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Math in Social Context: Belonging in Math and How it's Affected by Groupwork

Kara Mathes

The Problem

Interactions in groups for class assignments are an important part of a student's sense of belonging in mathematics and other academic disciplines. This sense of belonging has an impact on the student's sense of self as well as their academic performance.

Why is Belonging Important?

For students that don't quite know what field of study they want to pursue, having a sense of belonging and being able to picture themselves in that field are important factors when picking a discipline. Mathematics is one field where many people feel they don't belong. In order to keep people in the field, they need to feel as though they belong.

Because we are social beings, a large part of our sense of belonging in a specific group or discipline comes from how we interact with others in that group. Due to this, feeling as though they have a social connection to someone else in mathematics impacts a student's sense of self and belonging in the subject (Walton et al.). This social connection is very important and can come from many types of interactions. The most important of those interactions are with professors and with classmates in the field. Professors play a large role in empowering students to build their sense of belonging in mathematics by encouraging them and helping them when they feel discouraged. Unfortunately, even if their professors are very empowering, students can still lose their sense of belonging in mathematics if they do not feel encouraged by their peers.

While the social aspect is very important, another large part of a student's sense of belonging in mathematics is being able to picture themselves in the field. Often times, students that are minorities in society are also minorities in the field of mathematics, which causes them to question whether they belong in the field.



Groupwork and Belonging

Because of the impact that social connection has on students' confidence in academics, group assignments are often used so that students can learn from each other and display their knowledge while also getting that social connection. Groupwork is common in academics today and is very common at Hamilton, particularly in the mathematics and statistics department. Because working in groups is a large part of many courses and aspects of a student's academic life, it can have a big impact on their sense of belonging in their classes, their field of interest, and academics as a whole. This impact is not always positive, though. If a student does not have a positive experience in their group, their sense of belonging in the course and in mathematics can be diminished.

Where Groupwork Goes Wrong

- The student does not feel like they can have input in the group because they feel outspoken
- Not all members are actively included in the group
- The student does not have much in common with other group members
- The student does not feel a social connection with their group members

My Experience

As a woman in STEM, I am often a minority in groups of men in my math classes. Sometimes, I feel outspoken and struggle to contribute to the assignment. Being ignored or shot down when I try to contribute has left me feeling incompetent and less than my group members, which hurts my sense of belonging in mathematics.

While the core of this issue may be how students treat each other or a societal issue of how we view minorities in our academic fields, changing how groups are made and teaching students how to work better in groups will help to alleviate the issue.

CATME: The Solution?

To be sure that students are empowered in their groups, groups need to be made with more intention. In order to do this, the CATME team maker tool uses an algorithm to enhance groups based on criterion chosen by the professor.

How CATME Works

- Students take a survey that is customized by the professor
- Professors choose which criteria to use to form the groups
- The peer evaluation tool is used for students to rate their peers on five categories



- The peer evaluation results are taken into account when grading students and in future group creation

Which Criteria to Prioritize

- Identity features (gender, race/ethnicity, discipline/major)
- Extracurriculars
- Leadership preferences
- Relevant skills

Why Does it Matter?

Impact of Group Composition on Belonging

If a student feels as though they belong in their groups for group assignments in class and can work well with their group members, they will likely feel more confident in the course material. This will also allow them to have social interaction with other students in the course and in mathematics, which will increase their sense of belonging (Walton et al.). This sense of belonging will encourage students to stay in the mathematics field.

Math in the Process

Not only does this impact students in mathematics, but math is also used in the solution to this problem! The algorithm used to create groups in the CATME tool allows professors to make groups using criteria of their choice in a way that is much easier and more accurate than if they did it by hand.

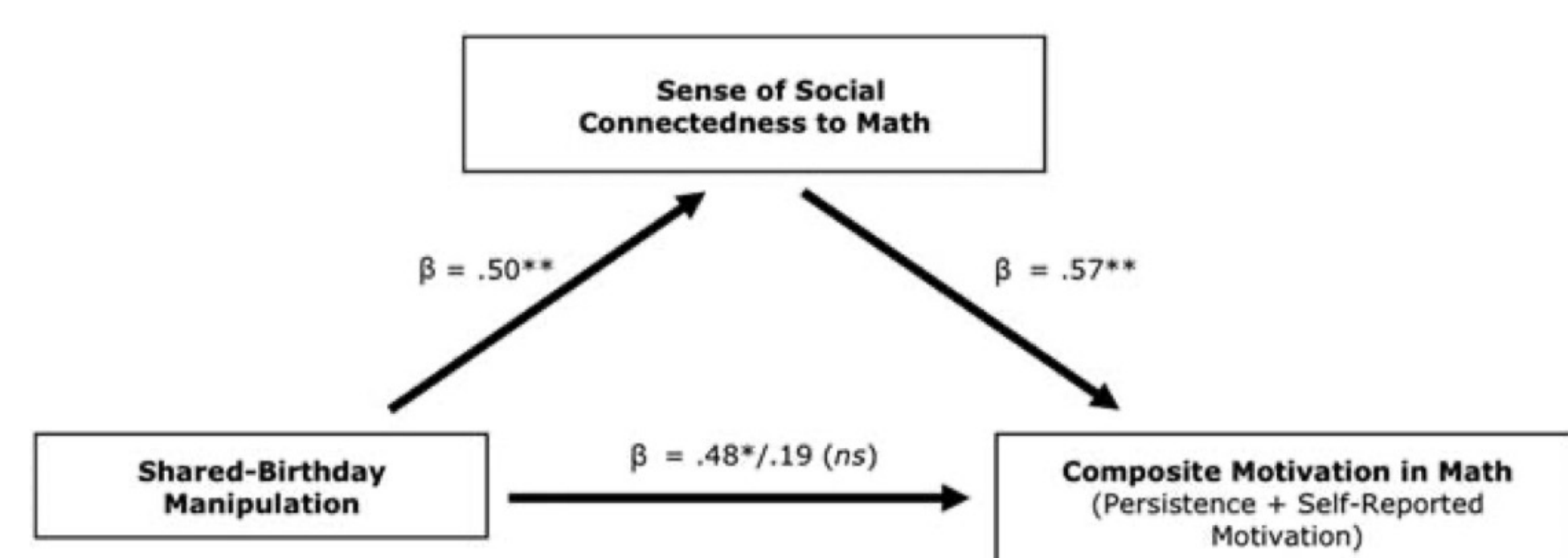


Figure 2. Mediation of the effect of shared-birthday manipulation on motivation in math by participants' sense of social connectedness to math in Experiment 2. All participants were moderately or highly identified with math at baseline. * $p < .025$. ** $p < .01$.

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