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 grade students 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.
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, 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 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, 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.

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

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