Review of: "Empowering Women in Mathematics: Shaping a New STEM Paradigm for 2047"

Julia Schaletzky[1]

1 University of California, Berkeley, United States

Potential competing interests: No potential competing interests to declare.

I have read with interest the review “Empowering women in Mathematics: Shaping a New STEM Paradigm for 2047”. Its central thesis is that women's work in mathematics has been undervalued historically, which is something few would disagree with, thinking, for example, of the work of Emmy Noether and the hostile academic environment she had to deal with, never being promoted out of the assistant professor role. Still, these women succeeded and contributed to society in significant ways - they couldn't be truly marginalized, as they all blew everyone else out of the water intellectually.

The review is taking on an important issue and makes several good points; however, it is still not systematic enough and should dig deeper. First, it should be acknowledged that women in mathematics have come a long way. The data the authors show actually shows that 43% of mathematics PhD candidates are women, which is a high proportion, given that they only constitute 30% of undergrad students in that field. Fewer become professors, which has been documented in other fields as well. In-depth interviews should be conducted with math PhDs to discover how they determine their career path. Is it truly because a field is unwelcoming, or are there other reasons?

The case study seems to be unrelated to the other points in the paper - I'm not sure why it's there and what it contributes. It would make sense to dwell deeper into the demographic data, maybe conduct some interviews, and make recommendations based on that. Without a good root cause analysis, recommendations are difficult to make, although some of the listed ideas are common sense and definitely good ideas - others depend more on the determination of causality. There is a body of literature also around sex-specific variation of interest and also cultural factors in families - rarely does a child go to study something the whole family is against. In my culture (Western Europe), there is still a lot of pressure put on some girls wanting to study math to not do it because it is 1) a really odd thing to study for most people, it's a philosophy after all, and no job is associated with it like a doctor or lawyer, and 2) other women in the family were really bad at math and wait for the first bad grade to tell them “this is not for us” and want to build community by commiserating about how awful math is. As a child, except for my father, who was obsessed with the beauty of math (and himself wanted to study it but was pushed by his parents to become a doctor instead), I haven't heard anyone talk about mathematics without an exasperated sigh and an eyeroll. I would be very interested to hear if the same phenomenon is observed in India.

The conclusions aren't properly supported by the data in their breadth - i.e., “underrepresentation is a multifaceted issue influenced by cultural, institutional, societal factors” - I would like to know what these factors are exactly and what quality the data is;

“Mentorship programs, scholarships, inclusive practices” are the main solutions proposed, but it hasn't been shown conclusively that those actually work. Particularly “inclusive practices”, interpreted wrongly, can lead to quotas for hiring and awards, etc., devaluing women's contribution to mathematics as everyone assumes “she just got xyz because she is a woman”. Merit is a central principle of education, and inclusive practices should focus on equal opportunities, removing barriers, getting more women and girls excited about math, and allowing them to do the work on the level required to compete.

I particularly miss a discussion of our modern times and how it influences math education - exposure to the Internet has reduced educational attainment for children on average - there is a lot of educational content, but children aren't watching it. There is (at least in the US) a strong movement away from rigor and merit and towards abolishing homework, standardized testing, and accountability for grades. There is a large amount of grade inflation, and advanced classes are no longer offered. Everyone has to be equally talented by definition. All this is bad news for people interested in mathematics, both men and women, as rigor is your friend - most people realize that they should study math because they're really good at it and others aren't. This is increasingly lost, and it would be interesting to discuss future risks to the pool of excellent mathematicians posed by these misguided approaches. Again, it's possible that in India this is very different, but if it is, it would be good to recommend maintaining rigor as a strategy.