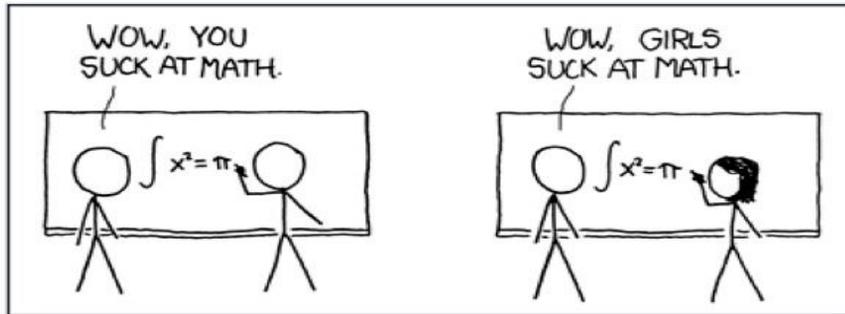


# Narrowing the Gap:

Targeting the achievement gap between males and females in mathematics



## Is there a problem? YES!

Unfortunately, there is both a performance and a confidence difference between males and females- one that only increases with time. If left unchecked, low confidence in math can lead to math anxiety, "a feeling of tension and anxiety that interferes with the manipulation of numbers and solving of mathematical problems" (Ashcraft & Moore, 2009). This can cause students to avoid further math education and careers in math related fields.

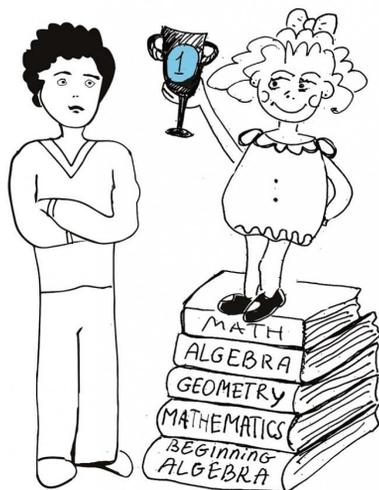
- EQAO questionnaire data indicates that females are less confident in math
- When math is no longer mandatory it only comprises an average of 14% of a females course load compared to 17.4% of the average males (Curriculum System, 2004-2005)
- 52% of boys who had mathematics marks in the 80% to 89% range in high school chose a STEM program, compared with 22% of girls in the same category (Statistics Canada, 2011)
- While 60% of post-secondary students are female, only 30% of students in math fields are female ( Statistics Canada, 2008)
- Women are grossly underrepresented in STEM fields (Ganley, Vasilyeva, & Dulaney, 2014)

## What Can We Do?

The Ontario Ministry of Education has acknowledged the existence of the gender achievement gap in mathematics and has suggestions for how educators can address it in class. The front matter of the math curriculum states that "[f]or some girls, additional encouragement to envision themselves in careers involving mathematics may be beneficial. For example, teachers might consider providing strong role models in the form of female guest speakers who are mathematicians or who use mathematics in their careers" (OEM Mathematics Curriculum, 2005).

## Practical Suggestions

- **Build self- esteem:** Encourage perseverance and celebrate successes
- **Supportive and positive teacher-student relationships** that emphasize a growth mindset
- **Challenge over remediation:** Remediation can be ability-demeaning so instead offer manageable challenges
- **Stress the expandability of intelligence** and the possibility for continued growth
- **Value multiple perspectives** and many ways of solving a problem: Give your students multiple tools and allow them to approach problems differently
- **Present various role models** from the stereotyped group (females). This helps to show the successes females have had in math and debunk the stereotypes
- **Foster spatial ability skills** with all students; Sketching figures from many angles, block play, practical skills (mapping), use of manipulatives



## Target Stereotypes

Avoid mentioning stereotypes in class and be careful with your language. Instead seek to disrupt the negative cycle!

Find strong females in STEM fields and highlight them. Try to bring in female guests in these fields and those who represent different oppressed groups.

### Examples of females in STEM fields:

Hypatia, Egyptian mathematician and astronomer  
Sophie Germain, Helped prove Fermat's last theorem  
Ada Lovelace, First computer programmer  
Marie Curie, Polish/ French physicist and chemist  
Katherine Johnson, American mathematician  
Euphemia Haynes, first African American woman to get PHD in mathematics

And many more!

## Build Spatial Sense

Spatial sense predicts future math success and may be an area of weakness for some girls. (Kris, 2016; Ganley, Vasilyeva & Dulaney, 2014)

Toys that build spatial sense are marketed to boys. This means boys tend to come to school with an advantage. But, research shows that training can close the gap!

### How to fix it?

Sketch figures from multiple perspectives (both physically and mentally flipping)  
Playing with blocks in early years  
Mapping activities  
Hands-on geometry games

## ACTIVITY! Hypatia and How to Make an Astrolabe

Using the Book:  
*Of Numbers and Stars the Story of Hypatia* by D. Anne Love



### Steps:

Begin by prompting the students with the question "Do you know any famous mathematicians?" allow time for discussion and then prompt, "Today we will be learning about a very famous mathematician named Hypatia."

Introduce the book and begin reading it aloud to your students. You may choose to pause at various points to ask questions or encourage discussion.

**For younger grades:** This may be as far as it goes. You may wish to have a student(s) create a poster on Hypatia to include in a famous mathematicians wall which you can later fill with other great thinkers.

**For older students:** Take out a clinometer and show it to your students. Ask, "What do you think this is? Can anyone give me a hypothesis on what it may be used for?"

**Explain:** This is something called an astrolabe and it was invented by one of Hypatia's students (with her help of course!) Not only was she a brilliant mathematician, but she helped to teach and inspire many others. An astrolabe can be used to find the angle between the sun and the horizon. It helped sailors determine latitude and find true north as they travelled. "Why might that have been useful?" "What else could it be used for?" (measuring angles for mapping)

For detailed instructions on making the astrolabe and for template see:

[http://cse.ssl.berkeley.edu/AtHomeAstronomy/activity\\_07.html](http://cse.ssl.berkeley.edu/AtHomeAstronomy/activity_07.html)

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