

Exploring the Role of Emotion in Students' Response to a Growth Mindset Program

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Positive emotion is important to students' learning.¹ Previous cross-sectional² and longitudinal³ studies found that experiencing positive emotion while learning predicted better task performance among medical students and better mathematics test scores and grades among students in grades 5-9, respectively. Recent studies⁴ also showed that the visual design of characters in digital learning games influenced learner's emotions. However, few studies have considered the role of emotions in what researchers call interventions: relatively brief exercises that introduce students to new information with the goal of changing their beliefs about learning and school.

While in recent years many researchers have focused on developing interventions that promote adaptive beliefs (e.g., "This isn't my favorite subject, but I know that it will help me reach my future goals"), they have focused less on how those materials may instigate emotions among students and how such emotions may shape the intervention's outcome. This project analyzed the impact of emotions expressed during a growth mindset intervention on the intervention's primary targeted outcome (i.e., grade point average [GPA] improvement about a year after the intervention).

STUDY DESIGN

As part of the National Study of Learning Mindsets (NSLM), students were randomly assigned to complete either the growth mindset program or a control activity during two 25-minute sessions. In the growth mindset program, students read and listened to materials describing scientific evidence about how the brain works and why people can grow their intellectual abilities over time. The program encouraged students to think about why they might want to grow their brain in order to make a difference on something that matters to them, such as their family, community, or a social issue they care about.

The students were then asked to complete a brief writing assignment in which they advised future 9th graders how to ease the transition to high school, based on what the participants had just learned from the program. The writing exercises gave students an opportunity to engage in active learning by synthesizing the ideas they'd just heard and thinking through their implications.

KEY FINDINGS

- This project demonstrated that emotions can be detected in students' writing using an automated analysis.
- Students showed primarily positive emotions after partaking in the growth mindset intervention used in the National Study of Learning Mindsets (NSLM).
- Students' positive emotions during the growth mindset intervention were associated with higher grade point average (GPA) in a year.

SAMPLE

This study leverages data from the National Study of Learning Mindsets (NSLM), the largest- ever randomized controlled trial of a growth mindset program in the U.S. in K-12 settings, in which a brief online growth mindset program was administered to 9th grade students during the 2015-2016 academic year. The NSLM features a nationally representative probability sample of regular U.S. public high schools. Additional information about the NSLM sample of schools and students can be accessed [here](#).

This project uses a random sample of 10% of the NSLM data, which includes measures for approximately 830 students who participated in the growth mindset intervention. Out of these 830 students, approximately 50 students did not complete a written reflection and approximately 780 did. Those students who did not write any reflection were, on average, similar to those who did write the reflection (similar pre and post-intervention GPA and similar proportion of male and female students). This analysis uses only the students who wrote the reflection after the growth mindset intervention. The sample contained approximately 43,120 words written by the students.

**MINDSET
SCHOLARS
NETWORK**

The National Study of Learning Mindsets Early Career Fellowship is a project of the Mindset Scholars Network and the University of Texas at Austin Population Research Center. The Mindset Scholars Network is a group of leading social scientists dedicated to improving student outcomes and expanding educational opportunity by advancing our scientific understanding of students' mindsets about learning and school. The University of Texas at Austin Population Research Center aims to provide outstanding infrastructure resources and sustain a dynamic interdisciplinary culture geared toward facilitating the highest level of population-related research among its faculty members and graduate and undergraduate trainees.

**TEXAS
PRC**
POPULATION RESEARCH CENTER

RESEARCH TEAM

- **Early Career Fellow:** Manyu Li, University of Louisiana at Lafayette

Areas of expertise: Social psychology, community psychology, belonging and education, computational statistics

This snapshot was published at the close of the National Study of Learning Mindsets Early Career Fellowship and captures in-progress work.

The current project used automated text analysis to identify the emotion expressed in students' writing assignments and examine whether that emotion was related to students' outcomes.

All responses were classified as either positive, neutral or negative. A positive response, for example, was, "...When you work on challenging assignments, your brain is getting stronger (and smarter!) ... A strong brain will help you do what you want in your life..." In contrast, a sample negative response was, "...school is the worst thing in life right now. It makes you sleep deprived, irritable, and not as happy as you used to be..."

The research team manually coded 500 responses and, based on the manual coding process and a lexicon of terms and phrases related to growth mindset, set up an automated text analysis to be able to work through the large volume of responses. After the responses were classified, the researchers predicted students' post-intervention GPA based on the sentiment of the text, controlling for pre-intervention GPA and school achievement level (determined by combining several schools' within-state rankings based on test scores, average PSAT scores, and AP test-taking data). In other words, the research team was interested in whether students who expressed more positive emotions while participating in the growth mindset program would experience greater increases in their post-intervention GPA.

KEY FINDINGS

This project demonstrated that emotions can be detected in students' writing using an automated analysis.

The automated text analysis method used in this project was validated by comparing computed scores to 500 manually coded text samples. Specifically, 500 text samples were manually coded as positive, negative, or neutral, and agreement between the automated classification and the manual classification was satisfactory.⁵

Importantly, text was analyzed at the sentence level rather than at word level. This means that the sentence "I am not happy" would be coded as negative, accounting for the qualifier "not," whereas in a word-level analysis, "I am not happy" would be coded as positive due to the appearance of the word "happy."

Examples of positive sentences were "...there are always opportunities to improve and grow;" "do not worry if a subject is hard;" and "...do not be afraid of high school. There are many ways to learn how to be better at the subjects." An example of a negative sentence was, "I am not smart, so why bother doing homework."

Students showed primarily positive emotions after partaking in the growth mindset intervention used in the National Study of Learning Mindsets.

Among the students who wrote a reflection, 72% of the text analyzed reflected positive sentiments, 9% reflected neutral sentiments, and 19% reflected negative sentiments. In other words, students who completed the growth mindset program mostly reported positive emotions. Specifically, many students expressed positive emotion through encouraging fellow students to persist when facing challenges, or to get help from teachers and friends.

Students' positive emotions during the growth mindset intervention were associated with higher GPA in a year.

On average, students' expressions of positive emotion were positively associated with post-intervention GPA, even after considering students' incoming GPA and the overall achievement level of their school. In other words, on average, students who expressed positive emotion had better outcomes related to the growth mindset intervention than students who expressed less positive emotion.

INSIGHTS AND FUTURE DIRECTIONS

Consistent with prior research,⁶ this project showed that emotions are related to learning in an intervention study. One implication of this research is that in creating learning materials and experiences for students, it is important to not only consider content, but also what emotions may be generated for students by that content and how it is presented. According to the present findings, positive emotions may lead to better learning outcomes than negative emotions.

In addition, our research calls for more attention to students' emotions in the learning environment in general. Previous research has shown that when students feel a sense of belonging in school and experience more positive social relations at school, their academic motivation is also higher.⁷

The research team will continue to investigate the role that emotions play in the growth mindset intervention and other learning experiences. For example, does the

growth mindset intervention function through changing students' emotion toward learning and academic achievement, rather than changing their beliefs about the malleability of intelligence? Or does the intervention change both their emotion and beliefs related to learning? Further analyses will also examine different types of emotions (e.g., joy, fear, sadness) related to the growth mindset program. More broadly, the researchers will continue to study the relations among students' emotions during learning experiences, their sense of belonging in school, and their academic motivation and outcomes.

References

- ¹ [Kort, Reilly, & Picard, 2001.](#)
- ² Duffy, M. C., Lajoie, S. P., Pekrun, R., & Lachapelle, K. (in press). Emotions in medical education: Examining the validity of the Medical Emotion Scale (MES) across authentic medical learning environments. *Journal of Learning and Instruction*.
- ³ [Pekrun, et al., 2017.](#)
- ⁴ [Plass, et al., 2019.](#)
- ⁵ [Koo & Li, 2016.](#)
- ⁶ [Pekrun, et al., 2011.](#)
- ⁷ [Li, et al., 2013.](#)

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