PRE-SERVICE TEACHERS' NOTICING PRACTICES OF AMBITIOUS INSTRUCTION

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Professional Vision of Teaching

"Socially organized ways of seeing and understanding events that are answerable to the distinctive interests of a particular social group" (Goodwin, 1994, p. 606)

- What do teachers attend to?
- How do they understand what they see?
- How are teachers socialized to see and understand teaching in particular ways?

Developing a Vision of Ambitious Instruction

☐ Student-centered, adaptive approach to instruction (Ball & Cohen, 1999; NCTM, 2014; Robertson et al., 2015)

☐ Lack a conceptual framework of ambitious pedagogy (Grossman et al., 1999; Kennedy, 2016)

☐ Need opportunities to learn to see teaching in new ways (Lampert, 2010; Levin, et al., 2009)

☐ Carefully designed learning environments can support teachers developing new visions of teaching (Lampert et al., 2009; McDonald et al., 2013; Nolen et al., 2011)

Noticing as a Core Construct of Teaching

- What do teachers attend to?

- How do teachers reason about what they observe?

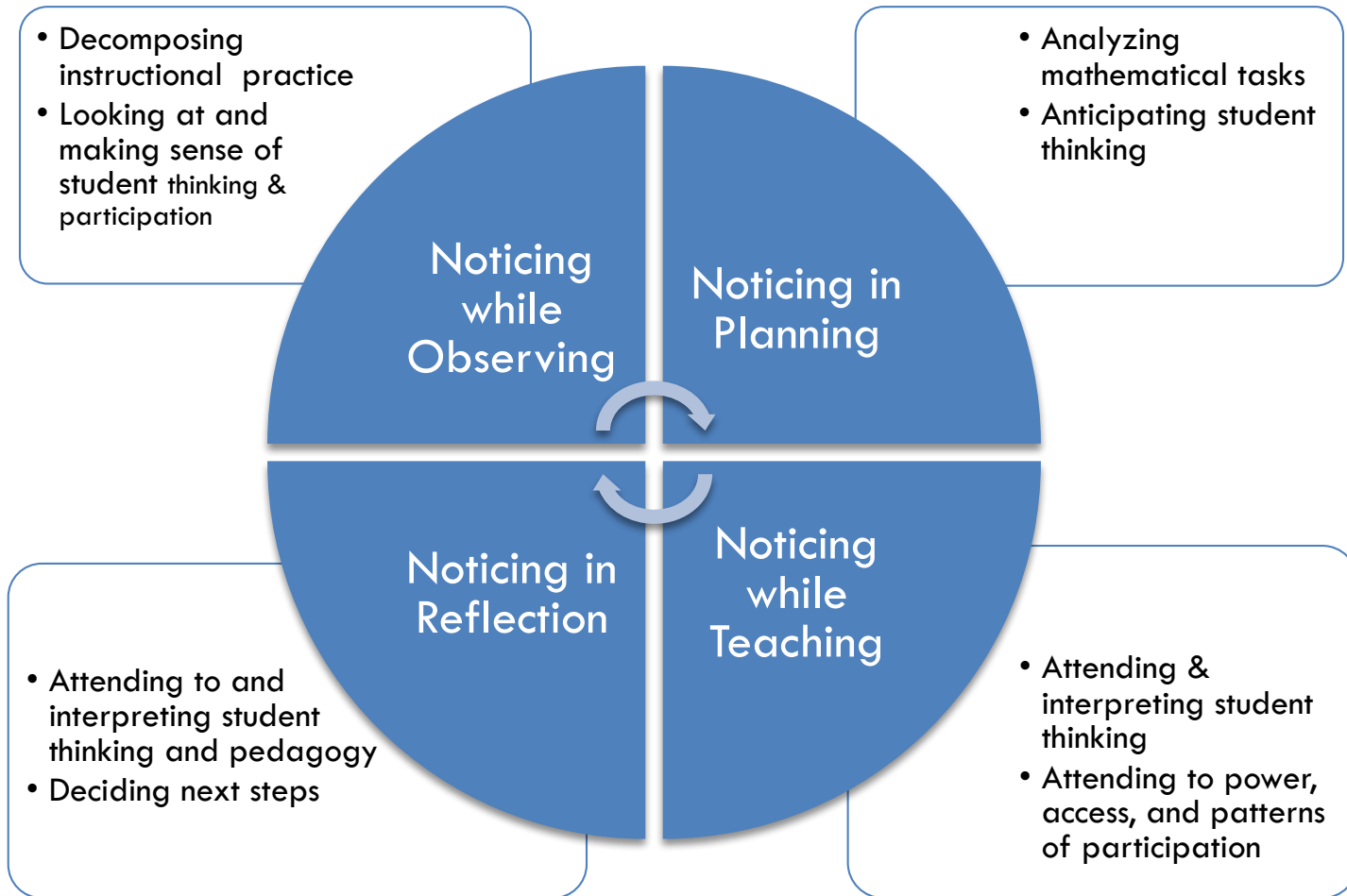# Noticing as a Core Construct of Teaching
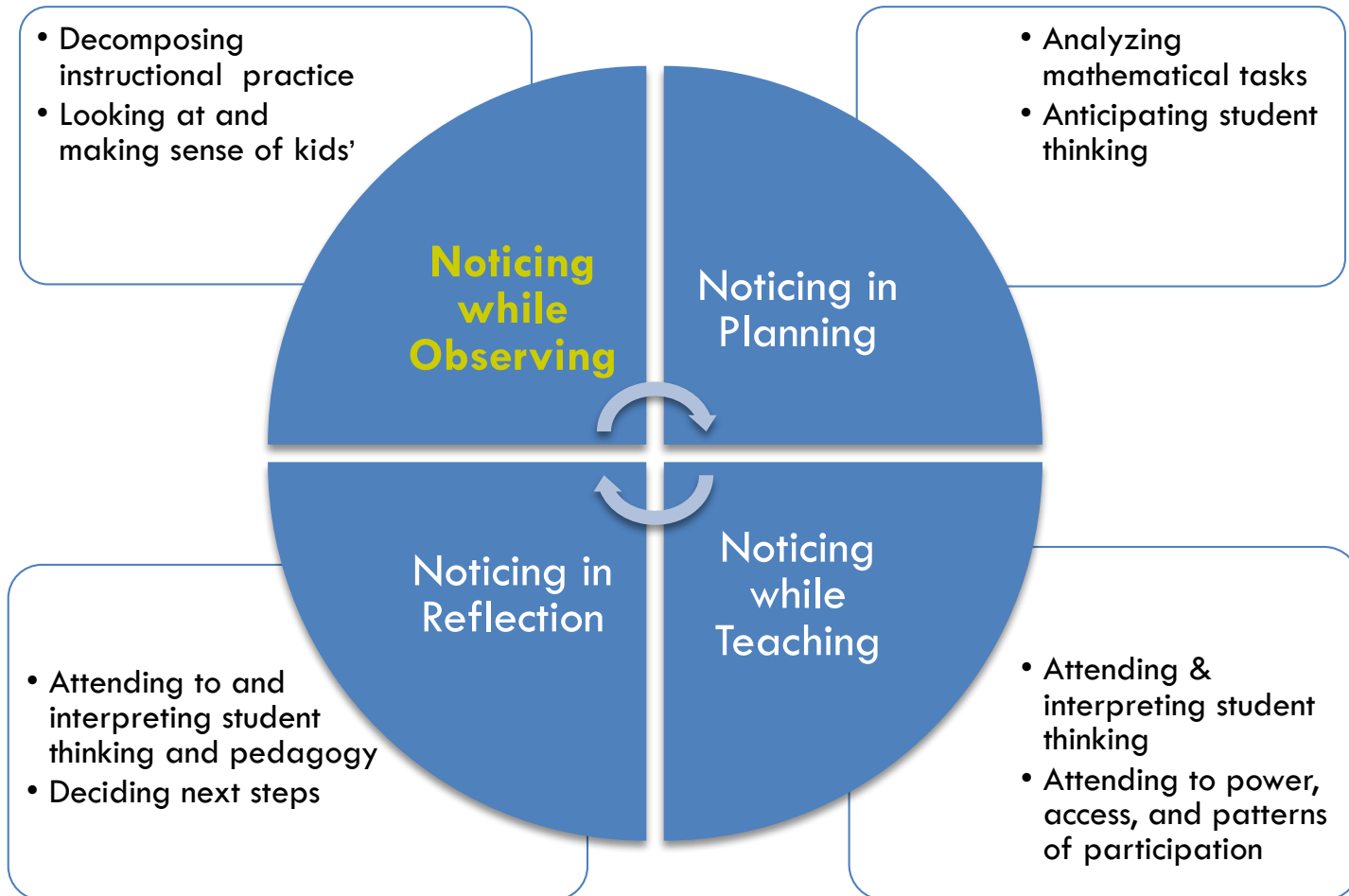
Learning to Notice and *Not* to Notice

- What is important to attend to? How do I make sense of this situation? What does this mean?

- What elements should I not focus on?

Learning to suspend attention is as important as learning to notice

Contexts of Teacher Noticing

- Decomposing instructional practice
- Looking at and making sense of student thinking & participation

- Analyzing mathematical tasks
- Anticipating student thinking

Noticing while Observing

Noticing in Planning

Noticing in Reflection

Noticing while Teaching

- Attending to and interpreting student thinking and pedagogy
- Deciding next steps

- Attending & interpreting student thinking
- Attending to power, access, and patterns of participation

(van Es & Santagata, 2017)

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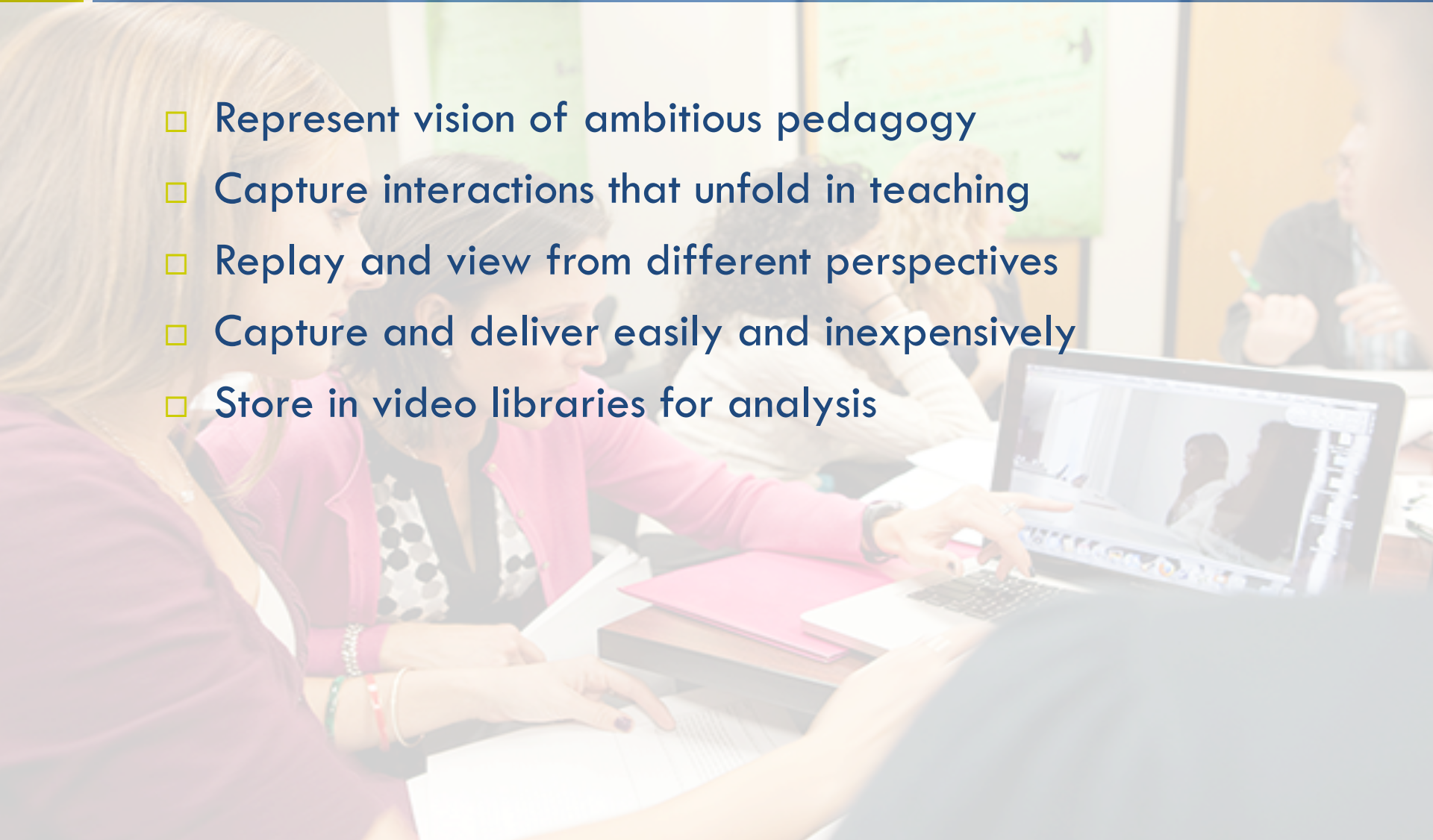
Learning to Learn from Teaching

☐ Noticing and Lesson Analysis

☐ Videos from expert and novice teachers' classrooms

☐ Research-based frameworks for analyzing student thinking and ambitious mathematics teaching

☐ Design, teach, and analyze own teaching practice
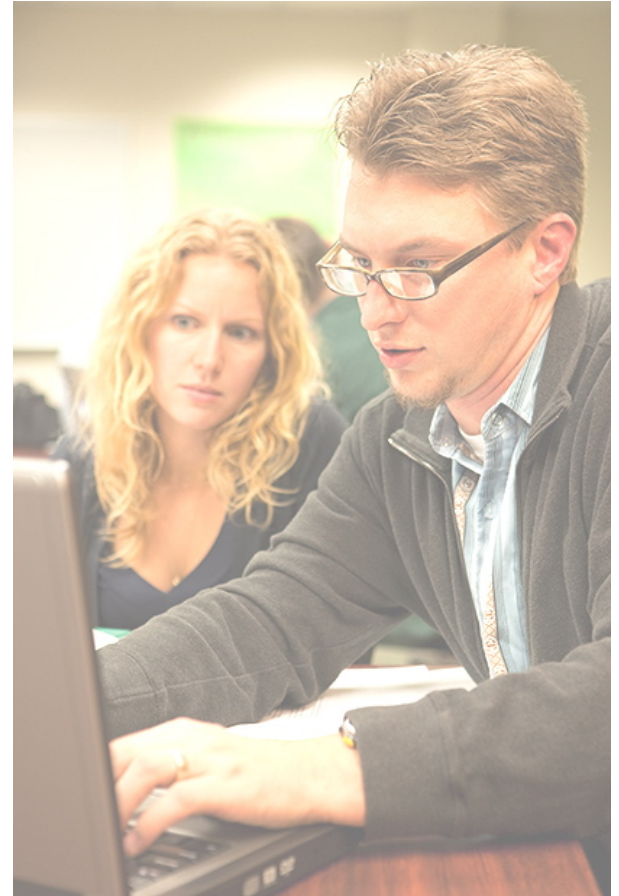
(Santagata & van Es, 2010)

Making the Case for Video

- Represent vision of ambitious pedagogy
- Capture interactions that unfold in teaching
- Replay and view from different perspectives
- Capture and deliver easily and inexpensively
- Store in video libraries for analysis

Learning to Learn from Teaching

Phase 1 – Introduce Frameworks for Noticing Mathematics Instruction	Phase 2 – Describing and Interpreting Observed Events	Phase 3 – Integrating and Elaborating on Observations
Student Thinking	Provide accurate descriptions of observed events	Examine classrooms as dynamic, interactional spaces
Patterns of Participation		
	Reference artifacts as evidence of observations (highlighting points in time)	Elaborate on the details of observed events
Cognitively Demanding Tasks		
Teacher Questioning to Elicit and Student Thinking and Promote Conceptual Understanding	Interrogate the meaning behind observations	Make connections between observed features of instructions
Classroom Discourse		

Research Questions

□ Do secondary mathematics teacher candidates who participated in a video-based teacher credential course, *Learning to Learn from Teaching,* develop new ways of noticing mathematics instruction?

□ What is the nature and development of their noticing practices? And how do their noticing practices develop over time?

Research Design

- 1 cohort of *LLfT* participants (n = 31)
- *LLfT* course offered in fall quarter of 3-quarter credential program
- Data: Pre and Post Video Analysis Task

Clip 1: Continuous and discrete functions; Whole class discussion (Seago, Mumme, & Branca, 2004)

Clip 2: Linear Functions; Comparing cell phone plans in small group discussion (Concord Consortium; *Seeing Math Project*)

What do you notice?

Describe what's going on in the clip.

How did the teaching support student thinking and learning?

Was anything else noteworthy?

Equation for Dial-n-Go

Objects of Noticing: Equation for Dial-N-Go

Student thinking	Dante wants to find the point of intersection and other students focus on finding the slope of the portion of graph that has a rate of change When students test the slope and interpret in the context of the graph, they recognize the y-intercept is incorrect
Mathematical focus and task	Non-algorithmic thinking and reasoning; promotes struggle Analysis of the task and cognitive effort because of its unpredictable.
Pedagogies for Making Thinking Visible	Teacher uses a range of questions to elicit thinking; to generate discussion; and to link and apply what students do mathematically to interpret the graphs within the broader context of the problem.
Classroom Discourse	Students are the source of ideas and act as questioners Teacher asks questions to place responsibility for learning in students' hands

Data Analysis: Phase 1

- Analyze shifts in noticing by cohort
  Coding scheme informed by research on noticing and lesson analysis (Davis, 2006; Santagata et al., 2007; Sherin & Han, 2004; Star & Strickland, 2007; van Es & Sherin, 2002, 2008; van Es, 2010)

	What Notice	How Notice
Level 0	Little or no attention to features of ambitious instruction	Overly simplistic observation, with few links between observed events
↓	↓	↓
Level 2	Detailed and inferential analyses of features of ambitious instruction	Focused, specific observations, linking observed events

Changes in Pre-Service Teachers' Noticing

		Pre Video Analysis Task			Post Video Analysis Task		
		L0	L1	L2	L0	L1	L2
What notice	Mathematical Content & Learning Goal	19	11	1	3	15	13
	Student Thinking	21	10	0	3	17	11
	Pedagogies for Making Thinking Visible	3	26	2	1	12	18
	Classroom Discourse Norms	11	20	0	1	19	11
How notice	Specificity	21	10	0	2	11	17
	Making Connections	21	8	2	8	15	8

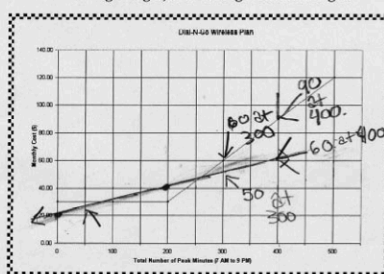(all changes significant at 0.05 level)

Nida's Clip 2 Pre Analysis
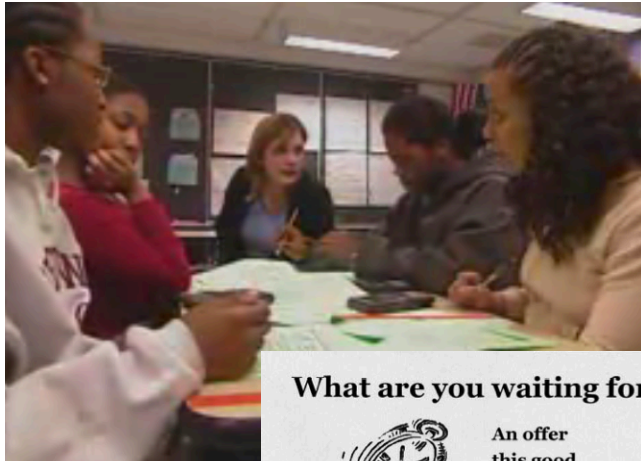
What are you waiting for?
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* Night minutes begin at 9 PM and end at 7 AM. Peak minutes are from 7 AM to 9 PM.

Just GO! ™

The clip is about a small group with a teacher discussing a problem. The students have some graph and they are discussing the graph together. The teacher did not explain much. She only asks guiding questions. Students are very comfortable talking and discussing their thinking about the problem. They are able to discuss and explain. They can also analyze the graph to support their ideas. This way of teaching creates a good environment for students to talk about the math, explain themselves, and understand the problem.

Nida's Clip 2 Post Analysis

Students are working in a small group of four with the teacher. They are working on graphing a linear equation. A student starts the discussion with a question… One of them gives some reasons why the graph looks the way it looks. They discuss the growth of the graph, after every hundred minutes, "it goes up thirty dollars." The teacher keeps asking questions to make students think about slope and y-intercept. She uses a student's incomplete work to give some hint to the whole group. Students have a problem finding the slope. They use the graph and point to the graphs to explain their ideas…. The teacher does not answer students' questions directly. She asks questions to make students think about the problem and allows them time to work. This helps scaffold students' thinking and helps them be more independent.

Noticing Mathematics Content

*Students are working in a small group of four with the teacher. They are working on **graphing a linear equation**. A student starts the discussion with a question… One of them gives some reasons why the graph looks the way it looks. They discuss the **growth of the graph**, after every hundred minutes, "it goes up thirty dollars." The teacher keeps asking questions to make students think about **slope and y-intercept**. She uses a student's incomplete work to give some hint to the whole group. Students have a problem **finding the slope**. They use the graph and point to the graphs to explain their ideas…. The teacher does not answer students' questions directly. She asks questions to make students think about the problem and allows them time to work. This helps scaffold students' thinking and helps them be more independent.*

Noticing Student Thinking & Discourse

Students are working in a small group of four with the teacher. They are working on graphing a linear equation. A student starts the discussion with a question… One of them gives some reasons why the graph looks the way it looks. They discuss the growth of the graph, after every hundred minutes, "it goes up thirty dollars." The teacher keeps asking questions to make students think about slope and y-intercept. She uses a student's incomplete work to give some hint to the whole group. Students have a problem finding the slope. They use the graph and point to the graphs to explain their ideas…. The teacher does not answer students' questions directly. She asks questions to make students think about the problem and allows them time to work. This helps scaffold students' thinking and helps them be more independent.

Noticing Teaching for Visible Thinking

Students are working in a small group of four with the teacher. They are working on graphing a linear equation. A student starts the discussion with a question… One of them gives some reasons why the graph looks the way it looks. They discuss the growth of the graph, after every hundred minutes, "it goes up thirty dollars." **The teacher keeps asking questions to make students think about slope and y-intercept. She uses a student's incomplete work to give some hint to the whole group**. *Students have a problem finding the slope. They use the graph and point to the graphs to explain their ideas….* **The teacher does not answer students' questions directly. She asks questions to make students think about the problem and allows them time to work**. *This helps scaffold students' thinking and helps them be more independent.*

Learning to Notice Ambitious Pedagogy

☐ Pre-service courses can help candidates develop their noticing skills

☐ **Do they all develop in the same ways?**

☐ **What is the variation in their noticing over time?**

| Phase 1 – Introduce Frameworks for Noticing Mathematics Instruction | Phase 2 – Describing and Interpreting Observed Events | Phase 3 – Integrating and Elaborating on Observations |

Data Analysis: Phase 2

- Generate a framework to characterize noticing practices
  - Returned to each case and analyzed analytic memos to gain insight in to variations among the 31 candidates' noticing
  - Examined practices they seemed to employ to notice (Erickson, 2011; Kersting, 2009, Mason, 2011, McDonald et al., 2013)

- Analyze variation in shifts in noticing over time
  - Do candidates shift differently from the beginning to the end of the course?
  - Are there some practices that support particular forms of noticing?

Framework of Noticing Practices

Attending to Features of Instruction	*Using Generic Frames to Observe Instruction*	Providing simplified observations and evaluations guided by generic frames of effective teaching
	Using Framework Terminology	Using the framework of ambitious mathematics instruction promoted in the course to identify events and interactions that stood out to them.
Elaborating on Observations	*Providing Detailed Descriptions*	Describing in detail observed events without a clear vision of instruction guiding observations
	Exploring Details of Ambitious Instruction	Using the framework of ambitious teaching to highlight features of instruction, with greater focus on the details of observed phenomena.
Integrating Observations to Reason about Instruction	*Blending Visions of Teaching to Analyze Instruction*	Drawing on different frameworks of instruction to inform observations of instruction; providing detailed and interpretive analysis of observed events.
	Using a Vision of Ambitious Teaching to Systematically Analyze Instruction	Using frameworks from the course to identify and interpret particular features of classroom interactions and making connections between the features they observed in systematic ways.

(van Es, Cashen, Barnhart, & Auger, 2017)

Variation in Developing Noticing Practices

Pre Video Analysis Task	Post Video Analysis Task
Using Generic Frames	Using Generic Frames
	Using Framework Terminology
	Providing Detailed Description
	Exploring Details of Ambitious Pedagogy
	Blending Visions of Instruction
Providing Detailed Description	Exploring Details of Ambitious Pedagogy
	Blending Visions of Instruction
Blending Visions of Instruction	Using Vision of Ambitious Instruction

Early Noticing Practice: Generic Frames

Pre Video Analysis Task	Post Video Analysis Task
Using Generic Frames	Using Generic Frames
	Using Framework Terminology
	Providing Detailed Description
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	Blending Visions of Instruction
Providing Detailed Description	Exploring Details of Ambitious Pedagogy
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Blending Visions of Instruction	Using Vision of Ambitious Instruction

Generic Observations

The classroom is nicely decorated with posters. Good classroom set up. The teacher can walk through the aisles easily. There's a pi poster in front of the class. Students are trying to figure out an equation to the pattern and generalize it. Teacher asks questions that can allow students to determine the pattern. Good classroom atmosphere. Students volunteer answers. (Evey)

Developing Practices in Attending

Pre Video Analysis Task	Post Video Analysis Task
Using Generic Frames	Using Generic Frames
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	Providing Detailed Description
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Providing Detailed Description	Exploring Details of Ambitious Pedagogy
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Using Framework Terminology

- "It is clear **student thinking** is taking place because the students are working together while the teacher asks questions."

- "Students explain and discuss with each other. **Students** were able to demonstrate their own **thinking**."

- Although the clip was short, we can still see **student thinking** happening.

Developing Practices in Elaborating

Pre Video Analysis Task	Post Video Analysis Task
Using Generic Frames	Using Generic Frames
	Using Framework Terminology
	Providing Detailed Description
	Exploring Details of Ambitious Pedagogy
	Blending Visions of Instruction
Providing Detailed Description	Exploring Details of Ambitious Pedagogy
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Blending Visions of Instruction	Using Vision of Ambitious Instruction

Providing Detailed Descriptions

The teacher asks questions to the group ("do you agree with that?") to answer student questions ("how can you find the slope of the line?... look at your paper"); Teacher asked questions that related the problem to the real-world situation ("so what could you tell your customer?");'"What do you notice about the line?'"

Developing Practices in Elaborating

Pre Video Analysis Task	Post Video Analysis Task
Using Generic Frames	Using Generic Frames
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Elaborating Details of Ambitious Pedagogy

- **Task**: Find out which is best wireless plan. How can you find the slope of the line?

- **Student Thinking**: Were trying to find the intercept/ no were trying to find the slope; Every hundred minutes goes up by $30; Where do they get the numbers from?

- **Questioning**: Can you repeat what you just said? What different ways can you use to find the slope?

- **Class talk**: Ideas come from the students; share ideas and respond to each others' concerns

Variation in Developing Noticing Practices

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Blending Visions

- "Math-talk community Level 3; students share ideas and strategies and explain what they know and say if they agree or disagree; Teacher asks questions to require students to check understanding and reasoning and to help them make sense of the question; task requires conceptual understanding"

- "What does the teacher do when students throw down the pencil and lose interest? What happens when students don't like to put effort into solving problems?"

Elaborating Guided by Framework of Ambitious Pedagogy

Pre Video Analysis Task	Post Video Analysis Task
Using Generic Frames	Using Generic Frames
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Elaborating Guided by Framework of Ambitious Pedagogy

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Systematically Analyzing with an Ambitious Pedagogy Frame

"Someone from this group" – teacher asks for participation

"Show us how you got it" – teacher asks to explain

"How many agree with…" – informally assess student thinking

The teacher asks students to share their work and asks for students to articular their thinking… references what student do ("what Irma said"). Rather than focus on the right answer or one correct procedure, the teacher continues to solicit different ideas – explicitly asks for "someone to explain in a different way" and does not attach judgments. The teacher creates a discourse where students can share their ideas without having them validated by the teacher as right or wrong.

Future Questions

- What are variations in the visions of teaching candidates develop through their participation in different contexts and how does that influence their noticing practice?

- What are similarities and differences in noticing practices when noticing in different contexts of the work of teaching (i.e., observing, planning, teaching, and reflecting)?

- What aspects of the course need to be redesigned to cultivate more robust forms of noticing?

Making Productive Use of Video

The central goals of preservice education

Deciding learning goal of a lesson

Theory of preservice teacher learning:
- How and under which conditions do preservice teachers likely make a progress toward the desired learning goals?

Informed by   attending to & addressing

Learning ecology & problems of practice:
- Who are the preservice teachers, and where are they in their learning trajectories?
- When, where, and with whom do the learning activities take place?
- What are affordances and constraints of the setting in the moment?

Designing a system of video-embedded activities

| Selecting video clips | ➡ | Before viewing | ➡ | During viewing | ➡ | After viewing |

- What is the appropriate grainsize of the video to be viewed?
- Whose clip should be viewed?
- Is the quality of the video (i.e., what is captured) good enough and appropriate?

- **Defining tasks**: What are preservice teachers asked to do and in what ways before, during, and after viewing the video?
- **Selecting tools**: What tools or scaffolds (e.g., protocol, framework) should be provided to support preservice teachers to have high quality interactions while completing the task?
- **Orchestrating discussions**: How to facilitate post-viewing conversation to support noticing and systematic analysis of teaching and learning?

(Kang & van Es, under review)

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