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FRAMING ELEMENTARY SCHOOL TEACHERS' CONSIDERATIONS WHEN ENGAGING WITH THEIR OWN STUDENT WRITTEN WORK

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Professional development (PD) is widely used to aid teacher development and improve student learning outcomes. In PD, skilled facilitators use research-based frameworks to support and provide a lens for teachers' engagement with artifacts of practices (e.g., student written work). However, often what is unaccounted for in PD design is the use of teachers' insider knowledge of their students. This study explored considerations that arose when teachers engaged with written work from their classes outside PD. Results identify the range and prevalence of considerations used in teachers' conversations. Also discussed are implications for professional developers and those who support teacher learning through the analysis of written work.

Keywords: professional development, frames, student written work, elementary school teachers

Professional development (PD) is widely used to support teacher development and improve learning outcomes. In PD, the complex work of teaching is decomposed into manageable parts, and teacher learning is often supported through engagement with artifacts of practices (e.g., student written work) led by experienced facilitators (Kazemi & Franke, 2004). In addition, the use of research-based frameworks (Carpenter, Fennema, Franke, Levi, & Empson, 2014) and protocols of instruction (Krebs, 2005; Little, 2003) provides a lens to support teachers' engagement with classroom artifacts in PD with the intent that the same lens is used in their classrooms. However, what is often unaccounted for in most PD is the potential role of teachers' insider knowledge of their children and the influence of their engagement with artifacts of practice.

Take for example the task of examining written work, which is a prevalent activity inside and outside PD. In PD, teachers are asked to bring in samples of written work from their own class as they utilize research-based frameworks to understand their children's thinking. Facilitators and collaborative groups play a role in co-constructing what to consider as teachers engage with their written work with the hope those considerations will remain the same once teachers leave the PD. Outside of PD, teachers engage with written work individually in their classrooms and sometimes collaboratively with their peers (e.g., within grade level meetings). When teachers are in their classrooms, engaging with written work is typically constructed by the individual teacher's insider knowledge of their children and is guided by the need to make decisions in the moment or in preparation for the next day. Considerations are influenced by goals set for each child, the class as a whole, or curricular expectations. When teachers work collaboratively with their peers, considerations for engaging in the written work are driven by school-level expectations, standards, accountability, and curriculum (Little, 2003). In collaborative settings, the goal of analyzing the written work is often not closely linked to the teachers' individual child but related to understanding classroom performance, more generally. The different settings in which teachers examine written work—in PD contexts, teachers' individual classrooms, or school-based teacher groups—position written work differently, and teachers draw upon different relationships in their analyses. These differences highlight the use of teachers' knowledge and beliefs but also the context of teaching should be considered when trying to understand teachers' engagement (Webel & Platt, 2015).

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Conceptual Framework

In this study, I chose to think about teachers' considerations as "frames" to look beyond what teachers say as they work with written work, and instead focus on the nature of the engagement. Framing or frame analysis was theorized by sociologist Erving Goffman to explain how individuals structure information for sense-making. Goffman (1974) argued that we all actively classify, organize, and interpret our life experiences to make sense of them by filtering relevant information and discarding what is not needed depending on the situation. Individuals, whether aware or unaware, construct frames on a day to day basis to make sense of the world around them. I argue framing is a broad construct that includes knowledge, beliefs, dispositions, and experiences. In the case of engaging with written work, the frames used by the PD facilitator, the individual teacher, or grade level teams could shape individual teachers' engagement. For example, in schools and PD settings, the framing of written work could include making sense of children's mathematical thinking (Kazemi & Franke, 2004; Little, 2003), understanding misconceptions (Krebs, 2005), or checking for correct answers (Horn, 2007).

Researchers in mathematics education have applied framing in PD to understand teachers' noticing in video clubs (Sherin & Russ, 2014) and in schools to investigate teachers' conversations when categorizing students (Horn, 2007) and in teacher learning through collaborative groups (Bannister, 2015; Louie, 2016). Across these studies, framing served as an analytical approach to provide the meaning of teachers' conversations. For example, Bannister (2015) noted individual teachers expressed different conceptions of how to classify a "struggling student" based on the needs of their own students. However, the framing of "struggling students" was co-constructed by the group's collective interpretation which was not representative of every teacher's interpretation.

In PD settings, facilitators guide teachers through the use of research-based frameworks that frame ways to structure meaning of written work. For example, Kazemi and Franke (2004) used a research-based children's mathematical thinking framework (Carpenter et al., 2014) to promote elementary school teachers' analysis of written work in professional development. During the PD, teachers shared written work samples from their classrooms while the facilitator questioned teachers to attend to and make sense of strategies according to the children's mathematical thinking framework. Findings showed that, over time, teachers learned to frame how they attended to and made sense of children's mathematical thinking in ways that were reflective of the framework used in the PD. In essence, the design of the PD guided teachers' framing of the written work as intended.

The Kazemi and Franke (2004) study is representative of studies that have provided evidence that teachers can learn to use a *children's thinking* frame as they engage with written work during PD, which is a controlled setting. There is also some evidence that teachers who have adopted a children's thinking frame in PD, continue to use this frame in their own classrooms (Sherin & van Es, 2009). However, we do not know if there were other frames that arose as teachers engaged with written work because that was not the focus of these types of studies. Looking beyond the *children's thinking* frame used in PD to examine written work can provide insight into other frames that were not addressed in PD. Further, by looking at the frames that arise outside the context of PD when teachers engage with written work after having taught a lesson, we can better understand the issues that could emerge in a more naturalistic and applied setting.

In this study, I chose to explore frames outside of a *children's thinking* frame and outside of PD. I draw heavily upon Sherin and Russ's (2014) conception of *interpretative* frames, which

were defined as structures that described the way teachers' attention grows out of and informs their reasoning. Sherin and Russ (2014) used interpretative frames to understand the relationship between teachers' reasoning about classroom events and the role of reasoning used in teachers' noticing of short video excerpts. Analysis of teachers' conversations in video clubs identified 13 interpretative frames that characterized the network of ideas teachers used to reason when analyzing video excerpts from their own classrooms during PD. My study is similar to the work of Sherin and Russ (2014) because I investigated the frames used when engaging with children's ideas, but there are some important differences. Sherin and Russ (2014) worked with middle and high school teachers who were analyzing video of classroom events. I chose to focus on elementary teachers' individual engagement with their own written work after a classroom lesson.

Research Focus and Questions

The focus of this study was to explore considerations elementary school teachers used when examining their own students' written work. Specifically, I addressed the following questions: What considerations arose in elementary school teachers' conversations when engaging with written work from their classrooms? More specifically, what frames were utilized (outside the *children's thinking* frame provided in the PD) when teachers engaged with written work from their classrooms?

Methods

Participants

This study involved 42 grades 3–5 teachers who were a subset of teachers who participated in the Responsive Teaching in Elementary Mathematics (RTEM) study — a professional development design study focused on research-based knowledge of children's fraction thinking and how teachers can use this knowledge to be responsive to children's thinking in their classrooms. The 42 participants were teachers whose classrooms were observed solving an equal sharing fraction problem (Empson & Levi, 2011), completed 1, 2, or 3 years of PD in the RTEM study, reflected a range in years of teaching experience and prior experiences with research on children's thinking. They were drawn from three school districts in the southern region of the United States, and these districts included not only a diversity of ethnicities and achievement levels but also purposeful variations in instructional supports and constraints, which could influence teachers' engagement with written work.

Professional Development

The 3-year PD consisted of 8.5 total days each calendar year, including the summer and academic school year. Teachers engaged in numerous activities focused on using research-based frameworks for children's thinking of whole-number concepts and fractions to support responsiveness to children's thinking. Additionally, teachers participated in practices (e.g., questioning and noticing) that built on children's mathematical thinking. Equal sharing problems were a type of problem widely used in the PD to support building children's foundational understanding of fractions and conceptual knowledge of working with fractions. An example of an equal sharing problem is: *Six children want to share ten brownies so that everyone gets the same amount. How much brownie can each child have?*

Data Sources and Analysis

Data Sources. Data included 42 audio-recorded, semi-structured teacher interviews that took place following an observation of each teacher's classroom instruction. Teachers were asked to pose an equal sharing problem during their instruction that they considered appropriate

for their class. After the lesson, teachers were immediately interviewed. I am focused on the portion of the interview in which teachers were asked to identify a student's written work that was interesting to them and then discusses what stood out about that child's thinking. Additional questions asked teachers to describe the details of the child's strategy, their understandings, and next instructional steps.

Data Analysis. The analysis of teachers' conversations occurred in multiple steps and was guided by the question: "What frames beyond children's thinking do teachers typically draw upon when making sense of their own students' written work?" Again, the focus for looking beyond children's thinking was to look for what teachers considered beyond what was addressed in the PD. The first analysis stage focused on segmenting the interview transcripts into idea units when a single topic was discussed. In the second stage, I determined the focus of each idea unit. During the third stage, I used an iterative process looking across the idea units to generate five frames for conversations about the teachers' own written work. I was inspired by the approach of Sherin and Russ (2014) but did not begin with their 13 *interpretative* frames for teachers' engagement with video. Instead, I generated frames that emerged from the data. Finally, in stage four, I used the five frames identified in the third stage to code the entire data set. In this final phase of analysis, I identified themes across frames to create categories and noted how many teachers used each of the five frames.

Results

The main result of the analysis of teachers' conversations was the identification of five frames used in the teachers' conversations. These five frames fell within two broad categories: non-mathematical or mathematical performance comparisons. Non-mathematical frames highlighted affective aspects or personal aspects of the child and their sense making. Mathematical performance comparison frames highlighted the child's mathematical performance in comparison to the child's performance in previous problems, the performance of others in the class on this problem or previous problems, or curricular or testing goals for that grade level. Table 1 describes each of the frames that emerged and includes the number of teachers who used for each frame.

Non-Mathematical frames

Confidence, behavior. This first category consisted of two frames in which teachers focused on some non-mathematical or personal aspects of the child in a discussion of the written work and sense-making. Non-mathematical frames were used to highlight the progress the child has made despite certain issues or as a way of making excuses for what the child was unable to accomplish. In the *confidence* frame, the teachers highlighted a child's mathematical confidence concerning their mathematical thinking. For example, when asked to describe the details of the child's strategy, Teacher 1 noted, "At first they did nothing. I had to walk them through the problem. They have the knowledge to solve the problem, but does not have the confidence to do it on their own without assistance." In this excerpt, Teacher 1 did not attend to the details of the child's strategy but excused the child's inability to solve the problem independently due to a lack of confidence when additional support was not provided. The confidence frame was used by 24% of the teachers.

Behavior was another non-mathematical frame in which teachers identified specific behaviors of a child and related that to their written work. In these instances, teachers' statements suggested that a child's behavior had a causal relationship to what was represented in the written work. For example, in response to the question, "What stood out to you in the child's work?" Teacher 2 stated, "I could not understand why they chose to draw so many lines. They

were on the right track, but struggles with attention and gets side-tracked easily and probably started to draw a lot of elaborate lines and arrows." A closer look at the child's strategy indicated the lines and arrows were used to purposefully denote passing out to the sharers. Teacher 2 attributed the details in the child's representation to his difficulty focusing on the problem. Only two teachers used the behavior frame, but this frame was included because it speaks to ways others have found that teachers categorize students (Horn, 2007).

Mathematical Performance Comparison Frames

Past performance, class performance, broader scope. This second category included three frames that highlighted the mathematical performance of the individual child in comparison to that individual child, the class, or curricular goals. Teachers discussed the child's work in a descriptive or evaluative manner regarding its consistency with the teacher's knowledge and experiences from previous involvement with that specific child, children in the classroom, research, curriculum, etc. In the *past performance* frame, teachers highlighted how the child's performance on the problem compared with prior work from that child and often mentioned typical strategies used by the child or his or her progress over time. For instance, in a description of a child who solved the problem using a valid strategy but had an incorrect answer, Teacher 3 said, "They drew two rectangles and split each into 6 pieces, but no answer was written. I was surprised because yesterday, they had an invalid strategy. They might know more than I thought." These statements indicated the teacher originally expected the child to solve the problem using an invalid strategy based on their work on the previous day. The teacher was surprised the child used a valid strategy and acknowledged a potential underestimation of the child's understandings. The *past performance* frame was widely used by 60% of the teachers.

Related to the *past performance* frame was the *class performance* frame in which teachers highlighted how this child's performance on the problem compared with the performance of the rest of the class on this problem or previous similar problems. For example, when probed about a child's understandings for a problem about 20 cookies being shared by 8 friends, Teacher 4 stated "They understand that if there are 20 [items], you have 2 groups of 8 with a remainder of 4. They did the division in their head, while everyone else first passed out wholes individually. In some ways, they are more advanced than the others." This statement shows the teacher's comparison of the child's strategy and level of understanding to the majority of the class. Teachers also used the *class performance* frame as a way to consider how the child might offer support to others in the class or for others to help the child in their thinking and was also widely used by 67% of the teachers.

The third frame in the mathematical performance comparison category, the *broader scope* frame, drew on teachers' expectations from goals that were beyond the performance of the specific children in the teachers' class. In this frame, teachers highlighted how a child's performance on this problem compared with the broader curricular or testing goals for the grade level. Teacher 5 provided an example of the *broader scope* frame when asked to share next steps for the selected child: "I want [the class] to start notating their thinking more since on their [state standardized test] they have to write out everything. They cannot draw to show their work." Here, the teacher framed her analysis to focus on the use of notation for the child and the entire class based on their knowledge of testing expectations. The *broader scope* frame was used by 29% of the teachers.

Table 1: Frames Used to Discuss Teachers' Own Student's Written Work

	Written Work Frames	Definition	No. (%) of teachers using frame *N = 42*
Non-Mathematical	Confidence	Teacher highlights a child's confidence related to his or her problem-solving performance	10 (24%)
	Behavior	Teacher highlights a child's behavior related to his or her problem-solving performance	2 (5%)
Mathematical Performance Comparison	Past Performance	Teacher highlights how a child's performance on this problem compares with prior work from this ***child***	25 (60%)
	Class Performance	Teacher highlights how a child's performance on this problem compares with the performance of the rest of the ***class***	28 (67%)
	Broader Scope	Teacher highlights how a child's performance on this problem compares with the ***broader curriculum goals*** or testing for the grade level	12 (29%)

Extended Example of Frames in Use

When teachers talked about their written work, they often used multiple frames or the same frames multiple times throughout the conversation. The following example shows the use of various frames in a conversation with Ms. Young and written work from Jordan (pseudonyms were used). Ms. Young posed the following problem to the class: *10 friends want to share 19 brownies equally. How much brownie will each friend get?* Jordan solved the problem by drawing 19 rectangles to represent the brownies. She numbered the first ten brownies to give each friend one brownie. Jordan then split the next five brownies into halves and gave 1/2 to each friend. Finally, Jordan split the remaining four brownies into fifths and gave each person 1/5 from every two brownies, totaling 2/5. Jordan combined 1, 1/2, and 2/5 incorrectly and wrote 1 7/10 as her final answer.

*Interviewer***:** What stood out to you about Jordan's work?
Ms. Young: Jordan's answer did not match her work. It's okay, but she is just not confident in her work. That is why she added them altogether. However, the rest of the class did what I expected them to do. Most of the class broke up the brownies into tenths, like I expected. Jordan did not do what I expected her to do.

Ms. Young was surprised that Jordan responded to the problem incorrectly despite having a valid strategy. Ms. Young used the *confidence frame* as a rationale for Jordan's mistake of adding the fraction pieces incorrectly. According to Ms. Young, Jordan's overall lack of confidence in her work was the reason for adding incorrectly. Ms. Young compared Jordan's difference in partitioning to the class, using the *class performance* frame. Ms. Young expected most of the class including Jordan to solve the problem by partitioning based on the number of sharers (10) and Jordan did not partition as anticipated, which was a reason her work stood out.

Later in the conversation, Ms. Young used the *past performance* frame to discuss Jordan's understandings:

Interviewer: Based on Jordan's work, what do you think she understands?
*Ms. Young***:** I think she can be flexible with her fractions. It's just interesting that she broke it up into halves first and then fifths. Usually, she does division and writes out the answer (without drawing a picture), so I don't know why she ended up drawing a picture today.

Ms. Young expected Jordan to solve the problem with a more advanced strategy than using a picture because according to Ms. Young, Jordan typically partitioned mentally and used symbols. Additionally, Jordan typically solved the problem by partitioning based on the number of sharers, but for this problem used halves and fifths. Jordan's variation in partitioning demonstrated flexibility with fractions for Ms. Young. In sum, Ms. Young's interview reflected a use of multiple frames to position her thinking about written work produced by a single child.

Discussion

This study investigated considerations drawn upon by elementary school teachers who examined written work from their classrooms. Findings suggest that teachers used their insider knowledge to think about the specific moment, past experiences, and their vision for the individual child and the class. The broad category of frames, non-mathematical and mathematical performance comparisons highlights topics that are typically overlooked or not foregrounded in the design of PD.

It is important to note that all teachers in this study used a *children's thinking* frame in their engagement with written work, but also included additional frames. The five frames identified suggest teachers often acknowledged an individual child's learning while considering the learning of others in the classroom (Webel & Platt, 2015). The use of multiple frames provided insight into how teachers coordinated what was shared in PD along with many other ideas of how to support student learning.

Table 1 summarized each of the frames found in the teachers' conversations and indicated some frames were used more by teachers than others. Overwhelmingly, teachers used more frames in the mathematical performance comparison category. This finding was not surprising given the task occurred during teachers' math lessons and the design of the PD was focused on children's mathematical thinking. It was somewhat surprising that the *past performance* frame was used as frequently as the *class performance* frame given the task was centered on the discussion of an individual child's work. The *past performance* and *class performance* frames were used by 60% and 67% of the teachers, respectively.

Conclusion

A closer look into the use of *frames* highlighted ways a single piece of written work came in and out of focus in teachers' discussion. Sometimes teachers only attended to aspects within the child's written work. Other times, teachers demonstrated an ability to maintain focus on the individual child's written work while comparing that work to others in the class or the class as a whole. Additionally, teachers exhibited foresight by thinking beyond the work of the individual child or the entire class to consider other curricular expectations. The different ways teachers attended to the child's written work linked to certain frames but highlighted another important feature to consider. These findings suggest the need for PD to afford opportunities for teachers to think about the complexity of honoring the individual child's thinking while keeping in mind thinking of the entire class and the connection to broader curriculum goals.

In PD, teachers are provided with a *children's thinking* frame that shapes their interaction with artifacts of practice (e.g., written work). In this study, teachers used the *children's thinking*

frame but also other frames when engaging with written work. As the analysis of written work continues as a widespread practice in PD, those who design PD should consider how the use of frames–beyond those shared in PD–shapes teachers' engagement. Teachers in this study grappled with considering goals related to individual child, the class, and curricular expectations. The identification of the five frames used in teachers' conversations of written work can provide professional developers with ways to address contextual aspects of teaching. Further research is needed to understand the interplay of multiple frames and the overall nature of teachers' engagement with written work in the context of PD and in the classroom.

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