence

Growth Mindset Task. ANCOVA was conducted to understand more about the impact of the growth mindset intervention on persistence as an outcome. The two groups were compared on the Growth Mindset Task post-test, using the Growth Mindset Task pre-test as the covariate. All assumptions were met before conducting this analysis. The Vocabulary Only group ($M = 1.77$, $SD = 1.92$) and the Vocabulary + Growth Mindset ($M = 2.62$, $SD = 2.33$) group were not statistically significantly different from each other in mean scores, [$F(1, 31) = 1.42$, $p = .243$]. The covariate did not have a significant effect on the outcome. An effect size was calculated for this outcome, $g = 0.40$, indicating performance in favor of the Vocabulary + Growth Mindset group.

CHAPTER V: DISCUSSION

The purpose of this intervention study was to examine the effect of a growth mindset intervention on the vocabulary acquisition, reading comprehension, self-perception, and persistence of young students. Specifically, the study sought to investigate whether students who received a growth mindset intervention in addition to regular vocabulary instruction would make greater gains in vocabulary development, using contextual analysis strategies. The hypothesis anticipated an increase in all stated outcomes. This chapter will discuss the support or rejection of hypotheses, implications for best practices, limitations of the intervention, and directions for future research.

Vocabulary Development

The first research question asked whether rising second- and third-grade students who receive a growth mindset intervention in addition to contextual vocabulary instruction would learn more new vocabulary words than students who do not receive such intervention. Results from this pre-test post-test intervention study revealed that students who received the intervention did not learn more vocabulary words than students who did not receive the intervention. There was no difference for students in vocabulary development whether they received the additional intervention or not. Furthermore, students in the Vocabulary Only group learned more words on average than students who received the growth mindset intervention.

The small effect size of this outcome further reinforces that there is essentially no practical significance to the influence of growth mindset instruction on vocabulary acquisition, under conditions similar to those in this study. However, the vocabulary

measure may have been a limitation. The students were not expected to know any of the vocabulary words before intervention, but did not gain many more words. In addition, the measure did not test use of context clue strategy, as students were trained to do in the intervention. The measure simply assessed whether students learned the words taught to them and discussed while reading during vocabulary instruction.

A notable outcome of statistical significance was seen in the pre-test measures. While PPVT scores between the two groups were more similar, the TOWRE score differences were much larger. This conveys important information about the reading skills of the group before the intervention began. Rather than measuring receptive vocabulary, the TOWRE asked participants to read sight words and to decode nonsense words. Several participants performed poorly in this area, particularly in the control group which held some of the lowest scores.

Although Schrodt et al. (2019) found significant results with writing outcomes for kindergarten students after a growth mindset intervention, the findings on vocabulary and comprehension outcomes in the current study are not in agreement. The age groups and some components of the research design are similar, but some of the limitations in this study may have prevented favorable results. The hypotheses for both the Schrodt et al. (2019) study and the current study expected positive effects on student achievement following growth mindset instruction. The current study is in agreement with the research of Saunders (2013). The intervention used in the research of Saunders (2013) did not have any impact on reading achievement, but participants believed a growth mindset program did positively affect their views about intelligence. The customized mindset

scale in the current study is the measure that showed the largest effects, which is a reflection of participant views on intelligence, talent, and ability.

Comprehension

Research question 2 referred to students receiving a growth mindset intervention and achieving better comprehension than students who did not receive the intervention. The hypothesis that students would improve comprehension was not supported in this study. There was no significant difference on any of the measures used between students who received a growth mindset intervention and students who did not, in improving comprehension skills. Although it was not significant, participants in the Vocabulary Only group performed better than students in the Vocabulary + Growth Mindset group on the two standardized measures. Two of the comprehension measures used targeted listening comprehension as the tests were read aloud to students. The WRMT was the only measure that explicitly required participants to read independently. No part of the test was read aloud to participants, as was done on the customized measure and the GMRT.

The small (and negative) effects from the WRMT and the GMRT suggest that there is no practical significance to the relationship between growth mindset and comprehension skills. The Passage Comprehension subtest of the WRMT is a cloze procedure test, requiring students to use contextual analysis skills. This is the skill that was taught explicitly during vocabulary instruction. It is noteworthy that the students in the Vocabulary Only group performed better on this task, and gives reason for further investigation. The pilot study that was conducted and described previously found similar

results for vocabulary outcomes – no significant differences in vocabulary learning – but did find moderate effects on comprehension for the treatment group. As discussed in Elleman et al. (2009), previous research has found that vocabulary instruction has improved reading comprehension more so on customized measures, but not as much as standardized measures. In the current study, students in the Vocabulary Only group performed better on two out of three comprehension measures than students in the Vocabulary + Growth Mindset group, which were two standardized measures. Growth mindset did not help students to perform better on comprehension outcomes. The results of the pilot study and the current study suggest that future research may find additional and helpful information about any connection between reading comprehension and growth mindset.

The results found here do not align with the findings of studies such as Pepi et al. (2004), Law (2009), and Petscher et al. (2017). These studies all discovered improvements in reading comprehension in relation to growth mindset or an incremental theory of intelligence. The current study differs because of the implementation of an intervention and an even younger sample, but still did not see better comprehension. Petscher et al. (2017) highlighted the importance of examining a mindset that is specific to reading, which may have been more beneficial to seeing significant differences in reading skills such as comprehension or vocabulary growth. This is a distinction to consider for future research.

Self-Perception and Persistence

Research question 3 asked whether rising second and third graders who receive a growth mindset intervention would increase their perceptions of themselves as learners. Data analysis indicated that these young students did not experience an improvement in their self-perception overall. One of the Growth Mindset scales (Growth Mindset Scale I) focused on how participants viewed themselves in terms of having a growth or a fixed mindset. The second growth mindset scale focused on a more general attitude about the participants' learning and ability to increase their intelligence and ability. The treatment group scored lower on this scale – meaning that participants held more of a growth mindset and the *p* value for this outcome was the closest to a level of significance. These two measures of mindset yielded the largest effects in the study, and specifically in favor of the Vocabulary + Growth Mindset group. The effect size of the impact of growth mindset on self-perception indicates a possible practical and meaningful relationship.

The final research question referred to elementary students receiving a growth mindset intervention and increasing their persistence. The hypothesis that rising second and third graders would increase their persistence, evidenced by working through difficult tasks, was not supported in this study. Based on the evidence of this study, there is no significant relationship between growth mindset and persistence. Findings from the previous pilot study indicated that growth mindset intervention had little influence on increasing student persistence. The current study did not reveal significance in this area, but the effect sizes were larger in this trial. The results in the current study also come with a smaller sample size. Schrodt et al. (2019) found significant and large effects on

motivation and perseverance for writing of kindergarten students. This difference in results may be due to the length of the intervention in the Schrodt et al. (2019) study. Their intervention was much longer, at 30 hours of instruction over 10 weeks. This likely allowed students ample time to learn and practice growth mindset strategies. There were also different outcomes examined, as the current study looked at vocabulary and comprehension, as opposed to writing achievement.

The current findings indicate that growth mindset intervention may not be effective when trying to transfer the skills and habits developed in the intervention to reading skills such as vocabulary or comprehension. This aligns with the meta-analytic research done by Sisk et al. (2018) that also produced small effect sizes for growth mindset interventions and their impact on academic achievement. Previous studies have seen outcomes of improvement in variables such as attitude toward learning, motivation, and beliefs about intelligence (Allen, 2018; Burnette et al., 2018; Chao et al., 2017; Sarrasin et al., 2018; Vsetecka, 2018). Specifically, Allen (2018) found more of a relationship between growth mindset and grit, with no increase in academic outcomes. Chao et al. (2017) pointed out in their research that growth mindset interventions did not intrinsically foster desired academic achievement results. A sense of autonomy was needed.

Similarly, a possible limitation of this study is important to note. Students were not taught specifically how to use growth mindset when working through vocabulary words only, but were taught more general growth mindset strategies. More time was spent on modeling how to determine the meaning of vocabulary words with contextual

analysis during the vocabulary instruction time. A goal of the research was for students to transfer these general growth mindset strategies to other any and all academic areas, including vocabulary work. However, students likely needed more guidance and direct modeling of using a growth mindset while working through vocabulary words.

Self-perception and persistence were the outcomes that yielded the largest effect sizes in the current study for the treatment group. Current results point to the possibility of a relationship between growth mindset and self-perception, and a lack of relationship between mindset and academic achievement, similar to the results of previous studies. Burnette et al. (2018) found that a growth mindset condition anticipated a stronger growth mindset, and Vsetecka (2018) saw improvement in attitudes about learning as well as beliefs about intelligence. The growth mindset intervention could simply be more effective for teaching and developing persistence and positive self-perception.

It is important to consider possible explanations as to why participants in the control group performed better than the treatment group in almost all reading outcomes (vocabulary, listening comprehension and reading comprehension). The two groups were different from one another in word-reading skills, which may have contributed to threats to internal validity, such as testing, statistical regression, or differential attrition (Gall, Gall, & Borg, 2003). On measures that were given as pre-tests (Vocabulary Assessment, Growth Mindset Scale II), students may have been affected by their experience with that test. For students who scored particularly low on these measures, there may have been more room for improvement for students in the control group. Most of the students in the

attrition group had been assigned to the treatment group at the start of the intervention. Their attrition from the study may have affected results.

Implications

It has become evident how the current study coincides and contrasts with prior research on growth mindset and its relationship to academic achievement as well as learning attitudes and beliefs. This research adds a worthwhile perspective to the existing literature because it focuses on the younger elementary grades two and three, which is not studied as much as middle and high school classrooms. The background of the students involved also adds a layer of information. As stated by Sisk et al. (2018), future research that focused on at-risk students would be insightful. The students in this sample were more diverse than in the pilot study and considered at-risk, which is evidenced by their participation in the summer programs offered in their communities.

A review of the literature emphasized the gaps in the research on growth mindset and reading achievement according to specific age groups and learning groups. It emphasized a need for further information on how growth mindset benefits (or does not benefit) young learners. This study sought to answer a few of these questions for second and third graders and for students who may have more difficulty with reading and achieving academic success. These results can be generalized to students entering second and third grade, particularly those who are spending time in summer day programs, similar to the Boys & Girls Club. They can likely be generalized to a range of readers from average to those who are performing below expected benchmarks.

There may be practical implications for the elementary school classroom based on this research. The results do not allow for any conclusions to be made about the effectiveness of growth mindset teachings on reading achievement, specifically in vocabulary and comprehension skills. These findings imply that teaching growth mindset in the classroom may not make differences across some vocabulary and comprehension outcomes in how students perform in reading. However, teaching growth mindset may still be advantageous for students in more general ways. Students may develop stronger and more positive views of themselves as learners and about learning in general, but this would need to be investigated in future research. There is potential for this to manifest within and outside of the classroom.

Limitations and Future Research

There are possible limitations that may have affected the findings of this intervention study. One major limitation was the small sample size. Conducting this intervention during the summer months, at summer program sites, was not conducive to maintaining a large number of participants. The individual sites did not serve a great number of young elementary students in their programs, and recruitment of families and children for participation was challenging. Throughout the summer, inconsistent attendance prevented some of the student data from being analyzed. The time frame of the intervention was also a limitation. While it may be expected that summer days will allow for longer intervention lessons and a longer intervention period overall, summer programs follow daily schedules that are not unlike school days in their structure. During the day, students were involved in various commitments (e.g. art class, field trips,

lunchtime) that did not allow for unlimited vocabulary and growth mindset lessons. These lessons typically occurred during a designated academic time. The researcher also traveled to two or all three of the sites each day. With six weeks allowed for the entire intervention, only four of those weeks were focused on instruction. Again, the overall summer schedule of each site dictated how long the intervention period could last. Additional time may make a great difference in future research, for better performance from students receiving the intervention.

The generalizability of the study results can also be considered a possible limitation, due to some selection bias. It is important to note that the parents of the participants were willing and able to send their children to each of the summer programs. Consequently, results cannot be generalized to any and all rising second and third grade students, only to students in similar contexts. The lack of vocabulary modeling during growth mindset lessons is a final limitation in this study. Spending some time during the growth mindset instruction to model for students or guide them in using the strategies to specifically solve difficult vocabulary words may have impacted the results positively.

The direct modeling is a component of the intervention that is necessary for future studies that may investigate growth mindset. It may be more useful to provide students with direct and specific instruction on the skill being targeted through growth mindset, rather than only incorporating a general approach and use of strategies. This is particularly important if future studied continue to focus on younger students. This is still an area that needs further exploration, as the body of literature in middle and high school grades is predominant. Future research should also investigate the use of a specific

mindset, such as a reading-specific mindset, more closely as the target of intervention. This may yield more promising results in the field of growth mindset and reading achievement. Noting the limitations in the current study, a longer intervention period with a much larger sample size is essential to future research in this topic. For example, Schrodt et al. (2019) found significantly large effects after implementing 30 hours of instruction. The potential of a study that would incorporate many hours of instruction combined with participant number over 100 is favorable.

The range of reading levels is a component that should still be considered in future research. A focus on struggling readers solely will also add valuable information about growth mindset and its effectiveness. While ethnicity was not a factor in the research questions of this study, it is another variable for consideration in future studies. The vast majority of participants in this study were Black students, so it is possible to generalize results to second and third graders in this population. Ethnicity may have been important in results, but would need further investigation as to how much of an impact it has on the outcomes.

Conclusion

The purpose of this experimental study was to answer research questions about the effect of growth mindset instruction on vocabulary growth, reading comprehension, persistence and self-perception in second and third grade students. Findings confirmed that there was no statistical difference in vocabulary growth and reading comprehension between students who received growth mindset instruction and students who did not receive such instruction. While there was no significant difference between groups of

students in their development of positive self-perception, it was noted that moderate effect sizes were seen only in this outcome. Therefore, there is a possibility that growth mindset teachings may be able to help younger elementary students view themselves positively as learners.

This study sought to help fill in some of the gaps in the research about young, at-risk students and the relationship between their attitudes about learning and their academic achievement. Hopefully, the information presented here has helped to highlight additional knowledge around motivation and student success.

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APPENDICES

APPENDIX A: Vocabulary Assessment

Student Name: _____ Date: _____

DIRECTIONS: **I'm going to ask you about some words, and I want you to tell me what you think each word means. If you aren't sure, or don't know, just say "I don't know."**

Record the student's response under each question.

1) What does the word *perched* mean?

2) What is a *procession*?

3) What is a *mirage*?

4) What is a *chamber*?

5) What does the word *gazed* mean?

6) What is a *sarcophagus*?

7) What is a *torch*?

8) What is a *scepter*?

9) What are *passages*? (If student gives meaning related to paragraphs or reading, ask if he/she knows any other meaning)

APPENDIX B: Growth Mindset Scale I

Growth Mindset Scale I
Based on Schrodt et al (2019) Literacy and Writing Motivation Scale

Student Name: _____ Date: _____

Read about Spikey and Jack in each question. Are you most like Spikey or Jack? Think hard about what you would really do. When you decide which one you are most similar to, circle their name. Read all of the questions and choose only one person, Spikey or Jack.

Vocabulary

1. When Jack comes to a new word in a story and doesn't know what it means, he tries some strategies and uses clues to help him figure out the meaning of the word. When Spikey comes to a new word in a story, he asks the teacher what the word means. Who are you most like?

   Spikey (0) Jack (1)

2. When Spikey sees a tricky new word in a book, he skips the word and keeps reading. When Jack sees a tricky new word in a book, he uses a strategy and keeps practicing to figure out the word. Who are you most like?

   Spikey (0) Jack (1)

3. When Jack is reading and figures out the meaning of a new vocabulary word, he checks with the clues around the word and knows he figured it out correctly. When Spikey sees a new word, he guesses what it means and keeps reading. Who are you most like?

   Spikey (0) Jack (1)

4. When Spikey sees a new vocabulary word, he thinks he can only learn what it means if he asks a friend. When Jack sees a new vocabulary word, he knows he can figure it out on his own by using strategies he has learned. Who are you most like?

   Spikey (0) Jack (1)

5. Jack gets excited when he comes to a big, difficult word in a book that he has never seen before. He likes to be challenged and try to figure out what it means.

Spikey gets frustrated when he comes to a hard word in a book and gets stuck because he doesn't want to try to figure it out. Who are you most like?

Spikey (0) Jack (1)

Mindset

6. Jack likes to learn new things and try things that are challenging to him. Spikey likes to do things that he already knows how to do and that are easy for him. Who are you most like?

   Spikey (0) Jack (1)

7. Jack is not afraid to make mistakes because he knows they help him learn. Spikey does not like to make mistakes and gets upset if he does. Who are you most like?

   Spikey (0) Jack (1)

8. When Jack finishes his work, he always chooses to do something else that might be hard for him to figure out. When Spikey finishes his work, he tells the teacher and doesn't do anything else. Who are you most like?

   Spikey (0) Jack (1)

9. Jack thinks school is most fun when he learns how to do something that was hard for him at first. Spikey doesn't like to go to school when things are hard. Who are you most like?

   Spikey (0) Jack (1)

10. When Spikey sees his friends doing something that is new and looks hard, he doesn't want to join in because he doesn't want his friends to see him make a mistake. When Jack's friends are doing something that he has never done before, he is excited about trying something new. Who are you most like?

    Spikey (0) Jack (1)

11. During math work time in school, Jack likes to try a lot of different strategies to solve a problem. If he gets the answer wrong the first time, he enjoys trying to solve the problem again in a different way. When Spikey is doing his math work, he just likes to quickly figure out the answer and write it down. If he gets it wrong, he does not want to try again a different way. Who are you most like?

    Spikey (0) Jack (1)

APPENDIX C: Growth Mindset Scale II

Growth Mindset Scale II
Based on Theories of Intelligence (Dweck, 2000) and Goal Orientation Scales (Midgley, et al., 1998)

Directions: Read each statement and circle the response that tells how true it is to you.

1	**2**	**3**	**4**	**5**
Very true	**A little true**	**I don't know**	**A little untrue**	**Not true at all**

1. You can't really change how smart you are.

1 2 3 4 5
Very true Not true at all

1 No matter who you are, you can change how smart you are, by a lot.

1 2 3 4 5
Very true Not true at all

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

1 2 3 4 5
Very true Not true at all

3 No matter how smart you are, you can always change that.

1 2 3 4 5
Very true Not true at all

4 I like schoolwork that I will learn from, even if I make a lot of mistakes.

1 2 3 4 5
Very true Not true at all

APPENDIX D: Growth Mindset & Vocabulary Challenge Task

Student Name: _____ Date: _____

Task 1.0

Use the context clues to figure out the meaning of the word *plunked*.

The air balloon was almost there, when SPLAAAAAASH! The basket **plunked** into the water. But it didn't sink. The balloon kept it afloat. Coerr & Croll, The Big Balloon Race
What does *plunked* mean?

Choose the challenge: Ask the student, *would you like a more challenging vocabulary word to figure out or would you like something just as easy?* If the student wants a more challenging task, move on to Task 2.0. If not, tell the student that he/she is finished.

Task 2.0

Use the context clues to figure out the meaning of the word *jolt*.

The men let go of the ropes. With a **jolt**, the air balloon took off. Coerr & Croll, The Big Balloon Race
What does the word *jolt* mean?

APPENDIX E: Comprehension Measure

Read the passage and answer the questions below. Write your own answer on the lines. If there are choices, choose the answer that you think fits best.

A very long time ago, in **ancient** Egypt, people were buried in something called a **sarcophagus**. It was like a coffin that we use today. The rulers of ancient Egypt were called **pharaohs**. Pharaohs in Egypt showed that they had power by holding something called a **scepter**. Some pharaohs ordered huge structures to be built, called pyramids. A Great **Sphinx** was also built to protect the pyramids. The sphinx had the body of a lion and the head of a human. In 1779, a soldier discovered a stone covered with ancient writing on it. The writing was a language of symbols called **hieroglyphs**. Egyptians drew hieroglyphs to leave a message on walls. The walls were deep down inside of a place that was dark, and old, and kind of secret, called a **tomb**. This was also a place where people were buried.

Adapted from *National Geographic Kids: Ancient Egypt* (Drimmer, 2018)

1. What does the word **ancient** mean in this passage?

_____

2. What is a **sarcophagus**?

_____

_____

3. Who were the **pharaohs**?
    a. People who lived in Egypt
    b. The rulers of ancient Egypt
    c. Places where people were buried
    d. People who protected pyramids

4. What was a **scepter** used for?

_____

APPENDIX F: Vocabulary and Growth Mindset Lessons

Scope and Sequence

Week 1-2

Vocabulary Lesson 1
Amos and Boris – **miserable, immense, leisurely**
Mummies in the Morning – Chapter 1

Growth Mindset Lesson 1
Introduction: *Your Fantastic Elastic Brain*

Vocabulary Lesson 2
Beware of the Bears – **launched, gleeful, astonished**
Mummies in the Morning – Chapters 2-4

Growth Mindset Lesson 2
Define growth mindset/fixed mindset: *The Girl Who Never Made Mistakes*

Vocabulary Lesson 3
Brave Irene – **insisted, coaxed, cherish**
Mummies in the Morning – Chapters 5-8

Week 3-4

Vocabulary Lesson 4
Extraordinary Egg – **impress, triumphant, extraordinary**
Magic Tree House Fact Tracker: Mummies and Pyramids – Chapters 1-2

Growth Mindset Lesson 3
Using growth mindset language

Vocabulary Lesson 5
Jamela's Dress – **clutching, cross, radiant**
Magic Tree House Fact Tracker: Mummies and Pyramids – Chapters 3-6

Growth Mindset Lesson 4
How can a growth mindset help us learn more?

Vocabulary Lesson 6
Metropolitan Cow – **fortunate, dignified, rambunctious**
The Time Warp Trio: Tut, Tut – Chapters 3-8

APPENDIX G: Vocabulary Lesson 1

Lesson 1 – ***Amos and Boris***

Introduction: **Over the next two weeks, we will be reading some stories and learning about how to figure out the meaning of new vocabulary words in a story. Sometimes when we read, we come across words that we have never seen before, and we have no idea what they mean! There is something you can use to help you figure out what those words mean, and they are called "context clues." Context clues allow you to use the other words in the sentence to help you figure out what the new or tricky words mean. You are using the other words as helpful "clues." I am going to show you how to use this strategy today**.

Teacher: **Today we will be reading a book called *Amos and Boris* and we will look at some tricky words in this book together. After I read, you will get to practice using this new strategy of "context clues" in a different book.**

The tricky words we will see and figure out in today's book are *miserable, immense,* and *leisurely*.

Teacher defines each vocabulary word.

Miserable: very unhappy or uncomfortable

Immense: extremely large or great

Leisurely: not in a hurry or relaxed

Teacher reads Amos and Boris aloud, with the three vocabulary words covered up inside the book. When the teacher comes to the first word (*miserable)*, she models using the words around it as context clues to confirm the meaning of the word *miserable*.

I notice that before the word *miserable*, the sentence says "And Amos, after one…" and after the word, the sentence says "day of seasickness." Also, before and after the word miserable, the story talks about the boat doing well in the sea and Amos being a good sailor. But, I know that seasickness is NOT a good thing and you usually feel pretty bad or uncomfortable when you are sick. And he had it for one day, in the middle of a lot of good days. So, these clues help me to understand that the word miserable means very unhappy or uncomfortable.

Teacher reads aloud until the next covered vocabulary word, *immense*. The teacher will model again how to use the words before and after the vocabulary word as clues.

I notice that before the word *immense*, the sentence says Amos was "gazing at" and after the word, it says, "starry sky, the tiny mouse Amos, a little speck of a living thing in the vast living universe." Amos is described here as being very small compared to the very big, or vast, space that he is in. When he looks up at the sky, it probably seems very big. These clues help me to figure out that *immense* means very big or large.

After modeling the second time: **Do you agree with how I used the words around *immense* to help me figure out that the word means really large or great? Do you agree that that is what the word immense means?**

Teacher reads aloud again until the third covered word, *leisurely*. This time, the teacher asks for help from the students to figure out the meaning of the word.

What are the words that come before this word? What are the words that come after? What clues does that give you to what *leisurely* might mean?

(Take student responses, next part may be adjusted according to responses)

Before the word *leisurely,* we see the words "sometimes at great speed, sometimes slowly and…" We can tell from the clues that sometimes Amos and Boris swam fast, but sometimes they swam… (wait for students to finish thought)….slowly! We used the clues to help us figure out that leisurely means something like slowly, not quickly, and not in a hurry.

After this third example, teacher gives a copy of the book to each student. Pages to be read from *Mummies in the Morning* in this lesson are 1-8 (chapter 1).

Today, we are all going to read some pages from *Mummies in the Morning*, and I am going to read with you from my copy. We will only read pages 1-8, which is all of chapter 1. As you read, you will see some words covered up with a sticky note. When we get to that word, we will practice using our context clues to figure out what that word could be. When we think we have it figured out, we will uncover the word together and check to see if it fits. Do you have any questions?

Turn to page 1, chapter 1 and let's start reading.

Students and teacher read the marked pages, figuring out and uncovering the covered vocabulary words for practice opportunities. Record the words learned on a white board for students to see.

Page 1: *gazed* – to look or stare at something for a while
Page 4: *moat* – a deep, wide ditch around a castle, fort, or town, that is usually filled with water

Page 6: *perched* – to sit or rest on something
*Students copy definitions onto their recording sheets and return books with sticky notes intact.

Closing: **Today we learned how to use context clues to help us the figure out the meaning of new or tricky words when we are reading. We will practice this more over the next two weeks, in order to help us understand what we are reading even better. I will see you again on Wednesday, and we will pick up where we left off in our books, *Mummies in the Morning.***

APPENDIX H: Growth Mindset Lesson 1

Introduction: **Today we are going to learn about our brains and how they work. I am going to read a book called "Your Fantastic Elastic Brain" and it is going to show all the parts of our brain and how it stretches and grows when we learn.**

Teacher reads aloud "Your Fantastic Elastic Brain."

After the read aloud, teacher hands out a sheet of picture on which students can draw a picture (inside of an outlined head) of what they think their brain looks like. If possible, students may also write down anything they learned from the book about the brain.

On this sheet of paper, I would like for you to just draw a picture of what you think your brain looks like. If you finish before time is up, write down something you learned from the book about your brain.

After students complete their pictures, teacher allows them to show a neighbor. Then the teacher will show a picture of how the brain changes from birth to age 7.

Some of you are already 7 or you are going to turn 7 soon, and this picture shows us how much your brain has changed just since you were born! Today we learned what happens in our brains when we learn. Over the next several days, we will learn about how knowing about our brains can help us do our best in school.

I will take your pictures now, until I see you again on Thursday to learn more about how our brains work and learn.

APPENDIX I: Growth Mindset Studies

Study	Intervention	Grade/Age	Student Description	Length	Treatment Delivery	Standardized Measure	Standardized Measure Effect	Researcher Designed Measure	Researcher Designed Effect
Allen, 2018	Growth mindset training	9th and 10th	60 Southeast Asian students, 2 families	3 weeks null training, 3 weeks mindset training	Home visits, electronic training by researcher			Questionnaires: Grit Measure, Mindset Measure, Interest in School Measure, Usefulness of School Measure, Utility of Trying in School, Importance of Studying, School's Climate	Growth mindset and grit were positively correlated ($p < .05$); no significant improvement in academic performance after training
Andersen & Nielsen, 2016	Growth mindset reading intervention for parents	2nd grade	1,587 (72 classrooms); Danish, immigrant, children of both low-income and high SES	7 months	Parents given information and access to online videos by school officials			Language comprehension, Text comprehension, and Decoding measures; Writing test	Significant differences for language comprehension and decoding ($p < .05$), and text comprehension ($p < .01$)
Baldridge, 2010	*Brainology*, online computer program	9th grade	12 Learning Disabled students (failed 8th grade reading test)	8+ weeks, 9 sessions	Brainology in the classroom, surveys given in classrooms by instructional assistant	Theories of Intelligence Scale; Effort Belief Scale; PALS	No positive motivational change after intervention	Pretest and posttest surveys, student interviews	Differences in pretest and posttest survey responses, no significance noted
Bifulco, 2017	Online growth mindset intervention	9th grade	Students with low performance in math, from suburban high school in Northeast	3 40-minute sessions	Online medium	Theories of Intelligence Scale; Short Grit Scale	Theories of Intelligence: $p = .80$, $d = 0.11$	Perseverance, Intelligence, and Beliefs Inventory	Academic Perseverance: $p = .13$, $d = .62$; Beliefs about math: $p = .05$, $d = .73$

Blackwell, Trzesniewski, & Dweck, 2007	Teaching incremental theory and ability to "grow your brain"	7th grade	Study 1: 198 females, 175 males; varied in ethnicity and SES status, moderately high-achieving; Study 2: 99 students, majority African American, relatively low-achieving	5-year study; 8-week intervention (8 25-minute sessions once a week)	Structured workshops with instruction	Citywide Achievement Test; 6th grade math grades, 7th grade final math grades; Theory of Intelligence Scale; Learning Goal Scale; Effort Belief Subscale	Participation in intervention increased math grades (d = .62, p < .05); increased classroom motivation (p < .05) and higher achievement; Study 2: Learning intervention content – d = .95, p < .05	Postintervention Assessment	Experimental change in theory of intelligence: d = .66, p < .05; no control group change: d = .07
Brougham, 2016	Lessons on brain science concepts, testimonials	9th grade	69 students; RMHS – more diverse, 50% gifted, 42% FRL; THS – larger, 25-30% IEPs, 86% FRL	3 45-minute group sessions	Classroom	3-Item Theories of Intelligence Scale; cumulative GPA; Child & Adolescent Social Support Scale	Negative GPA change for treatment group (d = -.68, p = .01); significant improvement to mindset scores for treatment group; no significance for connectedness; magnet school (d = .54), traditional school (d = -.96, p <.05)		
Burnette, Russell, Hoyt, Orvidas, & Widman, 2018	Project Growing Minds – 3 modules on incremental theory and ability to "grow your brain"	10th grade	222 girls from 4 rural, low-income high schools – 38% White, 25% Black, 29% Hispanic	45 minutes (one session), 3 school modules	Online intervention, private room, minimal interaction with researcher	Course grades for 9th and 10th grade year	No significant effect on final 10th grade average	Online scales for mindsets, learning motivation, learning efficacy, and school belonging	GM condition predicted stronger GM (p<.001); no significant effect on learning motivation, learning efficacy, or school belonging; consistent results

									at 4 months (d = .06)
Castiglione, 2019	Growth mindset teaching practices in math – book study	3rd grade	57 students, 2 teachers	Four 40-minute sessions; 7 months	Researcher interviewed teachers, co-taught lessons with teachers and collected data from students			Teacher and Student Mindset Survey; teacher interviews, reflective notes, Classroom Diagnostic Test	Teacher Mindset Survey: p = .00; Student self-efficacy: p = .00; Student Growth Mindset survey: p = .00; no positive impact on student achievement
Carvalho & Skipper, 2019	Online workshop programme embedded into PSHE curriculum; examples from Mindset Works, strategies implemented in English lessons	14-16 years old	9 males, 9 females, Special Educational Needs and/or Disabilities	10 weeks, 50-minute once a week PSHE lessons	Online, supported with classroom activities and discussion	English reading exam scores	Intervention did not accelerate academic progress	Theories of Intelligence Scale, Academic Resilience Scale, Perception of Ability Scale, Preschool Racial Attitudes Measure II	No effect for mindset maintained, no effect from change in mindset to academic resilience or self-concept, positive attitudes towards disability influenced, but effect not sustained
Chao, Visaria, Mukhopadhyay, Dehejia, 2017	Mindset intervention to teach students about the brain	3rd grade	949 students; 51% female, students from low SES in western India	10 1-hour lessons	Teachers led instruction, class exercises and activities	ASSET test: Persistence measure, Performance measure	Significant effects when prior performance was high (p = .04) but not when prior performance was low (p = .47); significant effects on persistence (p < .001)		

Clevenger, 2019	Survey	Grades 4-8	180 students, 15 teachers who participated in high ability programs in Indiana schools	3-week period for surveys to be completed	Survey taken online			Qualtrics survey measuring growth mindset and grit	GM and grit did not predict reading (p = .299) or math (p = .516) achievement significantly
Claro & Loeb, 2019	Survey	4th-7th	66% Latinx, half ELL, 77% free & reduced lunch	Survey administered once, close to end of school year	Classroom			CORE SEL Survey	Mindset predicts academic gains for students, $p < .05$
DeBacker, Heddy, Kershen, Crowson, Looney, & Goldman, 2018	Growth mindset lesson, comprehension check, self-persuasion task	9th and 10th	School 1 (135 students): 38% of color, 62% white, 45% low SES; School 2 (126): 33% low SES	One 55-minute lesson	Facilitated by researcher in ELA class, classroom teacher present			Self-report measures (implicit beliefs, achievement goals)	Incremental beliefs positively correlated with mastery goals (r = .29, $p < .001$); negative correlation with performance-avoidance goals ($p < .05$)
Dixson, Roberson, & Worrell, 2017	Surveys on associations between grit, growth mindset, ethnic identity, and other group orientation	Ages 14-18	105 Black high school students in Western state; 59% female; GPA or 3.0 or higher	Surveys administered once	Surveys administered and collected by teachers within classroom	Cumulative GPA; Theories of Intelligence Scale; Grit-S measure	Growth Mindset not associated with achievement; low correlation with academic achievement		
Donohoe, Topping, & Hannah, 2012	Online program (Brainology), mixed methods	Second year of secondary school (13-14 years old)	25 boys and 8 girls in city in Scotland	40-minute blocks over span of three months	Classroom setting (homework activity done at home)	Theories of Intelligence Scale; Resiliency Scale	d = 1.20, p = .005 at post-test; d = .31 at follow-up; no significant changes in resiliency		
Eskreis-Winkler, Shulman, Young, Tsukayama, Brunwasser,	Study 1: Deliberate practice task/questionnaire; Study 2: tenets of deliberate practice/study	6th and 7th graders; 5th and 6th graders; 6th and 7th grade	959 students, mixed ethnicities; 209 students; 427 students; 232 students	45-minute class period; 25 minutes; 50 minutes; 2 class periods	Classroom setting	Deliberate practice task, Self-report questionnaire; GPA	Study 4: whole sample (d = .21, $p < .05$); low performers (d = .23, $p < .05$); Study 5: whole		

& Duckworth, 2016	advice; Study 4 and 5-same psychological intervention			spread across 3 days			sample (d = .19), low performers (d = .21)		
Good, Aronson, & Inzlicht, 2003	Teaching messages to help students cope with stereotype threat	7th	138 students from rural district in Texas enrolled in a computer skills course, 67% Hispanic, 13% Black, 20% White, low-income	Two 90-minute sessions and weekly email correspondence throughout the school year	7th graders were mentored by college students via 2 in-person visits at school and through weekly email correspondence	Texas Assessment of Academic Skills Test; GPA – whole sample (d = .25, p < .05)	Whole sample performed better on state reading test (d = .52); significant effects for girls' math scores (d = 1.31); marginal effects for boys' math scores (d =.62, p = .05)		
Guich, 2007	Surveys	1st	90 students in San Francisco: 49% White, 20% Hispanic, 18% Asian, 3% Black, 9% mixed race	Data collected over two months; Measures administered in three 20-30 minute sessions	Measures administered individually or in a small group by lead researcher and assistant	WISC-IV; PPVT-3; CTOPP; WJ-III; Reading Self-Concept Scale; Theories of Intelligence Scale; Concepts of Ability	Negative correlation between ability concepts and reading (p < .05); positive correlation between reading self-concept and reading achievement		
Law, 2009	Questionnaires and reading comprehension tests	5th	120 students in Hong Kong; 55 boys, 65 girls	One 35-minute session for questionnaires; One hour-long session for comprehension tasks	Administered by researchers in classroom			Implicit Theory of Intelligence Measure; Motivation Questionnaire; Awareness of Reading Strategies Questionnaire; Reading Comprehension Tasks	Intrinsic motivation and awareness of reading strategies: r = .43, p < .001; Motivation and intelligence/ability beliefs: r = .32, p < .001; Reading comprehension and intelligence/ability beliefs: r = .30, p < .01

Lin-Siegler, Ahn, Chen, Fang, & Luna-Lucero, 2016	Story-based instruction – Achievement story, Intellectual Struggle story, Life struggle story	9th and 10th	402 students enrolled in science classes, 60% male, 40% female, mostly minority and from low-income families	5 weeks	Given during science classes	Science class grades at end of 6 weeks	Both struggle story conditions improved science learning postintervention ($p < .05$), relative to control condition; more pronounced for low-performing students	Beliefs about intelligence measure, Beliefs about effort measure, Goal orientation measure, Attributions regarding failure measure	No effect of intervention on motivation ($p = .70$)
Orosz, Péter-Szarka, Bőthe, Tóth-Király, & Berger, 2017	Train-the-trainer intervention	10th	55 Hungarian students with high GPAs	Five 45-minute sessions, one per week	Delivered in classroom by homeroom teacher	GPA	No significant main effects in GPA	Intelligence Mindset Scale, Personality Mindset Scale, Academic Motivation Scale, Short Grit Scale	Difference in intelligence mindset scores ($p = .015$) but not in second post-test ($p = .188$); Difference in personality mindset scores ($p < .001$) but not in second post-test; difference in motivation scores in first post-test ($p = .001$)
Paunesku, Walton, Romero, Smith, Yeager, & Dweck, 2015	Online interventions teaching growth mindset and/or sense-of-purpose	High school	1,594 students in 13 geographically diverse high schools	Two 45-minute growth mindset sessions, 2 weeks apart	Administered in school computer lab	GPA; Psychological measures (theories of intelligence)	Each intervention raised at-risk students' GPAs in core academic subjects; $d = .09$, $p < .05$		
Pepi, Alesi, & Geraci, 2004	Metacognitive training	8-9 years old, 3rd grade	36 children, reading difficulties in decoding and comprehension	26 units, 30-minute sessions, 8 weeks long (3 sessions a week)	Classroom			Text Comprehension Test; Decoding Test; Intelligence Representation Test	Differences in reading comprehension ($p = .004$); improvements for group with incremental

							intelligence training (p = .001)		
Rhew, Piro, Goolkasian, & Cosentino, 2018	Brainology intervention	6th-8th grade	68 special education students	2.5 hours	Delivered by 6th, 7th, and 8th grade teachers	The Reader Self-Perception Scale, Motivation for Reading Questionnaire	No significant difference in reading self-efficacy scores; difference in posttest MRQ scores for treatment group (p < .001)		
Rienzo, Rolfe, Wilkinson, 2015	Changing Mindsets Project	Year 5	286 students in England	6-week course for students; 2 training sessions for teachers (8 weeks apart)	Students trained by undergraduates; teachers trained by project leaders at university	Progress in English test, Measuring Success in Math test	Pupil intervention: ES = 0.4 to 0.5, p = .05; teacher intervention: ES = 0.3 to 0.4, p = .13		
Rowe & Leech, 2019	Pointing to Success training program – video with growth mindset messaging, instructions for play time and pointing with infants; follow-up home visits	Parents and their 10-month old infants	34 White, 4 Black, 9 Other; 25 girls, 22 boys; diverse SES	Brief video and instruction; 45-minute home visits every 2 months for 8 months	Data collected in participants' home by trained researcher	McArthur Bates Communicative Development Inventory; Mullen Scales of Early Learning – Expressive Language Subscale	No main effect on vocabulary (p = 0.75); no main effect of mindset on (expressive) Mullen scores	Theories of Intelligence Questionnaire	Larger effects on changes in pointing for parents with fixed mindsets; stronger effect on vocabulary for parents with fixed mindset
Sabatine, 2019	Review/meta-analysis	Middle and high school	Racially diverse group of students, many from low-income rural communities	One school year	Classroom interventions	GPA, standardized test scores, course grades	Small, positive effects of interventions on GPA; 3 out of 7 GM studies; d = .09 to .62		

Sarrasin, Nenciovici, Foisy, Allaire-Duquette, Riopel, Masson, 2018	Meta-analysis – 10 peer-reviewed studies teaching neuroplasticity to induce a growth mindset	Age 7 to adulthood	N/A	N/A	N/A	N/A	Inducing GM has positive effect on motivation, achievement, and brain activity; more beneficial for at-risk students, especially in math (g = 0.78)
Saunders, 2013	Brainology program	6th	At-risk students; 15 males, 15 females, racially mixed	Once a week for five weeks	Classroom setting (homeroom)	MAP test, Mindset Questionnaire, Elementary Reading Attitude Survey	No significant results for impact of intervention
Schmidt, Shumow, Kackar-Cam, 2015	Brainology program	7th grade	160 students and 2 teachers; 42% male, 58% female; 50% received free or reduced lunch	6 weeks	Classroom setting	Science grades; Malleability of Intelligence; Mastery goal orientation	Moderate effect for increase in malleability of intelligence beliefs (p = .001); small effect for change in belief about mastery goals (p = .06); large effect for change in student achievement (p = .000)
Schrodt, Elleman, FitzPatrick, Hasty, Kim, Tharp, Rector, 2019	Mindset training within Writer's Workshop	Kindergarten	27 students at small, private school in mid-South	30 hours across 10 weeks	Classroom	TEWL-3; Writing sample rubric; Literacy and writing motivation survey; Writing challenge task	Significant growth for basic (d = 0.72) and conceptual writing (d = 1.77); Treatment group significantly improved motivation and

							perseverance for difficult writing tasks (d = 1.32, d = 2.49)
Seals, 2018	Mindsetworks Mindsetmaker teacher professional development program	6th-12th grade	25 math teachers (92% white, 68% female); 1,653 students, ethnically diverse	30 days (4 modules)	Teachers given open access to online program	Implicit view of ability/mindset; math self-efficacy; mastery/performance goals; behavioral engagement; academic achievement	Gains for students in mindset condition for math interest, p < .01; teacher GM marginal effect on student GM, p = .04; student-rated teacher practices affected student mastery, p = 0.9 (increase in mastery and interest but not beliefs)
Sherman, Hartson, Binning, Purdie-Vaughns, Garcia, Taborsky-Barba, & Cohen, 2013	Self-affirmation activities, writing task	Study1: 6th, 7, and 8th grade Study 2: 7th grade	111 male, 88 female, mostly White and Hispanic; Study 2 – 93 males, 92 females	6th and 7th graders – 4 treatments over period of 1 year, 8th graders – 5 treatments of period of 1.5 years; 1 school year	Given in regular classroom	Grades in two math and science courses; grades in two language arts and social studies classes; Affirmation task	Study 1: Overall affirmed students – d = .12, p = .066; Latino American students: d = .29, p < .01; Study 2: d = .45, p < .05; Hispanic students: d = .56, p < .01
Sisk, Burgoyne, Sun, Butler, Macnamara, 2018	Meta-analysis 1: Relationship between mindset and acad. achievement/ moderating factors;	Children to adults	Meta-analysis 1: 365, 915 participants; Meta-analysis 2: 57, 155 participants	Long and short intervals	Computerized training, in-person training, reading material; inside and outside	Course exams, Standardized tests, average grades	Correlation between growth mindset and acad. achievement: r = .10, p < .001;

	2: Effectiveness of interventions on acad. achievement				classroom activities		effects of interventions: d = .08, p = .010		
Stevens, 2018	Growth mindset intervention, integrated growth and stress mindset intervention	7th and 8th grade	85 students, enrolled in program for students with disabilities and higher functioning students with special education needs	2 weeks, one 45-minute intervention	Classroom setting, video component of intervention	Implicit Theories of Intelligence Scale, Stress Mindset Measure	Intervention effects on GM scores: p = .040, p = ,049; Intervention effects on stress mindset scores: p = .000, p = .049		
Tecker, 2017	Growth mindset intervention in math classrooms; teacher and student perspectives of the effectiveness of 4 GM instructional strategies	6th grade	449 students, 7 teachers from two middle schools	90-minute intervention	Classroom teachers learned to implement strategies through online professional development series	PALS Student Survey, MAP Survey; student focus groups	No difference in growth scores (p = .486); No improvement in student achievement		
Vsetecka, 2018	Growth mindset lessons	5th and 6th grade	112 students at middle school in Midwestern state	Five 50-minute lessons, delivered every other week	Classroom setting, Google Forms for survey			Learning Attitude Survey; Effort, Attitude toward Learning, & Belief of Intelligence	Academic achievement of intervention group: d = .87, p < .001; difference in attitude toward learning: d = 1.01, p < .001; difference in belief of intelligences: d = 1.10, p < .001
Wang, Yuan, & Wang, 2020	Surveys	13-18 years old	1828 adolescents at secondary vocational school in China; most from low SES, low academic performance	March-June 2017	Online questionnaire done in computer room, overseen by research group	Reasoning Ability Test, Academic Achievement Test	Main effect of GM on academic achievement (p < 0.001); Effect of GM on Reasoning Ability (p < 0.001)	Growth Mindset Scale, Self-Affirmation Scale	Self-affirmation moderated effect of GM on AA (p < 0.001); SA moderated effect of GM on RA (p < 0.01)

Wilkins, 2014	Brainology intervention; classroom lessons that reinforced growth mindset principles	7th grade	684 ethnically diverse 7th graders from 5 different schools, science teachers; 46% white, 50% FRL	September 2012-March 2013	Classroom (online and by teacher)	Student Mindset Assessment; PALS-academic efficacy; MSLQ-task value; Teacher Ratings; Teacher Mindset Assessment; math and science grades	$p < .005$; Significant effects for science grades ($d = .26$) but not math grades ($d = .02$)
Yeager, Romero & Paunesku, Hulleman, Schneider, Hinojosa, Lee, & O'Brien, Flint, Roberts, Trott, Greene, Walton, & Dweck, 2016	Reading scientific article, generating personal examples, "saying-is-believing" exercise	9th grade	7,501 students; 17% Latino, 6% Black, 3% Native; 48% White, 5% Asian	2 sessions, 1 to 4 weeks apart	Led by school coordinators in computer labs	Fixed mindset scale; behavioral task; Challenge-seeking scenario; Fixed trait scale; Performance avoidance scale	Revised intervention significantly effective at reducing fixed mindset; reduced tendency to choose more easy than hard math problems, $d = .19$, $p < .001$; $d = .07$, $d = .06$, $p < .01$
Yeager, Romero, Paunesku, Hulleman, Schneider, Hinojosa, & Dweck, 2016	Reading task; revising and scaling up previous psychological interventions	9th grade	3,676 students from 10 different schools across the country, racially mixed, 48% female	2 one-period online sessions, 1 semester	2 one-period online sessions in a school computer lab or classroom	9th grade GPA	$d = .10$, $p = .003$ (-1 SD of prior performance, low performers), $d = .03$, $p = .33$ (+1 SD of prior performance, high performers); whole sample $d = .09$, $p < .01$

APPENDIX J: Contextual Analysis Studies

Study	Intervention	Grade/Age	Student Description	Length	Treatment Delivery	Standardized Measure	Standardized Measure Effect	Researcher Designed Measure	Researcher Designed Effect
Baumann, Edwards, Font, Tereshinski, Kame'enui, & Olejnik, 2002	Instruction in morphemic analysis and contextual analysis	5th grade	88 students from diverse public elementary school	Twelve 50-minute lessons	3 experimental groups, 1 control group; led by classroom teachers			Immediate Morphemic Production; Immediate Morphemic Recognition; Immediate Context Production; Immediate Context Recognition; Immediate Vocabulary in Passages; Delayed Morphemic Recognition; Delayed Context Recognition	*d* = 1.32, 1.01; *d* = .87, .31; *d* = .87, .27; *d* = .49, -.01; delayed morphemic recognition: *d* = .30, .12; delayed context recognition: *d* = .60, .01
Baumann, Edwards, Boland, Olejnik, & Kame'enui, 2003	Vocabulary intervention integrated into textbook-based social studies curriculum	5th grade	157 students, ethnically diverse	33 days, 33 45-minute lessons	Led by classroom teachers			Textbook Vocabulary Test, Word part Test, Immediate Vocabulary in Context Test, Comprehension Test, Chapter Tests, Delayed Vocabulary in Context Test	ES = .179, *p* = .002; ES = .423, *p* = .000; ES = .009, *p* = .199; Delayed vocabulary: ES = .016, *p* = .015; no significant difference for comprehension test or chapter tests

Cain, Oakhill, & Elbro, 2003	Short stories with unknown words	7 and 8 years old	15 students with weak comprehension skills and typically developing comprehension skills	Eight stories	Reading and task facilitated by researcher	Gates MacGinitie Vocabulary Test, Neale Analysis of Reading Ability	Skilled and less-skilled comprehenders did not differ significantly		
Cain, 2007	Practice with reading short stories and defining novel words via context	7 and 8 years old	45 students in England, predominantly middle class	Three sessions	Delivered by researcher	Neale Analysis of Reading Ability, British Picture Vocabulary Scale	Two explanation groups performed better than feedback only group ($p <$ .05)		
Curtis, 2008	Teachers developed lessons and implemented strategies in classroom	5th grade	14 teachers	20 weeks	Classroom setting	Gates-MacGinities (distal); 2 curriculum-based vocabulary measures	Signficant gains on CBMs, contextual strategies produced most gains; socially-mediated strategies improved performance on distal measure		
Diakidoy, 1998	Students read and responded to various passages, tested on comprehension	6th grade	73 students from middle school in Midwestern town	Three sessions over three days	Classroom setting			Comprehension tests, Introductory passage tests, Vocabulary pre- and post-tests	Increase in word knowledge (p<.01); significant relationship between comprehension and learning vocabulary from context; effect of context clues not significant
Fukkink & de Glopper, 1998	Meta-analysis of studies on using context to gain word meaning	Late elementary to adult	21 studies	90 to 720 minutes of instruction	Classroom			Multiple choice and definition tests/tasks; reading comprehension	d = .43, p < .000 for effectiveness of using contextual analysis to derive word meaning

								and vocabulary tests	
Griffin, 2008	Teachers were trained to provide tasks to measure meaningful learning and student engagement	4th and 5th grade	120 African American students, low-income	6-7 days of instruction	Regular classroom with teacher	Measure of Engagement, Autonomy, Competence, and Relatedness, Task Motivation Questionnaire	Motivation was higher in high variability condition, d = 1.09, p < .01; Higher relatedness in high meaningful learning conditions, d = .58, p < .01	Context Clue pre/post-test	Context clue learning was higher in the high variability condition, d = .59, p < .01
Hayes, 2011	Use of graduated prompting to test word learning skills	4th grade	28 students in southern Ohio K-8 public school	2 months	Classroom setting	Expressive One Word Picture Vocabulary Test, Dynamic Assessment of Vocabulary in Context	No difference in DAVIC scores, d = .19, p = .605; EOWPVT and DAVIC scores significantly correlated; higher scores on transfer task, d = 2.84, p < .001		
İlter, 2019	Effectiveness of contextual strategy instruction on vocabulary knowledge at frustrational reading level	6th grade	44 students, suburban middle school in Turkey	Twice a week for two weeks, 30-40 minute lessons	Classroom	Qualitative Reading Inventory-5	Context clues strategy affected vocabulary knowledge, p < .001; experimental condition ES = .42; control ES = .20		
Jenkins, Matlock, & Slocum, 1989	Direct teaching of novel words vs. teaching how to derive meaning from context	5th grade	135 students from suburban school district in Pacific Northwest	20 days of instruction	Instruction led by classroom teachers			Two pretests, six post-tests	Specific word-meaning instruction more effective to instruction in deriving meaning, p < .001

Nagy, 1987	Learning word meaning from context in normal reading	3rd, 5th, and 7th grade	352 students	Six days of practice followed by testing	Read from grade-level textbooks in classroom	N/A	Small gains in learning words from passage reading at all grade levels; learning from context influenced by amount of difficult words		
Nelson & Stage, 2007	Effects of vocabulary instruction in words with multiple meanings on vocabulary and comprehension	3rd and 5th grade	283 students in small Midwestern school; 32% of students received free and reduced lunch	2 days of intervention	Classroom setting, as a part of language arts instruction	Gates-MacGinitie Reading Test	Group receiving multiple meaning instruction performed better in vocabulary and comprehension, $p < .001$		
Sampson, Valmont, and Van Allen, 1982	Teaching cloze strategies to improve vocabulary and reading comprehension	3rd grade	68 students, higher reading levels	15 weeks, 2-3 lessons per week	Led by classroom teacher	Gates-MacGinitie Reading Comprehension and Vocabulary subtests; Quasi-cloze comprehension test; Quasi-Cloze Divergent Production Measure	No difference in vocabulary scores, $p = .11$; increase in comprehension for experimental group, $p < .002$; significant gains on cloze measure, $p < .002$		
Schatz & Baldwin, 1986	Three different experiments investigating the most effective context for inference of word meaning	10th and 11th grade	101 students; 39 students at private school; 84 students at private Hebrew day school; all in Florida from middle to	Test given over 2 days	Classroom setting			Words-in-context test; Words-in-isolation test;	No significance due to context in any of the experiments: $p > .10$ in all three

			upper-middle class SES						
Silverman, 2007	3 approaches to vocabulary instruction in storybook reading: contextual instruction, anchored instruction, analytical instruction	Kindergarten (and first grade)	Study 1: 94 students in demographically diverse Northeast school; Study 2: 50 of the original 94 students, then in first grade	6 weeks; 6 months after intervention (students were in first grade)	Classroom	Test of Oral Language Development;	Participants in anchored and analytical groups learned more words than contextual group, ES = 1.02, .67, .85, 1.19;	Researcher vocabulary assessment	Differences in anchored and contextual groups, $p < .01$at post-test; at follow-up, anchored group was significantly higher than analytical and contextual groups (picture vocabulary); follow-up for oral vocabulary ES = .58, .94 (analytical and anchored over contextual group)
Steele, 2015	Reading passages to determine if position of context, rate of presentation, and part of speech influence word learning	9-11 years old	13 students with Language Learning Disability (LLD), 13 age-matched students, 13 vocabulary-matched students	Three sessions	Classroom setting	PPVT-IV; CELF-4; Test of Nonverbal Intelligence; Gray Oral Reading Test; Nonword repetition task	Age-matched peers performed highest; no effect for context position; more word learning with higher word presentation for LLD students		
Szymborski, 1995	Investigation of context vs. definition approach for vocabulary development	4th grade	45 students in a New Jersey elementary school	2 weeks of instruction	Classroom setting			Content area vocabulary test	No significant difference in scores between groups

Ward-Lonergan, Liles, & Owen, 1996	Intervention for use of context clues strategy to facilitate comprehension of novel words	13 to 16 years old	10 Socially/Emotionally Maladjusted students with Language Impairments, 10 non-impaired students	4 intervention sessions, 20-30 minutes each	Classroom			Pre-treatment test, post-treatment test	Both groups benefited from direct contextual instruction; participants with SEM/LI improved in comprehension of words in cause/effect sentences
Wise, 2019	Development of Noticing Unfamiliar Words Assessment; vocabulary intervention using contextual analysis	2nd grade	55 students received assessment; 78 students participated in vocabulary study; schools were in high-poverty community	15 intervention lessons, 7.5 hours	Classroom	NWA Map Growth Reading Assessment, Noticing Unfamiliar Words Assessment, Meaning Inference Assessment	Positive effects in development of skills to notice unfamiliar words; no difference in children learning to gain meaning from context		
Wysocki & Jenkins, 1987	Investigation of morphological generalization and its impact on vocabulary	4th, 6th, and 8th grade	135 students	2 weeks of intervention	Classroom			Three vocabulary measures	6th and 8th graders performed better with use of context and morphological clues than 4th graders; inferring word meaning influenced by prior word experience and strength of context