



What makes a classroom a community? Teacher mindsets and student sense of belonging in middle school mathematics classes

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Students' sense of belonging is an important reflection of personal and structural forces that shape their lives and is a key determinant of their educational investments and success.¹

We know that a sense of school belonging contributes to motivation and academic achievement.^{2,3} We know less about whether or how variation across classrooms in the same school can contribute to differences in school belonging and academic performance.⁴ Our multidisciplinary

RESEARCH TEAM

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Areas of expertise: Sociology, psychology, educational psychology, education

Key Findings

- Students' sense of belonging in specific classrooms was distinct from their sense of belonging in school more generally and varied across classrooms in meaningful ways.
- Teachers' confidence in their own instructional skills and their beliefs that mathematics skills can grow were related to a greater sense of mathematics classroom belonging among adolescents, net of demographics and past achievement in mathematics.
- Gender, race and ethnicity, and family income were not statistically significant predictors of classroom belonging, after accounting for students' prior achievement and other characteristics.⁵

team of researchers and practitioners sought to understand adolescents' classroom belonging and whether teacher mindsets (e.g., their sense of school belonging, instructional efficacy, implicit theories of intelligence, and more) relate to their students' sense of belonging and academic performance in mathematics.

We ask: (1) How is student sense of belonging distributed within and between middle school mathematics classes? (2) How is teacher mindset related to student sense of belonging, academic identity, and student success in middle school in general and mathematics classes in particular? and (3) How, if at all, does the relationship between belonging and achievement vary by student race and ethnicity?

Sample

Our sample includes students attending five middle schools (out of 12) in the Madison Metropolitan School District (MMSD). MMSD is a diverse, urban district in Wisconsin. It serves approximately 27,000 students who are 18% Black, 21% Latinx, 9% Asian, 43% white, and 21% two or more races. About half of the students in the district participate in the free- or reduced-price lunch program.

We surveyed mathematics teachers at each participating middle school in early 2020 on their views about their school, colleagues, and students. We took a broad view of ‘teacher,’ including teachers of record as well as bilingual and other support teachers.

Our final sample includes 1,887 students (an 83% response rate) and 60 teachers (a 70% response rate).

Study Design

In consultation with co-PI Patti Schaefer, Director of Science, Technology, Engineering, and Mathematics at MMSD, we proposed to work with the district to supplement existing district student and staff climate surveys in the 2019-20 school year by administering a survey to students and instructional staff in participating middle school mathematics classes.

The surveys included items created by study researchers and adapted from other instruments, such as the Becoming Effective Learners Survey from the University of Chicago Consortium on School Research. We also planned to observe a set of classrooms with relatively low and high levels of belonging to learn more about the teacher moves that impact belonging. We designed an observation instrument to guide research assistants who were prepared to go into the field in March of 2020. Unfortunately, the pandemic denied us this opportunity. The timing of the pandemic led the district to shift to fully virtual instruction, precluding the possibility of either linking classroom climate to achievement growth in mathematics or observing instructional practice in a setting that could inform future professional development.

Key Findings

Students’ sense of belonging in specific classrooms was distinct from their sense of belonging in school more generally and varied across classrooms in meaningful ways.

About a third to half of the variation in mathematics classroom belonging may be attributable to school belonging; the rest of the variation in mathematics classroom belonging was attributable to other factors. We

investigated whether the presence of peers who students may know from previous classes or from their neighborhood influenced classroom belonging. After adjusting for differences in school belonging and individual student characteristics, the presence of these peers had little influence on student reports of classroom belonging. The remaining variation in classroom belonging was associated with teacher beliefs and practices.

Teachers’ confidence in their own instructional skills and their beliefs that mathematics skills can grow were related to a greater sense of mathematics classroom belonging among adolescents, net of demographics and past achievement in mathematics.

We measured three teacher mindsets: teachers’ confidence in their own instructional skills (e.g., “I can help the least prepared students”), teacher growth mindset about mathematics ability (e.g., “Some people are math people and some are not” [reverse scored]) and teacher sense of school belonging (e.g., “I feel I belong at this school”).

Teacher confidence in their own instructional skills and growth mindset about students’ mathematics ability both contributed to adolescents’ reports of classroom belonging. We found meaningful relationships at the student and classroom levels – even after accounting for adolescents’ feelings of belonging in school and other classes, race and ethnicity, socioeconomic background, and past achievement. On the other hand, a teacher’s own sense of school belonging was unrelated to the belonging students felt in class. In all, the teacher mindsets that we measured explained 40% of adolescents’ mathematics classroom belonging among classes.

Gender, race and ethnicity, and family income were not statistically significant predictors of classroom belonging, after accounting for students’ prior achievement and other characteristics.

We found no meaningful difference in the average level of mathematics classroom belonging, nor in the variability in mathematics classroom belonging, by gender. For the most part, the distributions of mathematics classroom belonging among white, Black, and Latinx students overlapped. However, on average, Latinx and Black students reported slightly lower levels of mathematics classroom belonging. These modest differences can be largely attributed to differences among students in previous year mathematics grade and mathematics test scores and are not reliably different from the average mathematics classroom belonging of white students net of prior performance.

Insights & Future Directions

Results of our analyses fuel our optimism that belonging in mathematics classrooms can be shaped in part by the beliefs and actions of teachers. Even adjusting for students’ backgrounds, prior achievement in mathematics and general sense of belonging in school, teacher beliefs matter

for students' sense of belonging in their classrooms. Efforts to intervene on teachers' beliefs about their own efficacy as instructors as well as their mindsets about mathematics learning may yield changes to instructional practice and ultimately improvements to students' sense of classroom belonging and achievement.

Although we were not able to observe pedagogical practice directly due to the pandemic, we have built the qualitative and survey measures we believe are necessary to learn what teacher behaviors translate their beliefs into student perceptions, performance, and experiences of belonging in mathematics classrooms.

Jessica Calarco, a highly accomplished ethnographer in the field of sociology, is completing analyses of the open-ended responses she designed for our 2020 teacher survey. Our preliminary findings suggest that, when a student struggles with homework or an exam for the first time, teachers often assume that the problem was caused by circumstances outside of the student's control. As a result, teachers are typically empathetic to the student and respond by asking the student what happened, offering assistance, and even offering second chances at completing the assignment or exam. When students struggle regularly, teachers are more inclined to assume that those struggles are caused by a lack of understanding of the material, a lack of motivation to seek help, or a lack of responsibility or effort on the part of the student. As a result, teachers respond more directly and critically in these conditions and are less inclined to ask the student what happened or involve the student in a conversation. These differences in teachers' assumptions and responses are potentially troubling, as they suggest that teachers may justify giving harsher penalties to students who struggle regularly with homework than they do to students who experience less frequent struggles in school.

References

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5. The school district does not consider gender a male/female dichotomy. We operationalize gender as male or female based on parent reports rather than considering the more expansive measure of gender based on student reports.