The FCI and Non-physics Students

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Why non-physics students?

- Part of another study
- Lots of data on physics students
- What about non-physics students?

The sample

- 150 students in English, sociology, and Lit classes (2/3 women)
- Voluntary, given brief intro (helping professor with research study)
- No name, demographic questions at end of FCI

The Sample—Year in School

- 46% were first-year students
- 29% sophomores
- 10% juniors
- 14% seniors

- Data gathered in Fall semester 2001

Major programs

- Early Childhood Education
- Packaging
- Interior Design/Graphic Design
- Vocational Rehab.
- Construction Management
- Retail Management
- Business/Business Administration
- Graphic Communications Management
- Hotel & Restaurant Management

Background

- 59% had no previous physics (65% of women, 47% of men)
- 34% had high school physics (34% of women, 35% of men)
- 76% had algebra as highest math (81% of women, 63% of men)
- 21% had had calculus (16% of women, 31% of men)

Further Background

- Average of 3.18 years HS science
- .89 semesters college science
- 3.5 years HS math (3 or 4 year schools)
- 1.3 semesters college math
- Few gender differences (requirements?)

General score on original FCI (1995)

	Number (N)	Avg. percent correct
Women	100	20.6%
Men	51	31.7%

Comparison scores

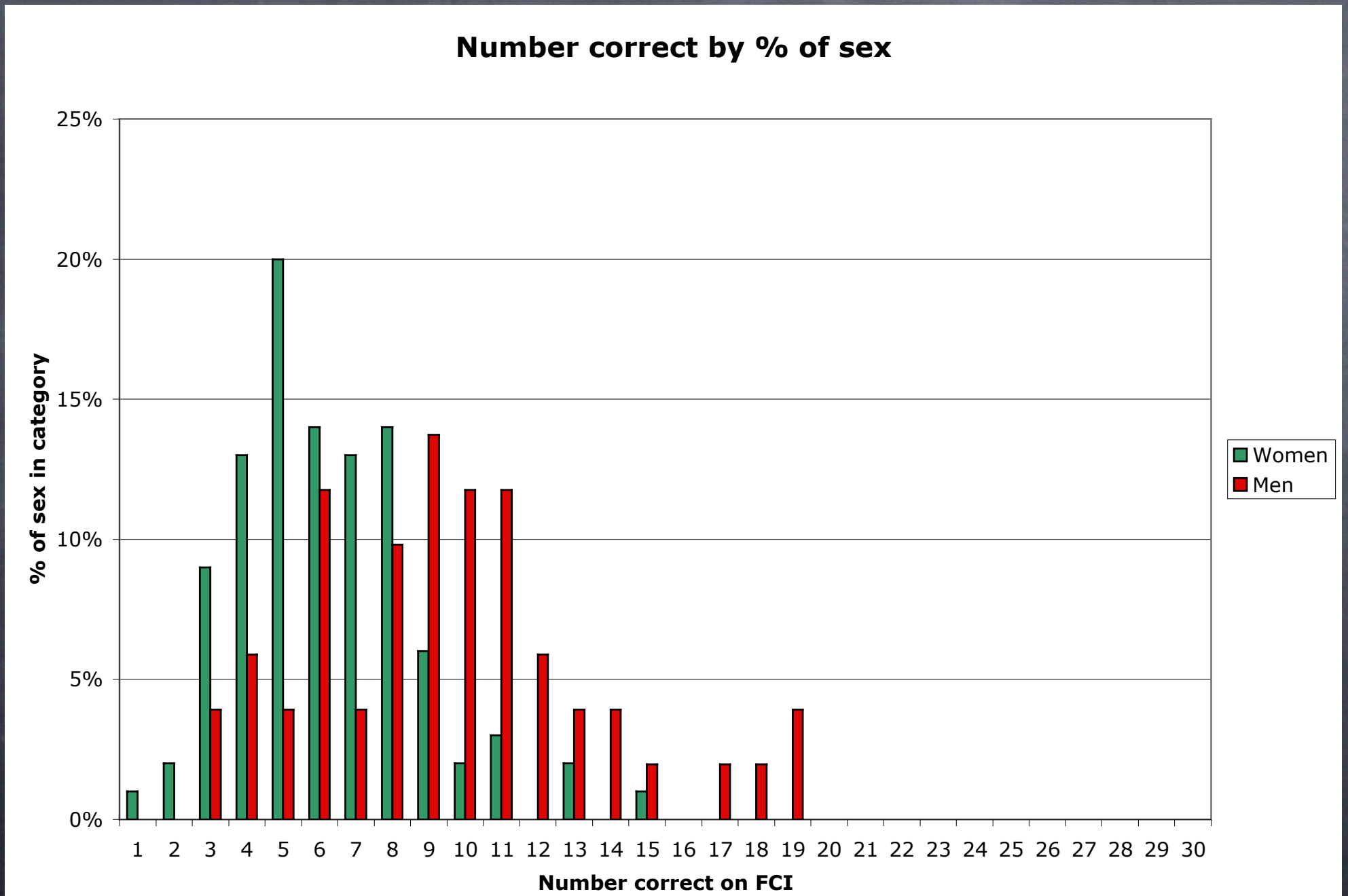
Average % correct on FCI

	Stout non-physics	Stout physics (pretest)	8 schools physics (pretest)
Women	20.6 (N=100)	23.1 (N=27)	35.7 (N=780)
Men	31.7 (N=51)	33.1 (N=146)	50.3 (N=1994)

Distributions

	avg. % correct	standard deviation	reliability (KR-20)
Women	20.6	8.3	.28 (!)
Men	31.7	12.9	0.65

Men usually have larger st dev on standardized tests;
more men at top and at bottom


Number correct by % of sex
25%
20%
15%
10%
5%
0%
% of sex in category
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Number correct on FCI
Women
Men

Particular misconceptions

- Predicted Newton's 3rd law would be among worst (questions #15, #16, #28)
- Poorest response (less than 10% of students with correct answer) on questions #26 (double force pushing box), #13 (forces on thrown ball), #11 (forces on puck), #20 (accelerations of blocks)
- "force in direction of motion" and "acceleration=velocity"

Best responses

- Over 45% of students responded correctly on questions #6 (56% correct), #7 (47%), and #24 (45%)
- direction & circular motion (ball leaves circular channel and ball breaks from string) and direction & no-force motion (rocket with no thrust)

Biggest gender differences

- Men outscored women on 18 questions by >5%;
  - worst gap on questions #14 (39% vs. 6% correct on path of bowling ball falling from plane),
  - #12 (63% vs. 31% correct on path of cannonball), and
  - #6 (75% vs. 46% correct on path of ball exiting channel)
- Women outscored men on 1 question by >5%; worst gap on question #5 (18% vs. 12% correct on forces in circular motion)

Conclusions

- average college student at UW-Stout has little physics experience
- average score only slightly above guessing for men and at the level of a random score for women
- FCI is not reliable for non-physics women
- "force in the direction of motion" is strong misconception
- strong gender gap favoring males
- further study?

Score and background

Physics background/average score on FCI by gender

	Women	Men
No previous physics	18.3%	27.5%
HS physics	25.3%	31.1%