

Investigating the Effects of Classroom Voting and Peer Instruction on Teaching and Learning in an Introductory Differential Equations Course

Ron Buckmire
buckmire@oxy.edu
Occidental College
Los Angeles, CA

Outline

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Definition of Terms

Classroom Voting

Classroom voting is a pedagogical technique where the instructor poses a multiple-choice question to the class and the students individually vote on their preferred answer, usually after working together in pairs or in small groups. Oftentimes a summary of the distribution of students' votes can be viewed by the entire class.

Peer Instruction

Peer Instruction is a particular implementation of classroom voting where after the students have indicated their answers to a multiple-choice question they are given an opportunity to discuss their responses with other students in the class and after this “peer instruction” time interval another classroom vote occurs.

Investigational Context

- Introductory *Differential Equations* course at a small liberal arts college in the Western United States (~2000 students).
- Class size: 2008(**13**), 2009(**15**), 2010(**21**), 2013(**18**)
- Course textbook: *Differential Equations*, 3rd Edition by Blanchard, Devaney & Hall.
- Course material: solution techniques, bifurcation, Laplace transforms, systems of linear ODEs, qualitative analysis
- Taught the class using same text book in Fall 2008, Fall 2009, Fall 2010, Fall 2013 (revised edition)
- Used Interwrite PRS clickers to implement classroom voting and peer instruction in 2009, 2010 and 2013.
- Evaluated student learning outcomes using same final exam

Research Questions

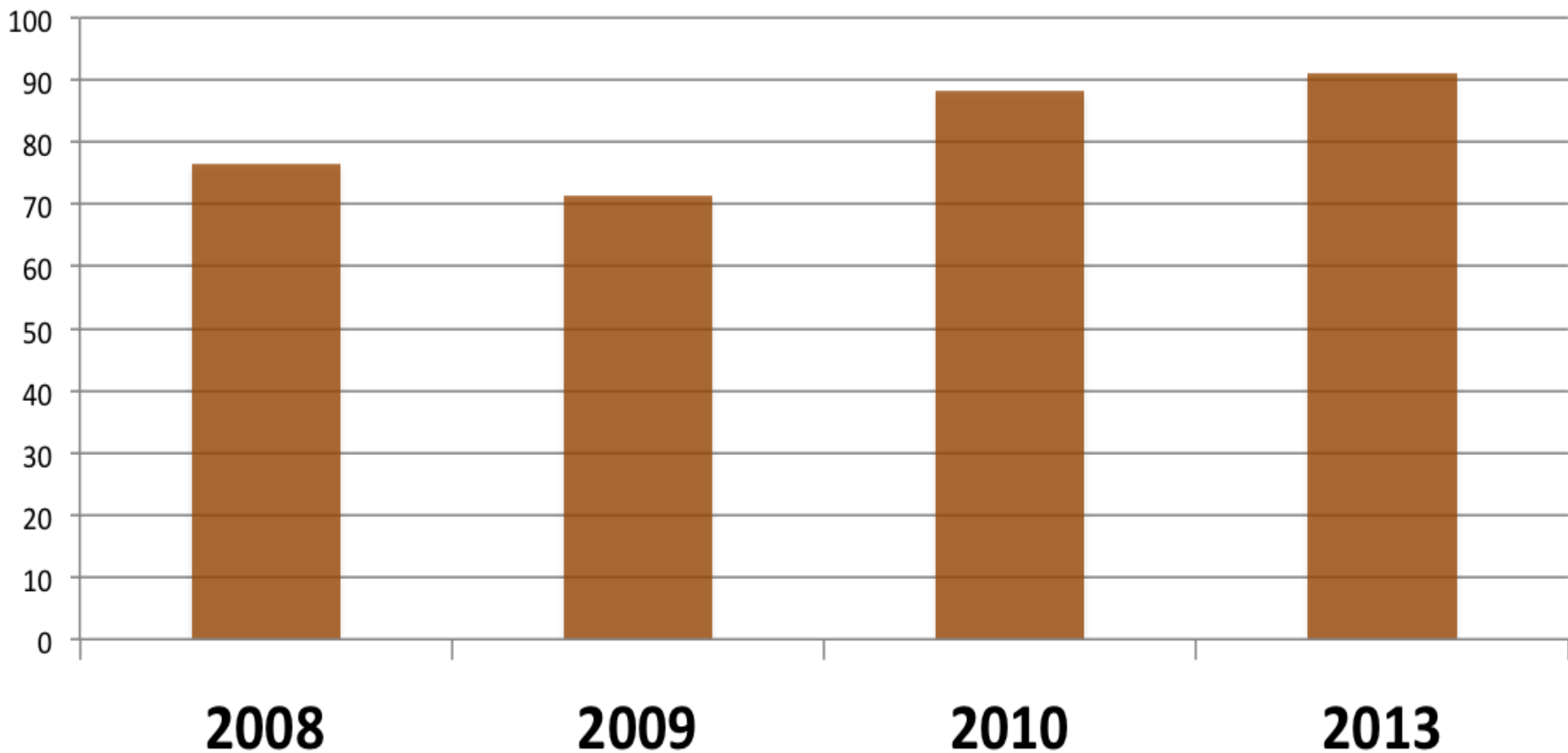
- (RQ1) What is the impact of using classroom voting/peer instruction on student learning outcomes?
- (RQ2) What is the impact of using classroom voting/peer instruction on student satisfaction with the course?
- (RQ3) What is the impact of using classroom voting/peer instruction on instructor satisfaction with the course?

Source Data

- Scores on every question on all final exams for every student
- Distribution of student grades for every time course was taught
- Semester GPA for students in the semester they took the course
- Anonymous student evaluations for every time course was taught

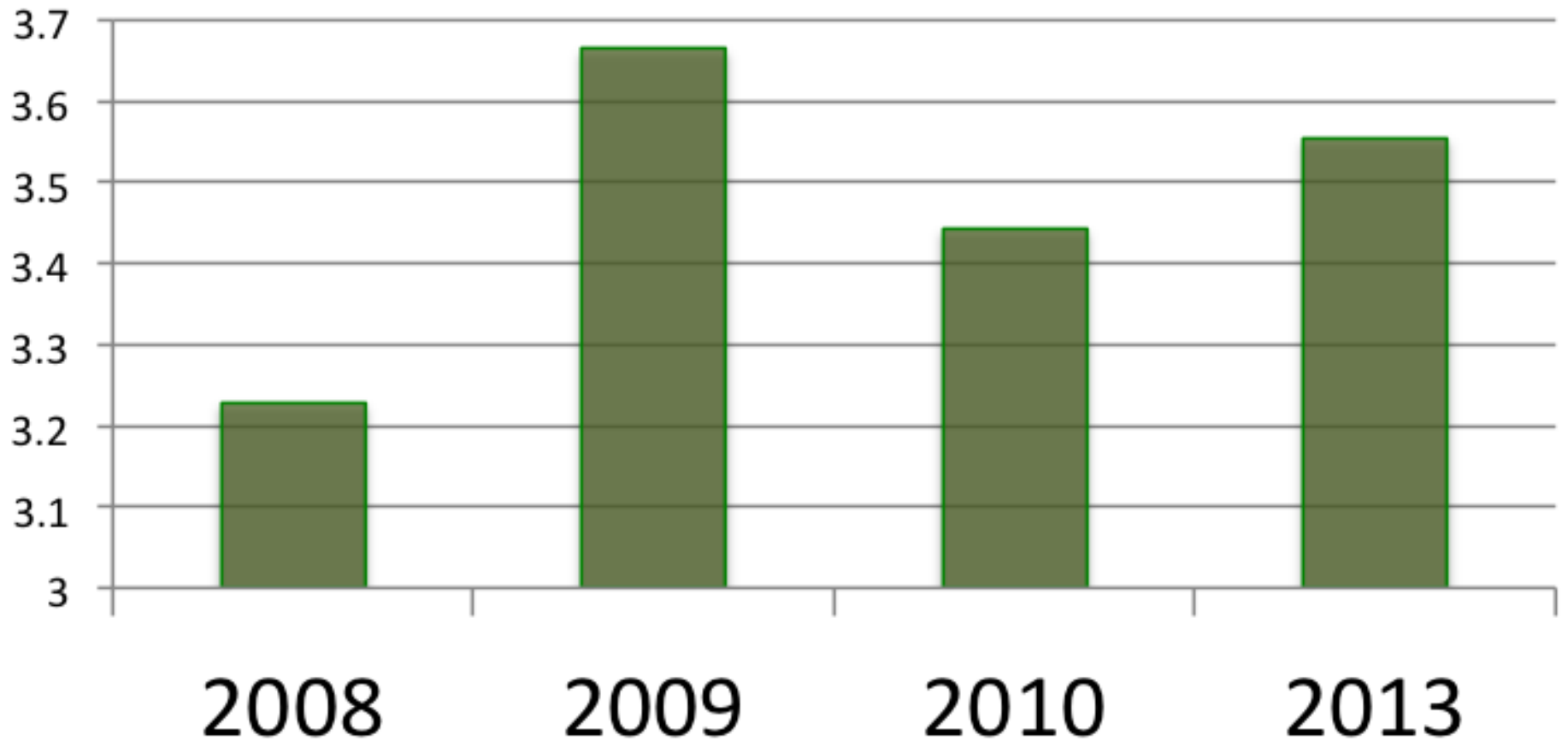
Summary of Results: RQ1

Final Exam Score



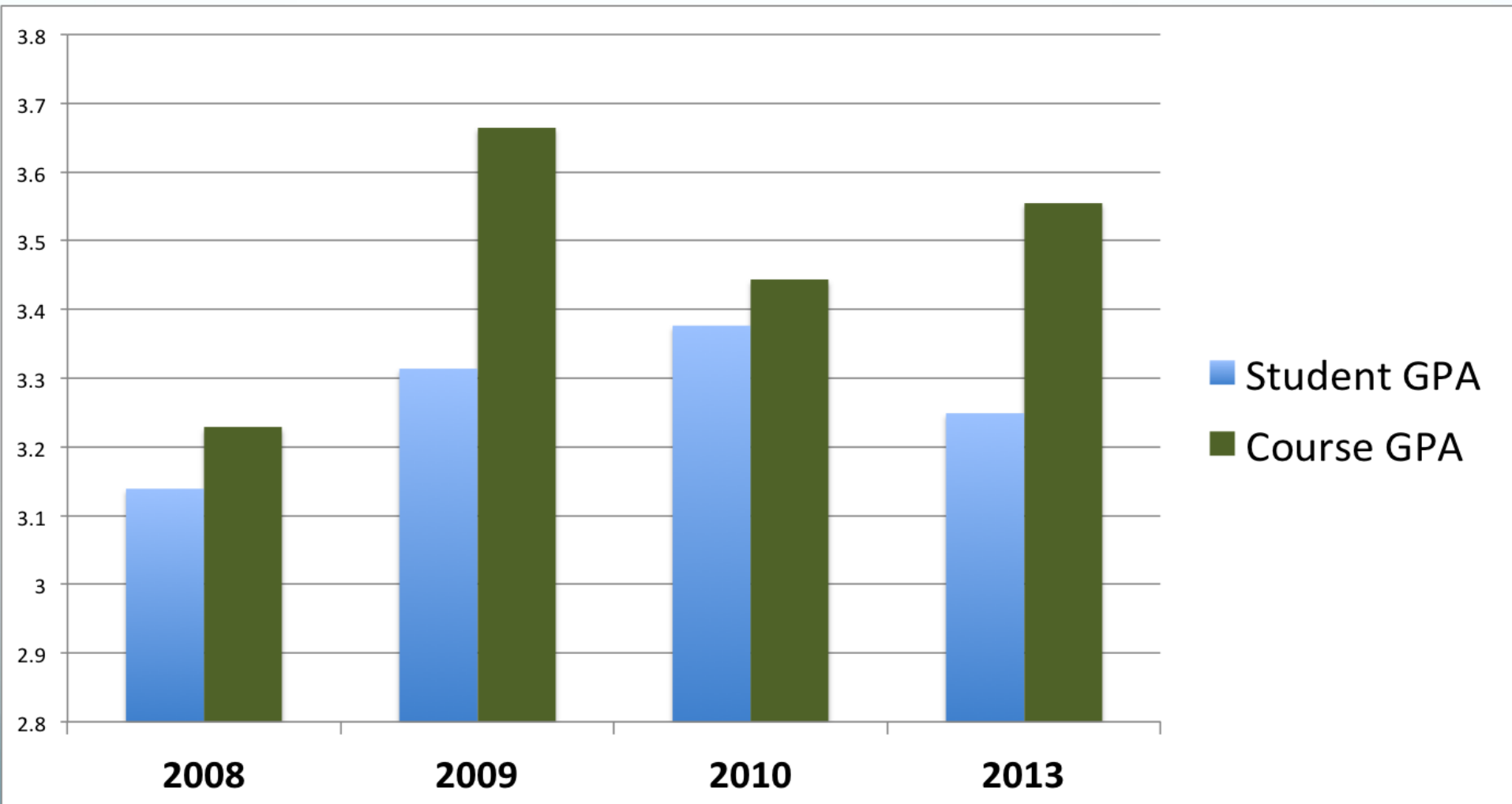
Summary of Results: RQ1

Course Grades



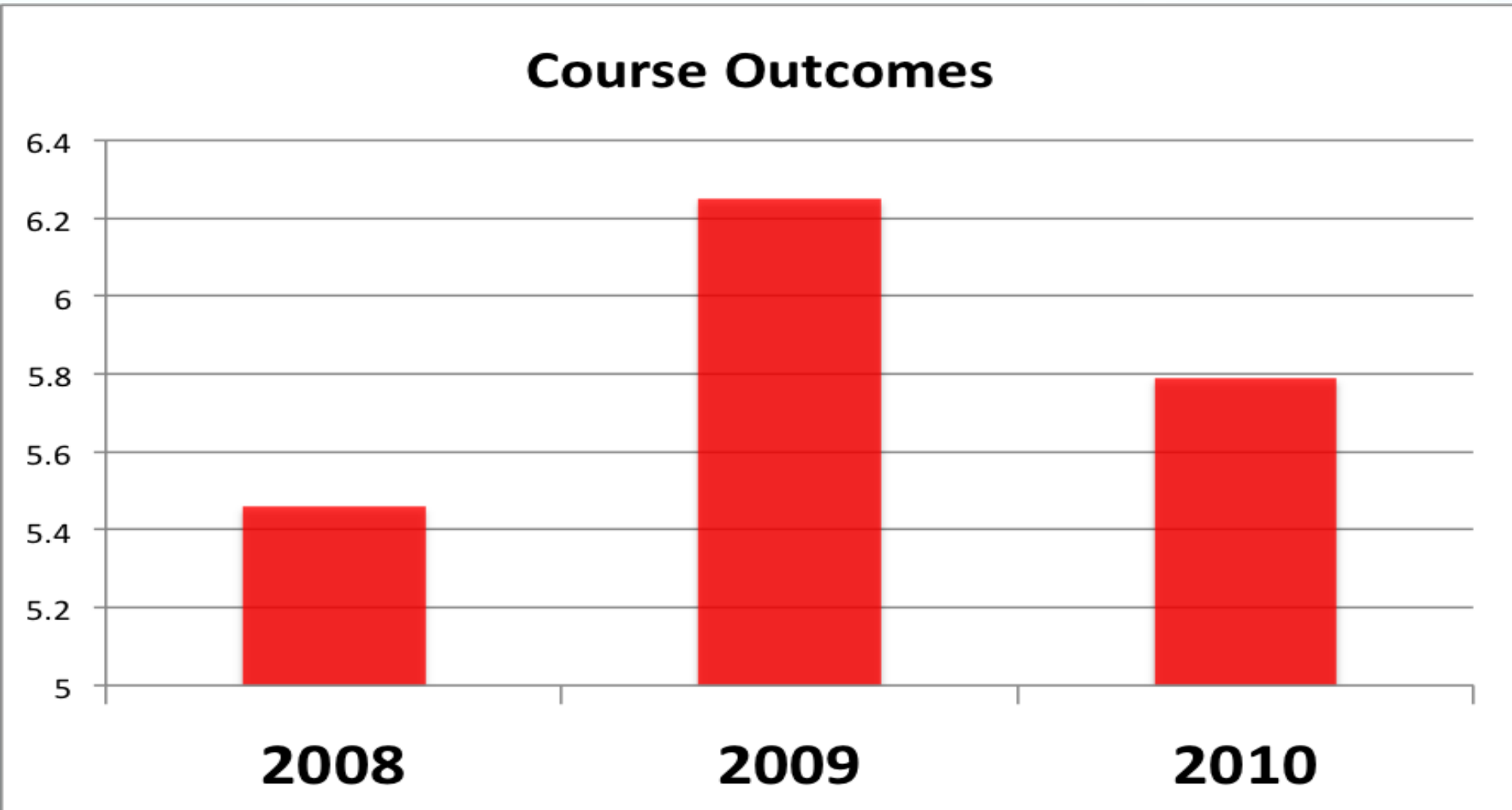
Summary of Results: RQ1

Average Student GPA versus Course GPA



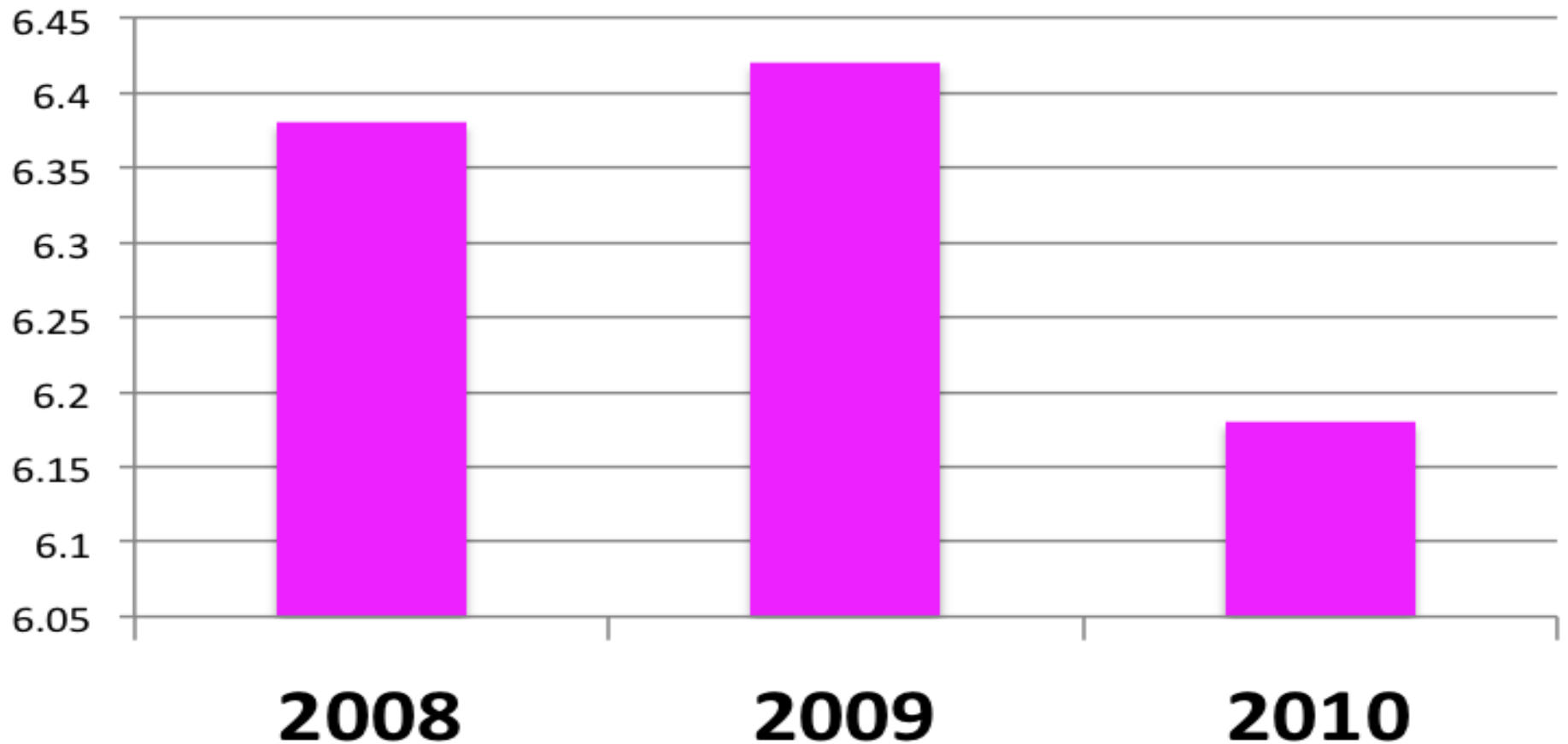
Summary of Results: RQ2

STUDENT EVALUATION: Overall Course Outcomes



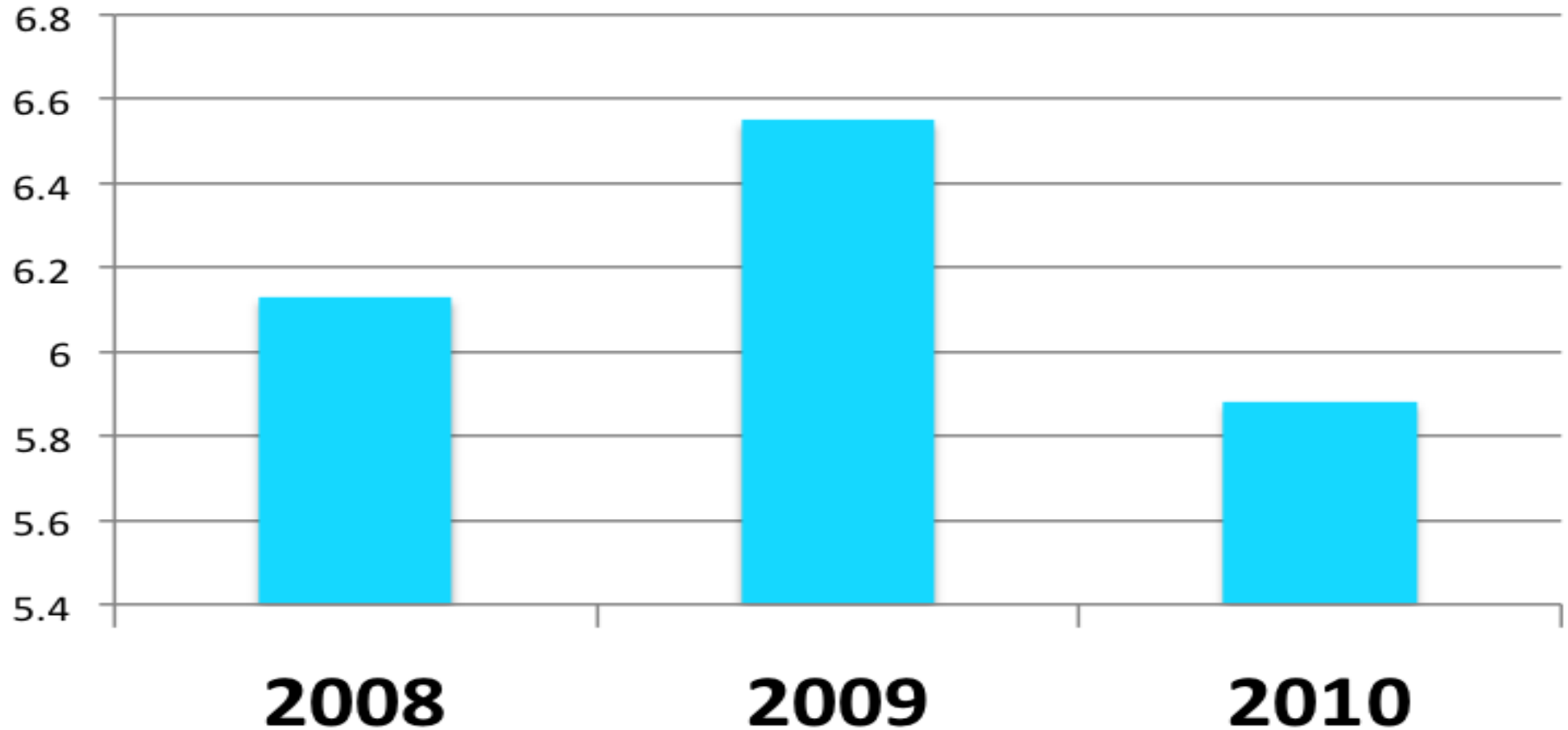
Summary of Results: RQ2

STUDENT EVALUATION: This course improved my basic knowledge and comprehension of the subject (7.0 scale)



Summary of Results: RQ2

STUDENT EVALUATION: This course improved my ability to analyze, synthesize and/or apply information regarding the subject



Summary of Results: RQ3

What is the impact of using classroom voting/peer instruction (CV/PI) on instructor satisfaction with the course?

- No Data Available To Answer This Question

(Preliminary) Conclusions

- On average, performance on the course content measure (final exam) appears to have increased over time
- Students who did not experience CV/PI (Fall 2008) did worse on course content measure (final exam) than students who did
- No apparent correlation between student satisfaction and the use of CV/PI
- Need a means by which to measure the impact of the implementation of CV/PI on instructor

Future Work

- What kinds of instrument can be deployed to measure the impact of classroom voting/peer instruction on the instructor?
- What kinds of instrument can be deployed to measure other (more affective) aspects of student outcomes?
- Conduct a statistical analysis of the data to discern correlations between treatment and non-treatment groups

