

Reflective Abstraction as a Mechanism for Developing Pedagogical Content Knowledge



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INTRODUCTION

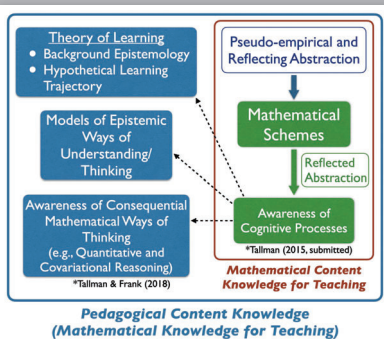
This project examines how supporting a pre-service teachers' engagement in reflected abstraction promotes her development of pedagogical content knowledge for teaching constant rate of change and linear functions. Analyzing one's teaching and commentary shows whether the educator is focused on pedagogical tactics or content knowledge.

However, the goal of this project is to blend the two approaches to maximize effectiveness in the classroom. By examining one's own understanding and mental conceptualizations, they can better support a student's road to understanding.

OBJECTIVES

- Identify sequences that address high-quality instruction in classroom lessons over rate of change before and after intervention interviews
- Identify sequences that address room for improvement in classroom lessons over rate of change before and after intervention interviews
- Highlight the changed emphasis during reflections: looking through a pedagogical lens versus pedagogical content knowledge

THEORETICAL FRAMING



RESULTS

A Look into Prevalent Sequences in Samantha's Reflected Abstraction

Sequence	Data	Description
Sequence 1: <i>What is a rate?</i>	<ul style="list-style-type: none"> Lesson 1 Pre-intervention Interview 1 Post-intervention follow-up question 	Samantha tags this sequence as a room for improvement in her pre and post-intervention activities. In the first round of analysis, she focuses on the effectiveness of her pedagogical strategies. She specifically addresses her questioning. However, in the second round of analysis, she addresses how with her questioning she should engage AND guide conversations towards the correct conceptualization.
Sequence 2: <i>65 Miles per Hour</i>	<ul style="list-style-type: none"> Lesson 1 Pre-intervention Interview 1 Post-intervention Interview 1 Post-intervention follow-up task 	Samantha tags this sequence as an area of high-quality instruction in both her pre and post-intervention activities. Initially, she comments on her ability to facilitate a conversation engaging multiple students with several different examples. Post-intervention shares similar praise, yet she comments on how this is a good starter conversation for rate of change. She even states "This is what I would call the first stage of understanding rates of change."

EXPERIMENTAL METHODS

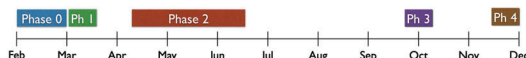
Phase 0: Video data of Samantha's instruction of rate of change and slope.

Phase 1: Samantha's pre-intervention analysis of her teaching videos.

Phase 2: Teaching experiment (9 teaching episodes, 2 initial interviews).

Phase 3: Samantha's post-intervention analysis of her teaching videos.

Phase 4: Series of clinical interviews.



Transcript for Sequence 1

Samantha: So today we're going to be talking a little bit about rates. So what do you think of when you hear the word, "rate"? (Pause)

Student 1: The average cost of a certain item (inaudible).

Samantha: Okay, so per pack of gum you might pay 75 cents? Is that what you're saying?

Student 1: Yeah.

Samantha: (Calls on Student 2, who has his hand up)

Student 2: Someone ranking something from one to ten.

Samantha: Someone ranking something from one to ten. (Pause) Anything else? What other kinds of rates are there?

Student 3: Oh, like movie rates!

Samantha: That may be a rating.

Student 3: A rating?

Samantha: (Calls on another student with his hand up)

Student 4: Maybe if, uh, if something goes up then something else will come down? Maybe like something having to do with prices?

Samantha: So prices? Rates and prices? (Calls on another student)

Student 5: Like discounts and clearance and stuff like that.

Samantha: Like discounts and clearance? Like we see a lot of rates in stores.

Student 6: (Inaudible)

Samantha: Oh like speed! Yeah! Speed is a rate! Speed is a great example of a rate. (Pause) What are the units of speed?

Student 7: Miles per hour.

Transcript for Sequence 2

Samantha: So have you ever heard your parents talk about a speed limit?

Students: Yeah.

Samantha: What does that mean? What is a speed limit?

Student 1: The speed limit I believe is how fast you can go without the cops having to pull you over.

Samantha: Yeah. It's like how fast you can go without being pulled over. So a lot of times, on like on the highway, I think going out of town it's 65 miles per hour? What does 65 miles per hour mean?

(Pause; calls on a student with his hand up)

Student 2: Like if you keep going you'd go like 65 miles per every hour.

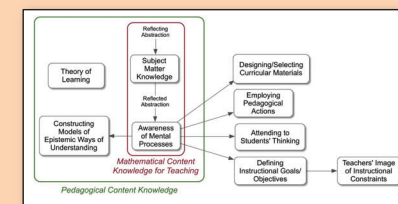
Samantha: Okay. So somebody kind of try to say that maybe just a little bit differently that makes sense. (Calls on a student with her hand up)

Student 3: You're going—you're traveling 65 miles in an hour.

Samantha: Yeah. So for every hour—which is basically what you said, [Student 2], just you worded it really similarly to the question. So every 65 miles that I travel, that's an hour of time, or if I travel for an hour, I've gone 65 miles. Does that make sense?

CONCLUSION

Initially Samantha was assessing her effectiveness in the classroom based on classroom management. However, after doing exercises to strengthen her own understanding of rate of change and to draw awareness to her cognitive processes, Samantha broadened her criteria for effective teaching. Samantha's labels for high quality instruction and room for improvement tended to stay consistent, yet her analysis was more inclusive of pedagogical and mathematical schools of thought. Implementing the practice of reflection can not only improve the logistics of a classroom, but also the learning of students.



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