Unconscious Bias in the Classroom: How Cultural Stereotypes Affect Teachers' Assessment of Students' Math Abilities

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Sixth-grade math students collaborate on a group assignment. Photo by Allison Shelley/The Verbatim Agency for American Education: Images of Teachers and Students in Action.

There are troubling, persistent achievement gaps among students from different racial and ethnic backgrounds in the United States. In addition, women and people of color are underrepresented in STEM-related fields, which contributes to the wealth and wage inequity in our society. Cultural stereotypes, for example, that mathematics requires natural ability or that certain groups have more mathematical ability than others, likely contribute to these issues, but it is not clear how.

Students might receive these stereotypical messages from multiple sources, such as their parents, peers, or teachers. Yet teachers' unconscious biases that have been shaped by cultural stereotypes have important negative consequences for students' academic outcomes. These *implicit biases* operate beneath teachers' awareness and can have subtle but lasting impacts on students. For example, teachers' implicit biases can shape their expectations of students, which may lead to racial gaps in their students' academic achievement (van den Bergh, Denessen, Hornstra, Voeten, & Holland, 2010). Such biases

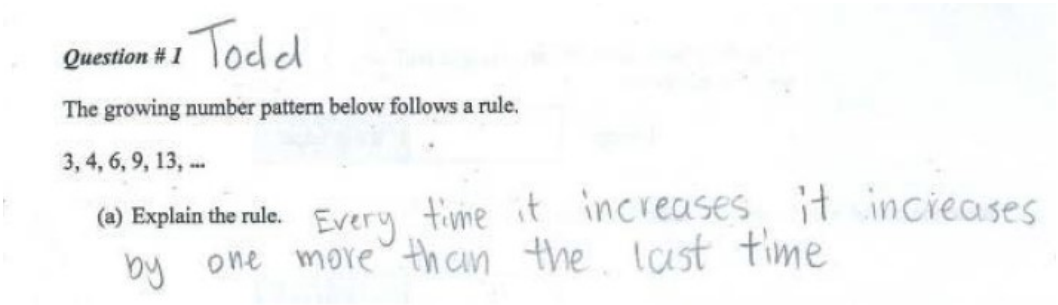
can also affect teachers' tracking decisions when placing girls and boys in advanced mathematics classes (Nurnberger, Nerb, Schmitz, Keller, & Sutterlin, 2016). In this way, teachers' implicit biases can feed into a *self-fulfilling prophecy* wherein teachers' biased perceptions of their students' cognitive abilities shape their instructional decisions and academic expectations of their students, which in turn, influence their students' self-concept and academic performance (Rosenthal & Jacobson, 1968).

Thus, an important question needs to be answered: To what extent are teachers' evaluations of students' performance or their perceptions of students' ability shaped by their unconscious biases?

Our Method: Experimental Study

Distinguishing between teachers' accurate evaluations of students and their biases is tricky. For instance, teachers' evaluations of the performance of students of different races and genders may differ because of actual differences in the students' performance and not because of bias related to the students' race or gender.

We designed an experiment to get around this issue. In this study, we investigated teachers' evaluations of student work in mathematics (see Figure 1). All teachers evaluated the same student work; the only difference was what name appeared on the student solution, such as "Todd" (a White male-sounding name) or "Shanice" (a Black female-sounding name). Because teachers evaluated the same students' solutions, if they had the same expectations of students' mathematical ability, regardless of the students' presumed race or gender, they would evaluate the students' mathematical ability the same regardless of the name on the work.


Question # 1 Todd

The growing number pattern below follows a rule.

3, 4, 6, 9, 13, ...

(a) Explain the rule. Every time it increases it increases by one more than the last time

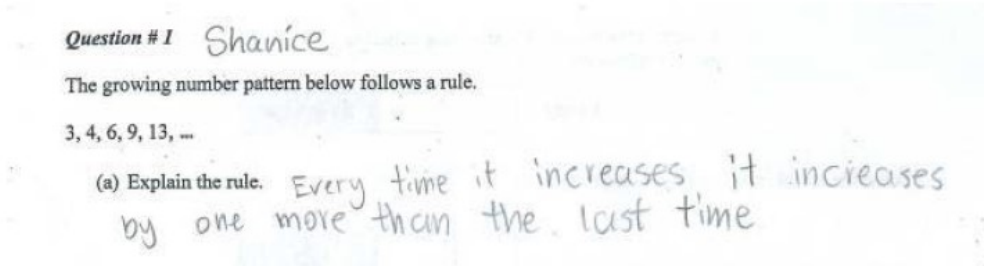


Figure 1. Sample student solutions used in the study.

Study Design and Participants

Because the names we selected were intended to bring to mind specific races and genders, we did extensive research to identify these names and tested them with teachers, as explained further in Copur-Gencturk, Cimpian, Lubienski, and Thacker (2020). To generate authentic student work, we identified problems from the National Assessment of Educational Progress (NAEP) that would be likely to prompt a wide range of student responses. We then collected data from middle school students from different racial and gender groups and identified solutions that were not correct, partially correct, and correct. We selected student work examples in handwriting that would not appear to suggest a specific gender. We then imitated students' handwriting to write the new names. Thus, each student's work sample was assigned a race- and gender-associated name for incorrect, partially correct, and correct solutions, and the samples were distributed to teachers in a randomized fashion.

Finally, because we aimed to capture teachers' unconscious biases, teachers were not told the real purpose of the study. We told them that we were in the final stage of selecting items for an assessment that would capture the features of middle school students' knowledge and skills and accurately predict their mathematical growth. Teachers were asked to evaluate students' solutions and were told that their anonymous feedback would help finalize the best items for the assessment. For each student's work, teachers rated the *correctness* of the student's solution on a 10-point scale ranging from *absolutely nothing correct* to *fully mathematically sound.* They then predicted the mathematical *ability* of that student based on the student's response, on a 7-point scale ranging from *very low mathematical ability* to *very high mathematical ability*.

The analyses are based on data collected from 390 K-12 mathematics teachers who participated in professional development activities provided by state-funded Mathematics and Science Partnership programs in a southern state. Ninety percent of these teachers were female, and 65% were White, 17% were Black, 12% were Hispanic, and 5% were of another race/ethnicity. They had an average of 10.6 years of teaching experience.

Findings: No Bias in Evaluating Students' Performance, but Bias Against the Mathematical Ability of Girls and Students of Color

We found that teachers' ratings of students' performance (how "correct" the response was) did not differ based on the students' perceived race or gender. Thus, teachers did not seem to show any unconscious bias toward a specific group of students when evaluating the correctness of their solutions. This was true for incorrect, partially correct, and fully correct responses.

However, teachers' ratings of students' ability varied by perceived race and gender in more ambiguous situations (i.e., partially correct and incorrect solutions; see Figures 2 and 3). In addition, we found that the implicit biases of teachers of color and White teachers were revealed in different situations. Specifically, teachers of color assigned higher ability ratings when they saw White-sounding names than when they saw Black- and Hispanic-sounding names for partially correct responses (see Figure 2). White teachers assigned higher ability ratings to boys than girls for incorrect solutions.

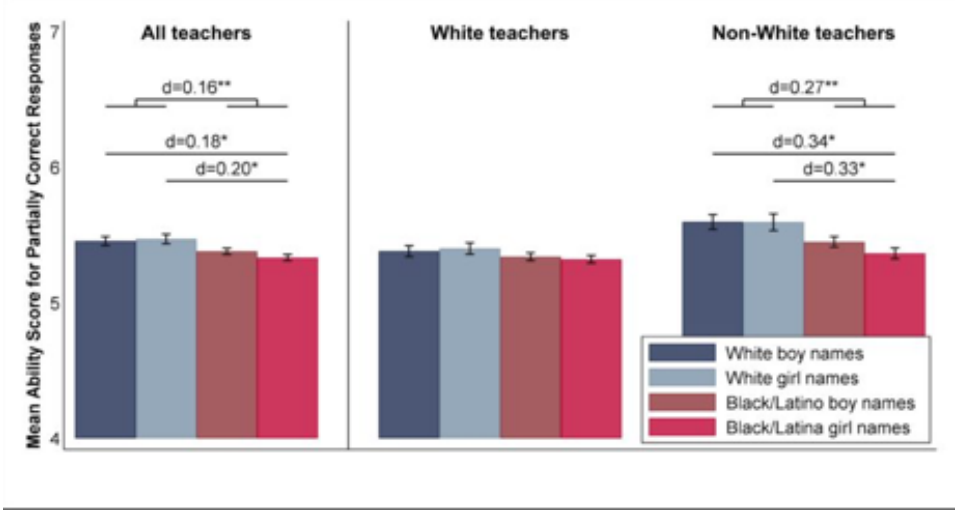


Figure 2. Mean ability score for partially correct responses by teachers' race and gender and by the race of the student names.

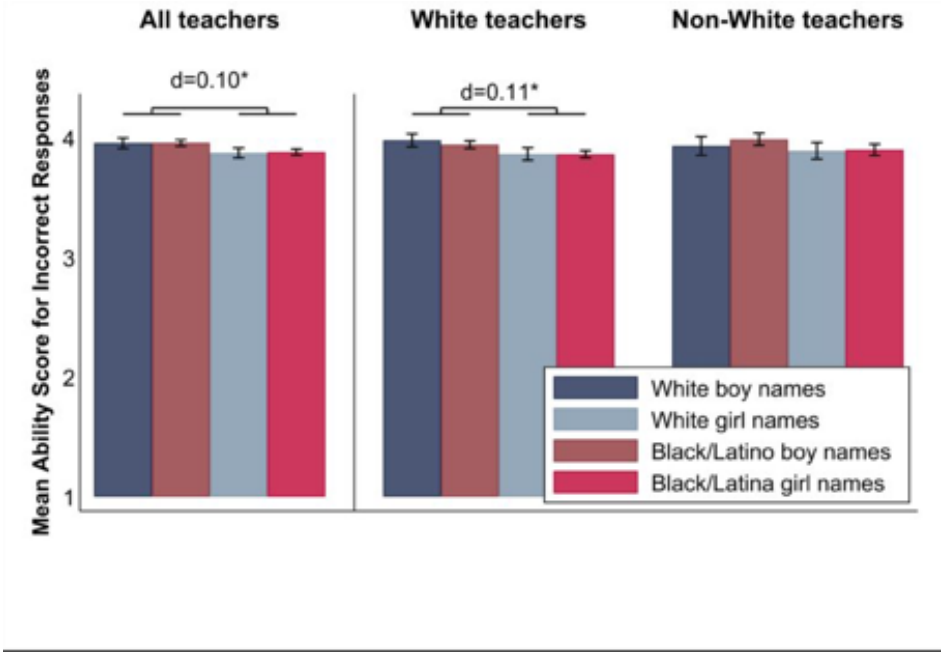


Figure 3. Mean ability score for incorrect responses by teachers' race and gender and by the race of the student names.

Most teacher background characteristics were unrelated to their ratings, including teachers' years of experience or educational background. However, when we looked at the teachers' race, we found that teachers of color rated the mathematical ability of White students—both boys and girls—higher than the ability of students of color for partially correct

responses and that White (and mostly female) teachers estimated boys' mathematical ability as being higher than the ability of girls for incorrect responses. These patterns are intriguing because they suggest that members of a negatively stereotyped group (e.g., people of color and women in mathematics) may have themselves internalized these negative stereotypes and may contribute to their reproduction. More simply, this work illustrates that no one can be assumed to be free of bias, including members of negatively stereotyped groups (Bearman, Korobov, & Thorne, 2009; Williams & Williams-Morris, 2000).

Implications: What Can Be Done to Help Teachers Overcome Their Potential Implicit Biases?

Implicit bias is an important problem affecting our students' academic success, selection of career paths, and academic self-concept (Greenwald et al., 2002; Nurnberger et al., 2016; van den Bergh et al., 2010; Wang & Degol, 2017). Thus, we offer the following recommendations:

- **Pre- and In-service Teachers –** Implicit bias training should be a regular part of teacher education programs. Existing programs that have been successful in overcoming implicit biases can be leveraged for teacher education and professional development programs to prompt educators to confront their biases. For instance, the National Education Association (NEA) (NEA, 2018) recommends that teacher preparation programs collaborate with community members and develop personal and professional growth experiences to support culturally responsive opportunities for pre-service teachers. The document cites successful approaches at Ball State University, University at Illinois, and Denver University. Furthermore, our findings suggest that both White teachers and teachers of color show implicit biases in different situations. Thus, implicit bias training should be implemented with teachers of all ethnicities to confront the biases they may implicitly hold toward particular groups of students in various situations.
- **Preparation Programs and School Pedagogy Administrators** – Given that teachers draw on their biases in more ambiguous situations, the more information teachers gather from their students, the less likely they may be to rely on their implicit biases. Teachers should be encouraged to use pedagogical practices that prompt

them to learn about their students, such as asking students to explain their thinking. Such practices might help teachers attend to students' as individual learners, as opposed to merely a member of an underrepresented group.

Conclusion

Overall, it makes sense that teachers are not immune to societal stereotypes, even—or perhaps especially—when those stereotypes are about groups of which they are a member. Our study reveals that teachers' biases about students of color and girls can affect their perceptions of those students' abilities. Given prior research showing the importance of teacher perceptions on students' learning (Nurnberger et al., 2016; Rosenthal & Jacobson, 1968; van den Bergh et al., 2010), it is important to help teachers more accurately assess their students' academic strengths and weaknesses.

+ References

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