Gender, Educational Reform, and Instructional Assessment: Part I

Laura McCullough, UW-Stout

Catherine H. Crouch, Harvard Univ.

Is there a gender problem in physics?

- Women get 19% of bachelor's degrees in physics, 21% of master's, and 13% of doctorates
- Overall science achievement shows gender gap with boys doing better than girls
- Most published research at the K-12 level
- Anecdotal & unpublished evidence in college physics (UMN, Dancy, Blue)
- One study (Grim, 1999) found gender difference on FCI pretest, little difference on post-test

Why study this issue?

- One goal of PER is to improve physics education for all
- Current reform effort is strong; reforms serving subpopulations?
- Is this gender gap showing at the college level in physics?

Our study

- At 1998 conference, participants from several different institutions gathered to discuss gender issues and this study evolved
- Eight different schools: private and public, large and small
- Collected FCI pretest and post-test data, gender, and where possible, high school physics background and grades

School	*Type*	*Instructor gender*	*Pedagogy*
Charleston	Small private	Female	Interactive
Creighton	Small private	Mixed	Traditional
Harvard	Medium private	Male	Interactive
U Minn.	Large public	Mixed	Hybrid

School	*Type*	*Instructor gender*	*Pedagogy*
Purdue	Large private	Mixed	Hybrid
RPI	Small private	Mixed	Interactive
Texas Tech	Large public	Mixed	Mixed
WPI	Small private	Male	Traditional

Gender gap?

	Pre %	Post %	% gain
Women (N=780)	35.6 (.5)		
Men (N=1997)	50.3 (.4)		

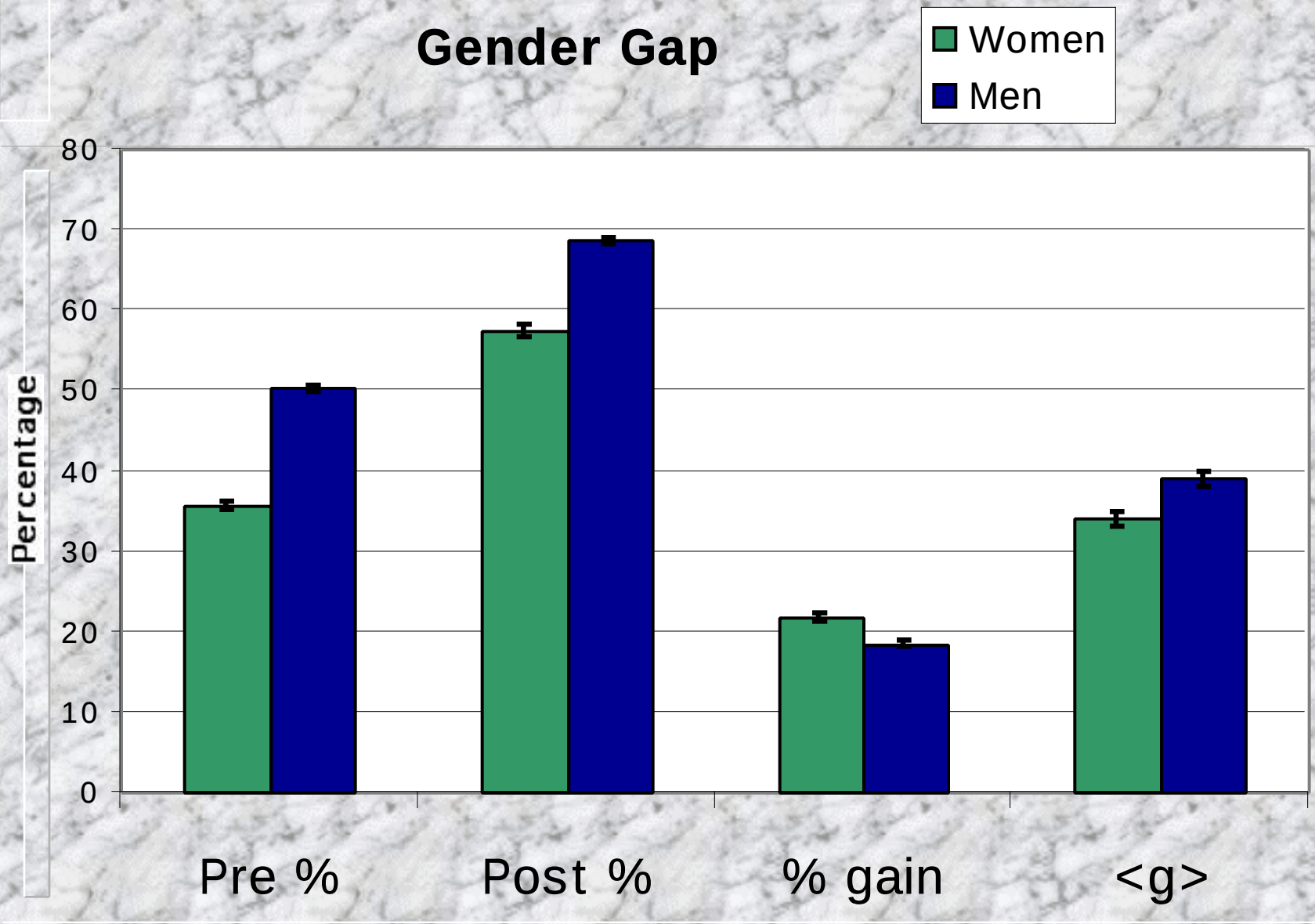
	Pre %	Post %	% gain
Women (N=780)	35.6 (.5)	57.4 (.7)	
Men (N=1997)	50.3 (.4)	68.6 (.5)	

	Pre %	Post %	% gain
Women (N=780)	35.6 (.5)	57.4 (.7)	21.8 (.6)
Men (N=1997)	50.3 (.4)	68.6 (.5)	18.4 (.4)

	Pre %	Post %	% gain
Women (N=780)	35.6 (.5)	57.4 (.7)	21.8 (.6)
Men (N=1997)	50.3 (.4)	68.6 (.5)	18.4 (.4)

	<g>
Women (N=780)	.34 (.01)
Men (N=1997)	.39 (.01)

Gender Gap



Pretest scores by preparation

Avg pretest score	Women (N=469)	Men (N=1129)
No HS physics	25.6	41.3
HS physics (reg/AP)	35.5	50.2
College	33.3	58.1
HS & College	34.4	45.9
AP physics	48.7	59.5

Grades

% of gender receiving grade	Women (N=526)	Men (N=1293)
A	15.4	23.9
B	41.1	39.8
C	36.9	31.0
D	5.7	3.9
F	1.0	1.4

Yes, we have a problem...

- Gender gap coming into college physics; gap is not explained by high school physics preparation
- Problem continues in intro college courses
- Post-test scores and grades show continued gender disparity

Why study this issue?

- Traditional instruction does not serve physics students as well as it should
- PER: improving physics teaching and learning
- Reform efforts
- Pre-existing gender gap
- Ideally, PER reform efforts ameliorate this gender gap
- So assess gender effects of reform efforts

What does this mean?

- We need more research in this area:
  - Effects of different pedagogies; especially new reform curricula
  - What affects students' physics understanding (FCI scores and grades), especially possible differential gender effect
  - Individual classroom and teacher level — what effects are occurring at the classroom level