Previously, we observed a gender difference of 10% on the pre and post FMCE [1] at CU. The posttest gender gap exists in both partially and fully interactive courses.[2] Prior research suggested that differences in student background and preparation may contribute to the persistence of the gender gap.[3]

Several researchers have investigated the factors that influence student performance in introductory physics. These factors include: high school physics experience[4], math preparation[5], affective factors[4], level of interactive engagement[2,6,7].

The gender gap sometimes increases from pre to posttest, sometimes decreases, and sometimes stays the same. Faculty and class practices influence the gender gap. All error bars represent standard errors of the mean. * indicates statistically significant at p<0.05.

7 semesters of intro calc-based mechanics (sp 04 – sp 07)

IE1: Peer Instruction using ConceptTests[8], online homework system[9], and voluntary help-room sessions on problem solving homework

IE2: Additionally used Tutorials for Introductory Physics[10]

Students are binned by pretest score and then male and female average posttest scores are calculated. There are no significant differences (p>0.1) in any individual bin. Percentages indicate the percentage of the women (men) from the total in each bin. Correlation between pre and post test is r = 0.56.

Impact of High School Preparation

FMCE PRETEST (%) Male Females M – F
Had HS Physics 33.5 23.9 9.6*
No HS Physics 20.2 15.8 4.4*
Phys. – No Phys. 133.5 81.4*

FMCE POSTTEST (%) Male Females M – F
Had HS Physics 68.0 58.9 9.1*
No HS Physics 60.7 44.9 15.8*
Phys. – No Phys. 7.3* 14*

There are significant differences (p<0.01) between males and females who did and did not take high school physics.

Correlations with Background

Effects Size = \( \frac{M_{avg} - F_{avg}}{SD_{all}} \)

Discussion of Results and Conclusions

Interpretation 1: The gap is not due to gender:
- female students with similar pretest as male students, achieve similar posttest scores
- variation in posttest scores can be attributed to factors other than gender

Interpretation 2: We argue, however, that there is an implicit gender bias:
- female students have less physics and math background knowledge and less expert-like attitudes and beliefs
- we do not teach the lower-starting students as well
- female students are disproportionately represented in the population that is less supported in these classes

Results are consistent with Tatum’s “smog of bias”[12] and Valian’s “accumulated advantage”[13]

Recognizing that student preparation in physics and mathematics is a means by which this bias is propagated allows us, as researchers and educators, to proactively address the challenges of the gender gap in physics.

References & Acknowledgements