27th Annual Conference on RUME
Contributed Report

Aspects of Culture and Context which shape Frames of Teaching and Learning

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OUTLINE

- ❑ Theoretical Frameworks:
  - ❑ What do I mean by "**culture**" and "**context**"?
  - ❑ What are **frames**?
- ❑ Research question
- ❑ Findings
- ❑ Discussion
- ❑ Conclusion & Takeaways

CULTURE

Culture is the collection of "**behaviors** and **values** that are learned, shared, and exhibited by a group of people" (Yosso, 2005, p. 76). Additionally, I include **norms** – the rules and expectations towards behaviors (Homans, 1966).

Concern:
I examine salient behaviors, values, and norms that surface in how instructors talk about teaching and learning mathematics. This could speak towards how cultures of teaching mathematics may perpetuate through new instructors.

CONTEXT

A context of the study is at a large, public, Mid-western doctoral-granting university that is a **predominantly white institution (PWI)** (at least 50% of student enrollment identify as White).

Thought:

Does whiteness seep into the classrooms? Wait… how could I even conceptualize whiteness in the mathematics classroom?

Whiteness can be conceptualized as property which has reputation, status, and rights to be disposed, used and enjoyed, and absolutely exclude others from having it (Harris, 1993; Ladson-Billings & Tate, 1995).

Concern:

See if college mathematics instructors at a PWI might treat mathematics knowledge as a kind of property that has reputation, status, and rights as above.

Frames (Goffman, 1986)

Generally, frames allow individuals to filter, organize, and make sense of information in a situation which allow them to respond appropriately.

Knowing instructors' frames allow us to understand what aspects of teaching or learning mathematics they highlight and how they interpret these aspects for the purpose of enacting them or enacting on them.

Note: We'll circle back to expand on what I specifically mean by frames in the context of teaching and learning mathematics.

RESEARCH QUESTION

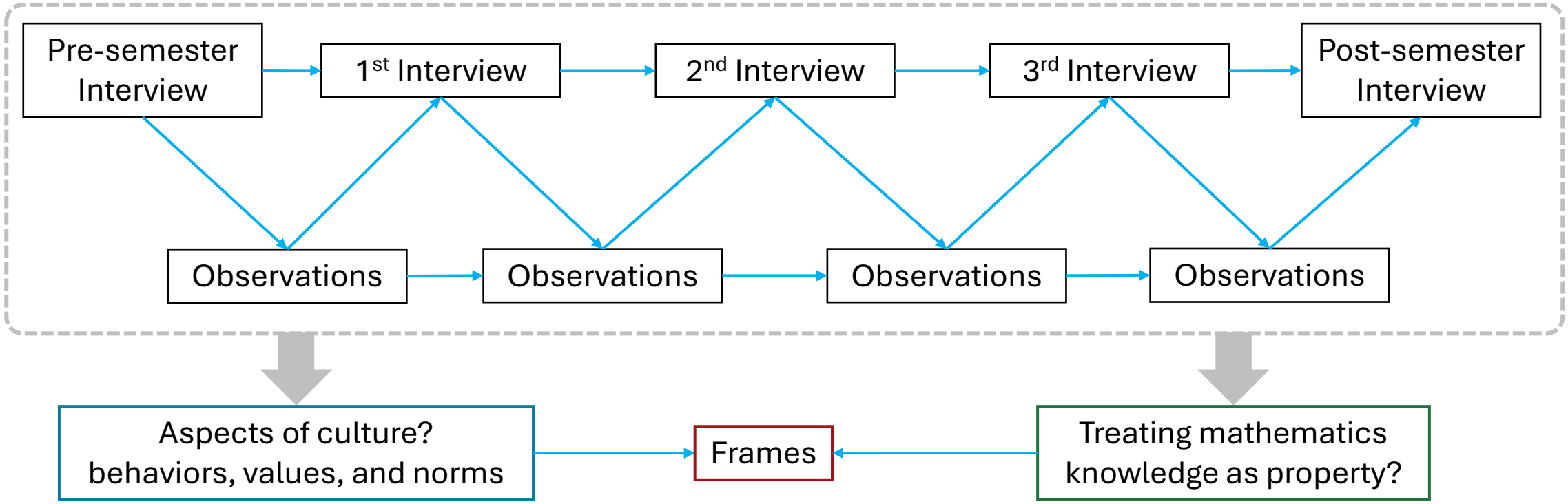
What aspects of culture and context were salient in the experiences of mathematics graduate students teaching as instructors for the first time which could be attributed to influencing their frames?

RQ

DATA & ANALYSIS

3 graduate student instructors teaching as instructors of record for the first time (Intermediate algebra, College algebra, or Math for Liberal Arts).

Five structured interviews with weekly classroom observations throughout the semester. Drawing on grounded theory and thematic coding analysis:



Findings: Aspects of Culture

Behaviors refer to how these instructors acted inside and outside the classroom.

- A fear of appearing incompetent and unprepared while they teach, especially when they made a mistake.
- Letting the class get rowdy since they didn't know how to respond to that.
- Attending to more silent groups during breakout group work:

> *Carlos (Intermediate Algebra):* Something that would take precedence is if… they're just like looking at it like this, staring without writing anything. At least the other people… they're talking and like sort of trying. **And so, a table that can't even start a problem… that would take precedence over a table that is like struggling with a problem.**

Findings: Aspects of Culture

Values refer to what the instructors valorized about teaching, learning, and overall experience during their semester.

- Expectations and beliefs about teaching were challenged by the realities of teaching.
    - Paul (Math for Liberal Arts) found the experience less scary than expected and more fun. He valued the activities more than the rout algorithms since the activities provided more intuition and better recall for his students.
    - Carlos valued feedback a lot, but did not expect the time sink that was grading mastery-based assignments weekly.
    - Andy (College Algebra) valued a more general and sometimes technical way of solving a problem but found that students preferred the quick, specific ways to get a solution.

Findings: Aspects of Culture

Norms largely refer to the rules and expectations which govern discussion in the classroom (Cobb et al., 1992).

- Challenges on what to attend to:
  - Algorithms versus conceptual ideas
    - It became an expectation for Carlos and Andy to explain or expand on the algorithm to a solution after a student provided a numerical answer
  - Rigor/technical language versus intuition
    - Paul making it an expectation that he will always ask students to "explain your thought process" whenever students gave a numerical answer.

Findings: Aspects of Culture

An overlap between behaviors, values, and norms, all three graduate students talked about how individual interactions with students were more valuable to them than lecturing on the board.

They could all tailor how they spoke to a student or a small group of students. Paul and Carlos dedicating most of their class time to group work, and Andy going so far as to frame group work to "actual learning."

> *Andy:* I tend to rush when I'm at the board, and I think I tend to do things in less detail at the board, as a sort of appetizer, so to speak… It's for people who want to meet some degree requirements, and then, like **small groups is actual learning, I suppose.**

Louie et al. (2021) and
Freire (1970/2006)

Findings: Context

Right to disposition (Harris, 1993) treats mathematics knowledge as a static body of knowledge which can be given to a person to receive it.

- All three had an understanding that they are giving knowledge to students as the expert, and deemed skillful instruction as being able to explain abstract concepts with flexibility and versatility.
- One instructor explicitly went against the idea of "static" in that mathematics cannot be essentialized under one definition as it encapsulates a large, growing body of knowledge:

> "[Mathematics] is sort of like a living subject... It wasn't handed down to us from God, that it was constructed by humans to solve real world problem."

Findings: Context

Absolute right to exclude (Harris, 1993) treats mathematics knowledge as something to exclude students from participating in mathematics (i.e., a math person versus not).

- All three opposed the idea of excluding any students.
- Perhaps shaped by the mathematics department's teaching orientation which heavily leaned on active learning and group work style teaching and learning.
- Observations confirmed their attempt and *insistence* that every student participate and engage.
- One instructor made it a goal to have students learn how to be a "good classmate" through the group work they do daily.

Findings: Context

Reputation and status (Harris, 1993) treats mathematics knowledge as granting special condition which places them above others.

- The instructors did not place reputation or status on their students depending on their mathematics knowledge.
    - No one spoke ill of their students who were not doing well, always talking about them with compassion and empathy.
- The instructors targeted their own teaching and being with this idea.
    - They were the expert in the room when it came to knowing the mathematics and explaining it. (Though, there was one occasion!)
    - So, when they made a mistake, they feared being perceived as incompetent, i.e., not having the status to teach them.

Findings: Context

Right to use and enjoy (Harris, 1993) treats mathematics knowledge as something to be used to exercise power and enjoy privileges.

- Power and privilege with regards to knowledge did not surface in the analysis of these instructors.
- Related perhaps is one instructor hoping to create an “egalitarian” classroom where everyone can contribute to how they want to learn, regardless of one’s previous mathematical background.
- Another realized that they should change their way of teaching from how they would prefer to be taught to how their students preferred to learn.

Connecting to Frames (1)

Finally circling back to it 😅!

From my work from last year's RUME (Cristobal, 2024) and briefly speaking, instructors' frames of teaching are made up by their understanding and enactment of

their role,

the relevant professional knowledge, and

interactions in the classroom.

- Behavior: mimicking instructors who they deem as skillful, not wanting to be perceived as incompetent (i.e., without status)
- Value: giving lots of feedback and realizing what they value (rigor and general understanding) isn't necessarily what students wanted (the quick solution method)
- Norm: individual interactions with students are more valuable than lecturing on the board.

Connecting to Frames (2)

Instructors' frames of students' learning are made up by their understanding and enactment of

what content, practices, and orientations the students should learn,

what the instructors must do for students to learn those things, and

interactions in the classroom (Cristobal, 2024).

- Behavior: Attending to silence during group work
- Value: doing more activities and less rout problem solving
- Norm: algorithm versus conceptual understanding or rigor versus intuition
- Inviting all students to participate and be "good classmates"

Discussion: Culture and Frames

Scheiner (2021) had previously conceptualized frames as the *cultural*-historical pillar of his comprehensive model for teacher noticing.

Louie et al. (2021) also demonstrated how instructors' frames are influenced and shaped by the larger social context of their department and even dominant national frames.

Through this study, I shed more light in how frames (with and through its aspects) are informed by culture and context.

Overlaps between the behaviors, norms, and instructors' goals of making sure all students felt included in their mathematics learning speaks towards the usefulness of the common professional development afforded to these instructors (teaching orientation and pedagogy seminar).

Discussion: Perpetuating Cultures of Math

Louie (2017) coined the term "culture of exclusion" in mathematics to discuss the perpetual and pervasive culture which narrowly defines and hierarchal-y delineates what is a mathematical activity and who can do mathematics.

This culture persisted even when instructors tried to counteract it, because it required more than good intention.

What I found here is we could perpetuate more inclusionary cultures when instructors are supported, oriented, and have a local departmental-level culture that seeks to include all students in the classroom.

Conclusion & Takeaway

- The task is not over; these were three first-time instructors in one context and fortunately one with a strong sense of inclusive instruction at the department-level.
    - A department-level emphasis on collaborative group work could instill in new instructors a positive view on mathematics knowledge.
- Graduate student instructors are where many future cohorts of college faculty will come from, and so one avenue of changing the culture of college instruction is to begin where graduate students begin to develop their frames for what it means to teach and learn mathematics.

Thank you!
Any questions & comments?

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Slides available at www.johanmath.com

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