

Theorizing and Modeling Teachers' Knowledge of Noticing

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Abstract: Efforts to improve science education offer a vision of science teaching requiring teachers to notice the productive resources in students' thinking and allow these resources to drive learning. However, we do not yet understand the complex teacher knowledge involved in the practice of teacher noticing. This research reports on in-progress theory-building work and presents a conceptual model of teachers' *knowledge of noticing*—a special kind of teacher knowledge that matters for science teaching.

Overview

Efforts to improve science education emphasize that an important shift needs to take place in what teachers attend to in the science classroom—shifting attention away from content as a body of correct information and towards content as disciplinary ideas and reasoning (Coffey et al., 2011). Teachers “need to understand what initial ideas students bring to school and how they best may develop an understanding” (p. 256) of phenomena in the world (NRC, 2012). This requires teachers to continuously notice the substance in students' thinking and allow this substance to drive students' learning. However, while the field supports this shift in what teachers attend to, it does not yet understand the complex teacher knowledge involved in the practice of teacher noticing, and therefore it does not know the true extent of making this practice learnable (Grossman et al., 2009; Sherin et al., 2011). As such, this research decomposes the practice of noticing by unpacking the knowledge pieces elementary teachers draw on when noticing students' thinking across the work of teaching science (in lesson planning, in teaching, and in assessing learning). Specifically, this research reports on in-progress theory-building work and offers up for scholarly discussion a conceptual model of teachers' *knowledge of noticing*.

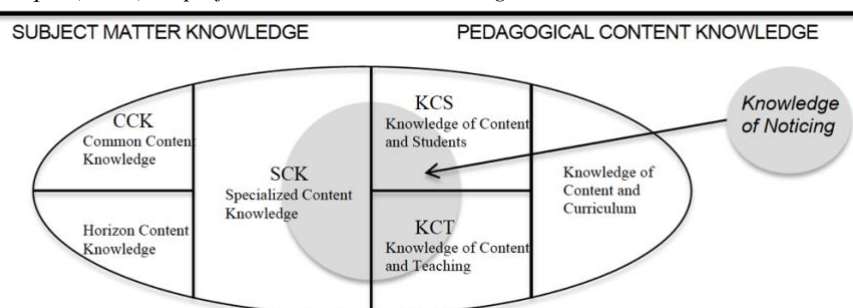
Motivation for theorizing teachers' *knowledge of noticing*

There has been limited research examining what within students' thinking teachers notice (i.e., the productive pieces within a students' idea) and the teacher knowledge base noticing draws on. It seems this is an important missing piece in research on teacher noticing, one that requires us to unpack the knowledge involved in this practice. Discussing teacher noticing as a process absent its knowledge base limits its usefulness as a construct in understanding teacher practice. As such, we need a practice-based theory (Ball & Bass, 2003) of teachers' *knowledge of noticing* for the purposes of making the practice of noticing the disciplinary substance in students' thinking both learnable (Grossman et al., 2009; Sherin et al., 2011) and useful to teachers in ways that support authentic disciplinary learning for their students.

Building a conceptual model of teachers' *knowledge of noticing*

Figure 1

Conceptual model showing where teachers' knowledge of noticing lies on Ball, Thames, and Phelps's (2008) map of teacher content knowledge



An investigation of elementary teachers' noticing practice across the work of teaching science provides the empirical basis for developing a conceptual model of teachers' *knowledge of noticing*. I have identified the teacher knowledge pieces evident in the empirical data and have mapped those pieces onto Ball and colleagues' (2008) model of content knowledge for teaching (Figure 1). As a result of this mapping, a *knowledge of noticing*

model has begun to emerge. For example, the shaded area on Figure 1 shows where the knowledge pieces identified from the empirical investigation mostly populated on the map of teacher content knowledge. From this initial representation, a picture of teachers' *knowledge of noticing* presents itself as an amalgamation of Ball and colleagues' specialized content knowledge (SCK), knowledge of content and students (KCS), and knowledge of content and teaching (KCT). (Table 1 lists and briefly describes these three categories of knowledge applied to the domain of science teaching.) Also emerging from this representation is the idea that teachers' knowledge in use while engaged in noticing is more than a grouping of these three types of knowledge. It seems to involve a special category of teacher knowledge active at the junctures of these domains—what I have named teachers' *knowledge of noticing*. This theory building work is on-going and further analysis of teacher noticing data will test whether this new category of teacher knowledge is indeed unique.

Table 1

Three domains of content knowledge for teaching (Ball et al., 2008) adapted to reflect science teacher knowledge

SCK: scientific knowledge and skill unique to teaching; disciplinary knowledge “not typically needed for purposes other than teaching” and “in its decompressed or unpacked form” (p. 400).
KCS: knowledge that combines knowing about students and knowing about science; knowledge that involves “specific [disciplinary] understanding” interacting with “familiarity with students and their disciplinary thinking” (p. 401).
KCT: knowledge that combines knowing about teaching and knowing about science; knowledge that involves “specific [disciplinary] understanding” interacting with “an understanding of pedagogical issues that affect student learning” (p. 401).

Potential contribution

Two reasons further motivate the model building work of this research, one theoretical and the other practical. First theoretically, as Schulman (1986), Schoenfeld (2008) and other scholars have argued, a model of teaching has explanatory power for understanding what drives teaching practice. Second, a model of teachers' knowledge can be leveraged in teachers' learning. This model building work is in service to both contributing to our theoretical understanding of teachers' knowledge in use surrounding their noticing practice and to informing teacher learning and knowledge construction around this practice. The research presented will report on the progress of this theory-building work and offer up for scholarly discussion a conceptual model of elementary teachers' *knowledge of noticing* the disciplinary substance in students' thinking.

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