



# Using tools to promote novice teacher noticing of science teaching practices in post-rehearsal discussions



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## HIGHLIGHTS

- Examines how post-rehearsal discussions promoted novice teacher noticing.
- Ambitious teaching practices and student misconceptions served as tools to foster noticing.
- Role-playing misconceptions in rehearsals provided novices with access to student thinking.
- Novices used a shared language to develop similar interpretations of problems of practice.

## ARTICLE INFO

### Article history:

Received 27 April 2015

Received in revised form

5 May 2016

Accepted 16 May 2016

### Keywords:

Teacher education  
Preservice teachers  
Science education  
Methods courses

## ABSTRACT

This study explores the potential of tool-supported post-rehearsal discussions in helping novice teachers learn to notice and interpret critical features of science teaching. Three tools are examined: a framework of science teaching practices, information about student misconceptions and scientific practice challenges, and a feedback form. Data were collected from 48 post-rehearsal discussions with 16 novices in four teams in a science methods course. The findings suggest the tools guided novices to collectively identify, interpret, and share insights to respond to critical issues of science teaching and learning related to using the science teaching practices to support student learning.

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## 1. Introduction and theoretical framework

Preservice teachers spend a substantial amount of time observing their own and others' instruction in teacher preparation programs. Teacher educators may ask novice teachers to study a videotaped lesson, watch a cooperating teacher, or reflect on their own practice. In fact, observations are so common that teacher educators may rarely question if novice teachers are learning from these experiences (Star & Strickland, 2008). Despite the importance of observations in teacher education programs, we know little about what novices attend to and how they make sense of what they observe (Brophy, 2004). We do know that expert teachers and novice teachers notice instruction in different ways (Berliner et al., 1988). Expert teachers focus on important aspects of classroom practice such as instructional practices, student thinking, and content. Novices may not know what to attend to, or how to

interpret what they see, given the complex environments of classrooms (Dewey, 1904; Feiman-Nemser & Buchmann, 1985). Mason (2011) emphasizes that in order to learn from our experiences, "we must withdraw from action and reflect on or reconstruct that action and its effects" (p. 41). In response to this concern, scholars argue that helping novice teachers learn to notice and analyze instruction should be a focus of teacher education courses (Sherin & van Es, 2005; Talanquer, Tomanek, & Novodvorsky, 2013). A group of teacher educators are beginning to investigate how rehearsals, in the context of methods courses, can provide a setting in which novice teachers and teacher educators use the novice's own teaching performance to promote the collaborative examination of complex teaching practices (Grossman et al., 2009; Lampert et al., 2013). Shared frameworks, comprised of ambitious teaching practices and principles, guide the rehearsal enactments and post-rehearsal discussions (Lampert & Graziani, 2009). Scholars have found that similar frames of reference—shared practices, principles, and terms—can serve as tools to simplify the complexity of teachers' work, emphasize what is important to notice, and guide

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interpretations (Horn & Little, 2010). This study explores the potential of tool-supported rehearsal enactments and post-rehearsal discussions to engage novice teachers in opportunities to learn to notice and interpret critical features of science instruction. Specifically, this study asks: To what extent and in what ways might tools help novice teachers notice critical features of science teaching in post-rehearsal discussions?

### 1.1. Learning to notice

A significant body of research emphasizes that noticing is an important skill for teachers to develop. Teachers need to learn to notice because experts notice and interpret their work in particular ways. Expertise research has found that experts focus on substantive issues and patterns, compared to novices who may only attend to superficial aspects (Chi, Feltovich, & Glaser, 1981). In addition, experts consider specific situations in terms of the concepts and principles that they represent (Larkin & Simon, 1987). Expertise research suggests that as individuals gain more experience they become more skilled at making sense of situations (Chi, Glaser, & Farr, 1988). Expert teachers have been found to alter their teaching based on noticing and interpreting important features of classroom interactions (Berliner, 1994). Building on the ideas developed around expertise, scholars argue that in the work of teaching, noticing critical features of practice involves three aspects: (a) identifying what is important in a classroom interaction; (b) interpreting the meaning of the interactions; and (c) deciding how to respond on the basis of the analysis of the observations (Hiebert, Morris, Berk, & Jansen, 2007; Jacobs, Lamb, Philipp, & Schappelle, 2011; Santagata, Zannoni, & Stigler, 2007; van Es & Sherin, 2002).

Recent reforms in science and mathematics education also stress the importance of teachers noticing their students' thinking and adapting their instruction to student contributions (AAAS, 1993; National Council of Teachers of Mathematics [NCTM], 2000; NGSS Lead States, 2013). A variety of studies have shown that noticing the relationships between instruction and learning may foster student learning (Carpenter, Fennema, & Franke, 1996; Wilson & Berne, 1999). Rodgers (2002) argues that teachers need to slow their instruction and pay attention to students' sense-making. Ball and Cohen (1999) add that teachers need to listen to and understand children's ideas about content. Similarly, Rosaen, Lundeberg, Cooper, Fritzen, and Terpstra (2008) emphasize that teachers need to develop an "analytic mind set," where they have knowledge of how to see and understand their instruction in nuanced ways.

While individuals observe things every day, teacher noticing is different. Teachers must focus on critical aspects of instruction, including reform-based pedagogy, content, and student thinking. However, studies suggest that even experienced teachers may need to learn to focus their attention on new aspects of their teaching practice. For example, in the midst of instruction, they may need to learn to be present to student thinking rather than focus on "covering" the material (Rodgers, 2002; Smith, 1996). Ball (2011) points out that what teachers naturally attend to may not be relevant or critical to the work of teaching. For instance, teachers may focus more on issues of classroom management or procedures, rather than the nuanced details of their students' ideas (Sherin & Han, 2004; Star & Strickland, 2008). Teachers may also pay more attention to their actions in a lesson, rather than to what their students are doing or saying (Davis, Petish, & Smithey, 2006). When teachers do attend to students, they may notice their behaviors rather than their learning (Rosaen et al., 2008). Teachers may understand that attending to students' ideas is important (Peterson & Treagust, 1998), but mainly focus on student interest and equate

engagement in hands-on activities with learning (Zemal-Saul, Blumenfeld, & Krajcik, 2000). As Rodgers (2002) asserts, "The ability to 'see' the world, to be present to it and all its complexities, does not come naturally, but must be learned" (p. 230).

### 1.2. Learning a new discourse is central to noticing

Learning a new discourse for discussing teaching is also important in learning to notice. Nemirovsky, DiMattia, Ribeiro, and Lara-Meloy (2005) found that teachers engaged in two forms of discourse when talking about case studies of classrooms episodes. The first type of discourse occurred as teachers aimed to provide a narrative and sequential account of the lesson events based on the available evidence. The second type of discourse focused on assessing the teaching episode in light of the teachers' beliefs of good teaching practices. Researchers have begun to argue that noticing instruction involves a third mode of discourse. van Es (2011) characterizes this discourse as "more interpretative in nature, in which the teacher's goal is to make sense of student thinking and use evidence from practice to reason through important teaching and learning issues" (p. 135). This discourse occurs as teachers collectively analyze their practice, listen to and share multiple perspectives, and develop common interpretations of teaching challenges (Rodgers, 2002). Borko, Jacobs, Eiteljorg, and Pittman (2008) found that when teachers engaged in productive mathematical discourse, they "talked in a focused, in-depth, and analytical manner about specific issues related to teaching and learning" (p. 432). Here, teachers questioned their instruction, pressed colleagues to explain their thinking, and used evidence to inform their analyses.

To illustrate, Horn and Little (2010) examined the discussions of two teacher work groups over a 2-year period and found that the use of shared frameworks and language enhanced or limited opportunities for teacher learning. The two teacher groups differed according to the ways they "made use of shared frames of reference—shared concepts, principles, and terminology—to structure their talk, justify their decisions, and guide their interpretations of classroom-based problems of practice" (Horn & Little, 2010, p. 209). The first group, the Algebra Group, developed common frameworks to guide how the group collectively grappled with and managed teaching difficulties. The teachers treated teaching difficulties as a natural aspect of the work, and asked one another questions to elaborate issues and to connect specific teaching challenges to broader problems and principles of teaching. The second group, the Academic Literacy Group lacked a shared language and frame of reference for describing and analyzing problems of practice, so individual opinions directed the group's sensemaking. Rather than acknowledge the complexity of practice, these teachers turned the group's attention away from teaching difficulties as they expressed sympathy or offered advice, moves that attributed the problem to the chaos of teaching or to an individual. A variety of studies have shown that it may be difficult for teachers to talk about one another's practice. They may be reluctant to critically examine the instruction (Rosenholtz, 1989), so they may promote a conversation that is friendly and agreeable (Levine & Marcus, 2007). Additionally, teachers may minimize the complexity of teaching and learning to suppress any conflict (Horn & Little, 2010), or offer advice without first examining the issue from multiple angles (Rodgers, 2002).

### 1.3. Promoting novice teacher noticing

Literature on learning from experience highlights the complexity of helping novice teachers learn to notice. Teacher educators may assume that novices will learn from their observations,

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