



# One graduate students' experience teaching for the first time

Johan Benedict A. Cristobal

AMS Contributed Paper Session on Mathematics Education

# Goals of the Talk

- Motivate my study of frames
- Present the study at hand
- End with some implications and takeaways for undergraduate mathematics instruction and learning

# Research Questions

**Overarching:** *What do instructors think teaching and learning mathematics are about?*

**Focused:** *to be revealed later...*



# Theoretical Perspective: Frames

Answering “What is it that’s going on here?” (Goffman, 1984)



# Theoretical Framework: Frames

Greeno (2009) provided this structure for understanding an individuals' frame:

“Frames provide interpretive contexts that supports participants in a given situation to understand

**what kind of task they are engaged in,**

**what kinds of knowledge are relevant or valuable, and**

**what sort of behavior they and others are expected or entitled to engage in.”**

(cf. Louie, Adiredja, & Jessup 2021, p. 3)

# Theoretical Perspective: Frames of Teaching and Frames of Students' Learning (Cristobal, 2024)

Frames of teaching provide interpretive contexts that support **instructors'** perceptions and enactment of

- (1) what their **role** is in the classroom,
- (2) what **professional knowledge** is relevant in the act of teaching, and
- (3) what type of **interactions** are favored or useful in fulfilling their role.

Frames of students' learning provide interpretive contexts that support **instructors'** perceptions and enactment of

- (1) what do they **have to do for students to learn** the intended content, practices, and orientations,
- (2) what **are the intended content, practices, and orientations** they should attend to in the classroom, and
- (3) what type of **interactions** are favored or useful in achieving the intended learning goals.

# Research Questions

**Overarching:** *What do instructors think teaching and learning mathematics are about?*

**Focused:** *How do instructors' frames of their teaching and their students' learning compare before and after teaching for the first time?*

# Study Context

**Where:** Large mid-western public R1 university.

**Who:** One first-time graduate student instructor Carlos teaching Intermediate Algebra (a course which does not directly satisfy any degree requirement), with 23 students divided in table groups.

## **Professional development opportunities:**

3-day teaching orientation before the semester, weekly course convener meetings, and a pedagogy seminar course.



# Data & Analysis

**Over the course of one semester:** weekly observations and five structured interviews (one before, three during, and one after the semester). Each subsequent interview built on the previous.

After the semester, I went through and analyzed the ways Carlos talked about **teaching** and about **student learning**, using the framework. This allowed me to create a throughline in the semester to see how things shift and what accompanied these shifts.

# Results: Carlos' frames **before** the semester

## Teaching intermediate algebra...

is to “give a flavor of each little thing”

His role in the classroom is to get students to buy into the mathematics content, which he can accomplish through getting everyone involved.

Good communication skills, humility, and adaptability are key skills to have.

Building a good rapport with students and in between students.

# Results: Carlos' frames **after** the semester

## Teaching mathematics...

is “playing a role in the mathematical development of the students... in their learning process and developing of acquiring problem solving tools.”

**Role:** He is more of a guide or advisor than a lecturer, to foster an “egalitarian” classroom where everyone is equal and working together.

**Knowledge:** Content and pedagogical content knowledge to have the foresight to know where students will struggle and knowing ways to. // Insecurity concerning students thinking he's unprepared.

**Interactions:** Student-to-student interactions is valuable for when Carlos has not had the chance to visit a table group. Carlos tries to get to each table group at least once during each day.

# Results: Carlos' frames **before** the semester

## Students learn...

when they're actively doing the problems by themselves *and* working with classmates (“good classmates as well as being good students”).

The problems become more challenging as students progress, and it's expected that students productively struggle before coming to Carlos.



# Results: Carlos' frames **after** the semester

## Students' learning...

is student-led and it is the student's classroom; “they decide how it happens and [how] it gets molded”.

**Content:** Learning the concepts to use for later, and emphasizing connections between topics

**Practices:** Talking to others (being a good classmate), productive struggle, and taking charge for the way you want to learn

**Orientations:** Patience to persevere through struggles. (Actually, Carlos believes that it is not his business to shape how students feel about math)

**Interactions:** Student-to-student interaction is valuable for practicing being good classmates and working through struggles.

# Highlights from Carlos' experiences

## **Towards Knowledge:**

Carlos didn't realize that students would struggle as much as they did. There was one moment where he had learned writing division operations differently than his students, and it came as a surprise that this was a point of confusion for the students.

He now highlights knowledge that allow him to know pitfalls that students can find themselves in and how to help students work around them.

# Highlights from Carlos' experiences

## **Towards Practices and Orientations:**

Carlos stayed consistent in his belief of “productive struggle” and that students need to build patience and perseverance.

Carlos still highlights that students should be good classmates.



# Highlights from Carlos' experiences

## **Towards Role and Interactions:**

“I wasn't able to successfully reach the students as I'd like... and I also was not able to build a good like personal connection with the students.”

One table of female students stood out to him as not wanting to interact with him, opting to have one student ask their questions in their stead.

So, Carlos thought the students should at least work together if not with him. He could at least try to create an egalitarian classroom.



# Conclusions & Implications

Uniquely, Carlos put a lot of value on having a “good classmate” *culture* because he came from a culture of learning where working with his friends and peers was an integral step in his learning of mathematics.

The *context* of college teaching also materialized through Carlos’ belief that his students should choose how they want to learn.



# Conclusions & Implications

This reaffirmed the idea that new college instructors leverage their past experiences as students to inform how they think their students learn math.

As for his teaching, Carlos' behaviors and norms aligned with the department's culture and expectation of active learning centering group work in the precalculus courses.

# Takeaways for Undergraduate Education

This concept of striving for a culture of “good classmate” on top of being a good student.

Better shaping the professional development of graduate student instructors and the culture of their professionalization consequently better shapes the learning experience of undergraduate students, because GSIs do not have the freedom to critically change instruction on the fly.



# Thank you for listening!

Special thanks to session organizers for this opportunity! And further thanks to the AMS Graduate Student Travel Grant for funding my transportation and lodging for this year's JMM.

Please send any inquiries to my email: [jcristobal2@unl.edu](mailto:jcristobal2@unl.edu)

Slides are uploaded here: [www.johanmath.com](http://www.johanmath.com)

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