Women in Mathematics:
Awareness and its Effects

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Although the gap is slowly narrowing, women are still grossly underrepresented among students of higher mathematics and in math-related fields (Boaler 2007).

This is not due to some inherent weakness that girls and women have, but rather a problem with social attitudes and classroom practices (Boaler 2007).

Despite this, most people, especially women, see their own difficulty in math as a personal deficit, not an external problem.

These conditions must be changed but can we also empower women now?
Stereotype Threat Theory: “This theory contends that cultural stereotypes about women’s inferior math ability create extra performance impairing stress for women. That is, women have an added burden of contending with the possibility that their performance might confirm the stereotype of female inferiority and that they might be judged according to that stereotype.” (Ford et al, pg. 219)

“Members of some minority and disadvantaged groups are targets of negative stereotypes alleging intellectual inferiority.” (Ford et al, pg. 219)

“When a female student takes a math test, for instance, she must contend with the extra stress of possibly validating the stereotype of women’s inferiority in math and being personally “reduced to that stereotype” (Steele, 1997, p. 204) (pg. 220)

Study: By having men in the room, women had lower self confidence in their test performance.
Research Question

➢ What effect does being conscious of external factors responsible for gender inequities in math have on women’s self confidence and ability to succeed in mathematics?
Methods

● We interviewed several women involved in mathematics with varying levels of accomplishment:
  ○ Liz Pannell and Felicia Tabing, graduate students working towards math PhDs and cofounders of the Noetherian Ring, a group for women mathematicians.
  ○ Women in Citlalic’s Math 2 section.

● Discussed with those interviewed their experiences and difficulties in math and if they felt that being women affected their experiences.
Math 2 Students

- Did not consciously consider that women are minorities in math.
- Fairly unaware of external factors responsible for many of their difficulties with math.
- Internalized failure as personal deficits; lacked confidence.
- Intimidated by peers; did not participate in class.
- By the end of the interview, after discussing their experiences, began to shift away from self blame and became more conscious of how external factors actually changed their experiences with math.
• “My teacher had no expectations or high standards for me. So when I came to college and my math 2 professor was expecting me to try my hardest...it was a first for me. I wasn't used to having a teacher push me to try my hardest in math.”

• “Nope! My teacher wasn't even prepared himself. My high school math teacher was a new teacher in our school. He would stutter a lot and question his own answers. That would confuse me all the time. He just didn't know how to teach math. We were like his guinea pigs. When I came to college I was very unprepared for math.”

• “I would always go to my teacher after class so he could explain the things I did not understand but he didn't make sense. He always expected me to know what he was talking about when I clearly had no idea. What really frustrated me was the fact that my teacher was very impatient with me. He seem to get flustered a lot so I stopped asking him for extra help.”
Graduate Students

- Shy in class compared to male peers; believed that male grad students are either smarter or possibly just more confident than they are.
- Doubted personal ability despite realizing they have done more than what most people can accomplish.
- Conscious of microaggressions against women in mathematics.
  - Upon learning about external factors working against them, were better able to question their self-criticism and believe in themselves.
- Conscious of the gap between women and men in mathematics, felt that it gave them something to fight for and prove. Appreciative of the opportunities offered specifically to women mathematicians.
On women’s self doubt: “Feeling like I’m inferior or feeling like because I’m a female, I’m not as good at math... but sometimes I feel like that’s true though, like the guys in my class really are better... I can’t really tell where that’s coming from.”

“If women know about [microaggressions], then they feel like they can do something about it and it doesn’t affect them as badly. Cause you can’t always make them better... But even if they just know [these issues] exist, that helps.”

On a math event at UC Berkeley intended for women but also open to men: “There were a lot of guys there... I felt kind of mad, ‘This is supposed to be a women’s thing, this is supposed to make it comfortable for women!’ ... Most of the time, the questions came from the men there, even at the women’s thing.”
Comparison

- Math 2 students were less conscious of microaggressions against women, did not identify as gender minorities in math.
  - Less able to question their self-doubt and identify causes of their difficulties.
  - By the end of the discussion about personal experiences and external factors, exhibited less self-blame and more awareness.
- Graduate students were more conscious of microaggressions against women, identified as gender minorities in math.
  - While still not as self-confident as male peers, were able to question their self-doubt and identify external factors affecting them.
- This is some evidence that being conscious of microaggressions may have a positive impact on women’s self-confidence and ability to succeed.
Noetherian Ring

- Group founded in 2012 by graduate students Liz Pannell and Felicia Tabing, modeled after UC Berkeley’s Noetherian Ring.
- Intended as a community for women mathematicians, currently only graduate students, where they can feel comfortable talking about math and women’s issues in math together.
- Have had some successful events but founders feel want to do more. Found that the few female graduate students are not very interested or are too busy to participate actively, so want to expand the group to include undergraduate students in the future.
- Other local organizations advocating for women in STEM fields:
  - UCSC WiSE (Women in Science and Engineering)
  - UCSC SWE (Society for Women Engineers)
Solutions

Note these are not complete solutions to gender inequities in mathematics, only a few ideas to address the massive problem.

- Make sure girls and women have more role models who study or use high-level math.
- Educate girls and women on external factors affecting them so they can begin to assess their self-doubt rationally.
- Make sure girls and women have active support groups so they are not as isolated in high-level math classes.
- Educate and assist teachers and schools so they can work to create gender equitable classrooms.
Citations


