# **Understanding Student Perspectives on Their Self-Efficacy and Learning** Experiences

RUTGERS

Aresty Research Center for Under the description for Undergraduates

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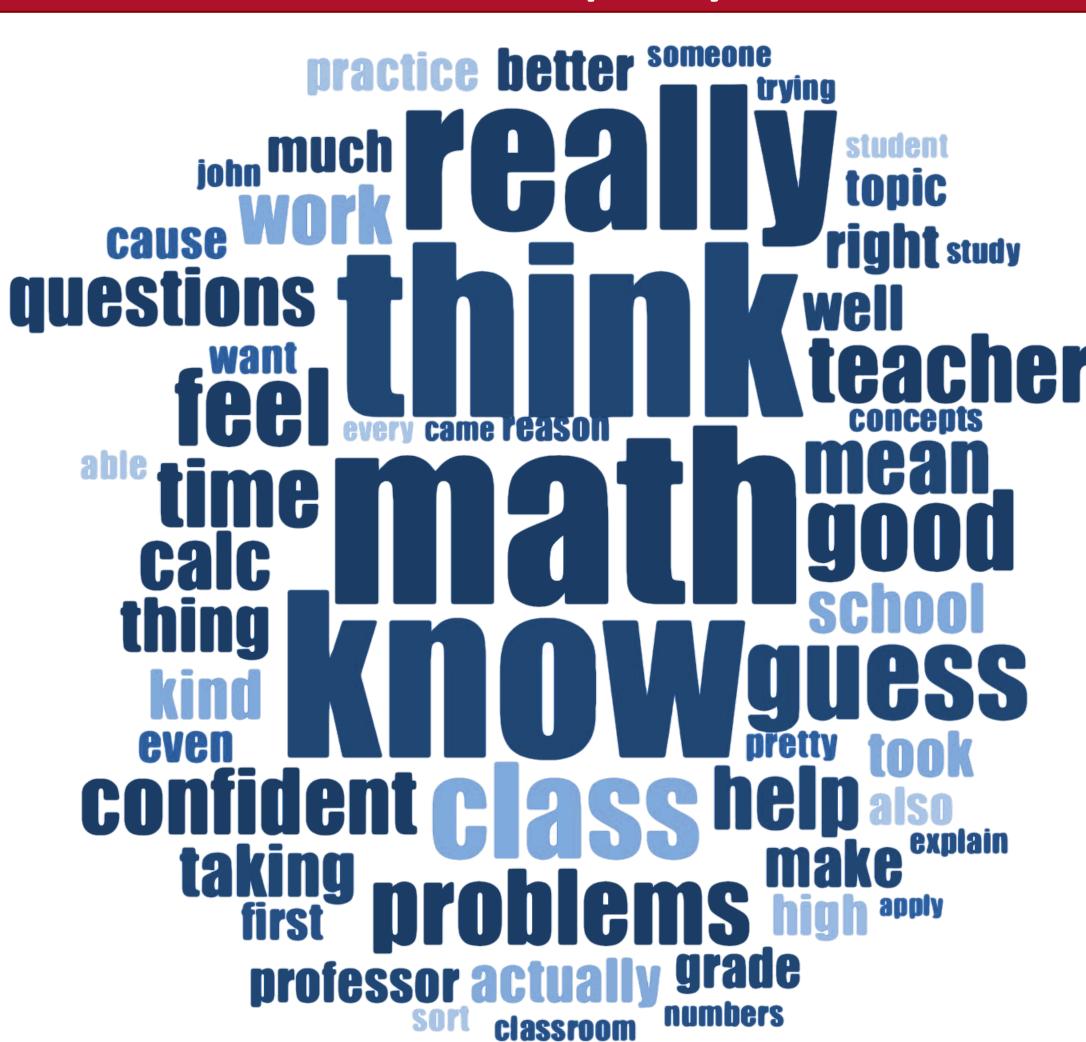
### Abstract

Students' learning experiences are impacted by their perceptions of their self-efficacy, or confidence in their ability to perform a task. Conversely, classroom dynamics impact students' self-efficacy by allowing for different kinds of self-efficacy opportunities. Previous research reveals that self-efficacy is context-specific and that male and female students benefit from different sources of self-efficacy. In this study, we analyzed interviews from 12 students enrolled in a flipped integral calculus course to understand their perceptions of self-efficacy and how these perceptions impact their learning experiences.

# **Course Structure**

- Pre-class video set
- In-class review & technology demonstration
- Online quiz on video set
- Rotating stations led by LA and instructor
- Online quiz on WebAssign & video set
- Finish any remaining problems, begin next set

# **Word Frequency**



### Background

Self-Efficacy is the belief one has in their ability to complete a task and can encourage or prevent one from trying new or challenging tasks. By flipping the traditional classroom model, we can examine more effectively how consistent, active interaction with a professor and undergraduate learning assistant provides self-efficacy opportunities to students and learn how these opportunities affects students' learning experiences. The course studied was integral calculus, over 8 weeks in the summer of 2018. The class met three evenings each and was held in an "Active Learning Classroom." The students in the course were mostly incoming sophomores and juniors, and many were retaking the course. In the flipped class model, students worked through video tutorials at home. Each 2hr 45min class session was made up of time spent at two or three rotating stations, working through WebAssign, workshops, and any other material with the professor or the learning assistant.

The self-efficacy opportunities we are looking for are:

mastery experience (successfully completing a problem, homework set, exam, etc.) vicarious learning experience (watching someone else work through or complete a problem) verbal persuasion (implicit encouragement from a teacher, learning assistant, classmate, etc.)

# **Coding Example**

### Qualitative 1st Analysis Example

Interviewer: Okay. Thank you. You actually answered the follow up question, but I'll ask anyway in case you have something else you want to add: which is, how did this impact your mastery of math classes, that experience?

Interviewee: Um, I think it just kind of taught me to take math more seriously. So, I guess in high school I never really, like I didn't really study as hard as I, like for what I like deserved to get, I don't think it was like even, like I probably deserved worse than I got, where in university I learned that's not the case like they're really, if you're unprepared you'll get a bad grade and that's just how it works.

### Qualitative 1st Analysis Example

Researcher 1: yellow Researcher 3: pink

Researcher 1 and 3 overlap: orange

Interviewee: Um, I think it just kind of taught me to take math more seriously. So, I guess in high school I never really, like I didn't really study as hard as I, like for what I like deserved to get, I don't think it was like even, like I probably deserved wors than I got, where in university I learned that's not the case like they're really, if you're unprepared you'll get a bad grade and that's just how it works.

# Qualitative 1st Analysis Example

Researcher 1: yellow Researcher 2: blue

Researcher 1 and 2 overlap: Green

Interviewee: Um, I think it just kind of taught me to take math more seriously. So, I guess in high school I never really, like I didn't really study as hard as I, like for what I like deserved to get, I don't think it was like even, like I probably deserved worse than I got, where in university I learned that's not the case like they're really, if you're unprepared you'll get a bad grade and that's just how it works.

### Qualitative 1st Analysis Example

Researcher 2: blue Researcher 3: pink

Researcher 2 and 3 overlap: purple

Interviewee: Um, I think it just kind of taught me to take math more seriously. So, I guess in high school I never really, like didn't really study as hard as I, like for what I like deserved to get, I don't think it was like even, like I probably deserved worse than I got, where in university I learned that's not the case like they're really, if you're unprepared you'll get a bad grade and that's just how it works.

# Next Stage of Coding Based on Categories

- Confidence
  - Positive/Negative Activity Identified
  - Self-Efficacy Opportunity
  - Identified
- Activities
  - Positive
  - Experience/Negative Experience
  - In-class/outside class Self-Efficacy Opportunity
- Feelings toward or about math
  - Positive/Negative
  - Activity Identified
  - Self-Efficacy Opportunity Identified
- High School Classes or Specific Courses
- Positive/Negative
- Activity Identified Feelings described
- Self-Efficacy Opportunity
- Identified

# **Qualitative Methods**

- 12 Post-class interviews
- Transcribe interviews
- First round of coding (open coding, broad words/phrases)
- Condense into loose categories
- Collapse categories into themes
- Write interview protocol
- Second round of coding per protocol, using Nvivo (in progress)
- Calculate inter-rater reliability
- Third round of coding if necessary
- Determine themes across interviews, verify preliminary findings

**Research question:** How does the self-efficacy of math/physical science students in a flipped Calculus 2 course change over the course of one semester?

### Interview questions:

- Tell me a story that explains something about the type of student you are in math. In other words, share with me something that happened to you that involves this subject and perhaps your parents, teachers, or friends.
  - How did this impact your mastery of math classes?
- Describe the best teacher you've had in math. What made her (or him) so good?
- Think about how math makes you feel. You probably haven't been asked to think about that before. When you are given a math test, how does that make you feel? How do you feel when you are given a math assignment?
- Earlier you rated your math ability on a scale of 0 to 9. How would you rate your confidence in math now? Why?
- What could make you feel more confident about yourself in math?

### **Conclusions & Future Work**

- Experiences in previous math courses, particularly high school, impacted student perception of their self-efficacy in math both positively and negatively
- Active learning increased students' confidence in their ability to do math from their perspective
- Verbal persuasion (implicit encouragement) increased confidence and was seen as a good way to learn.

In the fall of 2019, all 27 sections of Rutgers' Pre-Calculus for Engineers course was reorganized to the flipped format of this pilot study course.

I hope to continue research into self-efficacy in graduate school, exploring how it ties in with physics identity and retention of women and ethnic/racial minorities in physics.

### Acknowledgements

I'd like to thank the academy (seriously, I'll figure this out soon)

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