

Comparing Students' and Teachers' Descriptions of First Year STEM Instruction

Kristen Vroom & Sean Larsen
Portland State University

The precalculus through single-variable calculus (P2C2) sequence is often viewed as a barrier for STEM intending students. Additionally, many students point to poor instruction as a primary reason for leaving STEM. This leads to many questions about student experiences in the P2C2 sequence. This study is part of a larger national project and draws on student and instructor survey data from three universities. We aim to lay groundwork for understanding student experiences in the P2C2 sequence by answering: (1) How do P2C2 students and instructors describe their class, (2) Do students and instructors describe them differently?

Keywords: Precalculus, Calculus, Instruction, Student Perceptions, Instructor Perceptions

Methods

Data for this project pulled from student and instructor surveys administered to all students and instructors in the P2C2 sequence at three universities. To answer our research questions, we replicated Ellis, Kelton, and Rasmussen's (2014) analyses of student and instructor surveys. We consider 430 student surveys and 14 instructor surveys. The student and instructor surveys included 16 parallel items regarding classroom experiences (e.g., 'I listen and take notes as the instructor guides me through major topics' and 'I guide students through major topics as they listen and take notes'). Responses were obtained on a 5-point scale, with five representing most descriptive of their class. We considered descriptive statistics and conducted a paired samples t-test for each of the 16 student-instructor responses.

Sample Results

Both students and instructors responses indicated that the item related to the instructor knowing the student's name (i.e., 'The instructor knows my name' and 'I know most of my students by name') had the highest mean rating of the 16 items, $M_{\text{students}}=4.36$, $SD_{\text{students}}=1.08$, $M_{\text{instructor}}=4.76$, $SD_{\text{instructor}}=0.54$. Alternatively, student responses indicated that 'I explore or discuss my understanding of new concepts before formal instruction' had the lowest mean rating, $M=2.75$, $SD=1.11$, while instructor responses indicated that 'I structure class so that students constructively criticize one another's ideas' had the lowest mean rating, $M=2.14$, $SD=0.81$.

Results suggested that the average student rating was significantly different than the average instructor rating for 13 of the 16 items. For instance, instructors indicated that 'students regularly talk with one another about course concepts' was significantly more descriptive of their class, $M=3.59$, $SD=1.24$, than students, $M=3.20$, $SD=1.28$, $t(421)=6.27$, $p<0.05$, $d=0.31$. Additionally, students indicated that 'I have enough time during class to reflect about the processes I use to solve problems' was significantly more descriptive, $M=3.29$, $SD=1.13$, than what instructors indicated for 'I provide time for students to reflect about the processes they use to solve problems', $M=2.89$, $SD=0.91$, $t(419)=5.96$, $p<0.05$, $d=0.29$. The Cohen's (1988) standardized effect size suggests that the both of these differences in means were medium.

Along with the results presented here, we will further investigate the differences by separating our data by class. We will compare each class' average student rating to their instructor's rating. Additionally, we will compare our results to Ellis, Kelton, and Rasmussen's (2014) findings.

References

- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, New Jersey: Erlbaum.
- Ellis, J., Kelton, M. L., & Rasmussen, C. (2014). Student perceptions of pedagogy and associated persistence in calculus. *ZDM*, 46(4), 661-673.