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Running Head: GROWTH MINDSET

Growth Mindset and Academic Performance

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When comparing students' academic performance to their mindset survey results, it was found that there is a positive correlation between the possession of a growth mindset and academic performance. However, the data from this research was limited and may not be generalized to other classes.

Literature Review

A growth mindset is the belief that we are in control of our own learning and development, and that intelligence is not an innate or fixed factor. In contrast, a fixed mindset is the belief in which a person is born with certain abilities and can not do anything to change them. Numerous studies have shown that the mindset students have is a significant predictor of how they will perform academically. Students with growth mindsets tend to be more motivated and resilient than their peers with fixed mindsets. Furthermore, research indicates that the implementation of certain teaching strategies can change students' beliefs about intelligence and help them develop a growth mindset.

According to Carol Dweck, students who believe that their intelligence can grow are able to academically outperform their equally able peers who have a fixed mindset about their abilities. She states that, “The reason is simple: students with a growth mindset are not as worried about looking intelligent, and so they take on more challenges, persist longer, and are more resilient in the face of setbacks” (Dweck, 2016, p. 38). Since students with a growth mindset believe that struggling is a positive experience that they can learn from, they are not afraid of making mistakes or failing. In contrast, students with a fixed mindset think that failure is a sign that they are “unintelligent” which makes them avoid difficult tasks. However, the difference between these two mindsets has far more implications than just academic performance. Dweck states that, “Believing in people’s ability to change can help thwart teen depression, spur workplace creativity, and ease political conflict” (2016, p. 1). She explains how the idea that we are not fixed in who we are and are in control of our own strengths, can help adolescents who struggle with self-esteem. This same idea transfers to adults in the workplace

and politics because people with a growth mindset are less likely to perpetuate harmful stereotypes such as certain races or genders are innately better at different tasks.

Kathy Liu Sun suggests that mindsets themselves are also not innate, and that with proper instruction students can develop a growth mindset. However, authentically supporting a growth mindset in the classroom can be difficult and it is common for teachers to unintentionally send students mixed signals (2018, p. 280). Liu Sun states that practices in math classrooms such as giving students who finish their work early more difficult problems to work on, sends the rest of the class the message that only certain students can complete rigorous work (2018, p. 280). She also explained how it is common for teachers to take over students' thinking by providing leading questions, which prevents the student from practicing perseverance and making sense of the problem on their own (2018, p. 280). There are several strategies that teachers can implement to ensure they are not making these mistakes, and instead are creating an environment where a growth mindset is authentically encouraged. The first strategy Liu Sun explains is about placing more emphasis on sense making than procedures. It is common for mathematics teaching to be focused on doing the procedure correctly, which limits the number of ways students can demonstrate their understanding and ultimately the number of students who can succeed. Instead, Liu Sun suggests making the focus on conceptual understanding, problem solving, and valuing student contributions (2018, p. 282). Another strategy for encouraging growth mindset, is to maintain rigor as students struggle and make mistakes. Teachers can tell students about the importance of failure in the classroom, but if they immediately jump to giving students leading questions or easier questions when they are struggling, the message is being counteracted. This is why it is important to focus on asking students questions that challenge them to make connections and extend their thinking rather than leading them to the correct answer. If a student

does a problem incorrectly, you can then have them go through their thought process and find where the misconception was (Liu Sun, 2018, p. 283). This helps students to see how they can learn from struggling and making mistakes rather than just being told that they should learn from failure.

Although these strategies were directed at math classrooms, Deshpande & Guglielmo (2019) highlight strategies that can be implemented in all content areas. The first strategy is called the co-constructed persistence matrix. This strategy involves having students work on a problem and periodically asking them questions such as “what resources do you have available to help you solve the problem” and “what does it look, feel, and sound like to persist in solving a problem”. The teacher should chart all of the responses as well as share some observed problem solving behaviors students were doing. This process of identifying persistence and problem solving behaviors helps students both academically and in their home lives. Deshpande & Guglielmo state that, “Naming what persistence looks like is especially important for at-risk students who sometimes experience trauma in their home lives” (2019, p. 512). By unlearning that struggle is inherently negative, students can further develop a growth mindset. Another strategy described by Deshpande & Guglielmo is the revise and resubmit grading policy. This strategy can be implemented by allowing students to improve their grade by completing a similar task or exam with different questions. It has been shown that, “grades as evaluative measures of performance can diminish motivation, but when students receive meaningful feedback and have an opportunity to revise their work, student learning outcomes improve” (2019, p. 514). Overall, the revise and resubmit strategy reinforces the idea that learning is an ongoing process.

All of the strategies listed in the previous articles have been focused on students, however, according to Carol Dweck (2013) one of the most important parts of teaching growth

mindset in the classroom, is the teacher having a growth mindset themselves. Although Dweck states that, “it is ok if some teachers feel they’re not quite there yet, and they start using growth mindset techniques with their students” (2013, p. 19). It is important that teachers are working towards developing a growth mindset. Dweck explains that one way to do this is to simply note what you are thinking about students in your class. If you find you are categorizing students by past performance or evaluating them based on their skill level, then you can counter those thoughts with a growth mindset. These can be thoughts about how you can motivate the student, what you can do to help them succeed, etc.. It is also important that teachers have a growth mindset about their own teaching ability. New teachers who think that teaching is a gift that they naturally have, tend to become discouraged when they begin teaching because they realize the amount that they have to learn. Dweck states that, “It’s better to know that teachers can improve over a lifetime and that you really need to recruit mentors and collaborators early in the process” (2013, p. 20). Teacher’s having a growth mindset improves both their own teaching ability and the achievement of their students.

According to Andersen and Nielsen (2016), the mindset of a child’s parents is also a significant factor in the development of a growth mindset. A trial was conducted with 1,587 second grade students across 72 classrooms in Aarhus Municipality in Denmark (2016, p. 12111). In this trial, the classrooms were ranked by mean child language skills, and then each strata of four was split into two control groups and two treatment groups. In the treatment groups, the students' parents were voluntarily placed in a reading intervention group where they were provided with a booklet and an online video. The resources contained material to teach the parent’s how to view their child’s reading ability with a growth mindset, and strategies to help them develop their child’s growth mindset. These strategies encouraged parents to teach their

child using a mastery-oriented approach, support autonomous learning, take time to answer their child's questions, praise effort rather than performance, and to use a logbook to note every reading session. The logbooks could optionally be brought in to the child's teacher, and they would receive a sticker for every 10 reading sessions. The class with the most stickers at the end of the intervention period would then win a prize. The authors mentioned that although this may have complicated the study since it created a competition where students may lose motivation because they believe they can not win against the other classes, they still included it in their method because they believed this system encouraged students' efforts over their actual reading speed or accuracy (2016, p. 12112). This reading intervention combined with the growth mindset approach improved the student's language comprehension, decoding, and test comprehension by 0.12 SD over a period of two months. According to Andersen and Nielsen, these results, "support the notion that the reading intervention with a growth approach- which explains to parents that they can make a difference to their child's reading abilities and shows how to do so- has a large potential for supplementing school's efforts to teach children to read well and express themselves in writing" (2016, p. 12113). The authors explained that the results of the growth mindset approach could not be isolated from the reading intervention, however, the data does show that the parent's mindset and time spent reading with their child had a significant impact on their child's language skills.

Teaching students to have a growth mindset can be especially important in helping students who face adversity due to their socioeconomic backgrounds. According to Claro and Paunesku (2016) socioeconomic background and growth mindset are two comparably strong factors in predicting academic achievement. After collecting a dataset of all 10th grade students in Chile, researchers found that not only are students from families that are low-income more

likely to have a fixed mindset, their economic status also, “magnifies the deleterious effects of having a fixed mindset” (2016, p. 8666). The researchers theorized that this is due to low-income students having less access to resources or experiences to support their academics. Alternatively, the study also showed that, “students in the lowest 10th percentile of family income who exhibited a growth mindset showed academic performance as high as that of fixed mindset students from the 80th income percentile” (Claro and Paunesku, 2016, p. 8664). Researchers stated that this data implies that low-income students having a growth mindset may counteract socioeconomic factors.

A study by Broughman and Kashubeck-West (2017) on growth mindset was conducted at two urban highschools that were challenged with poor grades, attendance, and graduation rates. The participants in the study were 89 freshmen from the two schools (RMHS and THS). The students from RMHS had an average GPA of 2.67, and the students from THS had an average GPA of 1.9. In the treatment group, students participated in three sessions to teach them about growth mindset. In the first session, students watched a video about how the brain learns and completed a worksheet. In the second session, they were given a testimonial of a student who struggled but improved with effort, and in the last session, students were asked to write a letter of encouragement to a future freshman based on what they learned (Broughman, Kashubeck-West, 2017, p. 5). The control group for this experiment also had three separate sessions, but in their lessons they only learned about brain physiology. At the beginning of the first session and the end of the last session, students were given a survey to gauge which mindset the student possessed (growth or fixed). The researchers found that the students in the treatment group scored higher on the posttest mindset measure, which indicates they developed a stronger growth mindset, than the control group. However, the hypothesis of this study was that the

implementation of the three sessions would improve the student's GPA and attendance.

According to Broughman and Kashubeck-West, the study did not reveal a significant improvement in GPA or attendance, "although other studies have shown a positive relationship between growth mindset and academic performance" (2017, p. 6). The authors suggested that this was due to the small sample size, unrealistic testimonials used in the second session, and the short period of time the study was conducted over. Although students can learn about growth mindset quickly, in order for it to actually improve their academic performance growth mindset strategies need to be implemented for a longer period of time.

A different study done by Emily Rhew and Jody Piro examined the effect growth mindset has on self-efficacy and motivation rather than explicit academic performance. The participants in this study were 70 special education students ranging from sixth to eighth grade. The students were randomly split into a control and a treatment group. The treatment group spent 15 minutes a day on a computer program called Brainology for a total of eight weeks. The program Brainology uses multiple different forms of instruction (visual, auditory, etc.) to teach students about how their brains work and how they are in control of their own learning and development (Rhew and Piro, 2018, p. 2). The results of this study showed that the use of this growth mindset intervention improved student's reading motivation significantly (as measured by a pretest and post-test), however there was no improvement in student's self-efficacy. Rhew and Piro suggested that this was due to the fact that, "Students receiving special education support may work harder to attain the same results as their typical peers, which eventually affects students' self-efficacy" (2018, p. 5). This indicated that in order for special education students to improve in self-efficacy, growth mindset strategies would need to be implemented into the academic curriculum itself rather than just the intervention program.

A growth mindset is not only a significant factor in academic performance, but also in resilience, motivation, and self-efficacy. If the proper teaching strategies are implemented both into the classroom and at home, then students can develop a growth mindset. Students who believe that their strengths and weaknesses are dynamic factors that are within their control, are able to learn more and think more deeply about concepts than their peers with fixed mindsets.

Methodology

My hypothesis is that a student's mindset (growth vs fixed) impacts their academic performance. To carry out my research I gave Carol Dweck's growth mindset survey to every student in my 6th grade math classroom, and compared their score to their overall grade for the year. Their grade is determined primarily by their performance on homework and unit tests/quizzes. Students are allowed to resubmit homework assignments as many times as they would like, and they are also allowed to retake tests/quizzes if they get less than an 80% on their first attempt. Students are not allowed to retake a test if they got above an 80%, however, there are several opportunities for extra credit on the unit tests.

When I gave the survey, I provided students with both written and verbal instructions, and they were allowed as much time as needed to complete the survey. I also read the test aloud to struggling readers to ensure that they understood each question on the survey. I collected results from a total of 52 students. I then compared the results of the survey to each student's overall grade for the year.

Survey Questions:

	Strongly Agree	Agree	Disagree	Strongly Disagree
1. Your intelligence is something very basic about you that you can't change very much.				
2. No matter how much intelligence you have, you can always change it quite a bit.				
3. You can always substantially change how intelligent you are.				
4. You are a certain kind of person, and there is not much that can be done to really change that.				
5. You can always change basic things about the kind of person you are.				
6. Music talent can be learned by anyone.				
7. Only a few people will be truly good at sports – you have to be "born with it."				
8. Math is much easier to learn if you are male or maybe come from a culture that values math.				
9. The harder you work at something, the better you will be at it.				
10. No matter what kind of person you are, you can always change substantially.				
11. Trying new things is stressful for me and I avoid it.				
12. Some people are good and kind, some are not – it is not often that people change.				
13. I appreciate when parents, coaches, teachers give me feedback about my performance.				
14. I often get angry when I get feedback about my performance.				
15. All human beings without a brain injury or birth defect are capable of the same amount of learning.				
16. You can learn new things, but you can't really change how intelligent you are.				
17. You can do things differently, but the important part of who you are can't really be changed.				
18. Human beings are basically good, but sometimes make terrible decisions.				
19. An important reason why I do my schoolwork is that I like to learn new things.				
20. Truly smart people don't need to try hard.				

Scale:

	Strongly Agree	Agree	Disagree	Strongly Disagree
1. Ability mindset – FIXED	0	1	2	3
2. Ability mindset – GROWTH	3	2	1	0
3. Ability mindset – GROWTH	3	2	1	0
4. Personality/character mindset – FIXED	0	1	2	3
5. Personality/character mindset – GROWTH	3	2	1	0
6. Ability mindset – GROWTH	3	2	1	0
7. Ability mindset – FIXED	0	1	2	3
8. Ability mindset – FIXED	0	1	2	3
9. Ability mindset – GROWTH	3	2	1	0
10. Personality/character mindset – GROWTH	3	2	1	0
11. Ability mindset – FIXED	0	1	2	3
12. Personality/character mindset – FIXED	0	1	2	3
13. Ability mindset – GROWTH	3	2	1	0
14. Ability mindset – FIXED	0	1	2	3
15. Ability mindset – GROWTH	3	2	1	0
16. Ability mindset – FIXED	0	1	2	3
17. Personality/character mindset – FIXED	0	1	2	3
18. Personality/character mindset – GROWTH	3	2	1	0
19. Ability mindset – GROWTH	3	2	1	0
20. Personality/character mindset – FIXED	0	1	2	3
Total				
Grand Total				

Strong Growth Mindset = 45 – 60 pts.
 Growth Mindset with some Fixed ideas = 34 – 44 pts.
 Fixed Mindset with some Growth ideas = 21 – 33 pts.
 Strong Fixed Mindset = 0 – 20 pts.

Data and Analysis

Mindset Survey Statistics

Average	38.86538462
Median	39
Minimum value	23
Maximum value	52

The average total for the growth mindset survey was ~38.87 which means that the average student that was surveyed falls under the category of having a, “growth mindset with some fixed ideas”. The lowest result was a 23 which falls under the category of a, “fixed mindset with some growth ideas”., and lastly, the highest total was a 52 which is considered a, “strong growth mindset”. This means that the survey results had a range of 29 points.

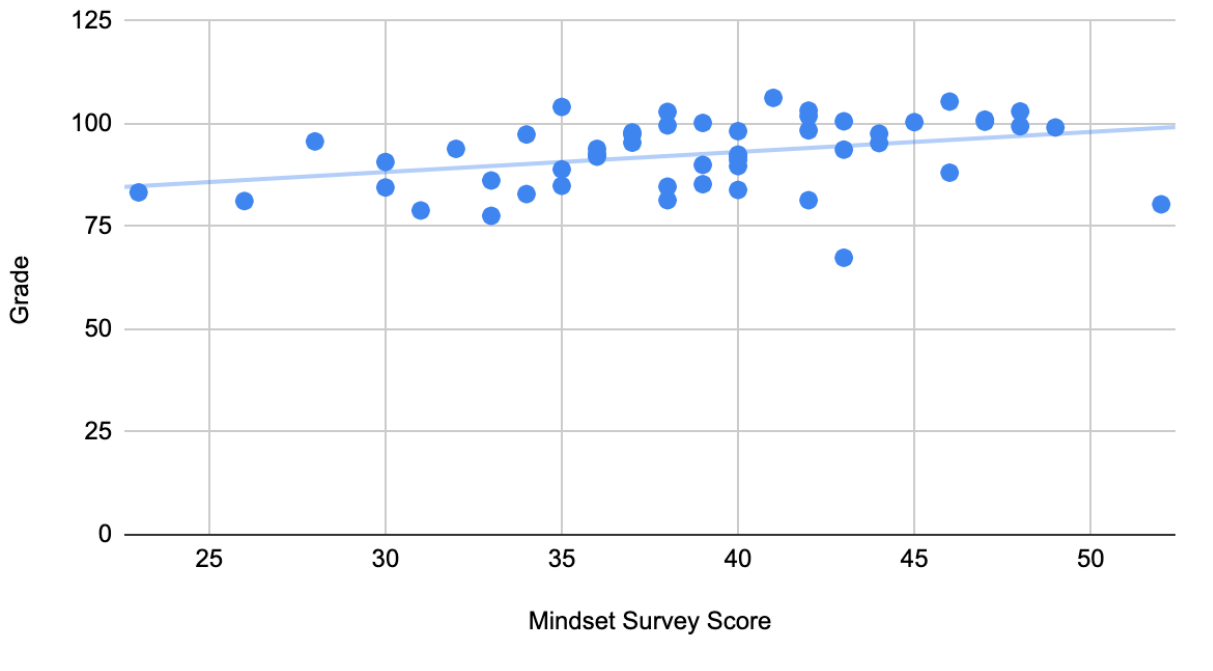
Grade Statistics

Average	92.58269231
Median	93.8
Minimum value	67.4
Maximum value	106.3

The average grade was ~92.6% with the lowest grade being 67.4% and the highest grade being 106.3%. The range of this data set is 38.9.

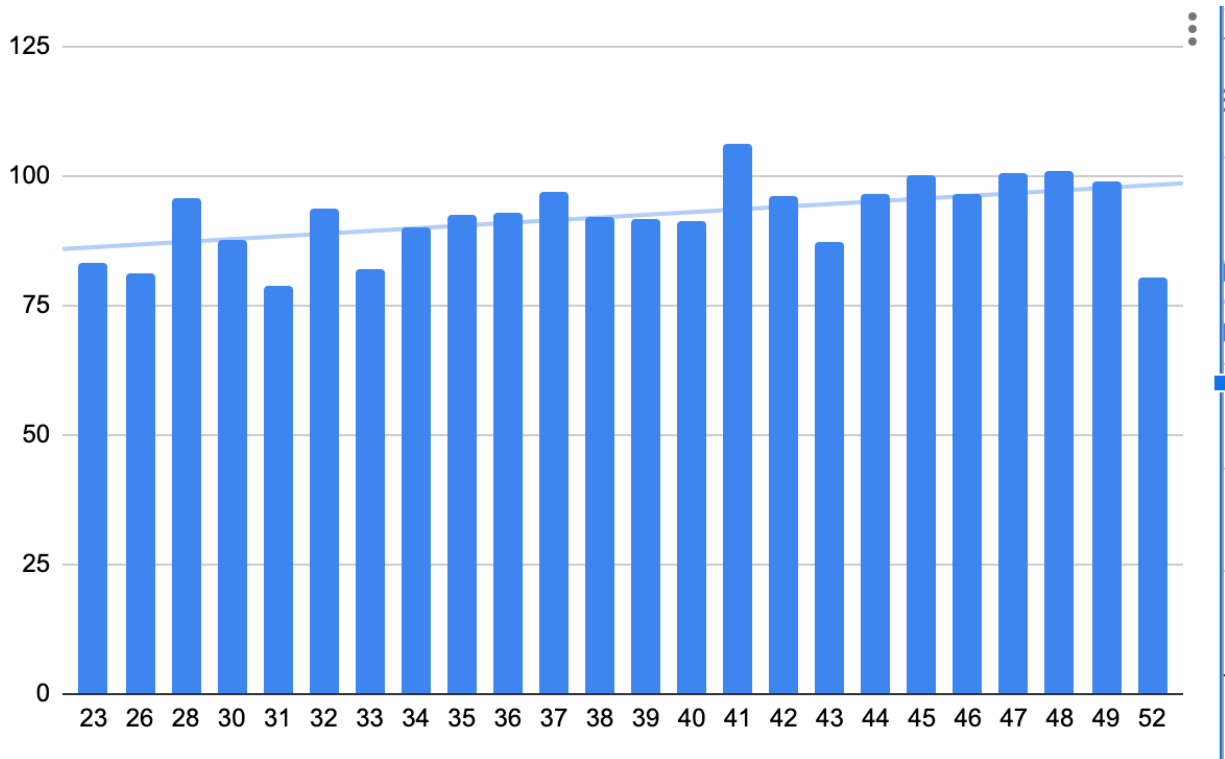
Grade vs Mindset Survey Score Scatterplot

Grade vs. Mindset Survey Score



This scatter plot comparing student's mindset survey scores (x-axis) to their grade (y-axis) shows that there is a slight positive correlation between the two factors (light blue trend line). However, there are numerous outliers which makes it difficult to determine whether or not these results are significant. Notably, a student who scored a 43 on the mindset survey (indicating a growth mindset with some fixed ideas), had the lowest grade in the class.

Grade vs Mindset Survey Score Bar Chart



This bar chart comparing student’s mindset survey scores (x-axis) to the average grade of each student who scored the same total on the survey (y-axis), shows a trendline that is similar to the scatterplot above. Several outliers can be seen in this chart (e.g. 28 and 52) and the positive correlation is slight between the two factors.

Average Grade by Mindset Categories

Mindset	Number of Students	Average Grade
Strong Fixed Mindset (0-20 points)	0	NA
Fixed Mindset with some Growth ideas 21-33 points)	9	85.8%
Growth Mindset with some Fixed ideas (34-44 points)	34	93.1%
Strong Growth Mindset (45-60 points)	9	97.5%

This chart separates the survey results into categories as described in the scoring rubric on the survey. This allows a broader view of the average grade within each category of mindsets. No students had a score that indicated a strong fixed mindset, however, students that had a fixed mindset with some growth ideas, had an average grade that was 11.7% lower than students with a strong growth mindset. Students that had a growth mindset with some fixed ideas had an average grade that was 7.3% higher than students with a fixed mindset, and 4.4% lower than students with a strong growth mindset. This chart shows a stronger positive correlation between growth mindsets and academic performance.

Conclusions/Implications/Limitations

From my research, I found that there is a positive correlation between the strength of my student's growth mindset and their grades. However, this was a slight correlation and there were several outliers that did not indicate that a growth mindset correlates with higher grades. Because of this, I believe the results are inconclusive and I would need to perform further research to confirm my hypothesis. The general pattern that I found in my data supports what I described in my literature review. Past research indicates that students with a growth mindset are more motivated and therefore have higher academic performance. However, I was surprised to find that some of my students that have a strong growth mindset had some of the lowest grades in the class, and some students with a fixed mindset had high grades. Since students are allowed to do retakes to improve their grade, I thought that there would be a stronger correlation between these two factors.

This lack of a correlation may be due to the limitations of the study. The only data that was collected was through a survey and students' grades. Since the survey was self-reported data, students may not actually practice the attributes of a growth mindset that they identified on the survey. Also, some students may have not fully understood the questions due to the vocabulary or wording of the questions. I believe the use of observations, interviews, etc. would have given a stronger indication of students' mindsets. Also, many of the assignments that their grade is based on only allows students to show what they know through written work. This limited view of students' knowledge may have caused the results to be skewed. If I would have included student discussions, presentations, observations of student work, etc. in my data, it could have given a more well supported view of students' academic performance. Another limitation of this study was the sample size. Only 54 students completed the survey, and all of

those students were from the same school, grade, and in a general education math class. This lack of data indicates that the results from my research should not be generalized or applied to other classrooms.

Although the results can not be applied to all students, performing this research still taught me a lot about my own students. I learned that the majority of my students have a growth mindset with some fixed ideas, and none of my students have a strong fixed mindset. This indicates that many of my students believe that they can change their intelligence and that if they work at something they can improve their performance. Using this information, I would want to continue to help strengthen my students' growth mindsets and include tasks that encourage productive struggle that give students the opportunity to make mistakes and work through difficult problems. I would also want to give some explicit instruction on what a growth mindset is and what it looks like in a math classroom.

If I were to continue this study with other students in another classroom, I would want to collect data from classroom observations and interviews. For example, I could provide students with a variety of challenging problems, and observe how students work through the problem, what language they use, what questions they ask, and whether or not they persevere in finding a solution. After these tasks, I would interview several students and ask them how they felt about the problem and other questions to gain an understanding of if they have a growth or fixed mindset. I would then analyze the data collected and see if there are any connections between the student's mindset and how/if they solved the problems. Although this data would have its own set of limitations, I think it would give a different perspective than my original research on the impact of growth mindset on academic performance.

Overall, the data from my research was inconclusive and I would not be able to apply the results of my study to other populations due to the limitations of the study. However, I did gain more knowledge about the mindsets of my own students and how a growth mindset can benefit their academic performance. Because of this, I want to focus on including complex mathematical tasks that allow students to demonstrate their perseverance in solving problems in my future teaching.

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