How Calculus students at successful programs talk about their instructors

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The CSPCC (Characteristics of Successful Programs in College Calculus) project was a 5-year study focused on Calculus I instruction at colleges and universities across the United States with overarching goals of identifying the factors that contribute to successful programs. In this poster, we draw from student focus group interview data collected from schools that were identified by the CSPCC project as being successful. The analyses we will present in this poster will characterize the ways in which calculus students talk about their instructors in an attempt to understand how their perceptions shape their experience.

Key words: Calculus, Student Perception, Thematic Analysis, Instructors

Over the past decade, numerous reports point to the need for national efforts to increase the number of students pursuing and professionals with degrees in science, technology, engineering, and mathematics (STEM) fields (see for example NSB, 2007; PCAST, 2012; Thomasian, 2011). According to the PCAST report (2012) increasing the retention rate of the students who enter college intending to major in a STEM field has the potential to significantly decrease the gap between the number of STEM degrees produced and the projected number of STEM degrees needed to sustain the United States position in the global market. While there are many reasons students leave STEM fields, there is a growing body of research that suggests that intending STEM students are switching out of STEM fields due to experiences in their introductory mathematics courses (Ellis, Kelton, & Rasmussen, 2014; PCAST, 2012; Rasmussen & Ellis, 2013), including experiencing poor instruction (Bressoud, Mesa, & Rasmussen, 2015; Seymour & Hewitt, 1997). In the United States each year over 300,000 students enroll in tertiary Calculus, many of which are just beginning their post-secondary education (Blair, Kirkman, Maxwell, 2013; Bressoud, Carlson, Mesa, & Rasmussen, 2013). To this end, we seek to better understand student experiences in successful Calculus courses by answering the question, *how do students in successful Calculus programs talk about their instructors?*

Methods

The CSPCC (Characteristics of Successful Programs in College Calculus) project was a 5-year study focused on Calculus I instruction at colleges and universities across the United States with overarching goals of identifying the factors that contribute to successful programs. The study consisted of a national survey conducted in fall 2010, followed by explanatory case study visits at seventeen institutions that were identified as successful because of student persistence (continuing to the next course in the calculus sequence) and reported increases in students' interest, confidence, and enjoyment of mathematics as a result of taking Calculus 1.

During site visits the research team conducted semi-structured student focus group interviews with current Calculus students in which they were given an opportunity to discuss various course components, their instructor, and overall course experience. We began data analysis by reading the interviews in their entirety and then choosing a subset of interview questions we felt were most relevant to our research goal. This subset of questions included:

- What types of things happen in class that help you learn calculus content?
- What would you say is your instructor's attitude towards calculus?
    - Does your teacher seem to care about your learning?
    - Does your teacher think students are capable of understanding calculus?

    - Do you think that this is typical of teachers in this math department?
- What do you think makes this program special?

Ongoing thematic analysis (Braun & Clarke, 2006) is being conducted on student responses from this subset of questions to identify overarching ways in which students at these institutions talk about their instructors. In the following section we highlight some initial themes that have emerged from our analysis.

Initial Findings

Currently our findings include three distinct perceptions of calculus instructors and their roles/characteristics in the classroom: (1) Students report instructors overwhelming *helpfulness* as an attempt to directly aid in students academic success; (2) a generally *friendly* demeanor; and (3) the instructor promoted an encouraging *atmosphere* in the classroom where students can interact with mathematics. To illustrate these findings we present experts from student interviews in Table 1.

Table 1

Emerging Themes Regarding How Students Talk About Instructors

Preliminary Theme	**Institutional Level**	**Excerpt**
Helpfulness	Bachelors	She's willing to help you as much as she possibly can if you're willing to try.
	Masters	She actually loves math so she wants to do everything possible for us to love math. She tries absolutely as hard as she can.
Friendliness	Bachelors	She's never condescending.
	Doctoral	I went to his office hours and he's really friendly and it makes it a lot easier to actually enjoy doing the math.
Great atmosphere	Bachelors	… Ms. M is interested in us doing well so it's a great atmosphere. That really helps… I mean you definitely have down there that the teacher definitely helps to make the experience, right?
	Bachelors	He creates a very comfortable environment and he (has) a really cool way of putting concepts together and making it connect with everything.

Conclusion

Overall students in successful Calculus programs speak highly of their experiences in the classroom and with the instructor. While analysis is still ongoing, one particularly interesting finding is the difference in the manner in which students at various institutional levels speak about their instructors. For instance, at bachelors granting institutions students tend to speak about their instructors with a very familiar tone while students at doctoral granting institutions give a real sense of distinct between them and their instructors, both physically and personally. Through ongoing analysis we hope to further develop current themes, illuminate more themes, and continue to investigate differences across institutional levels.

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