

THE IMPACT OF AN INTERVENTION ON GROWTH MINDSETS IN EDUCATION

The Impact of an Intervention on Growth Mindsets in Education

by

Courtney Filippis

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Abstract

Studies have shown the positive effects that growth mindsets can have in academic achievement. In this study, the researcher investigated the growth mindset scores of teacher participants, as well as the effects that a growth mindset intervention had on growth mindset scores, both in the short and longer term for the teachers sampled. Three data collection groupings were used to investigate four sets of hypotheses. Hypotheses set number one investigated whether the growth mindset intervention would have an effect on the participants' mindset scores. Hypotheses sets two and three investigated whether the effects of the growth mindset intervention would be retained for three and six months post intervention. Hypotheses set number four compared whether teachers who had participated in the growth mindset intervention measured higher in their knowledge of growth mindset theory than the participants in the control group. The results of the data analysis demonstrated that the participants' mindsets tended to lean towards growth versus fixed mindsets. The results also supported the idea that a growth mindset intervention could significantly affect the mindsets of participants, both three and six months post intervention.

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CHAPTER 1

INTRODUCTION

Overview

Previous research has clearly demonstrated the powerful influence that a mindset can have over multiple levels of one's life, including academics, relationships, work, performance, and health (Anchor, Crum, & Salovey, 2013; Aronson, Fried, & Good, 2002; Chan, 2011; Dweck, 2012). This is because mindsets help define people's belief systems, which are driving forces in the way in which people think, feel, and behave. In particular, there is a body of research in academics, cognitive psychology, and neuroscience that shows strong support for the positive outcomes of what Dweck calls the "growth mindset" versus the "fixed mindset". (Dweck, 2008; Dweck, 2014). Through her extensive research, Dweck has shown that the mindsets of students influence and predict their academic achievement trajectories. (Dweck, 2008; Tough, 2012). A growth mindset is characterized by the belief that one's ability level can be changed substantially with effort; whereas, a fixed mindset is characterized by the belief that one is born with a fixed ability level that can't be changed much regardless of effort or circumstance.

Within the modern educational context, with its 21st Century Skills, the Common Core Curriculum, and the National Guidelines for Science Standards, the topic of mindsets has an important place. The new era of education, with its standards, emphasizes a philosophy that tightly aligns with growth-mindedness as opposed to fixed mindedness (Dweck, 1998; Dweck, 2009). Processes of deep learning, critical thinking, and problem solving are key components. As such, deeper learning processes are likely to be gradual in nature and will require persistence, sustained effort, resilience, and

adjustment. The manners in which students react to challenges, struggles, setbacks, mistakes, failures, and the stress of learning new things are of key importance. Students with a growth mindset also have a higher affinity to delay gratification in order to obtain long term goals. (Abd-El-Fattah & Al-Nabhani, 2012). They tend to increase their engagement during struggles, putting forth more effort. (Aronson et al, 2002). Growth-minded students who belong to stereotyped groups are also more resilient to stereotype threat. (Aronson, Fried, & Good, 2002; Good, Aronson, & Inzlicht, 2003; Tough, 2012)

Research has indicated that teacher mindset about student intelligence levels and ability can affect students' beliefs about their personal intelligence, which then affect student motivation, learning goals, and behavior (Dweck, 1998; Dweck, 1999; Watanabe, 2006). It can be reasoned that teachers with fixed mindsets might negatively affect their students in areas of achievement with the use of unconstructive methods and involvement, and it is desirable for teachers to have a growth mindsets. Teachers with growth mindsets may help struggling learners adopt or reinforce growth mindsets to aid in the facilitation of skills needed to tackle such issues. For example, students could be taught that struggle, doubt, confusion, and mistakes are normal parts of the learning process. (Adams, 2013; Miller, 2013). A growth mindset could help children develop the framework for approaching these issues, as well as developing confidence and resilience (Paulina & Stanford, 2011).

Statement of the Problem

In light of the research on the benefits of having a growth mindset for both teachers and students, it is important for teachers to understand their own mindsets and

the impact their mindsets have on students. If a teacher doesn't believe that intelligence can be increased through effort, that perception may be transferred to his/her students. Students may be led to "give up" on learning or performing better. It would be beneficial to find out what type of mindsets teachers have, whether they have had exposure to growth mindset information, and whether or not a growth mindset intervention could have an effect on the teachers' mindsets, both short-term and long-term.

Purpose of the Investigation

The purpose of this investigation was to:

- 1) Determine the growth mindset scores of teacher participants
- 2) Examine teachers' knowledge, or lack thereof, pertaining to growth mindsets
- 3) Determine whether or not exposure to information on growth mindsets would alter participants' mindsets
- 4) Determine whether the effects of a mindset intervention would have lasting results

Research Questions

The questions that guided this study included:

- 1) How do teacher participants perform on a growth mindset scale?
- 2) In what way will teachers' mindsets be influenced by a growth mindset intervention?
- 3) Will the effects of the intervention be retained for three months after the intervention?

- 4) Will the effects of the intervention be retained for six months after the intervention?
- 5) Will a growth mindset intervention have an effect on how teachers rate their knowledge of growth mindset theory?

Hypotheses

Four sets of hypotheses were studied:

Null hypothesis #1- a mindset intervention has little or no effect on educator growth mindedness score based on a questionnaire that measures one's affinity for growth mindedness versus fixed mindedness.

Research hypothesis #1- A mindset intervention has a positive effect on educator growth versus fixed mindedness.

Null hypothesis #2-The effects of a growth mindset intervention would be retained for three months, indicated by no difference between the growth mindset scores of participants on the day of the intervention versus three months post intervention.

Research hypothesis #2-The effects due to a growth mindedness intervention would not be retained for three months, as demonstrated by a difference in growth mindedness scores on the day of the intervention versus a posttest given three months after the intervention.

Null hypothesis #3- There is no difference between educators' growth mindedness scores taken the day of the intervention and scores six months after the intervention.

Research hypothesis #3- The effects due to a growth mindedness intervention would not be retained, as demonstrated by a difference in growth mindedness scores on the day of the intervention versus a posttest given six months after the intervention.

Null hypothesis #4-The participants in the experimental group will have scores that are less than or equal to the scores of those in the control group, in terms of the measurement of their knowledge of growth mindset theory.

Research hypothesis #4-Participants in the experimental group will have higher scores on a question that measures their knowledge of growth mindset theory than the participants in the control group.

Definition of Terms

For the purpose of this investigation:

- **Growth mindset-**based on the belief that one's qualities, like intelligence, are cultivated through effort and education, and that everyone has the capacity to grow and change with application, effort, education, and experience (Dweck, 2006; Dweck, 2008). Students are more likely to persist in facing challenges, believe they can develop their intelligence over time, value new ideas, assess their own weaknesses, view their mistakes as learning opportunities, have increased willpower and confidence, have positive achievement patterns, recover from failure, and have mastery learning goals (Blackwell, Dweck, & Trzesniewski, 2007; Dweck, 2006; Dweck, 2008; Good et al., 2003; Jones & Lusk, 2011).
- **Fixed mindset-** based on the belief that one's qualities are not very malleable. Students with this mindset have an urgency to prove themselves and try to avoid

risk and failure (Dweck, 2006). They are more likely to adopt performance-based goals versus mastery-based. These students often try to avoid challenges, and sacrifice learning opportunities, because challenges represent threats. Performing badly would be admitting deficiencies and incompetence. They value looking smart over learning, disengage from and devalue academic areas in which they perform poorly, give up easily, and become discouraged when work becomes difficult. These students are at a significant disadvantage and are at a higher risk for negative academic outcomes (Aronson et al., 2002; Blackwell et al., 2007; Dweck, 1998; Dweck, 2008; Dweck, 2009; Dweck, 2010; Jones and Lusk, 2011). They are also at greater risk of feeling the effects of stereotype threat, since stereotypes are based on fixed mindsets. (Aronson et al., 2002; Good et al., 2003).

- **Incremental theory**-means growth mindset; a belief that people can change
- **Entity theory**-means fixed mindset; a belief that people are largely incapable of change

Chapter Summary

In this chapter, the idea of mindsets was introduced, as well as the positive effects of having a growth mindset, versus a fixed mindset for students and teachers. The purpose of the investigation, the problem statement, the research questions, hypotheses, and definition of terms were also presented.

Chapter 2

Review of Related Literature

Purpose of the Investigation

The purpose of the investigation was to determine the mindsets of teacher participants and examine their knowledge, or lack thereof, pertaining to growth mindsets. It was also of interest to the investigator to determine whether teacher responses to a growth/fixed mindset questionnaire could be experimentally manipulated with the use of an article that promoted growth mindsets and whether the results would be long term.

Mindsets in Academics

There is much support found in the literature pertaining to the positive effects that possessing growth mindsets, versus fixed mindsets, can have on students and teachers. An example of this can be found in Carol Dweck's research. According to Dweck (2009):

In our research we find that students with a growth mindset seek out learning, develop deeper learning strategies, and strive for an honest assessment of their weaknesses so that they can work to remedy them. In study after study, we have seen their engagement, critical thinking, persistence, and knowledge-sharing in action. And because of this, we have seen them outperform their peers with fixed mindsets over and over. (p.9)

Research that involved measuring junior high students' beliefs regarding intelligence at the beginning of junior high and then assessing their achievement results throughout the next two years supported the idea that students with incremental (growth)

mindsets were more likely to achieve higher levels academically than those with entity (fixed) mindsets. (Blackwell et al., 2007). The growth-minded students were less likely to “give up” after setbacks, and held the belief that more effort led to higher grades. In accordance, findings from another study found that test performance was impaired for students with entity mindsets. (Cury, Fonseca, Zahn, & Elliot. 2008). The students exhibited higher levels of worry and lower levels of practice time, which helped to explain the results.

A meta-analysis of implicit theories and self-regulation produced a large amount of support for the idea that mindsets affect achievement. A positive link was found between having incremental (growth) mindsets and more effective self-regulatory processes and goal achievement. (Burnett, Finkel, O’Boyle, Pollack, & VanEpps, 2013).

Mindsets have been shown to powerfully influence the quality of parent involvement in children’s learning. (Moorman & Pomerantz, 2010). Mothers with fixed mindsets were more unconstructively involved in their children’s learning; whereas, the growth orientated mothers were more constructively involved. Fixed mindset mothers tend to value performance in school over learning and development. They view challenge as threatening and seek to avoid it, since it could indicate a permanent lack of competence in their children. (Moorman & Pomerantz, 2010). Unconstructive involvement of these mothers has the potential to negatively affect their children’s motivation and attitudes toward school and learning and lead to decreases in achievement levels.

A study done on gifted students examined the link between three types of students (non-perfectionists, unhealthy perfectionists, and healthy perfectionist) and their

mindsets. (Chan, 2012). The participants completed questionnaires that allowed them to be rated on four variables: perfectionism, satisfaction with life, happiness, and mindset. The findings of this study indicated that the healthy perfectionist group had the highest percentage of growth minded individuals. This group also rated the highest on the life satisfaction and happiness scales. They set high standards for themselves and strove for excellence without maladaptive tendencies. The unhealthy perfectionist group had opposing results. They scored higher than the two other groups on fixed-mindedness, and scored the lowest on scales that measured happiness and life satisfaction. These individuals were found to be most neurotic, obsessive, and maladaptive. They had the highest discrepancy found between the high standards they set and desired for themselves and their actual performance in meeting those standards. The scores for the non-perfectionist group between the scores of the healthy perfectionists and unhealthy perfectionists.

Mindsets and Stereotype Threat

Mindsets influence students' decision making processes, regarding whether they believe they have the skills and intellectual capacity to achieve certain goals. Since stereotypes imply fixed ability levels based on group membership, students with fixed mindsets that belong to stigmatized groups are at higher risk for impaired academic performance due to "stereotype threat". (Tough, 2012) This means that students in stereotyped groups may carry an extra "emotional tax" and become anxious about whether a given performance will confirm the stereotype. This anxiety leads to diminished cognitive abilities on tests, and therefore reduced performance. Stereotype

threat plays a role in gender and race gaps in achievement and the underperformance of stigmatized groups of students. (Dweck, 2008). This pattern has been demonstrated by low-income and minority students, as well as women in mathematics and science. Yet, growth-minded students who believe that they can increase their intelligence through effort have been shown to outperform fix-minded students and be less vulnerable to stereotype threat.

In a study involving factors that contribute to one's theory of intelligence, student participants were given five minutes to draw an intelligent person (Aljughaiman, Handel, Stoeger, & Ziegler, 2012). They were then asked to fill out a questionnaire regarding the person they had drawn. The majority of the participants (62.7 %) drew males. Due to stereotypes and beliefs regarding intelligent people, female students may believe that they are less capable intellectually than male students. These false beliefs can have maladaptive and detrimental effects on female performance and academic achievements.

Research has supported the idea that when students are influenced to adopt a growth mindset, the anxiety inducing effects of stereotype threat can be substantially reduced. (Aronson et al., 2002; Good et al., 2003) Growth mindset interventions provide protection against stereotype threat. (Dweck, 2008). An intervention program designed to combat stereotype threat in seventh grade students was successful in increasing academic outcomes for all students groups, especially stereotyped groups. (Good et al., 2003). Students in the experimental group were mentored throughout the school year by college students who encouraged growth mindsets. They were given information and educational messages such as intelligence is expandable with mental work. They were also given facts about how the brain forms new connections. Additionally, they were

given information on how students are able to overcome educational difficulties.

Students in the control group were mentored on the dangers of drug use. All of participants were then asked to create their own web pages that advocated what they had learned. Standardized test performance was compared for the groups. Results for the control group demonstrated the typical gender and racial achievement gaps, but the gaps disappeared for the experimental group. The females in the experimental group had higher standardized test scores than those in the control group for mathematics, and the minority and low income students had higher reading test scores than the control group.

Another study that demonstrated that stereotype threat can be overcome by growth mindsets involved the academic performances of minority college students. White students typically outperform black students as measured by college grade point averages. Yet, following a growth mindset intervention, academic performance was shown to increase for all students, most notably the minorities. (Aronson et al., 2002). Three groups of students were compared. Those in the experimental group participated in a pen pal program that had the purpose of educating the participants on how intelligence is malleable and encouraging participants to internalize principles of growth-mindedness. These college students were asked to write letters to their younger pen pals that encouraged messages that aligned with growth mindsets. The two control groups consisted of students who participated in a pen pal program without growth-minded messages and students who did not participate in any pen pal program. Results demonstrated that minorities in the experimental group were less vulnerable to stereotype threat. They reported greater engagement and enjoyment of the educational process and had higher grade point averages than those in the control group.

The Mindsets of Educators Matter

A teacher's mindset plays an important role in his/her students' learning. His/her mindset will influence how intelligence is portrayed in the classroom, what approaches the teacher uses, and the types of relationships, judgements, and feedback given to students. These factors can propel or hamper a student's potential. (Dweck, 1999; Lusk & Jones, 2011; Ricci, 2013).

According to Adams (2013):

It comes down to this: when you walk into the classroom, your own mindset makes all the difference in the world. It affects how you connect or don't connect with each child, and in turn how they connect with you. That connection, of course, will influence what your students are able to take in. It affects what they feel is expected of them and how encouraged or discouraged they'll be about learning to use their own minds and thinking for themselves. Your mindset creates the *climate*, the *weather* in the classroom. (p.24)

Teachers can be successful in promoting the growth mindset in their classrooms (Miller, 2013). Strategies such as normalizing challenges, talking about what it's like to try something hard, and telling students that learning isn't easy all of the time have been effective (Paulina & Stanford, 2011). It is also helpful for teachers to praise a student's effort, work strategies, process skills, and persistence, instead of praising the end result or ability (Dweck, 2008; Dweck, 2010; Lusk & Jones, 2011). A series of six studies showed that praise for intelligence led to negative consequences for academic achievement and

motivation among fifth graders when compared with praise for effort. (Dweck & Mueller, 1998). The fifth graders who were praised for intelligence, later demonstrated characteristics typical of fixed-mindedness. These characteristics included maladaptive responses to challenges and failure, less task persistence and enjoyment, more distress after setbacks, and the tendency to choose performance goals over mastery goals. In accordance, they also valued looking smart over learning more. (Dweck, 2008; Dweck & Mueller, 1998).

Teacher mindsets regarding student intelligence and ability can affect students' beliefs about intelligence, which then affect student motivation and behavior (Dweck, 1999; Lusk & Jones, 2011; Watanabe, 2006). Teachers with fixed mindsets might negatively affect their students in areas of achievement. They are less likely to devote time and effort into teaching if they believe their students' learning is out of their control. A study found that the mindsets of experienced teachers were significantly more in line with the fixed mindset than novice teachers (Georgiou, 2008). Another study found that one fourth of teachers viewed intelligence as fixed (Bryant, Jones, Malone, & Snyder, 2012). This research suggests that even though growth mindsets in teachers have shown favorable results for students, many teachers still have fixed mindsets.

Interventions Can Change Mindsets

Since the research shows that it is favorable for a teacher to lean towards a growth mindset, it is important to understand how to cultivate growth mindsets and whether it is possible to change teacher mindsets from fixed to growth. Multiple studies have shown that a change in mindset is possible and can be accomplished rather easily with growth

mindset interventions. (Anchor et al., 2013; Chan, 2011; Dweck, 2008; Dweck, 2012; Good et al, 2003). Achievement can be promoted by simply educating students on how abilities are malleable, how the brain works, and/or promoting the message that all children can succeed. (Ricci, 2013; Tough, 2012) Successful studies relating to interventions involve providing participants with scientific information that challenges fixed mindsets or allows participants to reflect on their mindset beliefs. (Lusk & Jones, 2011). One study gained positive results by directly communicating to students that there were many ways to change ability levels through effort. (Cury, Da Fonseca, Zahn, & Elliot, 2008). In the Knowledge Is Power Program, which has been described as a talent hotbed for academics, students are taught that their brains are like muscles; the more you use them, the stronger they get. (Coyle, 2009).

Further research investigated practical steps/interventions which can be done to promote growth mindsets, and therefore, higher achievement levels. The mindsets of ninth and tenth grade students were experimentally manipulated quickly and easily by priming participants in the experimental group with an incremental theory (growth-minded) article. The article promoted the belief that people can change their characteristics and the kind of people they are. Participants in the control group read an article with the same story line, but without the growth-minded message that people can change. Results from questionnaires given to all participants after the articles were read demonstrated that the intervention succeeded in reducing fixed-mindedness. (Yeager, Trzesniewski, Tirri, Nokelainen, and Dweck, 2011; Dweck, 2012).

A computer based intervention program, Brainology, has also shown that interventions can succeed in changing the mindsets of students. (Dweck, 2008). The

Brainology workshop teaches students the principles of a growth mindset and how the brain works by forming connections. Teachers reported that students had a renewed interest in learning after participating in the intervention. Dweck, one of the program's creators, reported, "The image of new connections forming proved extremely motivating to the students in our pilot studies. They reported that as they paid attention in class or studied difficult material, they pictured their neurons growing new connections" (Dweck, 2008, p.11).

Growth Mindset Interventions Can Have Long Term Results

Multiple studies suggest that lasting mindset change is possible with interventions. A longitudinal study found that educating students on how their brains work and endorsing an incremental mindset had long-lasting, positive effects on student achievement and reversing declining grade curves (Blackwell et al., 2007). Another group of researchers successfully created a growth mindset intervention that was built to make lasting changes in mindsets. (Aronson et al, 2002). During this intervention, Stanford undergraduates were asked to mentor younger pen pals and influence their pen pals to view intelligence as expandable with work. Results showed that positive results in attitude change and academic achievements endured nine weeks after the initial intervention.

A study that involved managers with fixed mindsets who were trained to adopt growth mindsets with a five step intervention had lasting results. The intervention consisted of items such as showing the managers a video and scientific reports that endorsed incremental-mindsets (Heslin & VandeWalle, 2005). The results of this study

indicated effects that went beyond the experimental time period; the managers who had started with fixed mindsets used patterns of appraisal ratings and coaching suggestions similar to the managers with growth mindsets six weeks later. Implications suggested that managers were more willing to invest their time and energy in coaching employees when they believed people were capable of change.

An intervention that taught ninth and tenth grade students how to apply an incremental theory (growth mindset) in six sessions resulted in students who behaved more pro-socially and less aggressively one month after the intervention than their control group counterparts. (Yeager, Trzesniewski, & Dweck, 2013). The incremental theory intervention consisted of instructing students on how the brain works and changes with learning, how personalities can be changed, how thoughts and feelings motivate people, and how one can use incremental principles in response to rejection or conflict. Students were also given opportunities to practice using these principles. Two control groups consisted of students were taught six sessions of social-emotional coping strategies or students who received no treatment. Two weeks post intervention, the experimental group was found to have lower entity theory (fixed mindset) scores when compared to the control groups. Three months following the intervention, the experimental group was also reported by teachers as having the largest difference in improved conduct.

Chapter Summary

Mindsets, growth or fixed, significantly affects the achievement levels of students. Previous research demonstrates the powerful and positive effects of having

growth mindsets in education. Since teachers' mindsets can affect their students' mindsets, it is important to understand how to cultivate growth mindsets in teachers. Mindset interventions have shown some positive results, both short and long term, in altering mindsets from fixed to growth.

Chapter 3

Methodology

Purpose of the Investigation

The purpose of this investigation was to determine the mindsets of teacher participants, examine their knowledge of growth mindset theory, and determine whether teacher responses to a growth/fixed mindset questionnaire could be experimentally manipulated, both short and long term, with the use of an article that promoted growth mindsets.

Three data collection groupings were completed to investigate the growth mindset of educators using the four sets of hypotheses presented in Chapter One. In data collection grouping number one, the growth mindset scores of sixteen educators were determined. Their knowledge base of growth mindset theory was also examined. In an experimental manipulation, an article that promoted growth mindsets was used to prime participants in the experimental group to determine whether growth mindset measurements could be altered with an intervention. In data collection grouping number two, a separate group of sixteen educators participated in the same growth mindset intervention, and their growth mindset scores were determined. These educators were then retested with the same questionnaire three months after the initial intervention. The two sets of scores were compared to determine whether the effects of the intervention on growth mindset scores would last three months post intervention. Data collection grouping number three involved a subset of the participants from grouping number one. The eight educators in grouping number one's experimental group were retested with the

same growth mindset questionnaire six months following the initial intervention. Their growth mindset scores on the day of the intervention were compared to their mindset scores six months later to determine whether the results of the intervention lasted six months.

Data Collection Grouping Number One

Purpose

The purpose of this data collection was to determine the growth mindset scores of sixteen educators, to examine their knowledge base of growth mindset theory, and determine whether teacher responses to a growth mindset questionnaire could be experimentally manipulated with a growth mindset intervention. The data collection focused on hypotheses sets numbers one and four presented in Chapter One.

Sampling

The researcher used convenience sampling and chose sixteen teachers from various school districts in Wisconsin and Illinois to participate in this study. The level of teaching experience of the teachers varied, as well as the grade levels in which the participants taught. Teachers from elementary schools, middle schools, and high schools were included. The socio-economic levels of the students in the various schools also varied. Eight participants were randomly placed in the experimental group, and eight were placed in the control group.

Data Sources

A questionnaire (Appendix A) that was administered to both the experimental and control group served as the basis for the study. The questionnaire's main purpose was to measure the growth mindset scores of the teachers. The questionnaire also contained separate questions to gauge the teachers' knowledge regarding mindset theory. The subjects in the experimental group participated in a growth mindset intervention immediately prior to completing the questionnaire. The intervention consisted of reading an article by Carol Dweck called "Mind-sets and Equitable Education" (see reference section for details), which promoted a growth mindset. The subjects in the control group received no special treatment. The mindset scores from the teachers in the experimental group were compared to those from the control group.

Data Analysis

To investigate hypotheses set number one, the researcher conducted a quantitative analysis, utilizing a one-tailed t-test assuming equal variances, since the sample size was below 30. The t test was used to compare the growth mindset scores from participants in the experimental group versus the participants' scores from the control group. A one-tailed test was used since the hypothesis was directional. A 0.1 level of significance was used, since the questionnaire involved opinions in the education field.

To investigate hypotheses set number four, the researcher conducted an additional one-tailed t-test assuming equal variances. The t-test compared the experimental group's mean score on their knowledge of growth mindset theory to the mean score of the control group. A 0.1 level of significance was used.

Data Collection Grouping Number Two

Purpose

The purpose of this data collection was to determine whether the effects of a growth mindset intervention on participants' mindset scores would last three months after the intervention. This data collection investigated the second set of hypotheses presented in Chapter One.

Sampling

The researcher used convenience sampling and chose a local elementary school to recruit participants for the study. Sixteen teachers chose to participate. Fifteen of the sixteen teachers had more than five years of teaching experience. The elementary school that was chosen resides in a predominantly middle class neighborhood and is part of a large suburban school district.

Data Sources

The same growth mindset questionnaire that was used in data collection grouping number one was administered to the participants. Before completing the questionnaire, all of the sixteen teachers participated in the growth mindset intervention that was described in data collection grouping number one. The mindset scores of the teachers were determined. Three months post intervention, the participants were administered the same growth mindset questionnaire they had completed the day of the intervention. Mindset scores from the day of the intervention were compared to the participants' mindset scores three months post intervention.

Data Analysis

A quantitative analysis was conducted, utilizing a two-tailed, paired t-test, since the sample size was below thirty. The paired t-test was used to compare the growth mindset scores of the participants on the day of the intervention to their scores three months after the intervention. A two-tailed test was used since the hypothesis was not directional. A 0.1 level of significance was used, since the questionnaire involved opinions in the education field.

Data Collection Grouping Number Three

Purpose

The purpose of the data collection was to determine whether the effects of a growth mindset intervention on teacher participants would last six months after the intervention. The data collection investigated the third set of hypotheses presented in Chapter One.

Sampling

This data collection involved a subset of the participants from data collection grouping number one. The eight educators from the experimental group were included.

Data Sources

The same growth mindset questionnaire that was administered to the experimental group participants in data collection grouping number one was administered a second time to the same participants six months after the intervention. All eight of the

participants had initially undergone the growth mindset intervention that was described in data collection grouping number one. The mindset scores of the teachers were determined. Mindset scores from the day of the intervention were compared to the participants' mindset scores six months post intervention.

Data Analysis

A quantitative analysis was conducted, utilizing a two-tailed, paired t-test, since the sample size was below thirty. The paired t-test was used to compare the growth mindset scores of the participants on the day of the intervention to their mindset scores six months after the intervention. A two-tailed test was used since the hypothesis was not directional. A 0.1 level of significance was used, since the questionnaire involved opinions in the education field.

Chapter Summary

The researcher examined the difference between growth mindset scores for teachers in an experimental group and a control group with the use of a growth mindset questionnaire. The experimental group participated in a growth mindset intervention before given the questionnaire and the control group received no treatment before the questionnaire. Groups were compared to determine if there was a significant difference found resulting from the growth minded intervention. All participants were also asked questions regarding their knowledge of mindset theory. Additionally, the researcher examined whether the results of the intervention lasted three and six months after the intervention had taken place.

Chapter 4

Results

Purpose of the Investigation

The purpose of this investigation was to examine the growth or fixed mindedness of teacher participants, to investigate the participants' knowledge of growth mindset theory, and to determine whether teacher responses to a growth/fixed mindset questionnaire could be experimentally manipulated with the use of a growth mindset intervention. Additionally, the researcher investigated whether the results of the experimental manipulation would be retained three and six months post intervention.

Data Analysis

The growth mindset questionnaire (Appendix A) and the article used in the growth mindset intervention were sent via email using Survey Monkey to the appropriate research participants. The questionnaires were completed, returned, and tabulated. The scores from question numbers one through fourteen on the questionnaires were summed to determine the overall growth mindset scores for each of the participants. The highest growth mindset score that one could achieve was seventy points.

The data from the three data collection groups were analyzed in accordance with each group's corresponding hypotheses set. For data collection grouping number one, a one-tailed t-test, assuming equal variances, was used to compare the mean of the experimental group's growth mindset score (59.5) to that of the control group's (55.625). For data collection grouping number two, the mean of the growth mindset scores on day of the intervention (60.875) was compared to the mean of the growth mindset scores of

the same participants three months post intervention (58.375). A two-way, paired t-test was used in this analysis. The same type of analysis was also used to compare the means for data collection grouping number three. The mean for the participants' growth mindset scores on the day of the intervention was compared to the mean growth mindset score for the same participants six months post intervention. Table 1 displays the results of the three analyses (see Appendix B, C, and D for further details).

Table 1. Analysis Results for Hypotheses Sets One Through Three

Hypotheses Set	t-Crit	t-Stat	p-value	Hypotheses
One	1.34503	1.411802	0.089924	reject null #1, accept research #1
Two	1.75305	1.478712	0.159909	do not reject null #2
Three	1.76131	1.411802	0.179847	do not reject null #3

According to the t-test analysis results for data hypotheses set number one, there was a significant difference found at the 10% level between the mean scores of the experimental group and the control group. The experimental group had significantly higher scores for growth-mindedness. Null hypothesis number one was rejected, and research hypothesis number one was accepted. According to the results for hypotheses sets numbers two and three, there were no significant differences found between the means of the growth mindset scores on the days of the interventions and the scores both three and six months post intervention. The null hypotheses could not be rejected in either case.

A separate question (question #15) near the end of questionnaire was used to examine hypotheses set number four. The participants' knowledge, or lack thereof,

pertaining to growth mindset theory was investigated. The scores for question number fifteen from data collection grouping number one were analyzed. When the participants were asked how familiar they were with the terms “growth mindset” and “fixed mindset”, scores ranged from two to five points with a maximum of five points. The experimental group’s mean score for the question was 4.375; whereas, the mean score for the control group was 3.5. A one-tailed t-test was used to compare the data between the two groups for this separate question. Again, a 0.1 significance level was used in the analysis.

Table 2. Results for Hypotheses Set Number Four

Hypotheses Set	t-Crit	t-Stat	p-value	Results
Four	1.3450	1.6434	0.0613	Reject Null #4 Accept Research #4

The results from the t-test analysis (see Appendix E for more details), reported in Table 2, demonstrate a significant difference was found between the experimental and control group participants.

Chapter Summary

The results for the first three hypotheses sets, which were presented in chapter one, were analyzed and demonstrated in Table 1. The results for hypotheses set number four were analyzed and shown in Table 2. A significance level of 0.1 was used in all of the analyses.

Chapter 5

Discussion, Conclusions, Implications

Discussion

The results reported in Table 1 demonstrated that there was a significant difference found between the means of the experimental and control groups at a 0.1 level for data collection grouping number one. Null hypothesis number one was rejected and the research hypothesis one was accepted. This means that the growth mindset intervention did have a significant effect on the participants' growth mindset scores in the experimental group. Their growth mindset scores were higher than the participants' scores in the control group, who did not receive the intervention. Therefore, a quick and simple intervention was shown to influence growth mindedness in teacher participants.

The results related to hypotheses sets numbers two and three (Table 1) did not show significant differences between the control and experimental groups. The null hypotheses could not be rejected in either case. This means that the growth mindedness scores of participants on the day of the intervention and three and six months post intervention were essentially the same; the effects of the intervention on growth mindedness scores were retained. These results support the idea that a quick and simple growth mindset intervention can have lasting results on participants.

In terms of hypotheses set number four (Table 2), the results demonstrated that there was a significant difference found between the means of the experimental group and control group in response to question number fifteen. The experimental group was found to have more knowledge relating to growth mindset theory, as they reported having

a higher level of familiarity with the terms “growth and fixed mindsets”, versus the control group who did not participate in an intervention. This result means that the experimental group was impacted by the article that promoted growth mindsets.

Conclusions

The results of the current investigation demonstrate that the teachers’ mindsets for all groups in this study showed a trend towards growth versus fixed, although there is significant room for overall movement in the growth direction. Growth mindset scores ranged from 55 to 68 points for the groups that participated in the growth mindset intervention (See Table 1 for the Means) and from 46 to 67 for the group that did not participate (See Table 1 for the control group’s Mean). The highest possible mindset score one could achieve was seventy points, and the lowest was fourteen.

The results also support the idea that measures of growth mindedness can be increased with the use of a growth mindedness intervention. In this case, an article that cited research in favor of growth mindedness in education was used as the intervention. Due to these results, null hypothesis number one was rejected at the ten percent level and research hypothesis number one was accepted. The results indicated that the growth mindset intervention had long terms results on the participants’ mindset scores, which lasted both three and six months after the intervention. This conclusion was supported by the results found for data collection grouping numbers two and three. The mean differences for mindset scores and the day of the intervention and the mean scores collected three and six months post intervention were essentially equal. In accordance, null hypotheses numbers two and three could not be rejected at the ten percent level.

As was expected, the intervention also resulted in an increase of the teachers' reported subject knowledge of mindset theory. This conclusion was supported by the results from Table 2. However, the participants, in both the experimental group and control group, had moderate to high levels of familiarity with mindset theory. The finding that many of the educators were familiar with the terms "growth mindset" and "fixed mindset" is encouraging in light of the huge body of research which supports growth mindsets in education. The finding may also help explain why the effects of the intervention were only significant at a ten percent level and not a five percent level. If teachers were already familiar with growth mindset theory, the effects of a growth mindset intervention on participants might likely be less powerful.

Limitations of the Study

The study had a smaller number of participants than was anticipated, due to the researcher having difficulties with questionnaires that were not completed and sent back in a timely manner. It would have been desirable to have a larger pool of subjects, in order to raise the significance level of the study. The study was also limited in that it only investigated the effects of experimentally manipulating the growth mindsets of the participants with the use of one type of intervention. It would be valuable to examine the efficacy of several different types of interventions over a longer time period. Additionally, the results of the study were significant at a ten percent level. Results found at a five percent level of significance would have been more desirable.

Implications

Future studies should incorporate a larger number of teacher participants from a variety of experience levels, subject areas, demographics, and disciplines. Randomized sampling should also be done. Studies could also investigate different types of mindset interventions, such as videos, computer programs, or lecture presentations, to determine which are most effective and longer lasting. Additional research could help answer some of the following questions: Which types of interventions can be accomplished easily in a school or classroom? Which interventions are effective and require the least amount of valuable classroom time? Does teacher mindset tend to change over one's teaching career? Research that investigates how teacher mindsets are formed, influenced, and/or changed over time would be valuable as well.

Chapter Summary

Overall, the teacher mindsets in this study showed a trend towards growth mindedness versus fixed mindedness. Yet, there is substantial room for movement in the growth direction, which according to the research on growth mindsets in education, would be desirable. The study also determined that mindsets could be changed quickly and easily, and have lasting results, through a mindset intervention. Teacher participants from the experimental group reported having higher levels of growth mindedness and growth mindset knowledge.

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Appendix A

Appendix A: Mindset Questionnaire

To what extent do you agree or disagree with the following statements?

1. A student's intelligence level is something that he/she is born with and cannot be changed much.

Strongly Agree Agree Neutral Disagree Strongly Disagree

2. I attend professional development opportunities whenever possible, because I love to learn.

Strongly Agree Agree Neutral Disagree Strongly Disagree

3. Truly smart people do not need to try hard.

Strongly Agree Agree Neutral Disagree Strongly Disagree

4. Musical talent can be learned by anyone.

Strongly Agree Agree Neutral Disagree Strongly Disagree

5. No matter how intelligent you are, you can become substantially more intelligent with work, effort, and persistence.

Strongly Agree Agree Neutral Disagree Strongly Disagree

6. If students do not have success, I often reflect on my own teaching practices and come up with new ways to present material.

Strongly Agree Agree Neutral Disagree Strongly Disagree

7. Some people are good at school and some are not-it's not often that people change.

Strongly Agree Agree Neutral Disagree Strongly Disagree

8. Only a few people are truly good at sports-you have to be "born with it".

Strongly Agree Agree Neutral Disagree Strongly Disagree

9. The harder you work at something, the better you become at it.

Strongly Agree Agree Neutral Disagree Strongly Disagree

10. I tend to get angry when I get negative feedback about my performance.

Strongly Agree Agree Neutral Disagree Strongly Disagree

11. I love challenges, and I teach my students to embrace them.

Strongly Agree Agree Neutral Disagree Strongly Disagree

12. It is more important to acknowledge good grades versus effort and persistence.

Strongly Agree Agree Neutral Disagree Strongly Disagree

13. Mistakes and setbacks should be embraced by students as learning opportunities.

Strongly Agree Agree Neutral Disagree Strongly Disagree

14. Some students will never "get it".

Strongly Agree Agree Neutral Disagree Strongly Disagree

15. I am very familiar with the terms "growth mindsets" and "fixed mindsets".

Strongly Agree Agree Neutral Disagree Strongly Disagree

16. I understand the mechanics behind how the brain learns and grows, and I'm familiar with terms such as "synaptic pruning", "neuronal networks", and "neuroplasticity".

Strongly Agree Agree Neutral Disagree Strongly Disagree

17. How many years of teaching experience do you have?

- Less than 5 years
 5 years or more

Appendix B

t-Test: Two-Sample Assuming Equal Variances

	<i>Experimental Group Scores</i>	<i>Control Group Scores</i>
Mean	59.5	55.625
Variance	12.85714286	47.41071429
Observations	8	8
Pooled Variance	30.13392857	
Hypothesized Mean Difference	0	
df	14	
t Stat	1.411802106	
P(T<=t) one-tail	0.089923542	
t Critical one-tail	1.345030374	
P(T<=t) two-tail	0.179847084	
t Critical two-tail	1.761310136	

Appendix C

t-Test: Paired Two Sample for Means

	<i>Interv. Day</i>	<i>3 Months Later</i>
Mean	60.875	58.375
Variance	21.58333333	21.05
Observations	16	16
Pearson Correlation	-0.072718747	
Hypothesized Mean Difference	0	
df	15	
t Stat	1.478711913	
P(T<=t) one-tail	0.079954453	
t Critical one-tail	1.340605608	
P(T<=t) two-tail	0.159908906	
t Critical two-tail	1.753050356	

Appendix D

t-Test: Paired Two Sample for Means

	<i>Interv. Day</i>	<i>6 Months Later</i>
Mean	59.5	60.125
Variance	12.85714286	18.98214286
Observations	8	8
Pearson Correlation	-0.726982966	
Hypothesized Mean Difference	0	
df	7	
t Stat	-0.23933897	
P(T<=t) one-tail	0.408849729	
t Critical one-tail	1.414923928	
P(T<=t) two-tail	0.817699457	
t Critical two-tail	1.894578605	

Appendix E

t-Test: Two-Sample Assuming Equal Variances

	<i>Experimental</i>	<i>Control</i>
Mean	4.375	3.5
Variance	1.125	1.142857143
Observations	8	8
Pooled Variance	1.133928571	
Hypothesized Mean Difference	0	
df	14	
t Stat	1.643407254	
P(T<=t) one-tail	0.061279861	
t Critical one-tail	1.345030374	
P(T<=t) two-tail	0.122559722	
t Critical two-tail	1.761310136	