

Historical Methods and Gender in Science Education

Laura McCullough
University of Wisconsin-Stout
Physics Department

History as research tool?

- Few PER people have background in science education; usually physics departments not education departments
- Few PER people have had opportunity to take a history of science education class
- We need to know more about our history because it can be a valuable research tool

History of Women's Science Education

- Science has been dominated by males
- Has science education been as well?
- Surprisingly, no! In the late 19th century, science classes were predominantly for women

Following data from Kim Tolley, *The Science Education of America's Girls*. (2003) RoutledgeFalmer

School Curricula

% of NC & VA schools advertising science 1800-1840

	Natural philosophy	Astronomy	Chemistry	Botany	Mineralogy	Natural history
Girls' schools	74	47	54	35	5	13
Boys' schools	47	22	21	2	3	1

Classics vs. Science

Courses offered by gender at Vine Hill (NC) academy, 1837

Males

Spelling, Reading, Writing, Grammar	Spelling, Reading, Writing, Grammar
Geography	Geography
History	History
Arithmetic	Arithmetic
Rhetoric	Rhetoric
Logic	Logic
French	French
Latin	Nat'l philosophy
Greek	Chemistry
Algebra	Astronomy
Geometry	Botany
Navigation	Nat'l theology
Surveying	Drawing/painting
	Elements of Criticism

Females

High school physics enrollments (%) by sex

	Male students	Female students
1890	22.5	23.2
1900	19.5	18.7
1910	16.5	13.2
1922	11.3	6.9
1928	9.4	4.5
1948	8.4	3.0
1955	7.5	1.8

Why was science mostly for women?

- Men's college requirements were classically oriented; science was a low-esteem field; boys' schoolmasters taught what they were taught; no science jobs
- Women's schools were too new to have established a "traditional" curricula
- Women served to popularize science, increase attendance at science lectures, and served as unpaid assistants to museum curators and researchers

Why science education for the ladies?

- Women's academies were privately funded and could teach whatever they chose; many could also afford expensive science equipment
- Home science/home economics was an acceptable place for women in science; men were unlikely to advise women in such a female occupation; women were nutrition researchers, bacteriologists, chemists, biologists, etc. because these were viewed as part of the women's sphere

A Wisconsin example

- In 1868, the University of Wisconsin closed its “normal” college (teaching college) and instead opened the doors of a “female” college
- The curriculum was designed to serve young women in those subjects deemed most appropriate

Univ. of Wisconsin 1868-69

- Science requirements at the female college:
 - Geography freshman year
 - Botany and Physiology sophomore year
 - Zoology junior year
 - Chemistry, Astronomy and Geology senior year
 - Also natural theology and natural philosophy (physics)

Data from Talbot, M. (1910). *The Education of Women*. Univ. of Chicago Press.

University of Wisconsin

- About the same time, the University of Wisconsin also allowed women to enter its regular College of Arts & Letters and to receive a Bachelors of Arts degree which was equivalent (though not identical) to the men's degree

UW Bachelors of Arts for Women

- The women's Bachelors degree (ever think about the irony of women getting a bachelor's degree?) had seven required science classes!
- Botany sophomore year
- Chemistry, Anatomy, Zoology, and Physics junior year
- Astronomy and Geology senior year
- Also natural theology, physiology, and botanical analysis


What happened?

- As science gained prestige and classical studies became less fruitful (particularly in terms of employment), men took over science courses
- Also, domestic science/home economics drew women away from the natural sciences
- Today, men form the majority in physical science though women are still found in substantial numbers in “female” sciences such as food & nutrition and biology and veterinary medicine

History changing research —an example

- Pilot study at feminist convention for science fiction: ask women to share their stories about science
- 7 respondents age 43-55, all women
- Most felt disenfranchised from science and science education

Their stories

 “1977: I wrote to the Illinois Institute of Technology for their catalogue...I couldn’t even understand the NAMES of the courses.”

“When I won the science fair, the 7th grade teacher (male) kicked me out of an informal group that met after school.”

“I am far from science now but have forgotten more than most people ever know.”

“I am still angry at what the adults of 40 years ago did to a kid.”

Has science education gotten better?

- Why did no younger women tell their stories? Is science education getting better?
- A young woman at the conference sports a t-shirt reading “Future Nobel Prize Winner”
- Young middle school science teachers criticize data I present on the under-representation of women in science. They seem unable or unwilling to believe that a problem still exists.
- Science education is better for women now than it was 50 years ago

Analysis

- First analysis suggests that science education has finally gotten better for women
- But knowing the history changes the analysis—it's that things are finally shifting back to a more equitable balance
- Women can do science, have done science, we once encouraged our girls and not our boys to take science—this changes how the research is analyzed and conducted

Another example

- Physics First in high school
- History provides good arguments:
Committee of Ten report
- “The logical order would place physics first...” is quote from report!
- Also suggest instructional methods/
techniques: “it should not be the aim of the student to make a so-called rediscovery of the laws of these sciences”

History as tool

- History provides a useful tool in interpretation of data and for arguments for educational reform and educational equity