

SHIFTING TO AUTHENTIC SCIENTIFIC INQUIRY: UNPACKING THREE STORIES OF TEACHER CHANGE

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Entangled constructs related to inquiry science teaching

Mr. S: “And I wanna find the timing and the insight to really do more hands-on inquiry-based- to me, that was the, **that was the energizing part of what we did over the summer,** is that we **integrated hands-on learning with inquiry-based discussion.** And that’s the part that I think **I’d like to move towards?** I’m not there yet. I think it has to do with a lot of planning and/or being **very, very comfortable with, with the material being covered.**”

Affect related to inquiry

Conception of inquiry (here as distinct from hands-on)


(e.g., Blanchard, Southerland, & Granger, 2009; Lotter, Harwood, & Bonner, 2006)

Goal, self-efficacy related to inquiry instruction

(e.g., Basista & Mathews, 2002; Powell-Moman & Brown-Schild, 2011)

Belief about inquiry teaching, science content knowledge

(e.g., Jeanpierre, Oberhauser, & Freeman, 2005; Lee, Hart, Cuevas, & Enders, 2004)



Constructs related to inquiry instruction are often coupled and entangled. Our conceptualization of teacher change attends to such couplings and interactions – what we describe as teachers' shifting *relationship with inquiry science teaching*.

Data context and case selection

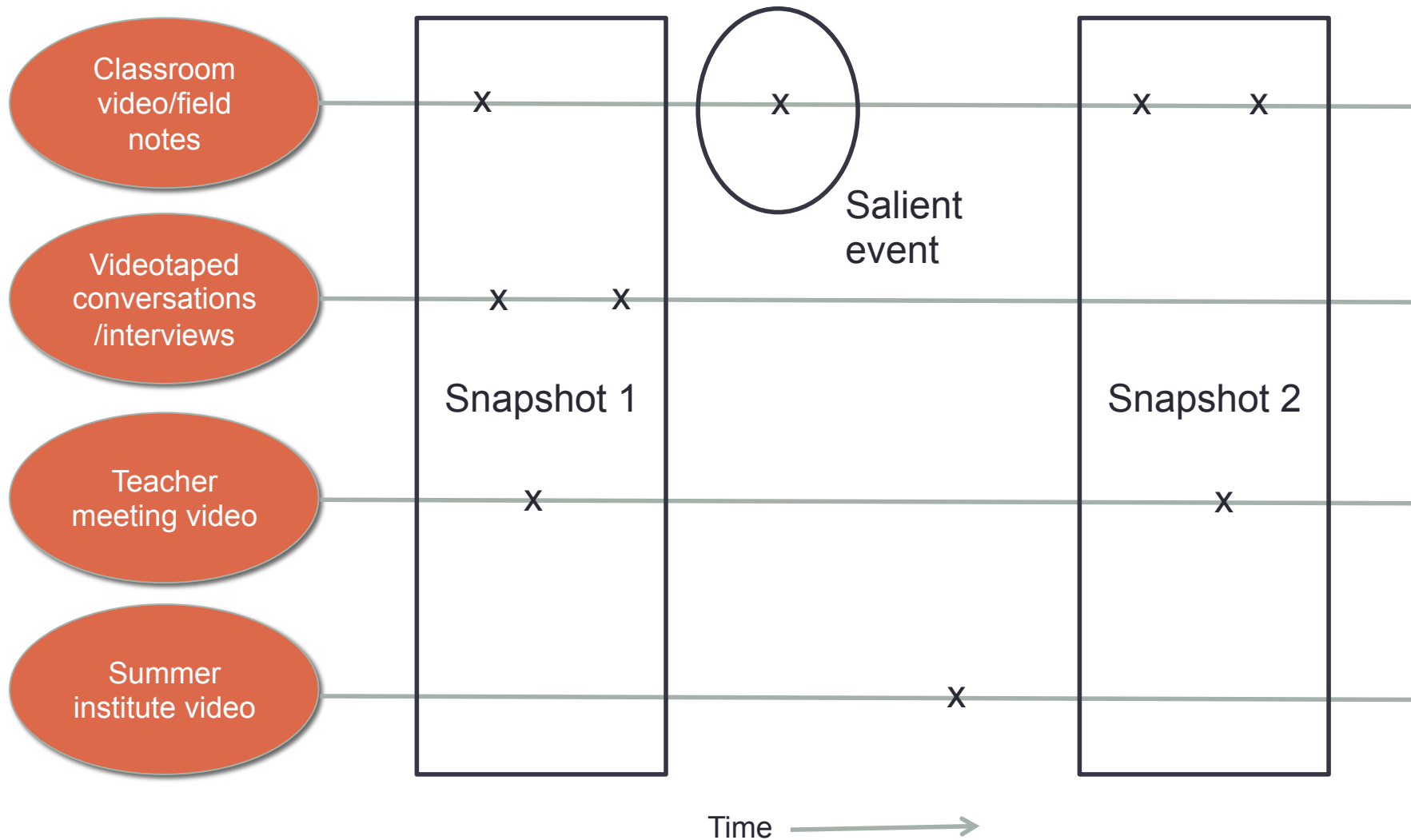
(MSP)² project

- PD aimed at helping 4th-8th grade teachers promote inquiry teaching and learning in science
- Voluntary participation
- 2-week summer institutes, classroom visits, teacher meetings twice/month

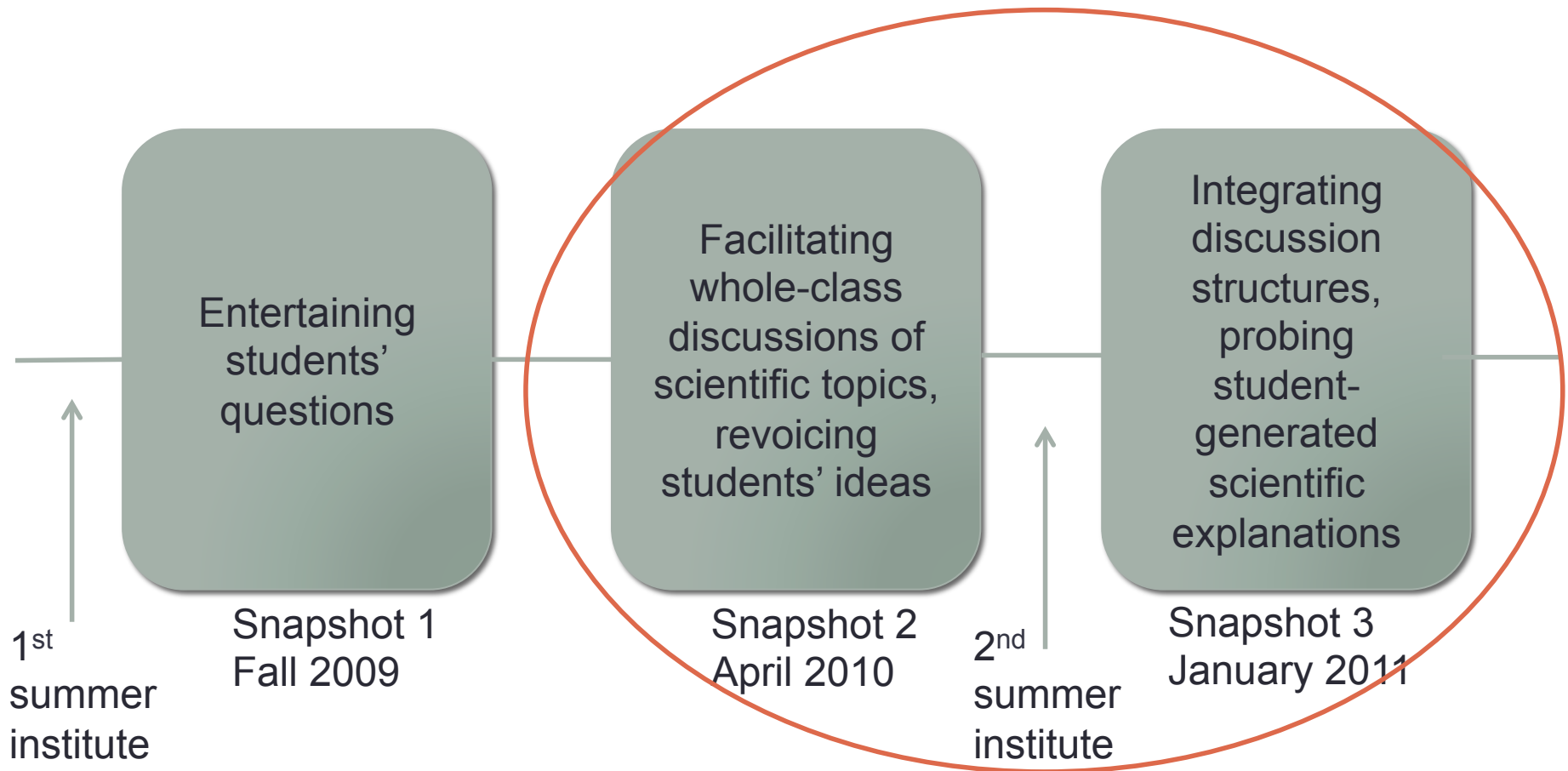
Case selection

- 3 teachers who made significant shifts in their inquiry teaching practices *and* for whom we had sufficient data

Analytical approach



Shifts in Mr. S's inquiry teaching practices



Mr. S: Highlights from Snapshot 2

1. Provided space for students to share ideas (practice)
2. Expressed concerns around classroom management (affect, management)
3. Found it difficult not to know where the conversation was heading (affect)

“I think part of my challenge is – you have this train that’s leaving the station, but you don’t really just know just – the ultimate destination of the train? So to me, that- that’s a challenge, you know?”

Mr. S: Highlights from Snapshot 2

1. Provided space for students to share ideas (practice)
2. Expressed concerns around classroom management (affect, management)
3. Found it difficult not to know where the conversation was heading (affect)
4. Struggled with how inquiry relates to content (affect, conception of inquiry, pedagogy)
5. Noted the participation of students who don't usually speak up, opportunity to demonstrate strengths (student abilities, student engagement)

"I thought there were some kids who normally don't speak who – started to talk, like Martin over here, and there's Nat even... the format, um, allows some kids to, to, um, demonstrate their strengths? That normally wouldn't be able to?"

Mr. S: Highlights from Snapshot 3

1. Had regular “inquiry Mondays,” employed discussion structures and pressed deeper into students’ explanations (pedagogy, practice)

“The fishbowl technique is allowing the group discussion to become more probative. It’s almost like the outside is like a shell of a drill, and then the middle is like the diamond bit, drilling down into the earth... if we had a whole-group discussion, we wouldn’t have gotten so deep so quickly because you have the other people kind of synergistically listening.”

Mr. S: Highlights from Snapshot 3

1. Had regular “inquiry Mondays,” employed discussion structures and pressed deeper into students’ explanations (pedagogy, practice)
2. Expressed concerns around coming up with engaging questions (affect, conception of inquiry, pedagogy)

“My concern now is just to keep the momentum going and being able to come up with questions that are, that are engaging for the kids or at least have enough questions. Ms. R was talking about having several questions in the, kind of in the dugout.”

Mr. S: Highlights from Snapshot 3

1. Had regular “inquiry Mondays,” employed discussion structures and pressed deeper into students’ explanations (pedagogy, practice)
2. Expressed concerns around coming up with engaging questions (affect, conception of inquiry, pedagogy)
3. Saw inquiry as able to stand alone, more comfortable with openness (affect, conception of inquiry)

“This year the inquiry is kind of sitting alone by itself, connected to what happens during the week, but not, not so integrated to it that the inquiry can’t take its own, go in its own direction, you know? Before I had an inquiry, but it was kind of like already tied to an exploration. It was tied to an explanation... this inquiry isn’t tied to anything... so far, there hasn’t been any preset, um, destination.”

Mr. S: Salient events

Positioned himself as someone focused on causal stories and mechanism

- Put forth mechanistic explanations in 2nd summer institute
- Took a public stance on what a “causal story” is, debating another teacher

“See, what I think is that your, from what you just said, mechanism, is what we’ve been talking about as a causal story... it seems like causal story in the summer was a rationale or an explanation of why something is occurring or why the student thinks something is occurring” (Meeting, November 2010).

Teachers' trajectories look different

Ms. L

Reported traditional teaching

Ms. K

Reported pushing students toward answers

Exhilarated by figuring something out for herself

Participation in inquiry in 1st summer institute

Frustrated not to be told answers, but recognized there is *not* always an answer

Focused on students' ideas and participated in inquiry herself

Opened space for students to explore phenomena, did not give answers

Summary and implications

- Teachers' change trajectories are individualized and non-linear (e.g., Clarke & Hollingsworth, 2002).
 - For PD, create a diversity of rich opportunities that can engage teachers in different ways and on different levels, and be attentive and responsive to how teachers experience/interpret them (Remillard & Geist, 2002).
- There are complex interactions among beliefs, knowledge, affect, practice, etc., making it difficult to understand change in terms of one or two of these constructs alone.
- Teachers have a variety of resources for inquiry-based science teaching.
 - Positive affect related to own inquiry experiences (Mr. S, Ms. L)
 - Productive assumptions about students' abilities (Mr. S)

THANK YOU!

For a copy of the paper or other questions, please contact Jennifer Richards at jenrichar@gmail.com.