Gender and student achievement with Peer Instruction
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Introduction
Many PER-based interactive engagement teaching methods are similar to strategies proposed to benefit female physical science students: cooperative classroom environment, opportunities to talk with students to discuss and explain ideas, direct connection between mathematical, graphical, and verbal representations, diverse, frequent assessment and feedback.

Peer Instruction (PI) is one widely used method for actively engaging students that has been shown to increase students’ conceptual understanding.

Research question: Do male and female students benefit differently in classes taught with Peer Instruction, and from classes taught with Peer Instruction combined with other, more structured interactive engagement methods?

We examined three different pedagogies in introductory mechanics at Harvard University:
• traditional instruction (passive lecturing)
• partially interactive (IE1): class taught with PI, traditional discussion sections
• fully interactive (IE2): class taught with PI, Tutorials in Introductory Physics and cooperative group problem solving in section

The calculus-based class was taught with all three pedagogies over seven years, the algebra-based only with IE2 over two years.

Final exam scores and grades
Final exam scores and grades display the same pattern:
• a marginally significant gender gap in the traditionally taught course
• no significant gender gap in the IE2 calculus-based courses (marginal in 1997 final exams)
• a statistically significant gender gap in the IE1 calculus-based course (marginal in 1991) and the IE2 algebra-based course that is accounted for by pretest scores

For IE1 calculus-based and IE2 algebra-based, linear regression on final exam scores and on grades shows that gender is not a significant predictor of exam scores or grades when pretest score is included in the regression model. For IE2 calculus-based, gender is not significant even without pretest.

Conclusions
Both male and female students benefit from Peer Instruction; female students benefit most in the fully interactive (IE2) calculus-based course. In all interactive courses, FCI pretest scores show a significant gender gap and the posttest gap is reduced or eliminated.

In the calculus-based course, fully interactive (IE2) instruction eliminates the gender gap in grades and FCI posttest scores. Logistic regression indicates that high posttest scores on the FCI are equally likely for males and females when controlling for pretest.

In the partially interactive (IE1) calculus-based course and the IE2 algebra-based course, a marginally significant gender gap in grades can be completely accounted for by differences in preparation as measured by FCI pretest. Logistic regression indicates that much, though not all, of the gender difference in high scoring on the FCI posttest can be accounted for by pretest.

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