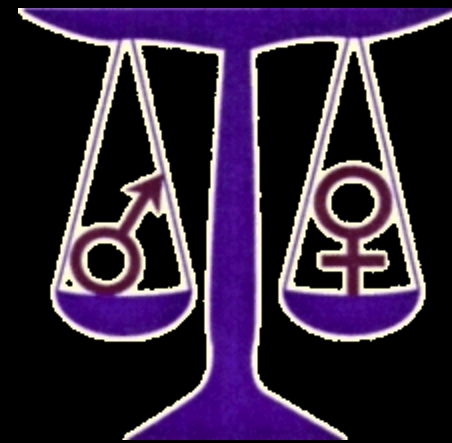


# Gender Issues in Mathematics Learning

## Chapter 13

Paul Hare, Jenny Humby,  
Mike O'Reilly, Tisa Way

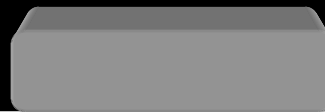
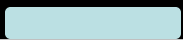


# Gender Issues in Mathematics Learning

- Introduction to Equality and Equity
- Gender Gaps
- Gender Theory, Equity and Educational Practice

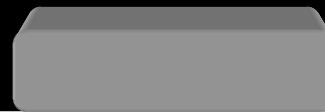
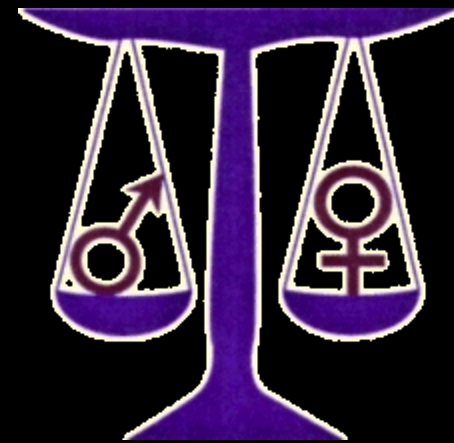


# Introduction to Equality and Equity



# Introduction

- Australian Textbook – Relevance?
- 21<sup>st</sup> Century: Men = Women ??
- Current Research
- The 'End of Equality'
- Chapter 13



# What is equality and equity?

- Fennema (1995) describes three aspects of equality:
- equal opportunity
- equal treatment
- equal outcomes





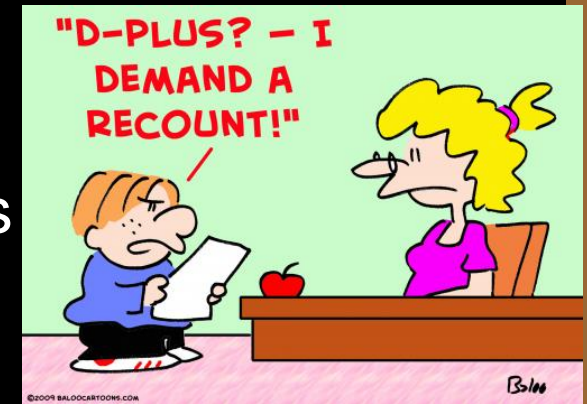
# Equal Opportunity

- Access
- Removing external barriers such as streaming, setting policies & timetable structures.
- Provide equal resources such as computers and calculators.



# Equal Treatment

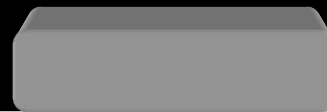
- 1980's
- Teachers interaction with girls vs. boys
- Higher-level questions
- Girls excluded from discussion
- Gender stereotyped scenarios, materials , and problems
- Textbook stereotyping
- A study by Boaler (1997b, 2002) found that particular teaching approaches have different effects on the attitudes and performance of girls and boys



# Equal Outcomes



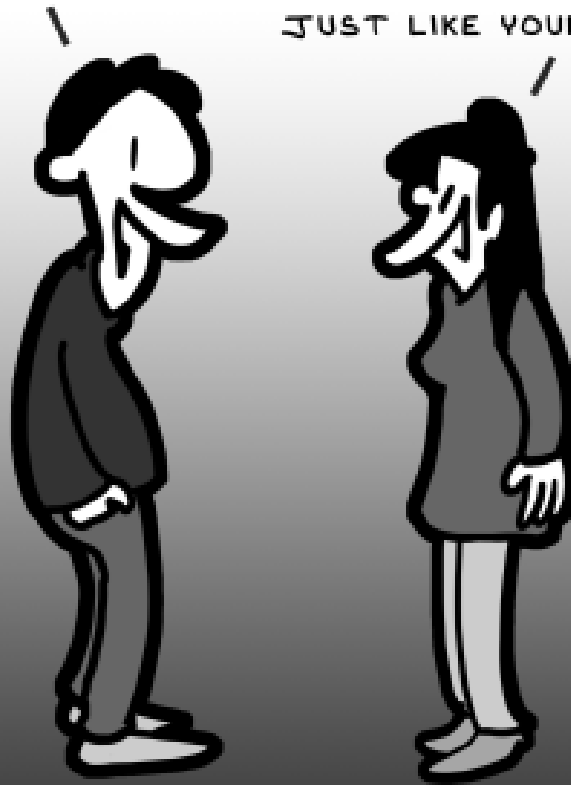
- Fennema(1995) – equal access and equal treatment are not sufficient for gender equity
- The pursuit of equity also involves a commitment to ‘closing the gap’ in outcomes, whereby outcomes include mathematical achievement, participation, retention and attitudes





HOW'S LIFE?

JUST LIKE YOURS!

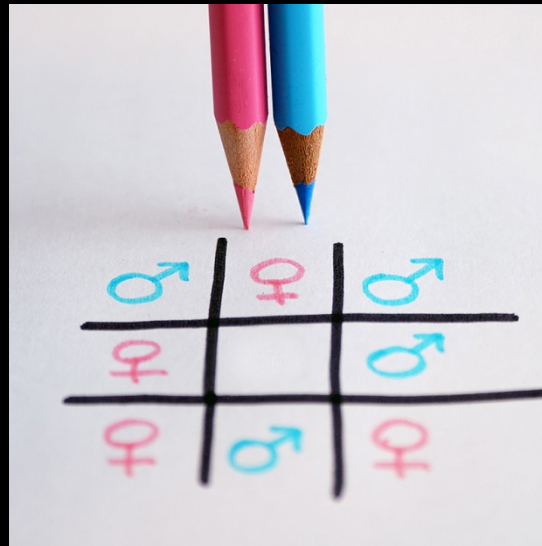


EQUALITY OF OUTCOME



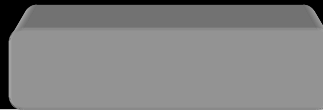
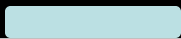
# Equitable Practice:

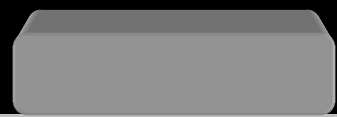
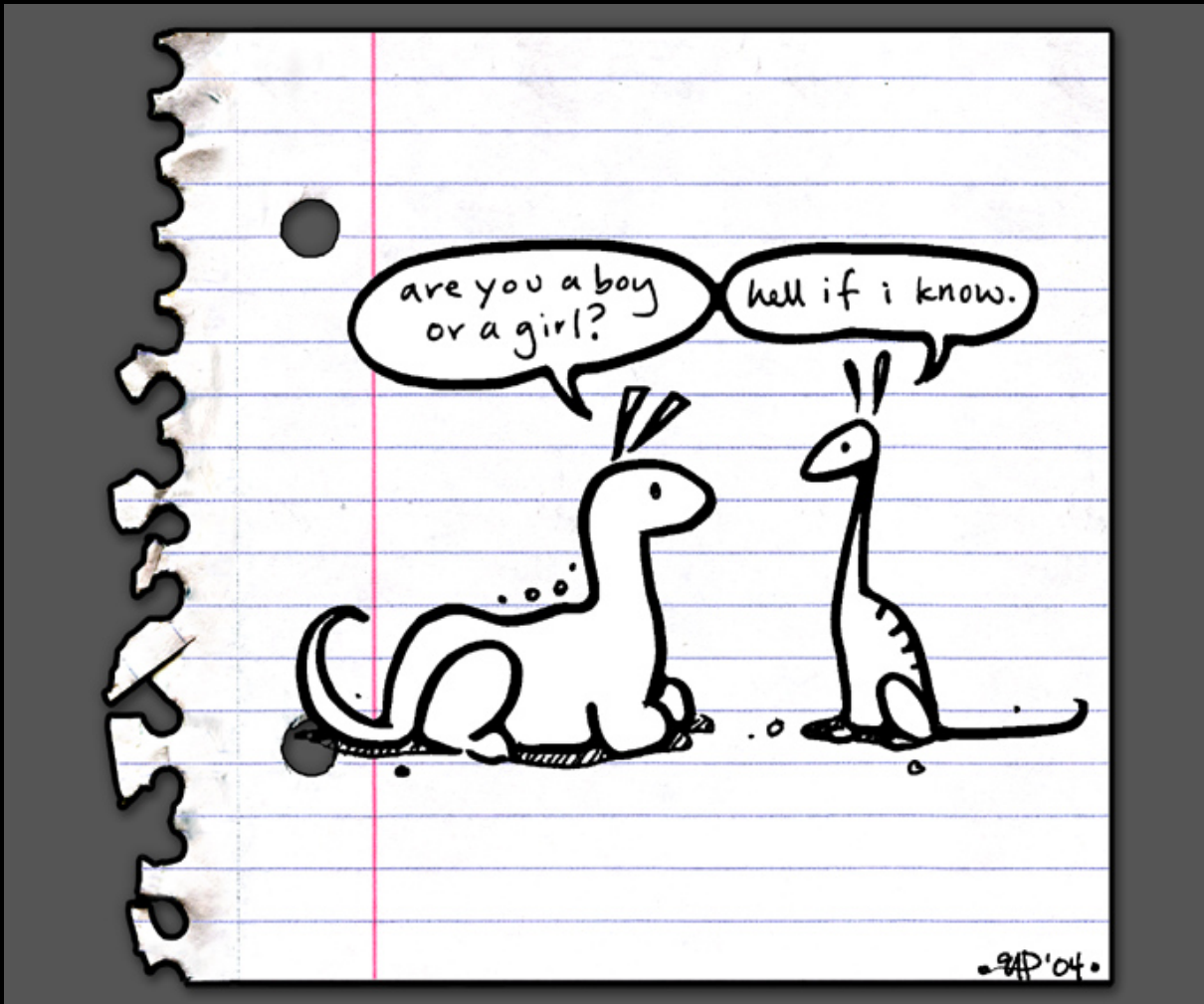
- *Equal access and equal treatment are not sufficient to overcome gender gaps and social injustices in schooling.*
- *A variety of approaches are needed to meet the needs of learners; one single approach won't do.*



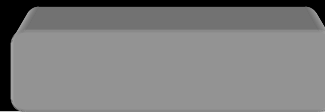
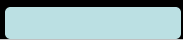
Are Men Better at Math Than Women? - Street Doctors

★ ★ ★ ☆ ☆





# Gender Gaps



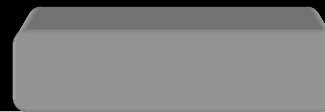
# Gender Gaps




Mathematical achievement

Mathematical attitudes

Mathematical participation



# Mathematical Achievement

- Until recently, favored boys 
- End of the twentieth century there was a trend towards equality.
- Twenty-first century, inconsistent findings (Val et al., 2004)
- Why this inconsistency?



# Performance Inconsistencies:

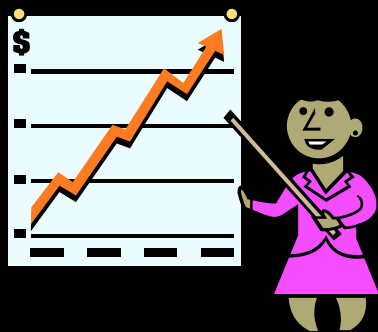
- (1) Depends on the content of the assessment tasks. (eg. Focus on language)
- (2) Nature of mathematical knowledge and skills being tested. (eg. Technology vs none)
- (3) Conditions under which assessment is completed. (eg. Time on task)
- Therefore, not explained by sex alone.





# Mathematical Attitudes

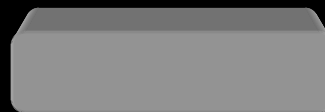
- Leder and Forgasz (2000)
- They surveyed a large number of students in Grade 7-10 to determine if boys or girls, or both, were more likely to display a particular belief or behaviour.



**ITEM****M or F or ND**

---

Think it is important to understand the work.	F
Think math will be important in their adult life.	ND
Are asked more questions by the math teacher.	M
The math teacher thinks they will do well	F
Finds math difficult.	M
Thinks math is interesting.	ND
Parents think it is important to do well.	ND
Teachers spend more time with them.	ND
Are good at using computers to learn math.	M
Think it is important for future jobs to be able to use computers for mathematical learning	M



# Result



»Most students did not gender-stereotype mathematics.



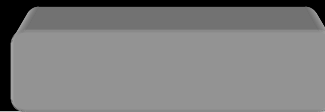
# Mathematical Participation

- Overall enrolments in advanced math courses are declining.
  - Lack of Career information
  - Lack of quality and qualified teachers
  - Lack of access to advanced math courses

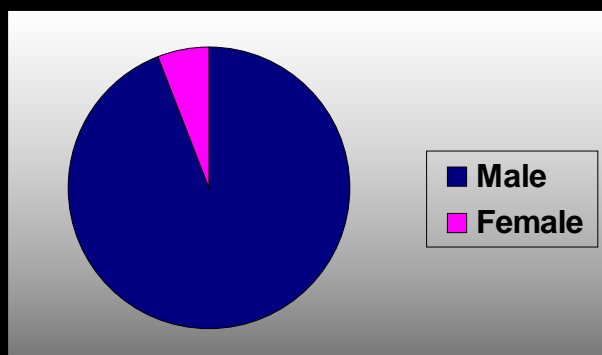


# Mathematical Participation

- Boys are more likely than girls to study math in Grade 12.
- Why?
- Technology increase → decrease in female participation.



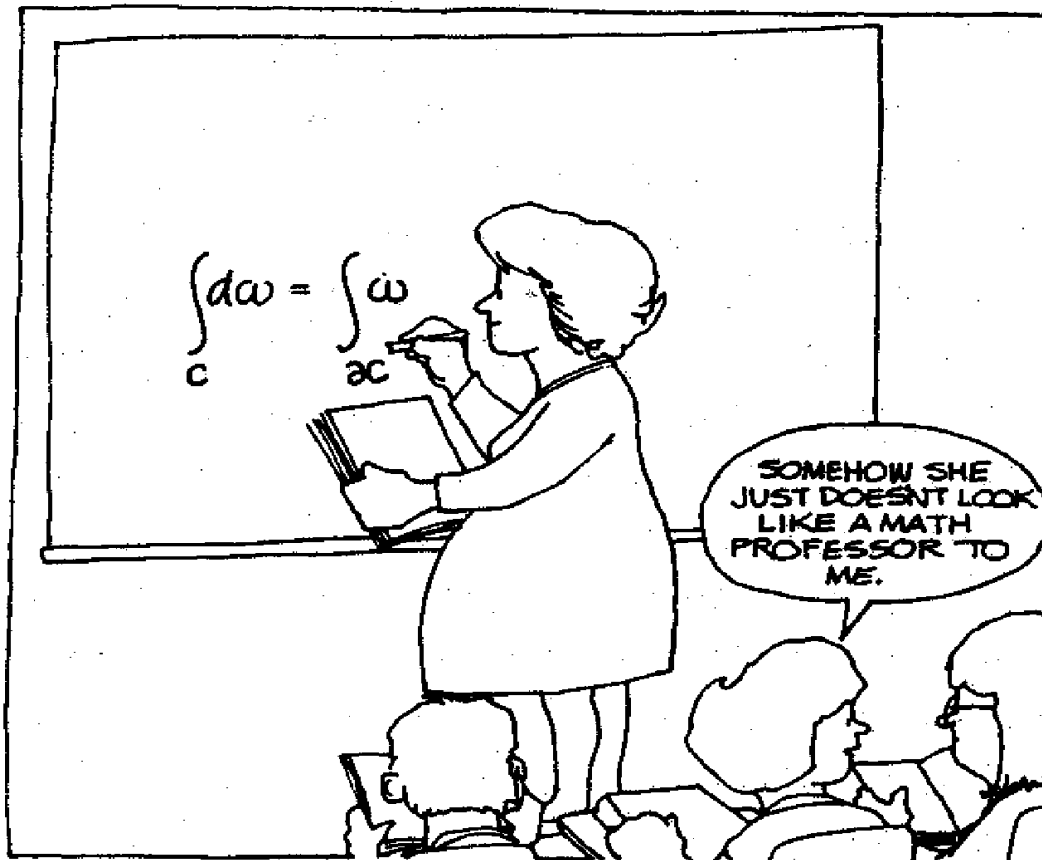
# Comparison of Male/Female Math Professors Working at MUN



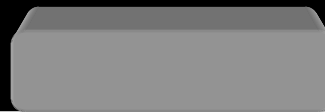
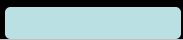
- Male  $\rightarrow$   $\sim$  49
- Female  $\rightarrow$   $\sim$  3

- Why is this so?
- In the past, math was a male dominated domain and few females chose to study math.





# Theories of Gender, Equity and Practice





Sociological  
Gender Theory



Educational  
Paradigm



Classroom  
Practice



# BEFORE 1975

THEORY

**DEFICIT  
THEORY**

PARADIGM

**GENDER  
STEREOTYPING**

PRACTICE

**TRADITIONAL**

- **Deficit Theory:** When it comes to mathematics, women are less capable, less interested and less skilled than males.
- **Gender Stereotyping:** Mathematics is the domain of males.
- **Traditional:** Little awareness and attention is paid to gender differences.



# 1975-1980s

THEORY

**DEFICIT  
THEORY**

PARADIGM

**LIBERAL  
PROGRESSIVE**

PRACTICE

**INTERVENTION  
PROGRAMS**

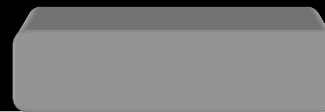
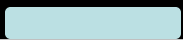
- **Liberal Stereotyping:** Given an equitable learning environment, women can be the mathematical equals of men and are capable of developing talent, skills and interest.
- **Intervention Programs:**
  - Single-sex classrooms and programs to isolate the sexes
  - Focusing on specific mathematical skills and knowledge in teaching girls (ie. spatial domain)
  - Increasingly equal treatment of the sexes in co-educational classrooms



# Intervention Programs

Socialization is main cause of female mathematical deficiencies

- Gender-Stereotyped patterns of play
- Gender Stereotyping of roles and careers
- Lack of opportunity in classroom

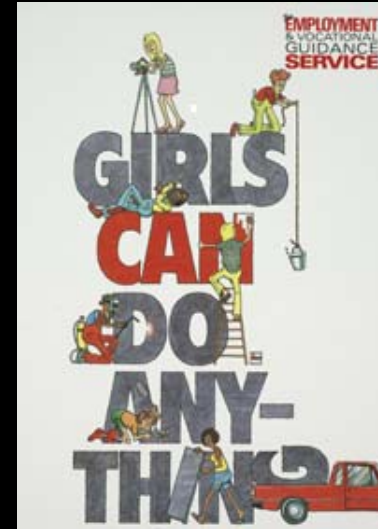


# Intervention Programs

- “Girls Can Do Anything” Programs
- New Zealand (1984-1990)



BLUEBUDDIES



- Single Sex Classrooms



# Intervention Programs

## Promotion of Female Mathematicians

- Hypatia of Alexandria (AD 350-~400)
- Marie-Sophie Germain (1776-1831)
- Sofia Vasilyevna Kovalevsky (1850-1891)
- Shafi Goldwasser (1958- )



# 1980-1990s

THEORY

PARADIGM

PRACTICE

**DIFFERENCE  
THEORY**

**RADICAL  
FEMINIST**

**GENDER-  
INCLUSIVE**

- **Difference Theory:** When it comes to mathematics, women just have *different* skills, interests and experiences as compared to males
- **Radical Feminist:** The female experience and knowledge of mathematics should be valued and more positively and consistently addressed
- **Gender-Inclusive:** The curriculum and classroom practice is altered to include things females are interested in and good at, to encourage the building of their mathematical strengths



# Gender-Inclusive Curriculum

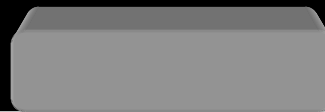
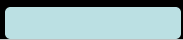
Example from text (p. 332):

It was a February heatwave. Michael Jones was driving to the shops with his six-month-old son. He parked his car, grabbed the shopping list, looked at his son who was now asleep and thought: “I’ll only be about twenty minutes, I won’t wake him, I’ll leave him in the car.” So he wound up all the windows, locked the doors and went off to do his shopping.

A little while later, on returning to the car, he saw someone smashing in the side window. He ran to the car. “What do you think you are doing,” he cried, “trying to steal my son?”

“Steal him?” said the stranger. “I’m trying to save his life.”

Why did the stranger think the baby’s life was endangered? Was he? If so, would Michael Jones have been as unsafe in the car under the same conditions? To answer this question you will model a baby’s body and adult’s body to find out about the relationship between volume and surface area.





# 1990-2000s

THEORY

PARADIGM

PRACTICE

**GENDER  
CONSTRUCTION**

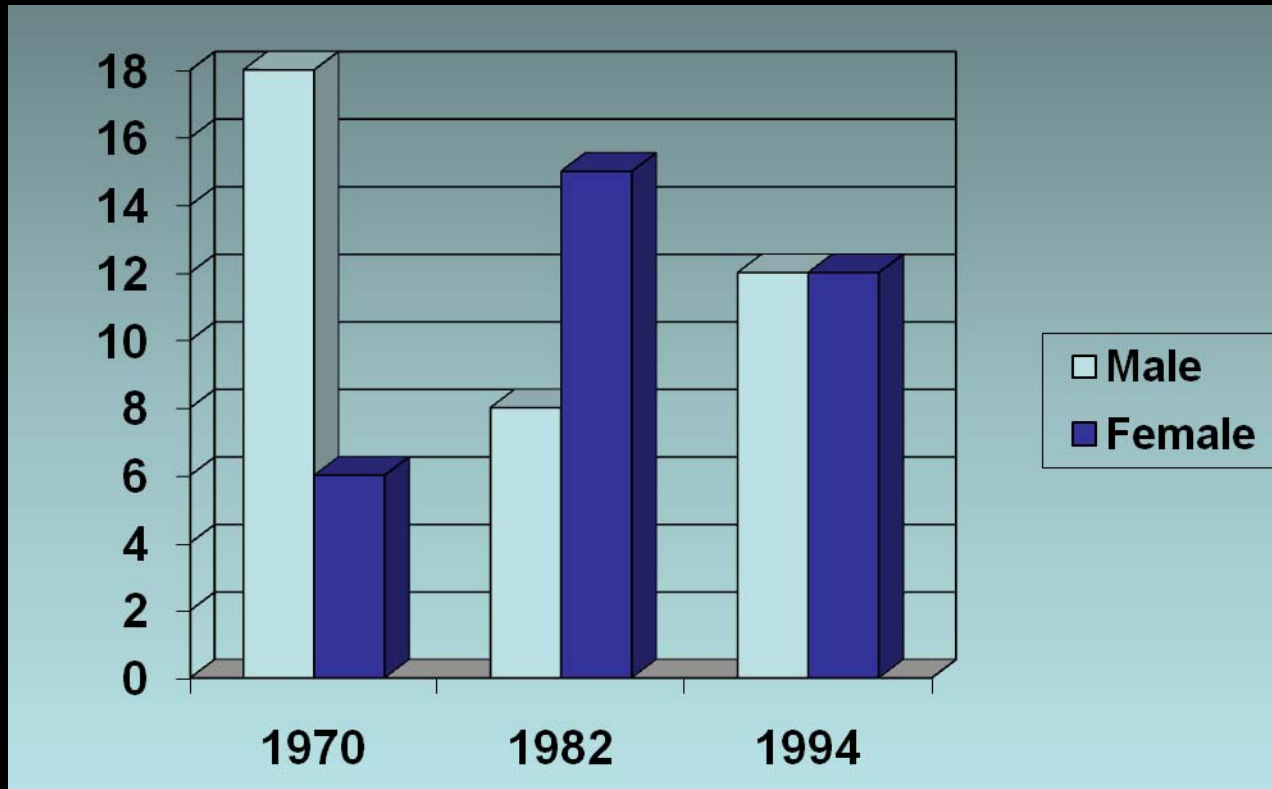
**POST-  
MODERN**

**GENDER-  
SENSITIVE**

- **Gender Construction:** Societal interactions construct gender identities and dictate the distribution of power across genders. Different cultures and situations result in different constructs.
- **Post-Modern:** Gender is arbitrary and not fixed and is learned through society. There are differences amongst men and amongst women.
- **Gender-Sensitive:** A more student-centered classroom is driven by the interests and needs of the learners.



# Gender-Inclusive Curriculum



Incidence of Male/Female References  
in Mathematical Textbooks



# Male/Female Perspectives on Math

Jo Boaler, *Reclaiming School Mathematics: The Girls Fight Back* (1997)

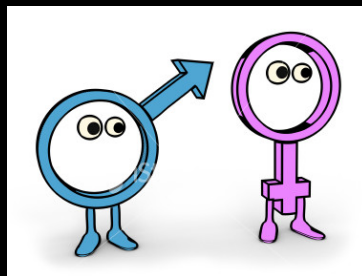
- Concepts of success and ability differed between sexes
- Boys emphasized speed and accuracy as indicator of success
- Girls valued experiences that allowed them to think, develop their own ideas and work as a group
- Therefore, males are more likely to succeed in traditional-style classrooms



# Gender Sensitive Curriculum

How does the classroom environment affect students' experience with math?

- Researchers have identified mathematics as having multiple masculinities and femininities.
- It has been observed that the boys have usually dominated the classroom and were supported by the practices of the teacher.



# Gender Sensitive Curriculum

What effect does the use of computers in math classrooms have on gender gap?

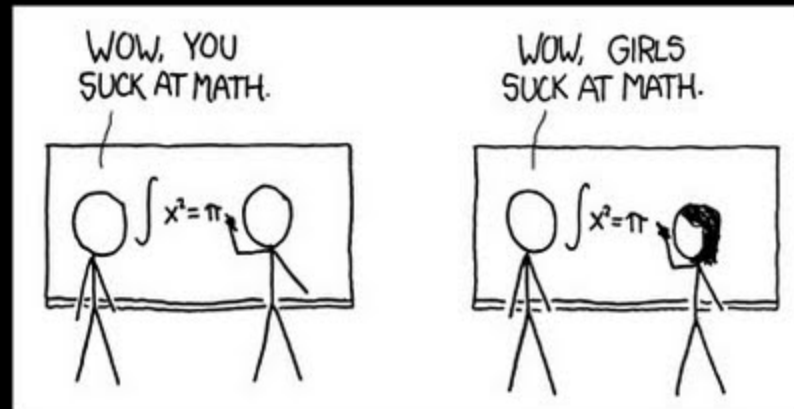
- Teachers would observe boys' interest and success with computers as an achievement in mathematics.
- The behaviour of the dominant males in such classrooms would interfere with the others' learning environment.



# Gender Sensitive Curriculum

Girls in a “no-win” situation?

- The question – answer feedback method of teaching which is most common in traditional classrooms is advantageous to the male population.
- AND...even if girls succeed, their success is taken to be achieved in the wrong way.



# Gender Equity in Practice

- To create an equitable learning environment, teachers must :
  - Use various teaching approaches
  - Be explicit about the mathematical concepts to be learned
  - Ensure that both males and females are supported and valued



# Gender Equity in Practice

Goodell and Parker list 12 practices for teachers and curriculum designers to follow to create a connected equitable mathematics classroom (CEMC):

1. All students have access to academically challenging mathematics curricula.
2. Students are encouraged to develop confidence in their mathematics ability and positive attitudes towards mathematics.
3. Basic skills are developed that will enable students to be mathematically literate in the world outside of school.
4. The learning environment encourages students to develop their own voice and construct their own knowledge.
5. Teachers have high expectations of ALL their students.
6. Teachers connect mathematics with the real world.

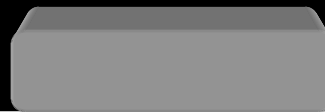
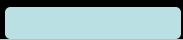
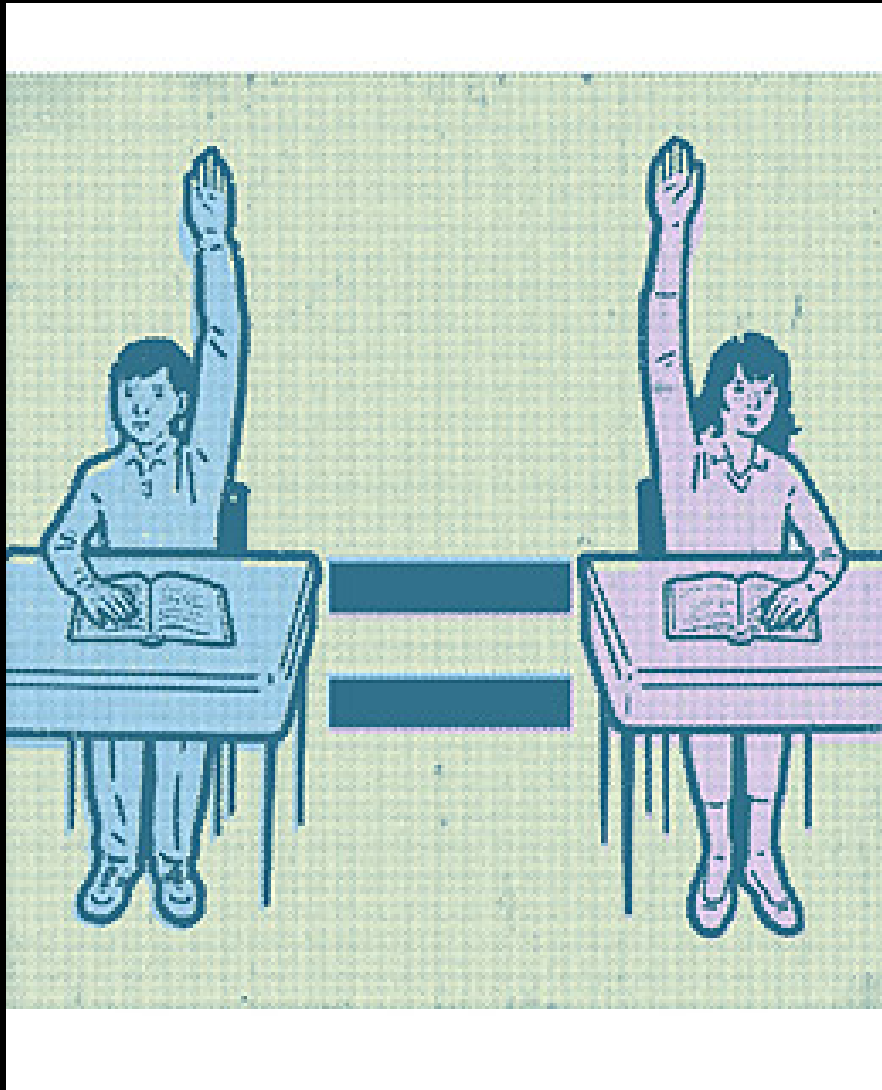




# Gender Equity in Practice

7. Teachers are able to recognize and act on inequalities in their classrooms.
8. Teachers use a variety of teaching and assessment practices.
9. The curriculum is designed within a social and cultural context, challenges stereotypes and values the contributions of women and minority groups.
10. The curriculum includes real-world problems.
11. The curriculum includes a focus on issues of social justice and world problems.
12. The curriculum explicitly states equity goals.





# Conclusion

## 2003 UNESCO Report: Gender and Education for All: The Leap to Equality

- In more developed countries, there is still a noted difference between male and female math achievement
- Gaps more significant in higher levels
- Not as significant as gender differences in language and reading
- In which case, females are better at language and more accomplished readers
- Overall, females do better academically



# Discussion/Questions

- What has been your experience with gender and math?
- Do you perceive any differences between male and female capabilities in math?
- Do you believe that socialization is the main cause for the gendered disparity in math?

