Peer Instruction Contributes to Self-Efficacy in CS1

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Abstract

- Recent studies in computing have shown that Peer Instruction can lowers fail rates, increases retention, and is enjoyed by students. This could be caused by the more interactive natural of this pedagogy, and students experience small confident boosts during the class.

- A similar study conducted by Simon et al at the **University of California** for their CS0 intro CS class, which yielded results that were **in favor of Peer Instruction** as the students in that section scored higher on the final exam than their traditionally taught lecture section.

- Self efficacy is an important factor to consider in addition to final exam mark, as it correlates to increased interest and leads to a higher chance of pursuing CS further

Peer instruction and Clickers

- Classes are centered towards a multiple choice ConcepTests instead of lectures
- Clickers are used for in class participation, and promotes facilitated discussion among students.
- Students learn from being engaged and actively participating instead of watching lectures and going through examples
- Instructors may do briefly lecture on a certain topic if it is deemed necessary

Hypotheses

- PI Students will also score higher on the final exam compared to traditionally taught students
- PI Students will complete CS1 with higher self efficacy
- Peer Instruction will reduce gap in gender
- Peer Instruction will reduce gap in programming experience

Methodology

- This experiment took place during a 12 week introductory CS1 course at a large Canadian university
- Sections were split into the Peer Instruction group and the traditional lecture style group, each being taught by a different instructor
- Use of **Ramalingam and Wiedenbeck scale** at the start and end of the semester to measure self-efficacy in students (>40 seconds)
- Comparison of final exam scores

Peer instruction vs Lecture Section

- At the beginning of the semester the instructor introduced the peer instruction pedagogy, along with its research findings and goals
- Students were to complete a reading quiz marked for completion worth 4% of their mark
- Each class centered around 3~4 ConcepTests with mini-lectures interspersed throughout when necessary, with in class clicker participation worth 5% of the students' final mark
- Both sections utilized the same labs, quizzes, term tests and exams

Threats to Validity

Inter-instructor Experiment

- Each instructor is comfortable and experienced with teaching use their respective pedagogy
- Assessments were standardized as possible, and course content was identical in both sections

Difference in students enrolled in each section

- Prior experiment measures of pre-self efficacy were consistent across both lectures sections
- Students were free to change sections if desired. However, it has been noted that this happens very infrequently

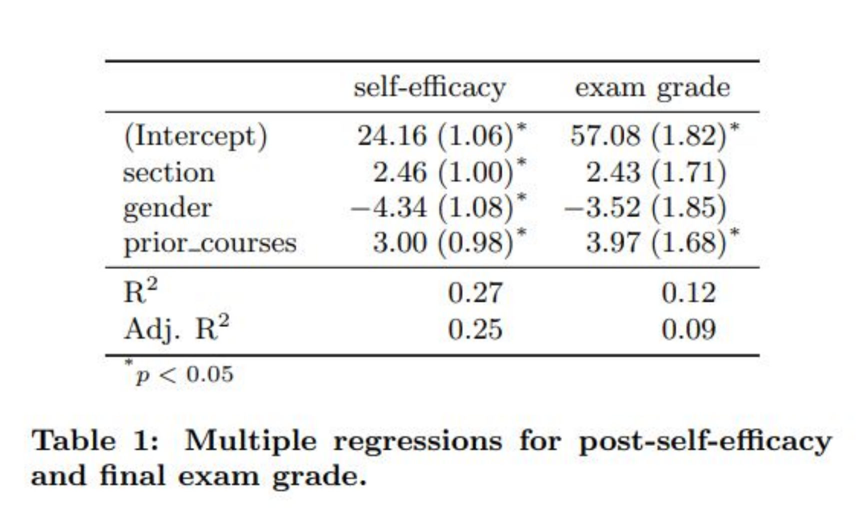
Results and Findings

1. Post-self efficacy was higher in the Peer Instruction group

2. No significant differences in final exam scores (in contrast with the earlier study)

3. Peer instruction did not moderate the difference in gender gap

4. Peer instruction did not moderate the difference in programming experience



	self-efficacy	exam grade
(Intercept)	24.16 (1.06)*	57.08 (1.82)*
section	2.46 (1.00)*	2.43 (1.71)
gender	−4.34 (1.08)*	−3.52 (1.85)
prior_courses	3.00 (0.98)*	3.97 (1.68)*
R^2	0.27	0.12
Adj. R^2	0.25	0.09

$^*p < 0.05$

Table 1: Multiple regressions for post-self-efficacy and final exam grade.

Results from 49% of the students enrolled in CS1

Author’s thoughts and conclusion

- Differences in the CS0 (UC) and CS1 final exam could have caused discrepancies in test results.

- While self efficacy doesn’t directly cause students to perform better on the final exam, it is still an important factor to consider. Success in these CS courses should not be solely based off of grades

- Conduct further experiments on whether or not PI students outperformed traditionally taught students in certain tasks and what causes that

Personal Findings and Thoughts

End of presentation