Female-friendly Physics: Lessons from a Radically-Reformed University Course

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Reformed Physics: Students

- At University of California, Davis
  - 30000 students, public research university
- 1200-1500 take the course each year
- 3 quarter course sequence
- Almost all biological science majors
- In 2nd or 3rd year of study
- Many plan on medical or veterinary school
- Some calculus background
- 2/3 women

Reformed Physics: Structure

- One 90 minute lecture each week
- Two 140 minute Discussion/Lab meetings each week
- 25/1 student to teacher ratio in Discussion/Lab
  - Most DL instructors are graduate students
  - Some are faculty (who really enjoy the small classes)
- Students work in small groups for the majority of Discussion/Lab time
  - Working problems
  - Collecting data
  - Presenting results to classmates

Group Work

Content Sequence

- Begin with energy, not mechanics
- Continue with particle model of matter
- Fluid statics and dynamics
- Fluid and electric circuits
- Motion and force
- Optics and E&M
- Modern physics
- Uses a text written by the faculty and self-published

Results / Implications

- Differences in male and female performance in the traditional class substantially reduced
  - Over-all course grades
  - Scores on physical science portion of the Medical College Admission Test
- Why?
  - Cooperative learning setting
  - Explanation and calculation both important
  - Criterion grading rather than comparative grading
  - Content connected to medical applications

Questions and Responses

- Did this course result in women changing to the physics major?
  - No. The mathematics requirement for the physics major and for this course are different, and most students put off this course until near the end of their university career.
  - The pedagogy used in this course can be adapted to the majors physics course, however, and could be helpful in retention of under-represented majors.
- Are the course materials available?
  - Go to **http://www.physics.ucdavis.edu/physics7/** for materials that are available on-line (but this is not everything)