



Supporting A Mathematician's Instructional Change in Undergraduate Mathematics Through Faculty Collaboration

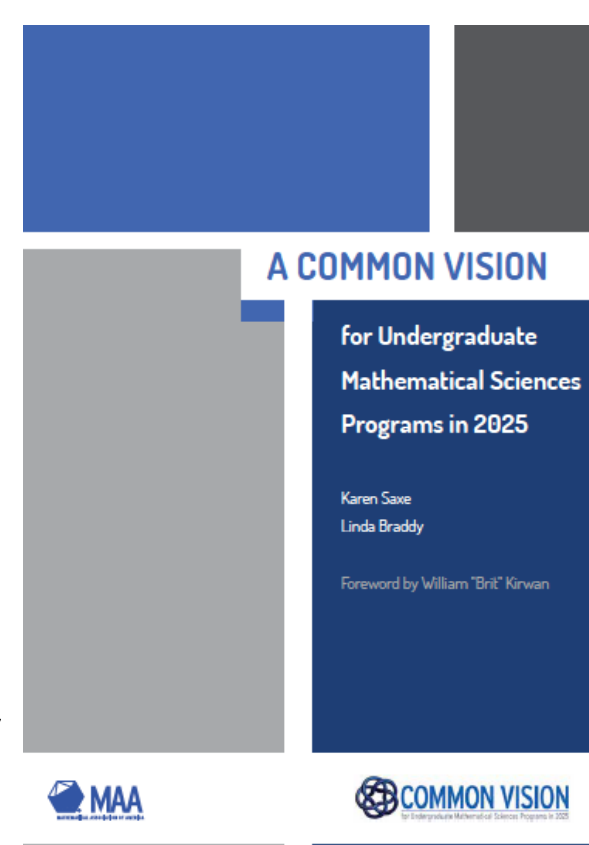


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Significance & Purpose

Instruction should move away from traditional lecture as the sole instructional method in undergraduate mathematics (MAA, 2015).

Departments and faculty members should collaborate more on the teaching and pedagogy aspect of their Job (MAA, 2011, 2015).



This study explored the experiences of a mathematician who participated in a faculty collaboration geared towards reforming instruction. It explores the relationship between his instruction and the faculty collaboration.

Research Questions

- In what ways does one mathematician's experiences in an online faculty collaboration on inquiry oriented differential equations relate to his instructional practice?
 - How does his instructional practice unfold over his first implementation of inquiry oriented differential equations and in what ways does it align with inquiry oriented instruction?
 - How does his participation unfold in the faculty collaboration online faculty collaboration?

Literature Review

Barriers to Instructional Change

Facilitating/Sustaining Instructional Change

Relationship between PD and Instructional Practice

Inquiry Oriented Instruction

Generating student ways of reasoning

Building on student contributions

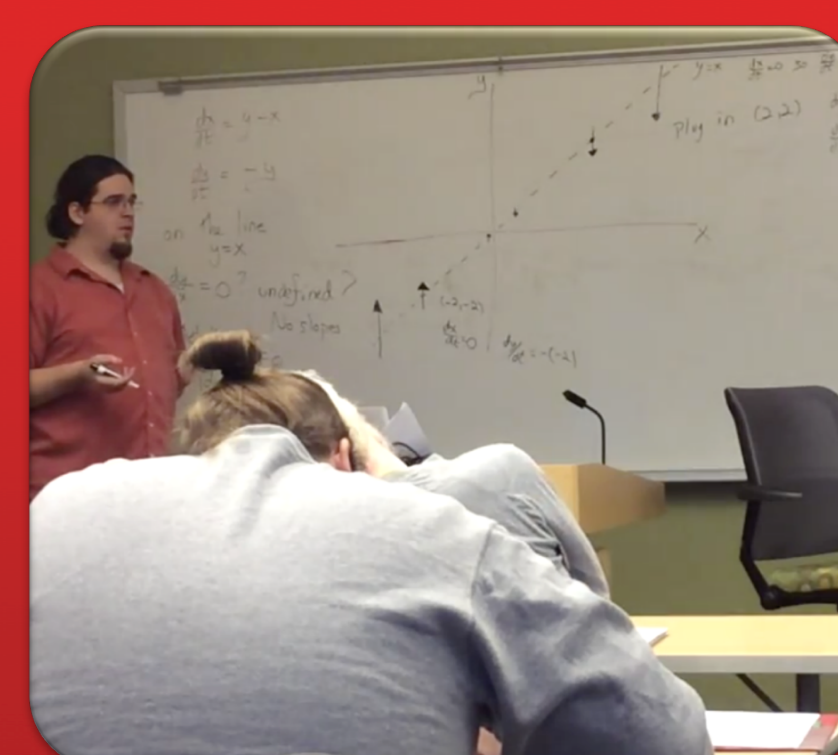
Developing a shared understanding

Connecting to standard mathematical language and notation

(Kuster et al., 2017; Rasmussen et al., 2017; Rasmussen & Kwon, 2007)

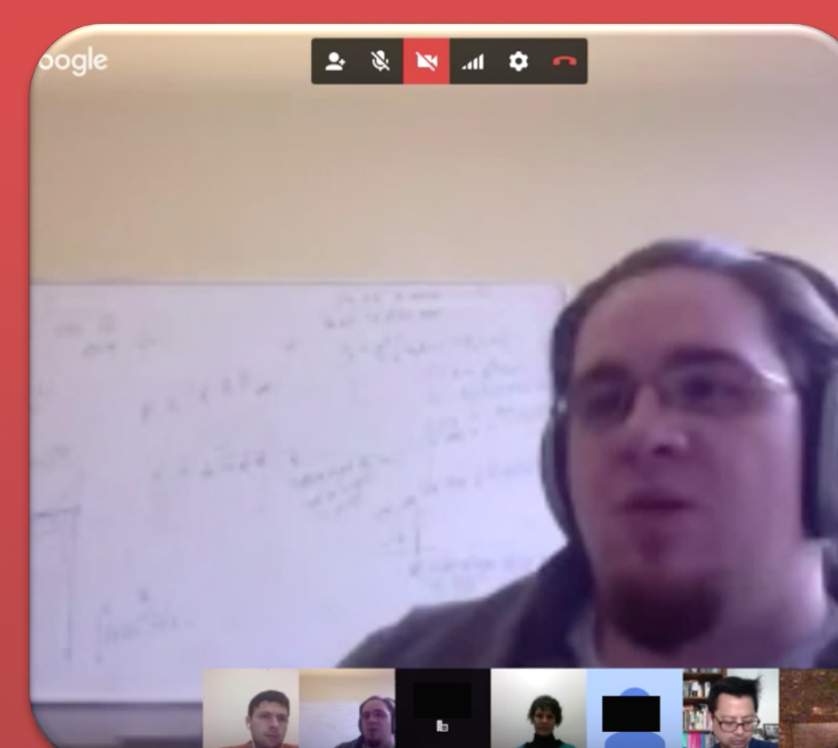
Results

Classroom Instruction



- Instruction focused on eliciting student contributions
- IOI LPs are heavily tied to the mathematics itself
- Dr. DM's research interest impact his use of student thinking
- Dr. DM knew exactly why his students were saying what they were saying or he was not interested in asking them why because he got the answer that he needed to move the class forward

Participation in Online Faculty Collaboration



- Dr. DM's participation was consistent throughout the semester
- Dr. DM took on an active role across all conversations
- Dr. DM was most interested in pedagogical growth
- Dr. DM did not seek mathematical assistance which was atypical of other participants

Overall Research Question



- Dr. DM's mathematics background played a role in how his instruction panned out throughout the semester and how he participated in the OFC
- Resources from the OFC were useful for Dr. DM in providing specific ways to reform instruction
- Tension between IOI and mathematician's agenda, in particular in relation to anticipating student thinking
- Passionate about differential equations, teaching, and student-centered instruction

Data Collection & Analysis

Classroom

- Units 1, 6, 9, 12 (9 hours)
- Inquiry Oriented Instruction Local Practices and evidences

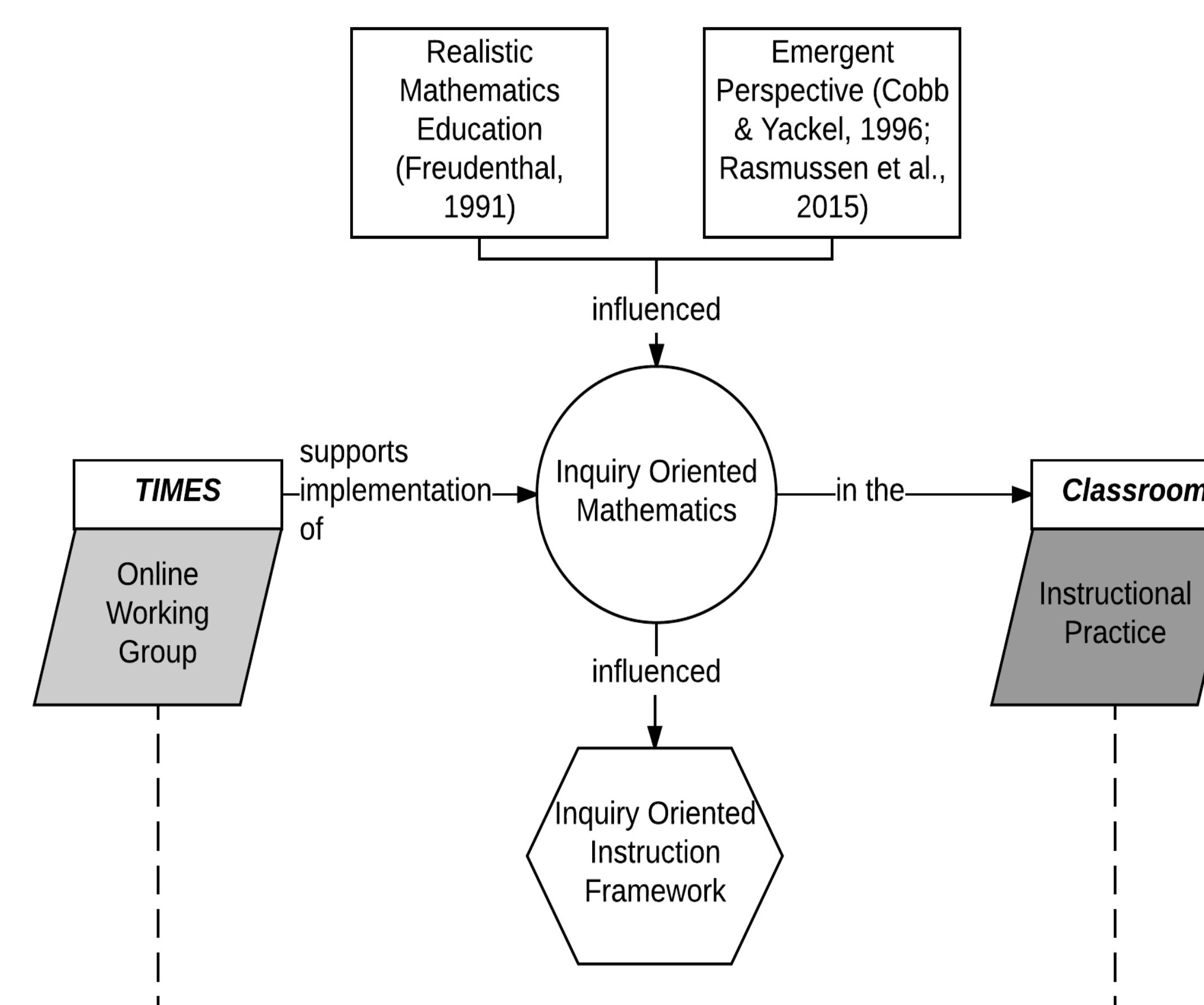
Online Faculty Collaboration

- Nine 1-hour meetings, transcripts coded in Atlas.ti
- Speakers/listeners (Krummheuer, 2007, 2011)
- Conversation

Interviews

- Two 30-45 semi-structured interviews
- Open coding (Strauss & Corbin, 1998; Yin, 2013) of transcripts in Atlas.ti

Conceptual Framework

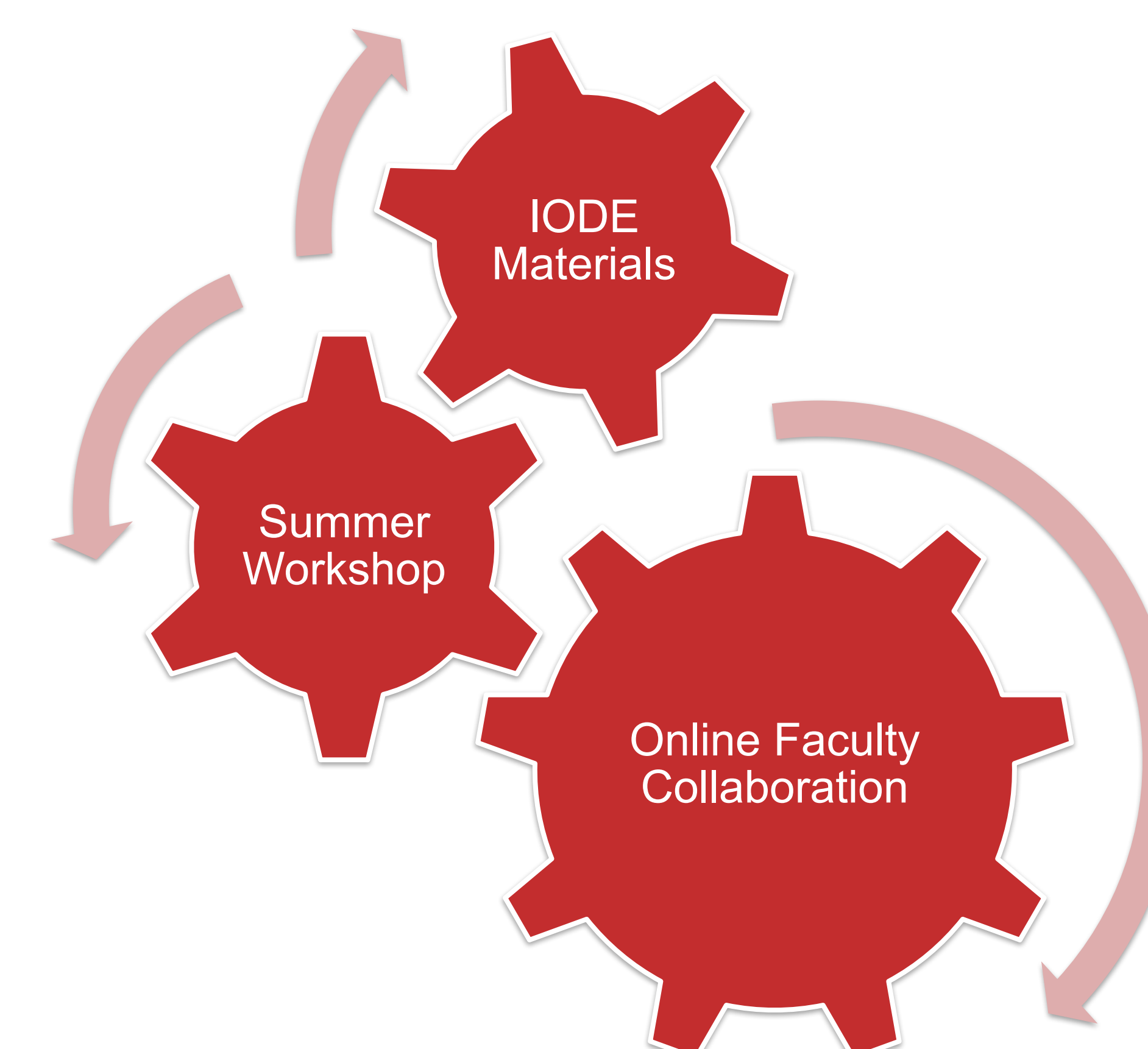


Study Design, Context, & Participant

Qualitative instrumental case study (Creswell, 2013; Stake, 1995; Yin, 2013)

Dr. DM

- Volunteered to join TIMES
- Public state university
- Participant in Fall 2015
- Facilitator in 2016-2018
- Passionate about IODE
- Purposeful sample (Creswell, 2013)



Online Faculty Collaboration

- Opening discussion
- Modified Japanese lesson study
- Do the math
- Anticipate student thinking
- Share videos of instruction

Implications

Using video in faculty collaboration settings can facilitate and sustain instructional change

Provides a detailed analysis of a faculty's instructional practice, something that is seldom reported in extant literature (Speer et al., 2010)

For Mathematics Education and Mathematics Communities

Practical applications in the mathematics community, namely, faculty collaboration can happen at the local level; active participants make good facilitators

When faculty collaborate on instruction they must consider their own mathematical understanding of the topics