The Relationship Among Classroom Growth Mindset Climate, Trust and Respect, and Student Performance in Mathematics

BY CHLOE STROMAN

While growth mindset is typically conceptualized as an individual belief, recent research shows that it can also function as an emergent cultural feature of the environment.[1,2,3] This study examines how growth mindset classroom climates – defined as students' shared perception that the teacher believes that all students can master the class material using hard work, effective learning strategies, and asking for help when needed – shape students' academic experiences and performance.

Importantly, the researchers explore growth mindset classroom climates in 9th grade mathematics classrooms. Mathematics is a domain in which students are particularly susceptible to fixed mindset beliefs about ability.[4] Indeed, common societal narratives suggest that some people are "math people" and others are not. These fixed beliefs about one's potential for success in mathematics can undermine students' motivation and performance. Research has also linked the mathematics beliefs, interest, and values that students develop in early adolescence to their participation in postsecondary STEM majors and careers, making 9th grade a particularly meaningful time to foster adaptive beliefs about mathematics ability.[5,6,7]

STUDY DESIGN

The research team designed the project as a set of two studies. The first study used data from the National Study of Learning Mindsets (NSLM) pilot for approximately 2,700 students and examined the relationship between growth-oriented mathematics classroom climate and mathematics GPA. The second study repeated this analysis using the full, nationally representative NSLM data set. The second study additionally explored the role of trust and respect between students and teacher.

Students completed measures of their perception of the classroom mindset climate, and in study 2, their trust in their teacher and perception of how much their teacher respected them. Classroom mindset climate was measured by students' agreement, on average, with statements about their teacher like, "My math teacher thinks that some kids are smart and others are not," and "My math teacher seems to believe that only a few students will understand the hardest material."

Trust and respect were measured by students' agreement with two statements – "I trust my math teacher" and, "My math teacher treats me with respect."

KEY FINDINGS

- Using two national samples, including a nationally representative sample of regular U.S. public high schools, the researchers found that in mathematics classrooms where students perceived their teacher to believe that intelligence can grow, students earned higher mathematics grade point averages (GPA).

- On average, students in these growth-oriented mathematics classrooms trusted their teachers more and felt more respected by their teachers, which in turn predicted students' GPA above their prior achievement and demographic characteristics.

RESEARCH TEAM

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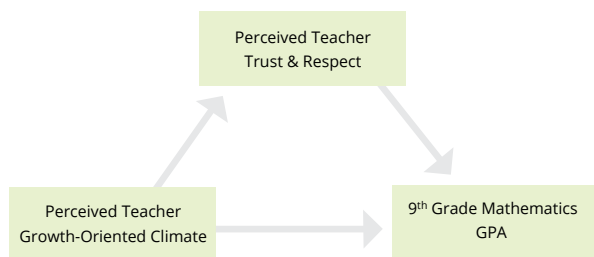
Students' mathematics GPA was obtained via school records.

The research team hypothesized that growth-oriented classroom climates would predict higher student achievement, and that students' positive relationships with their teachers in these classrooms would contribute to their high achievement. This model is illustrated in Figure 1.

MINDSET SCHOLARS NETWORK

Figure 1. *Across students with different incoming achievement levels, growth-oriented classroom climate predicted mathematics GPA, which was shaped by teacher trust and respect.*

Key Findings

Using two samples, the researchers found that in mathematics classrooms where students perceived their teacher to believe that intelligence can grow, students earned higher mathematics grade point averages (GPA).

In both the NSLM and pilot data, students' perception of their teacher's growth mindset was positively associated with student performance. This relationship held true after the researchers controlled for confounding factors including student demographics, students' personal mindset beliefs, and prior GPA.

On average, students in mathematics classes with growth mindset classroom climates trusted their teachers more and felt more respected by their teachers, which in turn predicted higher 9th grade mathematics GPA.

Analyses supported the researchers' hypothesis that students' perceptions of their teachers' mindsets (the growth-oriented classroom climate) predict students' GPA, in part, because growth mindset climates foster increased perceptions of trust and respect between teachers and students. This pattern held true after controlling for students' personal mindset beliefs, prior GPA, and demographics, including race/ethnicity, gender, and eligibility for free or reduced-price lunch.

Insights & Future Directions

The research team has further research underway to explore how growth-oriented classroom climate is related to students' personal beliefs about the malleability of intelligence, students' motivational outcomes (e.g., challenge seeking and reaction to failure), and the role of classroom climate in buffering students from stereotype threat.

The project findings could help to refine the application of growth mindset research in education practice and policy. Research on growth mindset continues to be a popular topic in professional learning for educators, and the current project adds validity to the conceptualization of growth mindset as a feature of the learning environment and as a foundation for positive relationships between educators and students.

Sample

This study leverages data from the National Study of Learning Mindsets (NSLM),[8] 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. The current study includes data for approximately 13,400 students. Additional information about the NSLM sample of schools and students can be accessed here. The study also used data from the pilot for the National Study of Learning Mindsets, which included approximately 2,700 9th grade students at eleven schools.

Because this work focuses on growth mindset in terms of students' perception of their teachers' mindset beliefs, school leaders and policymakers may also conclude that initiatives to improve mathematics performance or promote adaptive beliefs about intelligence should focus on how the attitudes and beliefs of educators and administrators play out in terms of concrete school- and classroom-level *practices and messages* that communicate the teachers' and administrators' mindsets and align with growth mindset research.

References

1. Murphy & Dweck, 2010.

2. Emerson & Murphy, 2015.

3. Canning et al., 2019.

4. Boaler, 2015.

5. Maltese & Tai, 2011.

6. McCoy, 2005.

7. Wang & Degol, 2013.

8. This manuscript uses data from the National Study of Learning Mindsets (principal investigator, D.Y.; co-investigators: R.C., C.S.D., C.M., B.S. and G.M.W.; https://doi.org/10.3886/ICPSR37353.v1). The program and surveys were administered using systems and processes developed by the Project for Education Research That Scales (PERTS (https://www.perts.net/); principal investigator, D.P.). Data collection was carried out by an independent contractor, ICF (project directors, K.F. and A.R.). Planning meetings were hosted by the Mindset Scholars Network at the Center for Advanced Study in the Behavioral Sciences (CASBS) with support from a grant from Raikes Foundation to CASBS (principal investigator, M. Levi), and the study received assistance or advice from M. Shankar, T. Brock, C. Bryan, C. Macrander, T. Wilson, E. Konar, E. Horng, J. Axt, T. Rogers, A. Gelman, H. Bloom and M. Weiss. Funding was provided by the Raikes Foundation, the William T. Grant Foundation, the Spencer Foundation, the Bezos Family Foundation, the Character Laboratory, the Houston Endowment, the Yidan Prize for Education Research, the National Science Foundation under grant number HRD 1761179, a personal gift from A. Duckworth and the President and Dean of Humanities and Social Sciences at Stanford University. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health and the National Science Foundation.

About the Mindsets & the Learning Environment Initiative

The Mindset Scholars Network launched a new interdisciplinary initiative in Fall 2016 to explore how learning environments shape the mindsets students develop about learning and school. The project's aim is to generate scientific evidence about how educators, school systems, and structures can convey messages to students that they belong and are valued at school, that their intellectual abilities can be developed, and that what they are doing in school matters.

Fourteen projects were awarded over two rounds of this initiative. Funding for the initiative was generously provided by the Bill & Melinda Gates Foundation, Joyce Foundation, Overdeck Family Foundation, and Raikes Foundation.