**How does active learning impact students’ self-efficacy in introductory STEM courses?**

### Motivation

- **Percentage of Degrees Awarded to Women in 2013**
  - **Engineering & CS:** 18%
  - **Physics:** 19%

- **Percentage of Degrees Awarded to Underrepresented Minority Women in 2013**
  - **Engineering:** 3%
  - **CS:** 5%
  - **Physical Sciences:** 6%

### Methodology

- **Conduct randomized controlled experiments in three disciplines (Statistics, Economics, Engineering):**
  - Taught in two ways (passive: lecture only, active: with clicker questions).
  - Use a screening survey to collect information on volunteers (Duke students) who wish to participate in the experimental sessions.
  - Randomly assign these subjects to one of six experimental sessions (active + passive Statistics, active + passive Economics, active + passive Engineering).

- **Develop and test-out mini-lessons to be taught in the experimental sessions.**

- **Develop pre/post surveys to be conducted during these sessions measuring self-efficacy:**
  - **Self-reported**
    - On four axes of the social cognitive theory:
      1. mastery of subject
      2. vicarious learning
      3. learning environment
      4. emotion towards subject

- **Run the experimental sessions and collect data.**

### Preliminary results

- **Mastery:** “I have a high level of mastery in [subject].”
- **Vicarious:** “I have seen other students, like me, succeed in [subject].”
- **SocPers:** “I felt supported in learning [subject] previously / in this environment.”
- **Psych:** “I feel anxious about learning [subject].”

### Goals

- Contribute to the current efforts to understand heterogeneity in the classroom and to explain why women and minorities are leaving STEM fields.
- Have an exploratory and explanatory approach to this question. Contribute to the solution of this issue by proposing methods that can be implemented in introductory courses and that can verifyably increase retention rates.

### Next steps

- Complete data analysis and write up results.
- Evaluate the research methodology based on experience with recruiting for, running, and analyzing the data from the experimental sessions.
- **Next year:** Apply same (or revised) methodology to investigate a different active learning tool.

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