

Growth Mindset: Pre-Service Teachers' Perspectives

by

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A thesis submitted in partial fulfillment of the requirements for the degree of

Master of Education

In

SCHOOL AND CLINICAL CHILD PSYCHOLOGY

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Abstract

The popularity of mindset theory has resulted in a surge of mindset interventions in the school systems (e.g., Brainology[®]). Nonetheless, Carol Dweck has recently emphasized that holding a growth mindset is much more than simply “positive thinking” and instead requires much more effort than teachers might understand. Thus, the purpose of this two-part exploratory study was to better understand how pre-service teachers think about growth mindsets. We wondered what aspects of the theory pre-service teachers continue to struggle with and how they would answer about their own mindset as well as how they think about students with different disabilities. We collected data from 182 participants through a correlational design involving separate quantitative and qualitative data. To answer our research questions, we used descriptive statistics and a thematic analysis. The quantitative results of this study suggest that pre-service teachers hold personal growth mindsets and they have growth beliefs for students with various disabilities. However, despite strong quantitative endorsement of growth mindsets, in the qualitative analyses we determined three ways in which they found growth mindsets hard to accept (1) the notion of the mindset theory itself, (2) the idea that every individual can grow, (3) and the necessary actions behind having a growth mindset. The findings of this study are discussed in terms of implications for theory, researchers, and educators.

Preface

This thesis is an original work by Gabrielle Pelletier. The research project, of which this thesis is a part, received ethics approval from the University of Alberta Research Ethics Board, No.Pro00084252, August 24, 2018.

Acknowledgments

Thank you to my committee members, Jacqueline Pei and Maria Cutumisu. I am very grateful for you taking the time out of your summer to review my work and provide feedback.

Thank you to my supervisor, Dr. Lia Daniels for your unconditional support. You took me on as your third Master student even if that meant much more work and I'll forever be grateful. Your mentorship to make me a better researcher, student, and person has been incredible. You are by far the most passionate and insightful mentor. I am so excited for what the future holds. Thank you indefinitely.

Thank you to the Social Sciences and Humanities Research Council of Canada for supporting and allowing me to do my research.

Thank you to my ACME lab mates. A special shout out to Lauren for all your time and dedication to helping me with my research whether it be using SPSS, making posters, or planning conferences. I feel lucky to be in such a collaborative, dedicated, and uplifting lab.

To my cohort members – you are some of the most amazing individuals I have had the pleasure to meet. We have grown to be a family. I am so lucky to have learned, laughed, and cried with all of you. I am beyond grateful to spend the next years with you.

To my Edmonton family – Andrew, Devon, and Cass. Thank you for holding me throughout the lows and cheering me on during the highs. You inspire me to be a better person every day. I'll always be grateful for the coffee, food, and activity dates that reminded me that I have such amazing people in my life.

Finally, my family. You are the most incredible, supportive and awesome individuals; I will always look up to you. Our phone calls and visits made the hard times easier. Thanks for everything. I would not be here without all of your love!

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Growth Mindsets: Pre-Service Teachers' Perspectives

Negative beliefs about students with different types of learning and behaviour challenges are common in the education system (Baglieri & Knopf, 2004; Chung, et al., 2015). The public may hold many misconceptions that students with cognitive or behavioural challenges cannot improve or change (Dweck, 2006). Working against these misconceptions, over the last decade, Dr. Carol Dweck's Mindset Theory has radically proposed that *everyone* can grow and improve. This notion resonates with teachers, many of whom enter teaching to help students learn and grow (Association for Supervision and Curriculum Development, 2014). However, as classrooms become more complex and inclusive, teachers are faced with quantitatively and qualitatively more challenging students than ever before to "grow."

Overwhelmingly, teachers tend to agree with growth mindset statements that students can grow (Coombs, DeLuca, LaPointe-McEwan, & Chalas, 2018; DeLuca, Coombs, & Lapointe-McEwan, 2019; Guthsall, 2014). However, they may not be equally confident in their agreement that growth is possible for different groups of students such as those with cognitive or behavioural disabilities. Although theoretically the mindset movement allows teachers and researchers to think differently about everyone including students facing challenges, most mindset research focuses on typically developing students. Thus, our first purpose was to examine pre-service teachers' mindsets about students with different disabilities.

Our second purpose was to explore what parts of a mindset message if any, pre-service teachers find hard to accept – that is, what about this idea of growth challenges future teachers? We came to this second purpose because the popularity of mindset theory has resulted in a surge of mindset interventions in the school systems (e.g., Brainology[®]) as well as informational materials circulated online, and yet little is known about pre-service teachers own thoughts about

this pervasive messaging. Searching “mindsets” results in thousands of pictures and activities that teachers can use including prompts for students to talk about challenging situations and how to overcome them, colouring sheets, and bulletin board displays. Despite the wide availability of mindset materials, Dweck (2016) has recently emphasized that a growth mindset requires much more than having a positive attitude and being open-minded. It requires effort and perseverance to continuously challenge fixed misconceptions people may have and to implement growth strategies. The information from this qualitative data will help researchers understand what ideas related to mindset theory are still difficult for pre-service teachers, despite tending to agree with the theory.

Theoretical Framework: Mindset Theory

Originally referred to as “theories of intelligence,” mindset theory is a social-cognitive motivation theory pioneered by Stanford University professor Carol Dweck that aims to understand implicit beliefs about abilities and intelligence. Within the theory, Dweck (2006) describes two broad paths of beliefs for intelligence: fixed or growth. The first path of beliefs is the growth mindset where individuals hold the belief that abilities and intelligence can be developed. According to Dweck, individuals with growth mindsets typically have positive feelings about their abilities. They put themselves in challenging situations with the purpose of being able to learn and become better. When faced with a situation where they fail, individuals with a growth mindset may still experience strong emotions such as sadness or frustration; however, they will use this opportunity to learn more about themselves and understand what they can do to improve. A person with a growth mindset does not let one situation impair how they view themselves in all situations.

The second path of beliefs is the fixed mindset. Individuals with a fixed mindset hold the belief that intelligence is set in stone and nothing much can be done to change. According to Dweck, individuals with fixed mindsets typically experience more negative emotions regarding their abilities. They are more likely to put themselves in situations that are easy for them so that they can look the smartest. When a person with a fixed mindset experiences failure, the setback is much harder on their personal worth. Failure may tarnish their self-esteem by believing they are incapable of improving and the situation will define who they are as a person. Although individuals can hold both fixed and growth mindsets for different individuals, situations or abilities, Dweck typically talks about mindsets as being separate.

Student Mindsets

Dweck developed the notion of mindsets while watching children respond to challenging tasks. Early research on mindsets focused on the impact of mindsets students hold for themselves. Mindsets are related to motivation for learning and academic achievement. In a study conducted by Haimovitz, Wormington & Corpus (2011), students' growth mindset predicted intrinsic motivation towards their academic tasks over the year while students who had a fixed mindset had a decrease in intrinsic motivation. A meta-analysis conducted by Burnette, O'Boyle, VanEpps, Pollack, & Finkel (2013) analyzed 113 samples looking at the impact of mindsets on self-regulation in individuals between the ages of 5-42. They found that a growth mindset predicted different self-regulation skills, which predicted goal setting, goal monitoring and goal operating. Growth mindset in students is also related to life satisfaction, sense of meaning, purpose (Martin, Nejad, Colmar, & Liem, 2013) and self-esteem (Kyoung Hwang & Lee, 2018). When students understand that they are in control of their success, it makes it easier to take charge of their life and seek challenges to learn and improve.

Mindsets influence academic achievement because they shape how students set goals, whether abilities are about effort or natural ability, and what strategies they will use in the face of adversity (Yeager & Dweck, 2012). A meta-analysis conducted by Costa and Faria (2018) looked at 46 studies and found a low but significant effect between growth mindset and academic achievement. Students with growth beliefs were more likely to have higher grades in verbal and quantitative subjects as well as higher overall achievement. Conversely, a meta-analysis conducted by Sisk, Burgoyne, Sun, Butler, and Macnamara (2018) found that 157 of the 273 effect sizes looking at growth mindsets and academic achievement were not statistically significant. These inconsistencies may be due to the fact that individuals in the education system – either students or teachers - do not accurately understand mindsets. Dweck mentions that it is important for teachers to understand and explain to their students that a growth mindset is not simply a promise that students can achieve anything they set their minds to (Dweck, 2016). Although the results of the meta-analyses do not include an explanatory mechanism, it is possible that these findings demonstrate that holding a growth mindset is difficult and involves much more than simply being positive. In other words, although students may have identified themselves as having a growth mindset, it could be possible that their actions were not consistent with their mindset. The same is possible for teachers.

Experimental studies. Because growth mindsets had such positive associations and fixed mindsets were detrimental for motivation and achievement, researchers began to create interventions to foster growth mindsets. Mindset research has a large number of experimental studies on which to draw. Some mindset interventions have been found to increase student motivation (Blackwell, Tresniewski, & Dweck, 2007) and decrease performance goals (DeBacker, Heddy, Kershen, Crowson, Looney, & Goldman, 2018). For example, an

experimental study conducted by Rhew, Piro, Goolkasian, and Cosentino (2018) investigated whether a growth mindset intervention would increase the self-efficacy and motivation of high school students in special education. They found a significant difference in motivation post-intervention. In a study conducted by Nussbaum and Dweck (2008), researchers had undergraduate students manipulated to get fixed or growth feedback. When students were faced with failure, those in the fixed condition used defensive self-esteem repair statements, while those in the growth condition used self-improvement statements. These findings suggest that when students hold fixed mindsets, they are more likely to attribute failure to their own self-worth, whereas students with growth mindsets do not. Blackwell, Trzesniewski, and Dweck (2007) examined high achieving students' mindsets and their influence on their achievement outcomes. Students who held more of a growth mindset had positive thoughts about effort, attributions, and chose more effort-based strategies when responding to failure. Following an experimental intervention, growth mindset also predicted higher math grades compared to those who had a fixed mindset two years later. As these students entered high school, math courses got harder. Those who were used to achieving without putting in as much effort realized that they could not keep up their high grades without working hard. As a result, their motivation decreased because they conceptualized effort as not being capable. A meta-analysis conducted by Sarrazin et al. (2018) analyzed 10 studies to explore whether teaching neuroplasticity to induce a growth mindset had an impact on motivation, academic achievement, and brain activity specifically attention mechanisms in elementary students through adulthood. They found significant effects for all three areas with interventions being especially helpful for at-risk students. A larger meta-analysis looked at growth mindset interventions for students (Sisk, Burgoyne, Sun, Bulter, &

Macnamara, 2018). They found no significant effect when it came to growth mindset interventions.

The intervention literature is more conflicted than we would expect given the public popularity of mindsets for all students. The large difference between lengths of interventions as well as how well the teachers administering the interventions understand the concept of mindsets may explain the conflicting evidence. Another possibility could be that mindset beliefs can be temporarily changed but if they are not constantly reinforced, they can go back to their pre-intervention beliefs (Orosz, Péter-Szarka, Bothe, Tóth-Király, & Berger, 2017).

Evidence on students with disabilities. A smaller body of correlational and experimental literature investigates the impact of mindsets for students with disabilities. A study conducted by Timpone (2012) explored the mindsets of school-aged students in different tiers of the Response-to-Intervention model. They found that the higher the intervention level the students were in, the more the students were likely to have fixed mindsets. These findings support that students with disabilities may typically perceive themselves as less able than their peers (Moller, Streblow, & Pohlmann, 2009). Similarly, Baird, Scott, Dearing, and Hamill (2009) found that students with learning disabilities were more likely to believe that they could not improve their intelligence. As a result, these students preferred performance-oriented goals because putting in the effort would mean they have low abilities. Hwang, Reyes, and Eccles (2019) found that a fixed mindset about mathematics in grade 10 predicted lower growth in academic achievement by grade 12 for low-achieving students compared to high-achieving students. In sum, these studies suggest that students with certain challenges may be more inclined to fixed mindsets than growth.

However, researchers have also found conflicting evidence with students with disabilities. For example, a study conducted by Blake (2015) found no difference in mindset beliefs between

students with learning disabilities and no learning disabilities. Another study conducted by Matheson (2015) found that high school students with learning disabilities had more of a growth mindset than students with no learning disabilities. Matheson concluded that these students may have been well supported by their teachers in order to endorse growth mindsets. The broader literature certainly supports that teachers' support for students and their own mindsets are important considerations.

Teacher Mindsets

As researchers gained understanding of student mindsets, they turned their attention to teachers' mindsets, recognizing that teachers' beliefs and practices may set the stage for student mindsets (Dweck, 2006; Dweck, 2014; Rattan, Good & Dweck, 2006). Overall, teachers typically endorse more of a growth mindset than a fixed one (Coombs, DeLuca, LaPointe-McEwan, & Chalas, 2018; DeLuca, Coomb, & Lapointe-McEwan, 2019; Guthsall, 2013; 2014). Pre-service teachers especially strongly endorse growth mindsets because they tend to be highly optimistic about students' abilities prior to entering the field (Asbury, Klassen, Bowyer-Crane, Kyriacou, & Nash, 2016). Generally speaking, they hold mastery-goals, similar to a growth mindset about their teaching expectations (Daniels, 2015).

Teachers with growth mindsets are more likely to engage in their work in a way that helps students overcome classroom challenges (Zeng, Chen, Cheung, & Peng, 2019). As a result, they are more likely to shape their classrooms with mastery-approach goals (Trouilloud, Sarrazin, Bressoux, & Bois, 2006), thus encouraging students to create these same types of goals for themselves. For example, a study conducted by Waid (2018) found that pre-service teachers' growth mindset was related to using multiple forms of assessment as well as providing feedback related to effort. Another study conducted by Smith, Brumskill, Johnson, and Zimmer (2018)

found that when university statistics teachers provided students with non-feedback oriented growth messages the students ended up adopting more growth mindsets and had better grades at the end of the year.

On the other side, teachers with fixed mindsets can negatively impact their students. They tend to create classroom environments that are high-stakes and encourage more performance-based goals (Deemer, 2004). They often believe that they are unable to control their students' success and as a result, they attend to the high achieving students compared to those with educational challenges (Shim, Cho, & Cassady, 2013). Even when teachers are not explicit about holding a fixed mindset, if a student perceives that their teacher has a fixed mindset about their abilities, it can negatively impact the student's thoughts on the potential for growth (Gutshall, 2016). Researchers found that when teachers responded to low math achievement with comfort-oriented feedback such as "It's ok, not everyone can be good at math", students perceived their teachers as having fixed mindsets and holding them to low expectations. Although the teachers were likely trying to make the students feel better, the statements resulted in lowering students' motivation (Rattan, Good, & Dweck, 2012). Another study found that teachers with a more fixed mindset reported less autonomy supportive practices in their classrooms (Leroy, Bressoux, Sarrazin, & Trouilloud, 2007), thus decreasing their students' motivation to be in charge of their learning.

Because teachers' fixed mindsets negatively impact students, interventions have been put into place to change teachers' mindsets from fixed to growth. In a recent study conducted by Seaton (2017), a mindset intervention was administered to a group of teachers over six sessions. Results demonstrated a significant shift to a growth mindset three months post-intervention. These results demonstrate that short interventions can change teachers' perspectives and thus

benefit their students. This is particularly important because recently Dweck and Yeager (2019) have argued that many teachers who report having a growth mindset do not fully understand the tangible practices required to enact the mindset. This could partly explain why intervention outcomes for students have become somewhat contentious. Because of some teacher misconceptions surrounding growth mindset, we wanted to show them a video introducing growth mindset theory and how it is applied. We were interested in disentangling what pre-service teacher find hard to understand about mindsets so that these questions can be answered prior to entering the field.

Individual difference variables. Although many of these studies looked at men and women teachers across grades, gender, and teaching level remain important variables. Both the Asbury et al., (2016) and Gutshall (2013; 2014) studies found no significant differences between men and women in their studies. Teaching level seems to be less commonly considered. Drawing from similar constructs, researchers have shown that secondary pre-service teachers have greater self-efficacy beliefs compared to primary pre-service teachers (Savran & Cakiroglu, 2003). In comparison, Daniels, Frenzel, Stupnisky, Stewart, and Perry (2012) showed that elementary school pre-service teachers had significantly higher personal mastery goals than their secondary counterparts. Within a student perspective, secondary students with learning disabilities have reported that teachers have negative attitudes toward their learning (Kortering & Braziel, 2006). Because of these findings, it is possible that pre-service primary school teachers may have high scores on growth mindsets than secondary pre-service teachers. It may also be that these scores are different depending on the disability groups.

Students with disabilities. Research is sparse when it comes to asking teachers about their mindsets for students with disabilities. The most direct findings come from Gutshall who has

done multiple studies in this area with mindsets specifically. In the first study, she explored teacher mindsets by giving them hypothetical scenarios of students with and without disabilities. She found that teachers had the same mindset for all students regardless of whether they were typically developing or had disabilities (Gutshall, 2013). Gutshall (2014) found that 73% of pre-service teachers had growth mindset beliefs throughout their training and that mindsets did not differ by disability scenario. Other researchers (Asbury, Klassen, Bowyer-Crane, Kyriacou, & Nash, 2016) explored pre-service teachers' mindset beliefs about students with disabilities and found that diagnostic label for dyslexia and attention-deficit/hyperactivity disorder (ADHD) did not impact their mindset beliefs. Because there is little research exploring mindsets for various disabilities, we wanted to ask teachers what their growth beliefs were for multiple disabilities.

Current Study

We used a two-part quantitative correlational and qualitative descriptive research design to explore pre-service teachers responses to the idea of growth mindsets. Research surrounding mindsets supports the notion that teachers and pre-service teachers tend to willingly and strongly endorse growth mindsets about intelligence (Gutshall 2013; 2014). Given this strong endorsement by pre-service teachers and the trend of mindset theory interventions growing in popularity, it is important to identify remaining stumbling blocks for pre-service teachers. Toward this end, we focused on two specific advancements.

First, little is known about how teachers' own personal mindset beliefs relate to their beliefs for students facing different disabilities. Thus, in the quantitative part of this study, we examined pre-service teachers' own growth mindset beliefs and their association with growth beliefs for students with different disabilities. We asked the following questions:

1. How do pre-service teachers score on growth mindsets and do these scores differ for gender (men vs. women) and teaching level (primary vs. secondary)?
2. How do pre-service teachers rate the potential for growth for students with different disabilities?
3. Do personal mindsets scores correlate with growth beliefs for different disability groups?

Second, we sought to identify what might be some of the challenges or places of resistance when it comes to accepting the principles of growth mindset theory that are typically presented during an intervention. Using qualitative responses to a growth mindset video, we sought to increase our understanding in this area by pursuing the following question:

4. What do pre-service teachers find hard to accept about a growth mindset video?

Method

Procedure

We recruited pre-service teachers for a study about student motivation, emotions, success, and relationships through the Educational Psychology Participant Pool, which was hosted in a second-year education course. Students who chose to participate signed up online and we provided them with the study link. They completed several self-report questionnaires related to mindsets. Then, they watched a 16-minute video about mindsets and how teachers play an important role in fostering growth mindsets in students. We asked them to indicate if they had watched the whole video before asking them to provide open-ended responses to the video content. Participants received a 5% credit towards their final course mark for participating in our study, even if they ceased participating before the end of the study (see Appendix A for

information letter). This study received ethical approval from the University of Alberta Research Ethics Board (Pro00084252 – Appendix B).

Participants

A total of 213 participants were eligible for the study. There were 168 women, 32 men, 7 non-binary participants, and 6 participants who chose not to respond to the gender question. The age ranged from 18-45 years old ($M = 23.2$). Of those who chose to respond to the question, 107 were in the primary teaching level and 95 were in the secondary teaching level. Thirty-one participants were excluded for not completing the questionnaire leaving the total sample at 182 participants for the quantitative part of the study. Following the video check, an additional 34 participants were excluded for not watching the full video leaving 148 participants for the qualitative part of the study.

Measures

We used a combination of pre-existing quantitative, created quantitative, and open-ended qualitative items to assess our constructs (see Appendix C for the full questionnaire).

Mindsets. In order to assess pre-service teachers own mindsets, we used a four-question measure adapted by from the *Theories of Intelligence Scale* developed by Carol Dweck (1999). We used this scale because it is recent and has evidence of high reliability ($\alpha = .93$). Participants responded to 4 growth ($\alpha = .85$) statements about intelligence beliefs on a 6 point Likert scale from 1 (*Strongly disagree*) to 6 (*Strongly agree*). They responded to statements such as: Even your basic intelligence level can be increased considerably. Total scores could range from 6 to 24 with lower scores representing a more fixed mindset and higher scores representing a more growth mindset.

Growth beliefs and disabilities. In order to explore pre-service teachers' growth beliefs for students with different disabilities, we used direct single items measures. Specifically, we asked participants: To what extent do you think a child with [condition] can grow their brain? Participants indicated their response on a 6 point Likert scale from 1 (*A little*) to 6 (*A lot*) for six conditions: brain damage, learning disability, autism, anxiety, attention-deficit/hyperactivity disorder, and fetal alcohol spectrum disorder. The total scores per question could range from 1 to 6, with lower scores representing lower beliefs about growth, and higher scores representing higher beliefs about growth regarding the disability.

Video and check. Participants watched a 16-minute video (see link: <https://arpdcreources.ca/consortia/shifting-mindsets/>) that explained what it means to have a growth mindset, links to brain science, and possible strategies for teachers to help their students adopt a growth mindset. In order to assess whether participants watched the full video, we asked them to answer the following question: Did you watch the whole video? Participants answered yes or no. Then, participants were asked to write a response to the following open-ended question: What is the hardest message in the video for you to accept?

Rationale for Analyses

We conducted the quantitative analyses in IBM Statistical Program for the Social Sciences Version 24 (SPSS-24). First, we ran descriptive statistics to observe if there were any trends in the data within the means, standard deviations, frequencies, skewness, and kurtosis for all variables. Second, we ran independent samples *t*-tests to test for gender and teaching level differences on personal mindsets. Third, we ran correlations to look for associations between pre-service teachers' own mindsets and their mindset beliefs for each disability group.

We analyzed the qualitative data through a deductive thematic analysis (Nowell, Norris, White & Moules, 2017). The author independently open-coded participants' written statements and then moved the codes into potential themes. During this process, she created a codebook that gave a definition for the themes and described what the theme is and what it is not in order to differentiate them (Appendix D). She then added sub-themes for each theme and defined these as well. She shared these themes with her thesis supervisor and they discussed several possible thematic structures before reaching agreement on a final set of themes. Another graduate student re-coded the statements to themes with 92% accuracy on the first attempt. The author and graduate student resolved the discrepancies and reached a consensus on all themes.

Results

Descriptive Statistics

All descriptive information about the variables is presented in Table 1. Pre-service teachers scored well above the midpoint (score of 12) on the mindsets questionnaire, suggesting their beliefs are more growth than fixed. Pre-service teachers also scored above the midpoint (score of 3) on growth beliefs for each category of students with different disabilities. Brain damage was seen as least malleable and anxiety and ADHD as most likely to grow.

Table 1. *Descriptive Statistics*

Variables	# Items	Scales	A	Range	N	M	SD	Skew	Kurtosis
Growth	4	1= Strongly Disagree; 6= Strongly Agree	.852	5-24	182	17.64	3.63	-.66	.5
Brain Damage	1	1= A little; 6= A lot	-	1-6	181	4.30	1.30	-.26	-.58
FASD	1	1= A little; 6= A lot	-	1-6	182	4.60	1.34	-.52	-.19
Learning Disability	1	1= A little; 6= A lot	-	1-6	182	4.90	.97	-.77	.64
Autism	1	1= A little; 6= A lot	-	2-6	180	5.01	.92	-.62	-.06
ADHD	1	1= A little; 6= A lot	-	3-6	182	5.30	.74	-.68	-.30
Anxiety	1	1= A little; 6= A lot	-	3-6	181	5.34	.73	-.72	-.45

T-tests

Histograms and P-P plots were created to test the assumption of normality. The data fit the normal curve reasonably well on the histogram and the majority of points were close to the P-P plot diagonal lines, indicating that the assumption of normality was met. The skewness and kurtosis values in between $[-2, 2]$ imply normality as well. We conducted an independent samples *t*-test to see if there were teaching level (primary vs. secondary) differences in growth mindsets. There was no statistical difference in the scores for primary school ($M = 17.71$, $SD = 3.3$) and secondary school ($M = 17.58$, $SD = 4.01$); $t(171) = .24$, $p = .81$ pre-service teachers' mindsets. Second, we conducted an independent samples *t*-test to see if there were gender (men vs. women) differences in growth mindsets. The category of participants indicating "non-binary" or for choosing to not disclose their gender was too small to be analyzed ($n = 13$) and thus these

participants were removed from the gender analysis. There was no statistical difference in the scores for men ($M = 16.86$, $SD = 4.44$) and women ($M = 17.80$, $SD = 3.47$); $t(170) = -1.27$, $p = .20$ for mindsets.

Correlations

With respect to growth mindsets, statistically significant correlations emerged between teachers' growth mindset scores and their beliefs about growth for three of the six different disability groups. Specifically, a growth mindset was statistically and positively correlated with growth beliefs for anxiety, ADHD, and FASD. There was no statistically significant correlation between a growth mindset and brain damage, learning disability and autism. Growth beliefs amongst the disabilities were also positively and significantly correlated. In line with the means described above, the correlation between anxiety and ADHD was quite large as was the correlation between learning disability and autism. All correlations between study variables are presented in Table 2.

Table 2. *Correlations Matrix for Personal Mindset and Growth Beliefs for Students*

C	1	2	3	4	5	6	7
1. Personal Growth	-	.14	.17	.18	.27**	.29**	.26**
2. Brain Damage		-	.66**	.58**	.34**	.37**	.65**
3. Learning Disability			-	.81**	.55**	.62**	.67**
4. Autism				-	.68**	.73**	.73**
5. Anxiety					-	.80**	.52**
6. ADHD						-	.57**
7. FASD							-

Note. ** $p < .01$

Thematic Analysis

We analyzed participants' written responses to the question "what is hard to accept" after watching a growth mindset video. Three final themes and nine sub-themes emerged from the thematic analysis of these statements. We identified the following three themes: (1) disbelief, (2) level of growth, and (3) action behind the belief.

The first theme we identified from the participants' responses was a *disbelief*, which questioned the notion of mindset constructs and theory in general. Within this broad theme, we identified four sub-themes: fixed, fixed as bad, alternatives, and neuroplasticity. Within the fixed sub-theme, participants questioned the veracity of the idea that individuals actually have fixed mindsets: "[I find it hard to believe] that there are actually people with fixed mindsets", "[I find it hard to believe] that some people can't accept growth mindsets". While some found it hard to believe that people could actually have fixed mindsets, another area of disbelief was that holding a fixed mindset was necessarily a bad thing. Participants wrote comments such as: "[I find it hard to believe] that fixed is bad", "[I find it hard to believe] that those with a negative or fixed mindset will be more easily disillusioned and won't be able to overcome challenges as easily". Participants also questioned whether there are additional mindsets than growth and fixed through comments such as: "[I find it hard to believe] that people are stuck with only a fixed mindset or a growth mindset", "[I find it hard to believe] that mindsets can only either be fixed or growth, I think there might be more alternatives". Finally, participants questioned the notion of neuroplasticity – or whether or not the brain is actually capable of changing through comments such as: "[I find it hard to believe] how the brain can change and establish new connections", "[I find it hard to believe] that the brain can be significantly changed".

The second broad theme we identified from the participants' responses was *level of growth*, which questioned the statements that everyone can grow and can possibly even grow to the same amount. Within this, we identified two sub-themes: everyone and equality. Within the everyone sub-theme, participants showed their doubt that everyone could improve their mindset through comments such as: "[I find it hard to believe] that anyone is able to improve their mindset with hard work", "[I find it hard to believe] that EVERYONE is capable of changing and learning this mindset". Within the equality sub-theme, participants revealed hesitation with the idea that everyone could grow to the same extent through comments such as: "[I find it hard to believe] that every student can reach an equal level of success", "[I find it hard to believe] the implication that intelligence is limitless for all individuals".

The third broad theme we identified from the participants' responses was *action behind the belief*, which questioned how easy it seemed to be or how much effort it took to convince students that they could grow. The three sub-themes were: ease, student effort, and teacher effort. Within the ease sub-theme, participants raised concerns about how easy the video made it seem to have a growth mindset or to help others hold a growth mindset: "[I find it hard to believe] that changing your fixed mindset to a growth mindset [happens] easily", "[I find it hard to believe] how easy it is to adopt a growth mindset". Within the student effort sub-theme, participants doubted students would be willing to exert the necessary effort to sustain a growth mindset through comments such as: "[I find it hard to believe] because I feel that some people just don't have the desire to perform in school", "[I find it hard to believe] that everyone is able to develop a growth mindset because it seems hard to imagine for everyone to be willing to put in the work to do so". Within the teacher effort sub-theme, participants expressed concern about the magnitude of the teachers' role through comments such as: "[I find it hard to believe] that

teachers are primarily responsible for getting kids to adopt a growth mindset”, “[I find it hard to believe] that the mindset a teacher possesses has the ability to change that of the students”. We have represented these thematic results in Figure 1 below.

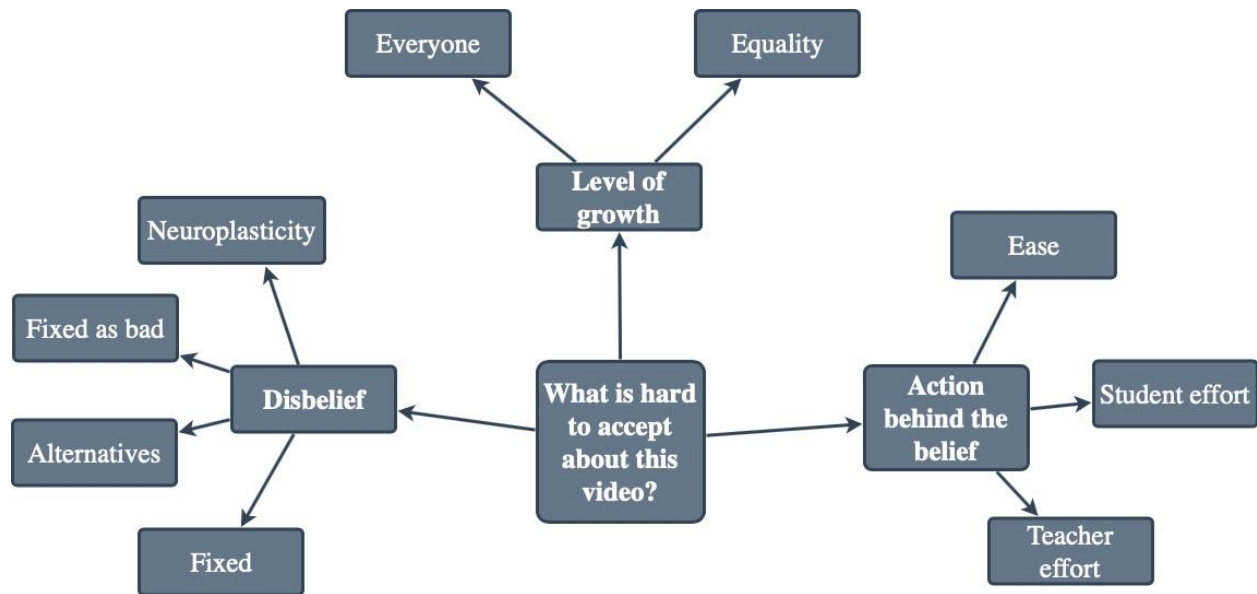


Figure 1: Results of Thematic Analysis

Discussion

The purpose of this exploratory study was to better understand how pre-service teachers respond to and understand mindsets. In this section we will address my research findings, the limitations of the study, directions for future research as well as implications for educators and researchers. Overall, the findings of the study suggest that pre-service teachers endorse growth beliefs over fixed beliefs and these scores do not differ by gender or teaching level (research question 1). Additionally, pre-service teachers hold growth beliefs about students with different disabilities and these scores correlate with their personal mindsets (research question 2 and 3). Finally, despite high scores on the quantitative items, pre-service teachers described three specific ideas related to mindsets as hard to understand including the notion of the mindset

theory itself, the idea that every individual can grow, and the necessary actions behind having a growth mindset (research question 4).

Quantitative Results

The first finding was that pre-service teachers endorsed growth beliefs over fixed beliefs when asked about their own general mindset about intelligence. Moreover, this endorsement did not differ by gender or teaching level. Both of these findings aligned with the existing literature (Asbury et al., 2016; Coombs, DeLuca, LaPointe-McEwan, & Chalas, 2018; DeLuca, Coomb, & Lapointe-McEwan, 2019; Gutshall 2013; 2014). Overall, these results suggest that pre-service teachers are optimistic about growth. This is promising considering their choice of profession: Teachers should believe that intelligence can be increased because they will spend much of their time teaching students new skills, ideas, and abilities. Furthermore, teacher mindsets have been shown to influence students' academic achievement, goal setting, and overall motivation in the classroom (Trouilloud, Sarrazin, Bressoux, & Bois, 2006; Smith, Brumskill, Johnson, & Zimmer, 2018; Waid, 2018) and thus the future students of these pre-service teachers will benefit from their current commitment to growth mindsets. Considering pre-service teachers and teachers primarily rate themselves as being growth minded, future research should ask teachers what growth beliefs mean to them and how they apply their growth mindsets in the classroom. This would help better understand how teachers understand the theory and whether their beliefs turn into practice – something that existing research with other motivation constructs suggests does not always happen (Daniels et al., 2012).

The second finding was that pre-service teachers endorsed growth beliefs for students regardless of if they were identified as having brain damage, a learning disability, autism, anxiety, ADHD, or FASD. These findings were consistent with the limited prior research

exploring the mindsets of pre-service teachers and teachers surrounding students with disabilities (Gutshall 2013; 2014). It is promising that pre-service teachers hold growth beliefs for students who present with disabilities. However, their own beliefs weren't always related to their beliefs about certain disabilities. Personal growth beliefs were only related to student growth in some cases. Scores on personal growth beliefs were not significantly correlated with growth beliefs for students with brain damage, autism, and learning disability, whereas a significant positive correlation emerged with anxiety, ADHD, and FASD. It was surprising that the correlations between personal growth mindset and growth beliefs for brain damage, autism, and FASD were not the same because we would have expected them to be together because they are brain-based. These findings suggest that changing pre-service teachers' mindsets generally, such as through an intervention, may increase their growth beliefs for some but not all groups of students. Instead, they may need additional targeted supports for some groups such as more education on the disabilities.

The rank order of growth beliefs for the disabilities was also surprising because brain-based disorders such as brain damage, autism, and FASD are etiologically similar and thus we expected pre-service teachers to respond to them similarly. Instead, pre-service teachers believed that students with a learning disability could grow less than students with FASD. One explanation for these results is that pre-service teachers may have a misunderstanding when it comes to the term learning disability as it encompasses a broad spectrum of challenges. Future research should explore why pre-service teachers do not have as high of growth beliefs for students with learning disabilities. It would also be of interest to ask how pre-service teachers define the term to see whether there are any misconceptions.

Qualitative Results

Even though mindset interventions and materials are so popular in the research and the classroom, we found three broad messages that pre-service teachers struggled to accept: disbelief, level of growth, and action behind the belief. First, pre-service teachers questioned several of the ideas that are foundational to mindset theory itself including the notion that the brain can grow. Neuroplasticity is core to mindsets as it explains how a growth mindset works and how abilities can improve by forming new neural connections (Dweck, 2006). If individuals learning about mindsets do not understand that the brain itself is malleable, it may be hard for them to believe that abilities can improve. Content on neuroplasticity may be important for teacher education programs to present.

Second, pre-service teachers struggled with the idea that everyone can grow and to the same extent. Some participants also found it hard to understand how easy it seemed to “just think abilities can improve” and then they would. This was a particularly important finding because the video did not state that everyone could grow to the same extent or that it was an easy process. Instead, the video explained how appropriate goals should be set for each student and that growth is relative to the individual and may look different for each person. The video also emphasized that it required effort and strategies building from both the teacher and the student. In other words, participants were struggling with an idea that was never presented as part of the theory or the video. This finding is critical for developers of interventions and materials who try to attend carefully to the accuracy of the messages. One option for future interventions or videos is to explain what a mindset is and to also explain what it is not. Addressing these misunderstandings when educating teachers about mindsets may help them parse out the differences.

In contrast to their numerical scores that rated growth beliefs for students of all disabilities, in their open-ended responses, participants admitted to questioning the idea that *everyone* can improve their abilities. Because these findings do not align, it is possible that pre-service teachers were responding in a socially desirable way when they were answering the quantitative mindset items about students with challenges. These findings may also align with what Dweck calls a false growth mindset (Gross, 2016). A false growth mindset is when individuals state that they have a growth mindset but they do not actually have one or do not understand what it entails. In order to address this issue, future research should consider implementing measures that may take into account these findings, such as using a social desirability scale (Reynolds, 1982). Likewise, because we uncovered differences in the quantitative and qualitative responses, we would recommend researchers consider conducting mixed methods research (Creswell, 2014) to tease out pre-service teachers' true beliefs.

Third, complementing the idea that “just believing” was too simplistic, some participants found it hard to believe that the actions supporting a growth mindset could be so simple. They felt that although the message spoke of simplicity it seemed to put a lot of responsibility on teachers – responsibility that teachers may not want. This aligns with prior research showing that both pre-service teachers and practicing teachers report low responsibility for their students' motivation (Daniels, Poth, & Goegan, 2018; Daniels, Radil, & Wagner, 2016; Daniels, Radil, & Goegan, 2017). Teachers may not feel that they need to be the driving force of mindsets in their classroom – as the video suggests. Future research may want to consider asking teachers what type of supports and intervention might they might need in order to realistically embed mindsets into their workload.

Limitations

The results of the current study need to be considered in light of the following three limitations. First, in the quantitative section, we did not ask a growth belief question about typically developing students. By not having a comparison group, we are unable to say certainly that growth is rated the same for disability groups as typical students because it could have potentially been even higher for a question on typically developing students. To remedy this limitation, future research should consider adding a question to compare findings between the students with disabilities and the typically developing student as they are usually studied separately. Despite this limitation, the scores are well above the midpoint and do clearly indicate growth beliefs for students with disabilities. Another limitation regarding this scale is that it relied on a single item and thus lacks evidence of validity and reliability. We cannot fully speak to its accuracy because it has not been used in other research. Other researchers examining similar constructs have written scenarios for students with educational challenges and have subsequently asked Dweck's original mindset questionnaire (Gutshall 2013; 2014). These scenarios may provide more information on students' specific characteristics instead of simply using labels.

Second, we did not provide definitions for the disabilities. It is possible that pre-service teachers lack detailed understanding of each disability to distinguish their responses based on the group. Research does show that pre-service teachers often feel uneducated about various disabilities (Guerra, Tiwari, Das, Vela, & Sharma, 2017). Potential misunderstandings could have influenced their growth beliefs about these students considering our finding of learning disabilities. To remedy this limitation, future research should consider defining terms when asking questions about individuals that hold specific characteristics.

Third, participants in this study came from a convenience sample of pre-service teachers at the University of Alberta. Therefore, their results may not generalize to other academic institutions, programs, and locations when it comes to understanding the mindsets of pre-service teachers. Additionally, our sample came from students in the second year of their teaching program and they cannot fully speak to the practice of teaching. Thus, these findings cannot be generalized to practicing teachers as their reality may be different. Nonetheless, it is still important to consider that pre-service teachers are endorsing growth beliefs as it may be easier for them to keep this mindset moving forward into their practice. To remedy this limitation, future research should consider a sample that includes all program years and that reaches a broader number of institutions in Canada as well as a practicing teacher sample.

Implications

The results of this study have implications for mindset theory (Dweck, 1999). First, teachers continuously score higher on a growth mindset scale across studies (Coombs, DeLuca, LaPointe-McEwan, & Chalas, 2018; DeLuca, Coomb, & Lapointe-McEwan, 2019; Guthsall, 2013; 2014) even though there is now a concern about “false mindset” which indeed our qualitative results support. As such, it may be important to reconsider how the theory is presented to pre-service or practicing teachers. For example, it may not be necessary to continue emphasizing growth mindsets to teachers because results are consistently showing growth regardless of gender, stream, or disability (Asbury et al., 2016; Gutshall, 2013; 2014). Instead, the theory may want to present a more nuanced picture of growth to teachers that includes ups and downs, setbacks, and teachable moments, etc. Lou, Masuda, and Li (2017) have explored a new concept to mindsets called a decremental mindset, which posits that mindsets can be reduced. Introducing a notion like a decremental perspective may help teachers who know

students can grow but also face the realities of not letting students' skills atrophy. This type of research would particularly benefit from mixed method designs (Creswell, 2014) when looking at mindsets. It may be necessary moving forward in order to accurately capture what individuals truly think about mindsets. Furthermore, based on our results and existing evidence, this would also be especially useful for researchers wanting to look at mindsets longitudinally and seeing whether there are differences as teachers move from pre-service to practicing.

Another implication is that mindset theory may need to add a focus on skills and strategies for teachers to their beliefs messaging. As mentioned, throughout the literature, educators endorse growth mindsets yet our study revealed that there are still many aspects of the theory that are hard to grasp and unlikely to be enacted. We encourage researchers to explore teachers' actions associated with their growth mindset beliefs and to provide teachers with resources that tackle the actions needed behind the beliefs to support and grow the abilities of their students in the classroom.

Conclusion

To conclude, the results of this study provide researchers with valuable information respective to understanding pre-service teachers' mindsets. This study further confirms Dweck's emphasis that mindsets are complex and do not simply entail thinking positively (Dweck, 2016) as it has been publicized by the media. Although our quantitative data showed that it is easy to endorse a growth mindset, our qualitative data highlights that there is actually uncertainty in the theory and its application. Next steps include finding ways in which researchers can provide tools and resources to teachers so that they can successfully adopt a growth mindset and fully implement it in their classrooms. When beliefs are supported with the right strategies, mindsets can hold a lot of positive value for teacher and student motivation and success.

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Appendix A

Study Title: Academic Motivation: Highlighting Students' Perspectives

Principal Investigator: Dr. Lia Daniels, lia1@ualberta.ca, 780-492-4761

Research Coordinator: Devon Chazan, chazan@ualberta.ca

Introduction: Dr. Daniels is the Director of the Alberta Consortium for Motivation and Emotion (ACME). This four part online study has been designed to help answer several pressing questions about student motivation identified by members of ACME.

Purpose: The purpose of this four-part study is to collect quantitative data about student motivation, emotions, success, and relationships.

Eligibility: You are eligible to participate through your enrolment in EDU 210 and its association with the Educational Psychology Participant Pool (see your syllabus or contact naveenku@ualberta.ca for more information). Your participation in this specific study is *completely voluntary* and you may *stop at any point*.

What you will do: Each session is designed on a Google Form that automatically collects your CCID. The first session will come to you after you sign up on SONA and we will email you a link to each of the remaining sessions throughout the semester. Each session will take 20-30 minutes to complete and can be done from any device and at your leisure. Here's a schedule and overview:

- ☐ Session #1: Through SONA: You will be asked to comment on how the content on a sample course syllabus may be motivating/unmotivating to you and answer some questions.
- ☐ Session #2 October 1: You will be asked to answer some questions about feeling successful and watch a video that presents contemporary perspectives on motivational beliefs and brain science.
- ☐ Session #3 October 15: You will be asked to answer a BUNCH of questions that describe different types of motivation and emotions. There are no right or wrong answers
- ☐ Session #4 October 30: You will be asked to answer some more personal questions about your relationships and body image.

Confidentiality & Anonymity: Each Google Form will automatically collect your CCID so that we can (a) connect your responses from each session and (b) ensure you receive your 5% for participating. As soon as the study is completed we will remove your CCID from the final file and the data will be completely anonymous. At all stages your responses will be treated confidentially and will only be accessed by Dr. Daniels and her research team.

Withdrawal: If you change your mind about participating, you can contact Dr. Lia Daniels at lia.daniels@ualberta.ca until December 1st and ask that your information be removed with no penalty. If you do not want to participate in any research, please contact the Participant Pool for an alternative assignment to earn your 5% (contact naveenku@ualberta.ca). Please do not ask your instructor for help with the participant pool.

What are the benefits/risks: Potential benefits include participants' opportunity to reflect upon their own motivation and beliefs, however, there are no explicit and personal benefits to participating in this research. Student will earn their full research credits through participation. There are no known risks associated with participation in the study. The sessions have been split into manageable units to prevent participant fatigue.

What happens with the data: The electronic data will be downloaded from Google Forms and entered into a computer software, which will have no identifying information from participants, and be stored on password protected computers. Only the principle investigator and her research team will have access to the data. All research assistants have signed confidentiality forms. The results for the study will be disseminated by means of conference presentations, publications in academic journals and included in students' thesis/dissertation projects. We will send you some Research Briefs at the end of the study so that you have a sense of our results.

The plan for this study has been reviewed for its adherence to ethical guidelines and approved by the University of Alberta Research Ethics Board. For questions regarding participant rights and ethical conduct of research, contact the Research Ethics Office at 780-492-2615.

For more information, please visit our website: <https://sites.google.com/ualberta.ca/acme/home>. You can also follow us on twitter: @LAB_ACME.

Appendix B

Statement of Ethics Approval

Date: August 24, 2018
Study ID: Pro00084252
Principal Investigator: Lia Daniels
Study Title: PP Fall 2018: Highlighting Students' Perspectives on Achievement Motivation
Approval Expiry Date: Friday, August 23, 2019
Approval Date: Friday, August 24, 2018

Thank you for submitting the above study to the Research Ethics Board 2. Your application has received a delegated review and has been approved on behalf of the committee.

A renewal report must be submitted next year prior to the expiry of this approval if your study still requires ethics approval. If you do not renew on or before the renewal expiry date, you will have to re-submit an ethics application.

Approval by the Research Ethics Board does not encompass authorization to access the staff, students, facilities or resources of local institutions for the purposes of the research.

Sincerely,

Stanley Varnhagen, PhD.
Chair, Research Ethics Board 2

Note: This correspondence includes an electronic signature (validation and approval via an online system).

Appendix C

Study Questionnaire Items

Growth Mindset Items:

Scores: 1= Strongly Disagree 6= Strongly Agree

Even your basic intelligence level can be increased considerably.
Your intelligence can always be substantially increased.
No matter how much intelligence you have, it can always be increased quite a bit.
No matter who you are, your intelligence can be significantly increased.

Growth Beliefs Items:

Scores: 1 = A little 6 = A lot

To what extent do you think...

a child with brain damage can grow their brain?
a child with a learning disability can grow their brain?
a child with autism can grow their brain?
a child who suffers from anxiety can grow their brain?
a child with a behavioural disorder like ADHD can grow their brain?
a child who was exposed to alcohol during pregnancy can grow their brain?

Video and Check:

Did you watch the whole video?
What is the hardest message in the video for you to accept?

Appendix D

Codebook

Question: **What is hard for you to accept in this video about mindsets?**

Range of quotes: There should be 2-6 quotes in each box

Category	Codes	Definition – What it IS	Definition – What it is NOT
Disbelief Questioning of the notions of the theory	Fixed	Used to describe that it is hard to understand that some people have fixed mindsets	It is not about how hard it is to develop a growth mindset
	Alternatives	Used to describe that there are no alternatives	It is not about just fixed and growth or its mechanisms
	Fixed as Bad	Used to describe that they don't understand why fixed mindsets have to be bad	It is not about it being hard to adopt
	Neuroplasticity	Used to describe that the brain or intelligence can change	It is not about how hard it is to develop a growth mindset
Level of Growth How everyone can grow and the extent to which the brain can grow	Everyone	Used to describe that everyone can change their mindsets, regardless of the challenge	It is not something that only certain individuals can do

	Equality	Used to describe that everyone can grow to the same extent	It is not used to explain that everyone can change their mindsets regardless of their challenges
Action behind the belief It's not just about a belief, there is work and effort behind it	Ease	Used to describe how easy it is to develop or change a growth mindset naturally	It is not about effort
	Student Effort	Used to describe how it takes a lot of hard work and effort to change mindset	It is not about other people's effort
	Teacher Effort	Used to describe how the teacher impacts the student	It is not about the student's effort