

Expectations, Flexibility, and Feedback: Exploring Possible Influences on a First-Year Teacher's

Responsive Teaching Decision-Making

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## Abstract

Over the past few decades, researchers and policy-makers have documented the importance of teachers attending to students' mathematical thinking and responding to students' ideas in ways that build on teachers' interpretations of students' thoughts, such as by asking relevant questions or using students' ideas to drive instruction (Fennema, Carpenter, Franke, Levi, Jacobs, & Empson, 1996; Jacobs, Lamb, & Philipp, 2010; National Council of Teachers of Mathematics, 2000; Mason, 2002; van Es & Sherin, 2002). However, few studies have documented the challenges teachers face when deciding how to implement innovative practices, or the conditions under which teachers may be successful (Cobb, Jackson, Henrick, & Smith, 2018; Towers, 2008). The purpose of this study is to examine influences that may have impacted how I, as a first-year teacher, made decisions around planning to attend and respond to my students' ideas. When I say 'influences,' I am referring to my interpretation of messages I have received from the environment or from my past experiences that may affect the practice I choose to implement. This paper will address the following research question: How did my interpretations of influences affect the decisions that I made towards implementing responsive teaching? I identified three influences—lack of flexibility, an expectations mismatch, and counter-productive supervisor feedback—that appeared to impact how I decided to enact responsive teaching practices. More specifically, as the semester progressed I decided attend to students' ideas from a more negative perspective and decided to plan more teacher-centered instruction, such as using direct instruction.

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There has been a strong push over the past few decades to reform mathematics instruction to become more student-centered and student-driven (e.g., National Council of Teachers of Mathematics [NCTM], 2000, 2014). One reform practice, responsive teaching, addresses this movement by asking teachers to attend and respond to their students' mathematical ideas. When teachers attend to their students' mathematical ideas, they identify specific students' written work and talk and interpret these data for students' mathematical understandings (e.g., Jacobs, Lamb, & Philipp, 2010; Levin, Grant, & Hammer, 2012). When teachers respond to students' ideas, they use their interpretations to drive their instruction (Fennema, Carpenter, Franke, Levi, Jacobs, & Empson, 1996; Jacobs, et al., 2010; van Es & Sherin, 2002). This type of instruction, sometimes referred to as responsive teaching (Levin et al., 2012), has been shown to increase student engagement in mathematics (Jacobs et al., 2010; van Es & Sherin, 2002).

Helping teachers better attend and respond to their students' mathematical thinking has been a major focus in mathematics teacher education literature (e.g., Bautista, Brizuela, Caddle, & Glennie, 2014; Fennema, et al., 1996; Jacobs et al., 2010; van Es & Sherin, 2002) and policy (NCTM, 2000, 2014) for the past few decades. Researchers have documented a wide variety of activities to support teachers in developing these skills (e.g., Amador, Estapa, de Araujo, Kosko & Weston, 2017; Kilic, 2018; Schack, Fisher, Thomas, Eisenhardt, Tassell, & Yoder, 2013; Star & Strickland, 2008) and have begun to explore whether and how teachers implement responsive teaching after receiving training. This work has primarily addressed how fellow teachers and administrators may influence implementation (Franke, Carpenter, Levi, & Fennema, 2001; Towers, 2008). However, less is known about other influences that may affect teachers'

implementation of responsive teaching, such as institutional (national, state, or district-level) policies (Cobb, Jackson, Henrick, & Smith, 2018; Towers, 2008).

A related body of research has examined the ways in which teachers implement national and state policy reforms, and has shown that teachers can enact national, state, and district-level reform in meaningful ways (Anderson, 2017; Bray & Russell, 2018; Coburn, 2004). This body of work differs from responsive teaching research in that it has primarily examined factors that affect whether and how teachers enact local, state, or national policies (e.g., Anderson, 2017; Coburn, 2004; Bray & Russell, 2018). It seeks to analyze individual or groups of teachers in a system and how teachers' interactions with other aspects of the system may affect the choices teachers make in their classrooms. In contrast, responsive teaching literature has focused on describing how teachers learn to attend and respond to students' ideas in professional development settings, typically without considering factors that may affect implementation (Borko, 2004).

The purpose of this study is to bridge the two bodies of literature by examining how my interpretations of various school and district policies and practices may have affected my decisions related to implementing responsive teaching. As such, I will consider an individual's perspective in the greater context of reform implementation, drawing from reform research for my analysis. However, I will also delve deeper into my own decisions surrounding responsive teaching decision-making and how my decisions changed over time, drawing from responsive teaching literature. Specifically, I will consider my experiences in the second semester of my first year of teaching high school mathematics. My first year of teaching followed multiple years of receiving instruction in responsive teaching practices, similar to teachers in prior responsive teaching research. Hence, the purpose of this study is to address the following research question:

How did my interpretations of influences affect the decisions that I made towards implementing responsive teaching?

By examining my experiences as a second-semester first-year teacher, I will argue that my interpretations of three influences—an expectations mismatch, a lack of flexibility, and supervisor feedback that I felt was counter-productive to responsive teaching—appeared to impact how I decided to attend to students' ideas and how I decided to respond to them as the semester progressed. The results of this study will provide additional insight into the challenges teachers face when attempting to implement responsive practices.

## **Background**

### **Attending and Responding to Student Thinking**

Over the past few decades, much attention has been given to help teachers better attend and respond to students' mathematical thinking (e.g., Fennema et al., 1996; Jacobs, et al., 2010; van Es & Sherin, 2002). As the body of literature on this topic has evolved, researchers have developed various terms to refer to the act of attending and responding to students' mathematical thinking, such as noticing (van Es & Sherin, 2002, 2008), professional noticing (Jacobs et al., 2010), and responsive teaching (Levin et al., 2012). Each term has its own nuances and the definitions in this work are based on Jacobs et al. (2010). In this paper, I will refer to two skills: attending to students' ideas and responding to students' ideas.

Here, attending to students' mathematical ideas refers to identifying a specific student's ideas through their talk or written work, as well as interpreting these data for their understanding of and ideas about the material. Teachers respond to students' mathematical thinking when they use their interpretation(s) of students' mathematical understanding and ideas to shape their instructional choices. In Jacobs et al.'s (2010) definition of professional noticing, the authors

included the step “deciding how to respond on the basis of childrens’ understandings” (p. 169). This paper will adopt Jacobs et al.’s (2010) notion of responding when examining my decision-making as I planned my lessons. Because a teacher’s planned response may differ from their actual response (Sherin, Russ, & Colestock, 2011), to clearly articulate the difference between response and intended response, I use the term *decisions around planning to respond in ways that align with responsive teaching practices*, which I will abbreviate with the phrase *deciding how to respond* when discussing plans I made to respond to students’ ideas. I will discuss how this affected my analysis in my methods section.

### **Implementing Reform Practices**

One aim of this paper is to determine influences that may have affected how I decided to attend and respond to students’ ideas. As such, it is important to consider prior research on reform implementation as well as how I am conceptualizing reform implementation in my analysis.

Early research considering reform adoption suggested that schools decoupled reform from classroom practice, essentially protecting classrooms from influences from the environment (Coburn, 2004). However, more recent research has found that reform implementation is a complex, messy process that can have a large impact on schools. Although reforms are implemented unevenly within schools (Spillane, 1999), as reforms are often modified, scaled-back, or ignored when teachers are asked to implement them, rather than being enacted as intended (Correnti & Rowan, 2007; Coburn, 2004), reforms still often impact the daily lives of the teachers, administrators, and students in that system (Coburn, 2004). Spillane and Zeuli (1999) argued that this is in part due to teachers’ varying beliefs about teaching and learning mathematics; that “because different teachers bring different knowledge, beliefs, and experiences

to reformers' proposals, they often construct different ideas about what the reforms mean for their teaching and pursue different courses of action" (p. 2). I will outline how I will use sense-making theory (Coburn, 2004) and decision-making theory (Schoenfeld, 2010, 2011) to model the ways in which teachers' beliefs and experiences interact with reform policy in the next section.

Finally, analyzing the impact of reform implementation necessitates a focus on both structure and agency (Rigby, Woulfin, & März, 2016). Structures are "regular patterns that can both enable and constrain individual actions," (Rigby et al., 2016, p. 296), whereas agency captures the "temporal capacity of individuals to take actions" (Rigby et al., 2016, p. 296). While many researchers choose to either focus on structure, such as by examining specific policies (e.g., Mazmanian & Sabatier, 1983), or on teacher or student agency (e.g., Achinstein & Ogawa, 2006; Miron & Lauria, 1998), the purpose of this paper is to join a growing body of research (e.g., Bray & Russell, 2016; Coburn, 2004) that considers both. Here, I will consider how influences, including structural elements such as district policies, may have impacted my responsive teaching decision-making.

**Framework for Reform Implementation.** Sense-making theory and decision-making theory are useful models to explain how teachers learn how to implement reform practices. Sense-making is most relevant to my analysis because it has been used as a tool to describe how organizational structures and cultures form and how they may change over time (Coburn, 2004). Sense-making theorists argue that these structures and cultures are built through interactions between the environment and members of an organization. More specifically, members of a system learn by making sense of explicit and implicit messages they receive from their

environment and other members of the organization (Coburn, 2004; Porac, Thomas, and Baden-Fuller, 1989).

Coburn (2004) applied sense-making theory to educational reform to understand why teachers implemented new state policies to varying degrees. Describing sense-making as an iterative, incremental practice, Coburn (2004) detailed a process that began when teachers become aware of and then interpreted messages from their environment. They place these messages into their existing belief system, and based on how they interpret these messages, teachers may “create new practices, patterns of interaction, and ways of thinking that may become institutionalized over time” (Coburn, 2004, p. 214). In this way, messages from the environment gradually become part of the classroom as they embed themselves in a teacher’s beliefs. Because this process is ongoing, past messages influence teachers’ future interpretations of new messages they receive from their environment (Coburn, 2004). While Coburn’s (2004) description of sense-making seems to emphasize the environment’s role in creating change in practice, Coburn (2004) also argues that teachers have agency as well; because the meaning behind messages teachers receive is often implicit, when teachers interpret these messages they “actively construct understandings” (Coburn, 2004, p. 214). In this paper, I will use sense-making theory to determine how influences I identified may have affected how I decided to implement responsive teaching practices. In the framework of sense-making theory, I interacted with messages from my environment (e.g., classroom, school, and district) and with other members of the organization (e.g., students, colleagues, and supervisors), which may have affected the decisions I made when planning to attend and respond to students’ mathematical ideas.



Schoenfeld's (2010, 2011) theory of decision making provides a complementary perspective to sense-making theory. Schoenfeld (2010) argued that teachers' decisions are born from their orientations, goals, and resources. Schoenfeld (2011) defined resources as a teacher's "knowledge, but also include[s] the social and material resources that are available to him or her... [and] personal and interpersonal skills and connections" (p. 459). Goals are both conscious and unconscious acts that teachers aspire to, whereas orientations include "beliefs, values, preferences, and tastes" (Schoenfeld, 2011, p. 460). Schoenfeld (2010) used his theory of decision making to conceptualize how teachers may implement changes in practice. In his work, he described how teachers learned to enact the reform practice of diagnostic teaching, which, like responsive teaching, aims to encourage teachers to focus on attending to students' ideas for the basis of instruction. Because teachers' decisions are, in part, shaped by their orientations (Schoenfeld, 2010), Schoenfeld (2010) argued that to change teachers' decisions it is necessary to provide new experiences that challenge teachers' prior knowledge of their students' ideas and capabilities. By challenging teachers' prior knowledge with new experiences, these new experiences will "serve as the anchor for a set of alternative orientations towards teaching" (Schoenfeld, 2011, p. 466). Over time, teachers will develop new sets of resources along with their new orientations, which will subsequently affect goals teachers set when making decisions.

Schoenfeld's (2010) theory of decision-making shares many commonalities with sense-making theory—both illustrate that context and background are important, and both suggest that implementing change in practice is an ongoing, gradual process. However, while Coburn (2004) emphasized the iterative, interactive nature of change that occurs between teacher and messages from the environment, Schoenfeld (2011) described the process as a slow shift in teachers' beliefs and pedagogy: "this kind of change... takes time to occur: habits of mind will evolve with

habits of pedagogy, and those in turn will evolve slowly as the teachers build new sets of resources with which to implement them” (p. 466). Schoenfeld (2011) appears to give more responsibility to the teacher than the environment. In this paper I will consider both external and internal messages, which I refer to as influences.

### **Influences**

In this paper, influences are defined as any message that may affect whether and how a teacher implements a reform effort (in this case, responsive teaching). From Schoenfeld’s (2010) theory of decision making, influences could arise from a teacher’s orientation, their resources, or experiences they encounter; as such, influences can originate from both internal and external sources. For example, influences can stem from cultural factors, such as such as race, gender, and socio-economic status; they can be institutional, such as state standards or national policies; they can exist within the learning environment, such as methods of instruction and classroom culture; and can be individual, such as personal beliefs and experiences. This is not intended to be an exhaustive list; rather, it is to illustrate the wide range of influences that may affect how teachers learn and implement reform practices. Because learning is so contextualized, this work often drew from grounded theory to identify influences that emerged specifically from the data themselves (Charmaz, 2014), as I will explain in the next section.

### **Methods**

#### **Participants**

I started teaching high school mathematics in the 2014-2015 school year. Prior to teaching, I spent two years working on a PD research project that sought to increase middle school teachers’ mathematical content knowledge and their ability to attend and respond to their students’ mathematical ideas. I also participated in education methods courses at the

undergraduate and graduate level where I conducted my own interviews with students, wrote reports to attend to their mathematical ideas, and watched videos of myself teaching lessons to my college peers. Because of these experiences, I entered my first year of teaching with a strong belief in a responsive teaching approach to teaching and confidence that my ability to attend and respond to students' ideas would transfer to my classroom. To provide greater transparency about my own background, I will also note that I am white, identify as female, come from a privileged background, and was 24 years old when this study took place. I also had very little teaching experience (student-teaching and the first semester of that school year).

My co-teacher did not report to have any experiences related to responsive teaching prior to entering the classroom. However, he had a master's degree in special education and was certified in both special education and mathematics. We both were first-year teachers to the district and it was my co-teacher's first experience as a classroom teacher.

### **Context of Mathematics 11**

My co-teacher and I taught a post-Algebra II and Trigonometry course, which I will refer to here as Mathematics 11, as 11<sup>th</sup> grade students were primarily enrolled in the class. We were expected to teach a broad range of topics over the course of one semester: linear, absolute value, quadratic, polynomial, and rational functions; limits; and trigonometry (proofs, equations, graphs, and real-world application problems).

I taught this course in a traditional public high school in an ethnically diverse, urban district in the Northeastern United States. The school's population that year was around 1,700 students. My district had several potentially impactful reform policies in place, most relevant to this paper being mandated supervisor feedback and rigorous assessments for all students that aligned with the Common Core State Standards (National Governor's Association Center for

Best Practices & Council of Chief State School Officers, 2010). However, students did not need to pass the prerequisite course to move on to the subsequent course. Therefore, several of my students had not passed Algebra I, and some students had never passed a mathematics class before entering my classroom. The ways in which these policies may have impacted my teaching will be discussed in the results section.

As mentioned previously, this was a co-taught course. While I co-taught the course, the focus of this paper is on my experiences. In my initial analysis, my co-teacher did not emerge as one of the three most prominent influences that affected my decisions around how to practice responsive teaching, and as such, will not be a focus of this paper. Because of this focus, I will use the pronouns of “I” and “my” when describing the course instead of “we” or “our.” This is to emphasize that the purpose of this study is to examine the ways in which I made decisions around attending and responding to students’ mathematical ideas.

### **Study Design**

This study was designed as action research (Adelman, 1975; Lampert, 1990; Townsend, 2014). Action research is often designed around a problem of practice (Townsend, 2014), and in this case, the change in practice I aspired to was increasing the frequency of making decisions aligned with responsive teaching practices. Therefore, I entered the study planning to use my knowledge and experiences as resources to drive the decisions I made in my classroom by setting goals corresponding with responsive teaching practices. As described previously, I began this study with a strong belief in responsive teaching practices. Further, I thought that I had sufficient resources (knowledge and experiences) to be able to make decisions productive to responsive teaching practices. These beliefs certainly had an impact on the way I designed, carried out, and

analyzed my data, as I hoped to find that I had shown an increase in decisions productive to responsive teaching practices by the conclusion of this study.

While some researchers have argued that the primary purpose of action research is to change practice, rather than to produce research (Elliott, 1991; Kemmis & McTaggart, 1982), I sought to design a study whose results might be replicable in other situations with broader research implications. Therefore, I endeavored to make the study as authentic to a traditional teaching experience as possible. For instance, I did not suggest that my co-teacher and I discuss student work to practice attending to students' ideas unless the notion of looking at student work arose organically as part of our conversations.

Although I consider this study to be primarily action research, because I am both the teacher and the researcher and am therefore reporting on myself, there are elements of autoethnographic research as well. While the processes researchers adopt when conducting autoethnographic research can vary, a key tenet is honesty and being critical of oneself (Bochner, 2000; Denshire, 2013). Therefore, I will acknowledge that my data collection and analysis were likely affected by my background. To provide as much transparency as possible, I included transcripts of conversations, email data, and log to provide the reader with a better sense of what I said and thought over the course of the semester.

### **Data Collection**

Retrospective data, in which teachers describe what they have noticed after the conclusion of teaching a lesson, are often the main source for determining whether and how teachers attend and attempt to respond to students' ideas in responsive teaching literature (e.g., Ainley & Luntley, 2007; Borko & Livingston, 1989; Sherin & van Es, 2009). Retrospective recall is often used because it is far less obtrusive than asking a teacher mid-lesson what they

may have been thinking about as they listened to students (Sherin, Russ, & Colestock, 2011).

This study adopts a similar approach. From late January to late June 2015, I took daily log. I had two goals when writing in my log: first, to summarize the day's class, and second, to allow myself a space to reflect on my impressions from that day. More specifically, because the change in practice I hoped to achieve as a result of the action research was to make more classroom decisions that were productive to responsive teaching, I described in my log on a daily basis decisions I made that, from my perspective, were productive to responsive teaching, such as asking a follow-up question or creating an opportunity for students to share their ideas, as well as areas I was challenged with, such as finding ways to motivate students or finding time to develop curriculum materials. These struggles and frustrations were not necessarily just with my own teaching ability; instead, I allowed myself to use the log to express my feelings at the time and record any and all frustrations that came to mind.

In addition, I recorded 26 conversations of varying length (5 minutes to 1.5 hours in duration) with my co-teacher as we planned lessons together after school. We typically met two or three times per week and I tried to record our conversations as frequently as possible. I recorded our conversations to provide myself with additional data of my thoughts and opinions as spoken to a colleague, rather than just my log. Finally, I collected all 123 email correspondences sent during the semester for the same rationale and gathered the assignments that we developed for our students as another way to consider how my decisions around plans to practice responsive teaching may have changed over the semester.

### **Data Analysis**

The purpose of this study was to seek initial patterns from the data themselves and produce context-dependent insights into a specific case, as opposed to producing "high level

theory” (Flyvbjerg, 2006, p. 223). As Flyvbjerg (2006) argues, it is essential to consider a breadth of cases before developing more general theory, and the cases themselves are useful for producing a more “nuanced view of reality” (p. 223). Although I entered the study planning to consider responsive teaching, I did not draw from preconceived frameworks to analyze what may have influenced my decision-making towards responsive teaching. Instead, I approached data analysis using analytical tools from grounded theory (Charmaz, 2014) and from sense-making theory (Coburn, 2004). More specifically, I used tools from grounded theory, such as open coding and categorization, to drive the initial stages of analysis, when I identified influences on different sources of data. I will explain the details of identifying the influences later in the methods section.

Once I identified the influences, I used techniques from sense-making theory (Coburn, 2004). To this end, I adapted Coburn’s (2004) approach to examine how these influences may have impacted my teaching, as she designed her study with a similar goal. Coburn (2004) sought to determine the ways in which three Californian teachers adopted state literacy reforms, as well as the factors that may have influenced teachers’ decisions. As such, she compared teachers’ actions to the wider historical timeline of California’s changing literacy policies to see how four influences, which she called factors, may have affected how teachers enacted state literacy reforms. Coburn (2004) observed teachers, wrote oral histories of the teachers’ careers, and analyzed state documents, and when she analyzed the data, she coded influences mentioned by teachers. She used those codes to identify the four most prevalent influences (congruence, intensity, pervasiveness, and voluntariness, in her study), and then identified patterns in the data between the influences and teachers’ classroom practices. While my study is smaller in scope, as Coburn (2004) considered the teachers’ entire careers up to the point of her study, I will also

compare my actions to the influences that I identified to answer the following research question: How did my interpretations of influences affect the decisions that I made towards implementing responsive teaching? To begin answering this question, I will describe the pieces of my analysis in the following way. First, I will explain my coding process and how it led to the identification of the three influences. Next, I will detail how I analyzed whether and how my decisions around my plans to attend and respond to my students' ideas may have changed over the semester. Finally, I will describe how I looked for connections between the influences and my teaching to understand how the influences I identified may have affected my decisions around implementing responsive teaching.

**Identifying Influences.** The first part of my analysis sought to identify the influences on my ability to teach responsively. After transcribing conversations with my co-teacher, I coded the transcripts line-by-line with the Nvivo software program (versions 11 and 12) using open coding. My goal for the first pass through the data was to provide an overall picture of our conversations to categorize the major themes. From this initial coding, I developed over 200 codes of varying degrees of granularity. I then consolidated the codes iteratively into 43 broader categories.

I then applied these categories to both the log and the email data. I added additional codes when necessary, which resulted in a total of 59 categories. Next, I consolidated the 59 categories iteratively to create 16 themes. Appendix A contains a table with the 16 themes and an example from each category that was consolidated into each theme.

After identifying the 16 themes that emerged from across the log, conversation, and email data, I selected the three themes of an expectations mismatch, lack of flexibility, and counter-productive supervisor feedback for further analysis because of their relative prominence (an



expectations mismatch appeared in at least one data source 81% of the weeks the course ran, lack of flexibility appeared in at least one data source 62% of the weeks, and counter-productive supervisor feedback appeared in at least one data source 38% of the weeks, but in 57% of weeks following the eighth week of the course). All three of these influences are based on my *interpretation* of school policy or supervisor comments.

The second part of my analysis sought to describe how my decisions shifted over the course of the semester in regards to responsive teaching. As noted in the Background section, I considered how my decisions around attending and responding to students' ideas separately to provide a more nuanced look at whether and how the influences may have impacted both my decisions around planning to attend and to respond to my students' ideas.

**Decisions around Attending to Students' Mathematical Ideas.** As noted previously, like in other responsive teaching literature (e.g., Ainley & Luntley, 2007; Borko & Livingston, 1989; Sherin & van Es, 2009), these data illustrate my decisions around planning to attend to students' ideas after the lesson's conclusion, as opposed to in-the-moment. I selected 3 of the 59 categories related to decisions productive to attending to student thinking: *reflections on student thinking*, *identifying areas of student difficulty*, and *discussing student thinking*. I will refer to these categories as practices related to decisions related to attending to students' ideas. These practices all contained moments where I reflected on students' thinking after the lesson had occurred, either in my log, in conversation with my co-teacher, or through email.

In some instances I demonstrated a capacity to discuss students' ideas in a positive way, as I described what students could do, instead of focusing on what students could not. However, there were also instances where I tended towards negative and occasionally general interpretations of students' ideas. The responsive teaching literature has tended to view teachers'

more negative, general interpretation of students' thinking as a more novice demonstration of attending to students' thinking than when teachers are able to provide specific, and sometimes multiple, interpretations of students' ideas (e.g. van Es, 2011). However, I argue that even when teachers provide a more negative, general interpretation of students' ideas, they still demonstrate an awareness of students' ideas in those moments. Therefore, despite that my attention to their ideas was often negative or general, I included these moments in my analysis of attending to students' ideas to give a sense of what I was capable of as a first-year teacher.

**Decisions Around Responding to Students' Mathematical Ideas.** Whole-class discussions are often considered a major venue for responsive teaching practices (Jacobs & Empson, 2016). However, to provide a broader view of how teachers may make decisions around planning to respond to students' ideas, my analysis also considers activities and practices my co-teacher and I utilized that could also be student-centered, such as asking students to present work at the board, group work, and talking one-on-one with students as they completed individual work, as part of examining whether and how I decided to attend and respond to students' ideas.

Because I was interested in how the three influences may have impacted whether and how I decided to respond to my students' thinking, I used the class summaries I wrote in my log, along with conversation and email data, to generate a list of the 14 different activities and practices I incorporated in class over the semester that either were productive or counter-productive to respond to students' ideas. I classified the activities and practices based on my intent for the practice as described in my log, email, and conversation data. For example, I identified the activity of a student-led Do Now as productive to responsive teaching because I described deciding to implement it with the intent to give students an opportunity to share their

ideas with the class and allow me to hear their ideas as they explained their process and solution to a specific problem. In contrast, I identified the activity of changing grades as counter-productive to responsive teaching because I changed grades with the intent to help students pass the class, rather than adjusting the content with the intent build upon their ideas and understandings.

It is important to note that the list I generated is not exhaustive; it does not include all activities and practices that are conducive to responsive teaching. Rather, it only includes practices that arose from the data. For instance, researchers have described whole-class discussion as productive venues for responsive practices (Jacobs & Empson, 2016), but because I never decided to plan a whole-class discussion, they are not included in this list.

Productive activities and practices that I identified were the following: (1) student-led Do Now; (2) flipped learning; (3) individual practice; (4) incorporating students' ideas into direct instruction; (5) cold-calling; (6) stations; (7) splitting the class in half to instruct; (8) an inquiry-based activity (such as seeking patterns for function transformation shifts using Desmos software or building a Unit Circle using right triangles and reflections); (9) asking students to post solutions on the board, and (10) adjusting assignments of lessons based on students' progress. Counter-productive activities and practices were (1) teacher-led Do Now; (2) direct instruction (with the intent of giving one or two examples); (3) direct instruction for the entire lesson; and (4) changing students' grades. A full description of each of the 14 activities and practices is found in Appendix B.

**Comparing the Influences to Decisions Related to Attending and Responding to Student Thinking.** Once I selected the three practices related to deciding to attend to students' ideas, and the fourteen activities and practices related to responding to students' ideas, I created a

chart for attending to students' ideas and a chart for responding to students' ideas to compare their presence and absence in the log, conversation, and email data to the presence and absence of the three influences. Table 1 found in the results section, illustrates the presence and absence of the influences and practices tied to attending to students' ideas, whereas Table 2, also found in the results section, illustrates the same for responding to students' ideas. An influence was indicated as 'present' if it appeared in at least one data source at least once per week. Similarly, I noted if I decided to attend or respond to student thinking by marking 'present' if, at least once in a given week, I described the decision to attend or respond to students' ideas through the identified activities and practices in at least one data source. Table 2, found in the results section, omits activities and practices that were present two times or less over the course of the semester to make the table easier to parse. A complete table is found in Appendix C.

By comparing the practices and influences, I identified patterns of presence and absence of the three influences and the practices related to deciding to attend and to respond to student thinking. Specifically, I examined the chronological order of presence versus absence: did I describe deciding to attend or to respond to students' ideas before an influence appeared in the data? If so, did I continue to make that same decision afterwards? While on a smaller scale, my comparisons are similar to Coburn's (2004) approach, where she sought patterns between influences and teacher actions. By comparing when each influence appeared and whether I made decisions to attend and to respond to students' ideas before and afterwards, I discerned whether the influence may have had an impact on how I decided to attend to students' mathematical ideas. I will share the patterns that emerged in the results.

## **Results**

The purpose of this section is to answer the following research question: How did my interpretations of influences affect the decisions that I made towards implementing responsive teaching? I will first describe the three influences—an expectations mismatch, a lack of flexibility, and counter-productive supervisor feedback—that arose from the data. I will then argue that these three influences appeared to be associated with both my decision-making around attending to students' ideas and in how I decided to respond to their ideas.

### **Expectations Mismatch**

The term “expectations mismatch”, which appeared in at least one data source—log, conversation, or email—at least once per week in 81 percent of the weeks of the course, refers to my interpretation of district policy that set teaching standards aligned with the Common Core State Standards (National Governor’s Association Center for Best Practices & Council of Chief State School Officers, 2010). Based on that interpretation, I felt that there was a mismatch between district expectations and the topics I believed were appropriate for my students given their background knowledge. To explain why I perceived such a discrepancy, I will describe my interpretation of the district’s expectations and then discuss why I believed they were mismatched with the beliefs I held about what was appropriate for my students. This will allow me to better illustrate my definition of an expectations mismatch.

As highlighted previously, I believed the district expected me to teach a broad range of topics over the course of one semester in Math 11: linear, absolute value, quadratic, polynomial, and rational functions; limits; and trigonometry (proofs, equations, graphs, and real-world application problems). When planning for this course, I believed that this range of topics was not a good fit for my students for two reasons: breadth and level of rigor. In terms of breadth, I felt as though I had little space to delve deeply into any one topic. As I complained to my co-teacher

at the beginning of the semester, “It's hard because, like, the Math 11 curriculum is garbage. Let's just.. let's spend 5 minutes on something, then 5 minutes on something else, and then just scrape the surface on all these things; I don't like it” (Conversation with co-teacher, January 14<sup>th</sup>).

I also believed that many of these topics were too rigorous given my students' Algebra knowledge. I made this assessment based on my observations of what students were able to do at the beginning of the semester and based on my knowledge of their performance in previous courses. While some students entered my classroom with a thorough understanding of prerequisite material, many students were simultaneously enrolled in Algebra I in credit recovery after school or were signed up to take Algebra I the fall after completing Mathematics 11. It could have been that students were well-prepared to succeed in Mathematics 11 and I made invalid assumptions about their capacity; however, my perception at the time was that a course that focused on Algebra I skills would have been much more appropriate and, as I will argue, the mismatch I perceived in part shaped how I wanted to organize the class.

It should be noted that NCTM (2000, 2014) has argued that all students should have access to rigorous curriculum, which perhaps stands in contrast to the remedial Algebra I curriculum I thought was appropriate at the time. In hindsight, I may have been narrow-minded in my perspective. Instead, the students could have been presented with a curriculum that presented a more conceptual understanding of higher-level concepts that perhaps deemphasized solving multi-step equations and other topics from Algebra I (if the goal of the course was to still touch upon every topic listed at the beginning of the section). However, the final exams, set by the district, heavily emphasized solving and required fairly robust Algebra skills in addition to

the Math 11 content. As such, I felt that without the Algebra I ideas, students were unlikely to pass the final.

Finally, it is important to recognize that like many other districts, the district in which this study took place is under tremendous pressure from the state to meet specific standardized testing goals, and that these benchmarks have serious ramifications on the school budget and other decisions. In addition, setting rigorous goals for students is well-intended and necessary to close the achievement gap. Therefore, the district likely had the students' best interests in mind when setting rigorous benchmarks for each grade level, but in this instance, their course topic selection and ways of measuring student understanding created my perception of an expectations mismatch.

### **Lack of Flexibility**

From the beginning of the year onward, I was told by senior teachers that it was against school policy to spend much time reviewing prior material. Further, when discussing the topics they had taught in class, teachers very rarely described revisiting prerequisite material. Indeed, teachers warned me that I could be penalized if I was caught doing so. Although I never saw any official documentation of this policy, I believed and feared the rumors that circulated, and deliberately tried to avoid covering pre-Algebra and Algebra I material, even when I thought that it may have benefitted my students. Hence, lack of flexibility refers to my interpretation of (unofficial) school policy around teacher autonomy and revisiting prior material, which gave me the impression that I was restricted from acting in the way I thought was best for my students. This influence was mentioned in at least one data source at least once per week in 62 percent of the weeks of the course.

### **Counter-Productive Supervisor Feedback**

In this study, all feedback was given through email or orally. Because I am considering supervisor feedback here, I only selected feedback given by James, the head of the math department, and Candice, my mentor teacher (their names here are pseudonyms), because they were both my supervisors. In this paper, counter-productive supervisor feedback refers to any communication given by a supervisor that I interpreted as counter-productive to responsive teaching. The supervisor giving the feedback may not have necessarily intended for the feedback to be counter-productive to responsive teaching; rather, the emphasis here is on my interpretation of their feedback. I mentioned counter-productive supervisor feedback in at least one source of data in 57 percent of the weeks after the 8<sup>th</sup> week of the course.

### **The Three Influences and Decisions Around Attending to Student Thinking**

Table 1 illustrates the presence of the three influences over time and the ways in which I reflected upon or discussed student ideas or areas of difficulty. The table shows that throughout the semester I decided to attend to my students' mathematical ideas, either in reflections in my log or in discussions with my co-teacher. The practice *Identifying Areas of Student Difficulty* appears later than the other two practices. This code identified moments where I attended to students' ideas, but in a typically negative way. As the practice *Identifying Areas of Student Difficulty* appeared after the influences of an expectations mismatch and a lack of flexibility, I may have had a more negative view of students' thinking because I was focused my interpretation of district expectations of curricular goals and of how I did not think my students could reach those goals in time. For instance, I wrote "it's hard to teach a kid how to solve complicated log problems when they don't know that  $x+x=2x$ ..." (Log, April 6<sup>th</sup>). This quote does not exemplify much attention to student thinking beyond an awareness of what students



appear to not understand; however, it does illustrate the challenge I felt between the expectations I was being held to and the perceived lack of flexibility with the expectations.

In summary, while I decided to attend to students’ ideas intermittently (and somewhat negatively and generally) throughout the semester, my interpretations of the influences may have encouraged me to have a more negative focus on students’ ideas as the semester progressed.

*Table 1*  
*Presence and Absence of Influences and of Practices Related to Attending to Students’ Ideas*

	Week																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
<i>Influences</i>																							
Expectations Mismatch	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Lack of Flexibility	■				■	■	■		■				■	■	■	■	■	■	■	■	■	■	■
Counter-productive supervisor feedback									■	■	■		■			■			■			■	■
<i>Practices Related to Deciding to Attend to Students’ Ideas</i>																							
Reflections on Student Thinking		■					■		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Identifying Areas of Student Difficulty							■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Discussing Student Thinking	■				■		■	■	■		■	■	■	■		■			■			■	■

*Note:* Shading indicates that the influence and activity and practice were mentioned in the conversation, log, or email data in the week indicated. Greyed-out weeks were school vacations.

**The Three Influences and My Decisions Around Responding to Student Thinking**

Table 2 shows that from my analysis it is impossible to explore the isolated impact of each influence. This is because both a lack of flexibility and an expectations mismatch appear so often together that considering each individually to see how each could impact how I made efforts to respond to my students’ ideas is beyond the scope of this analysis. However, because a lack of flexibility and an expectations mismatch appear before counter-productive supervisor feedback, I will first describe the possible impact of the first two influences without the presence

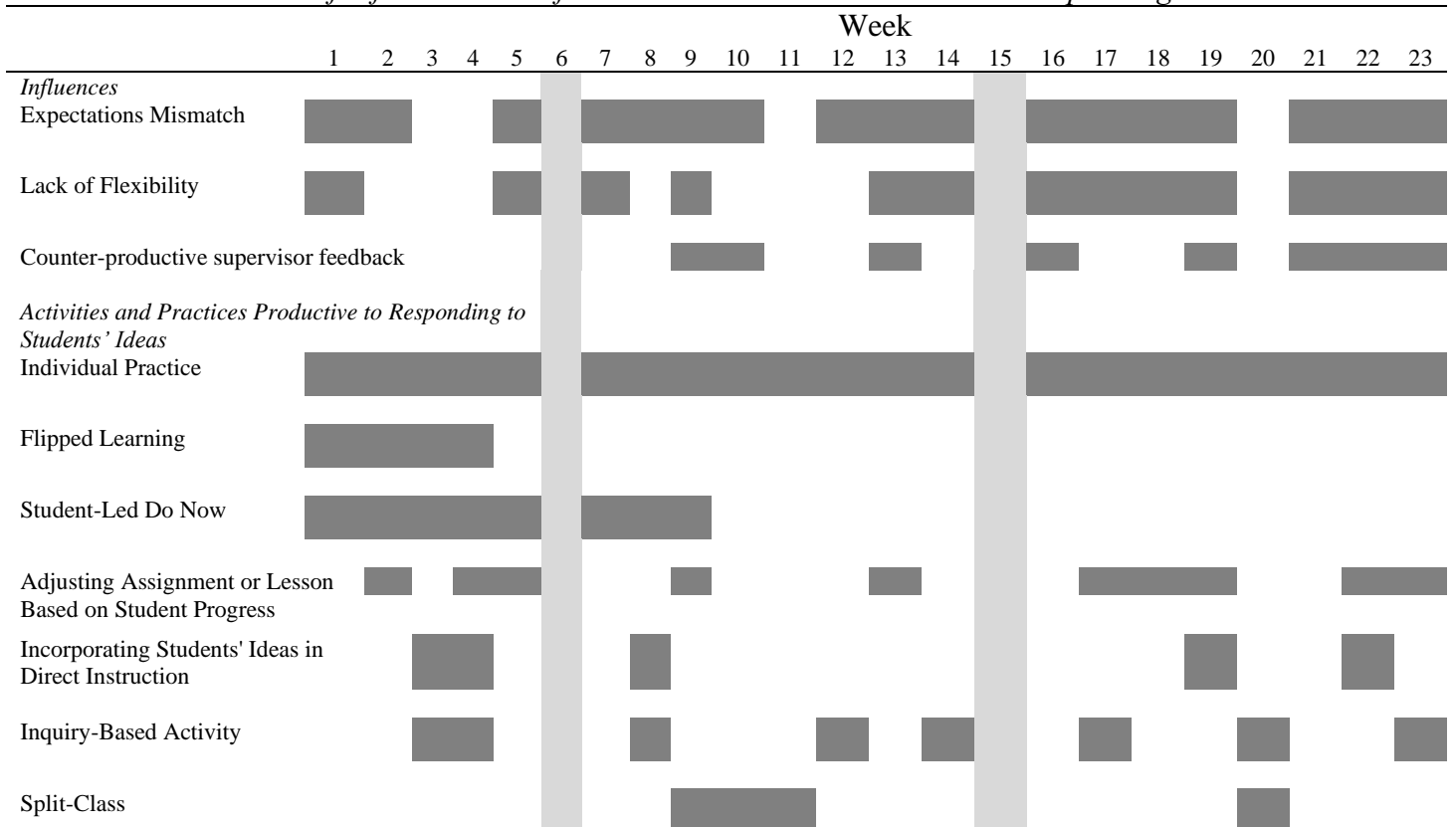
of the influence counter-productive supervisor feedback to illustrate their possible impact without the feedback. The purpose of describing these two influences first is twofold; first, to provide a more nuanced look into the role of the various influences. Second, since these two influences appeared from the beginning of the semester onward, describing them first can give the reader insight into my initial classroom structure to provide context for events later in the semester. In this first section, I will describe two changes that occurred: the disappearance of flipped learning and changes in the quantity of direct instruction. Afterward, I will discuss how counter-productive supervisor feedback, an expectations mismatch, and a lack of flexibility may have collectively affected how I made decisions around responding to students' ideas. In this later section, I will describe two additional changes: I stopped the practice of a student-led Do Now and began making grade modifications. While there were other shifts in practice, I will explore those two practices in more depth because they shifted most dramatically.

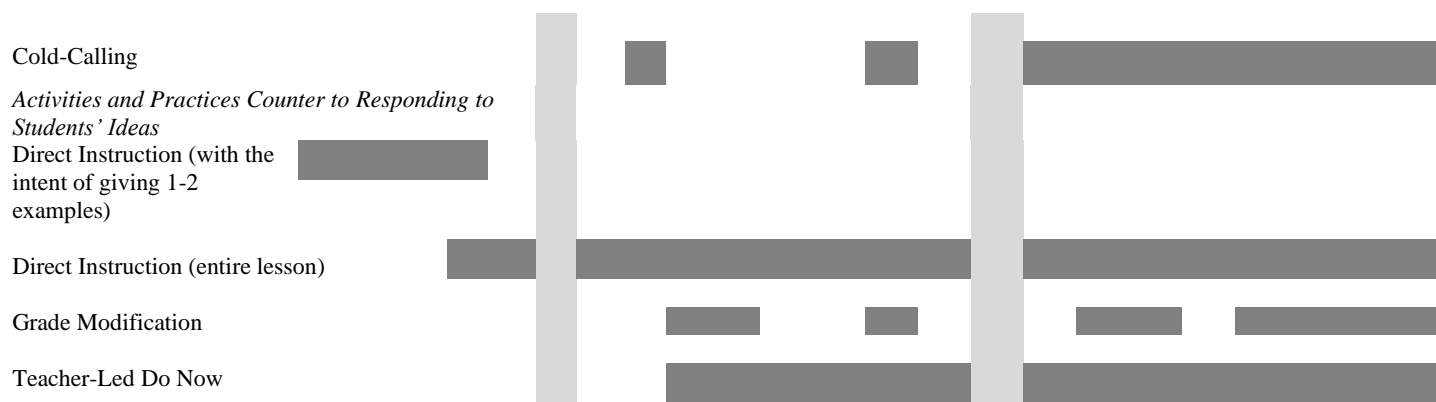
**Impact of an expectations mismatch and a lack of flexibility.** Table 2 illustrates that both an expectations mismatch and a lack of flexibility were mentioned throughout the semester. This may suggest that I often thought about the two influences from the beginning of the semester onward. Table 2 also shows the three changes occurred in or around week 4: flipped learning disappeared, direct instruction changed from giving a few examples to occupying most of the lesson, and I occasionally decided to incorporate my students' ideas when giving direct instruction. To demonstrate how a lack of flexibility and an expectations mismatch may have influenced these three shifts, I will describe my approach to teaching at the beginning of the semester and then the events of week 4.

At the beginning of the semester, I aimed to utilize a "flipped learning" approach, along with a student-led Do Now. In other words, I asked students to try problems and examples in

class and read notes or try extension activities at home. I preferred to be “almost never at the board” (conversation with co-teacher, January 14<sup>th</sup>), instead circulating around the classroom, checking with individual students, and going through examples as necessary to match each student’s individual pace. While this approach does not incorporate whole-class discussion that truly builds on students’ mathematical ideas, by implementing flipped learning, I decided to utilize a practice I thought would help me better respond to students’ ideas because it would provide more time in class for me to circulate and respond to students’ ideas individually. As noted previously, recent research has documented circulation time as a potentially productive space for responsive teaching (Jacobs & Empson, 2016). However, I also implemented direct instruction, albeit in short intervals, which was not conducive to responding to my students’ ideas.

*Table 2*  
*Presence and Absence of Influences and of Activities and Practices Related to Responding to Students’ Ideas*





*Note:* Shading indicates that the influence, activity, or practice was mentioned in the conversation, log, or email data in the week indicated. Activities and practices are sorted first by whether they were productive or counter-productive to attending and responding to my students’ ideas, and then sorted by first presence in the semester. Greyed-out weeks were school vacations.

As illustrated in Table 2, I incorporated flipped instruction at the beginning of the semester. However, flipped learning disappeared after week 4. At the end of week 3, I administered the first test, which I designed to align with the rigor of the district expectations. My students illustrated many non-traditional ideas and often incorrect work on their first test, resulting in many low scores. I wrote in my log that “We handed back the tests near the end of class... the highest grade was a 70-something, and nearly everyone failed... I’m a little worried because we can’t fail everybody!” (Log, February 25<sup>th</sup>). A couple of days later, I summarized a discussion I had with my co-teacher in my log:

We talked a little bit about what we might do differently next time, which I thought was very reflective of [my co-teacher]—for instance, what could we do differently to help them understand how to go from vertex to standard form? I personally think we taught so many algorithms the students didn’t know what to apply and when. Interestingly though, my co-teacher’s remediation seemed to be more direct instruction. I’m not sure how helpful that would be. (Log, February 27<sup>th</sup>)

These quotes indirectly illustrate my perception of an expectations mismatch. I believed I was being asked to teach students too many algorithms and that I did not have the space in the

semester to ensure that students understood how to apply them. The conversation also indirectly reflected a lack of flexibility, because I did not feel as though I could then revisit older material to help students better understand the algorithms they were applying. Therefore, both influences may have played a role in how I decided to respond to the ideas surfaced by my students in their exam.

In response to both the student work we saw on their tests and to their low grades, my co-teacher suggested incorporating more direct instruction. Although I expressed misgivings (“I’m not sure how helpful that would be”) as can be seen in Table 2, we stopped using flipped learning and went for a more direct approach. I felt alarmed (e.g., “we can’t fail everybody!”) and more willing to make changes to the teaching approach, as mine appeared ineffective. This is also reflected at the bottom of Table 2; until week 4, I decided to only use direct instruction to provide a handful of examples to students and then gave individual attention, whereas after week 4, I planned direct instruction for most of the lesson. An increase in direct instruction may explain why I decided to try incorporating students’ ideas into the lesson after week 4; in the previous weeks, when I gave direct instruction it took the form of a quick example or two at the board, so I was focused on using time efficiently up front rather than drawing on students’ ideas. However, when I was teaching for longer periods of time, I perhaps recognized to hold students’ attention I should try to engage with them to keep their interest. I only decided to draw on my students’ ideas in direct instruction infrequently though; it only appeared in at least one data source in five of the 21 weeks of our course.

In summary, my decisions in the first four weeks of the semester may be associated with an expectations mismatch and lack of flexibility. This is because the two influences were present as made fewer decisions productive to responding to students’ ideas; instead, I began planning

more direct instruction and ceased planning flipped learning after the first few weeks of class. However, I did decide to try bringing my students' ideas into my direct instruction on a few occasions.

**Impact of the three influences on decisions around responding to students' ideas.**

My supervisor, James, and my mentor teacher, Candice, began giving feedback that I interpreted as counter-productive in the 9<sup>th</sup> week of our course, which was in mid-March. More specifically, James began offering feedback when he saw that over half of my students were failing the class. In his initial email, he asked me to describe the ways in which my co-teacher and I had already tried to address low grades and suggested reaching out to parents. While James' feedback is not necessarily counter-productive to responsive teaching, my interpretation of his feedback was such that I began to increase practices that were counter-productive to responsive teaching.

I brought James' concerns to my mentor teacher, Candice. I summarized the feedback she gave us in my log:

On Thursdays we meet with Candice, our mentor, and asked her for advice. She suggested a very structured class; the standard I-we-you method with lots of examples, and less than 10 minutes between practice problems because 'sadly, not many of them are going to get it on their own.' I definitely think she has a point and although it does kind of kick in the face any sort of inquiry-math, I mean, it would be like asking me to reason about a class that [a mathematics graduate student] was taking. I would have no entry point to even start considering the ideas [the graduate student] would be learning about. It doesn't seem fair that the kids are in this class; how can they hope to find success? Regardless though, it is what it is. Candice suggested cold-calling more as well, and station activities, so [my co-teacher] and I are going to try to do something like that.

Candice also asked us why we thought our Mathematics 11 kids were struggling so much and I answered the question (need basic algebra skills, focusing issues, complex material). (Log, March 12<sup>th</sup>)

I interpreted Candice's message as against responsive teaching, as she suggested trying a gradual release model. Further, Candice implied an expectations mismatch because she seemed to suggest that because of students' background knowledge, students could not engage with the material in a productive way without significant assistance. I found myself agreeing with her because "I mean, it would be like asking me to reason about a class that [a mathematics graduate student] was taking." Candice also recommended two productive strategies, stations and cold-calling, which illustrates that her feedback was not purely counter-productive to responsive teaching (see Appendix B). The feedback I received from James and Candice appears to have had a large impact on the ways in which I responded to students' ideas, which I will describe below.

Table 2 highlights that after week 9, the first week featuring feedback from James and Candice, there were changes in some of the activities and practices I decided to implement, as some were absent in the table and instead I planned to try new activities and practices. First, I decided to split the class into two groups. My co-teacher and I each planned to work with a different subset of the class to provide a smaller student-to-teacher ratio as we interacted with them. In addition, I decided to try cold-calling students who had not raised their hands, planned to switch from a student-led Do Now to a teacher-led Do Now, and decided to make grade modifications. I will explore two of these changes—switching from a student-led to teacher-led Do Now and grade modifications—because these two practices shifted most dramatically. As seen in Table 2, the student-led Do Now had occurred each week until week 9 and then never

resurfaced; instead, the teacher-led Do Now was present every week after. In addition, grade modification was not mentioned until week 9, whereas it was mentioned in 9 of the 14 subsequent weeks in at least one data source.

*Student-Led Do Now.* Every week until week 9, we asked students to present solutions to the Do Now problem at the beginning of class to give them an opportunity to share their ideas (see Table 5 in Appendix B for a description of this practice, which I viewed as productive to responsive teaching). However, after receiving James' and Candice's feedback, my co-teacher and I re-evaluated this approach. In the following conversation from mid-March, my co-teacher had skipped the student Do Now presentations and presented the solutions himself instead for the first time.

*Me:* So we could maybe do one long division problem for the Do Now, or do you think it should be earlier stuff to review? 'Maybe just given something, figure out the factors.'

*Co-teacher:* That might be good, cuz I think there's a lot of gaps, so revisiting that. I think one thing is like, if we do three problems and three people presenting, then all of a sudden that's like, half a class.

*Me:* No, it's true, it needs to be shorter.

*Co-teacher:* Yeah, I think today where it was really short, they seemed really engaged, it was almost like a new Math 11 class. So I'd like to model that as much as possible (Conversation with co-teacher, March 19<sup>th</sup>)

While neither my co-teacher nor I directly cited James or Candice when discussing adaptations for the Do Now, this conversation happened in the context of receiving Candice's feedback that students would not understand the material on their own and to abbreviate the Do Now to leave



more time for students to practice. Therefore, her feedback might have influenced me to shift away from the student-led Do Now. The expectations mismatch appears to have played a role in the decision as well, as my co-teacher said, “I think there’s a lot of gaps,” which may highlight the perception that the material was not a good match for students, as my co-teacher and I both felt as though there were many pieces of algebraic understandings students did not yet have, which we believed hindered their progress to learn more advanced material. Hence, multiple influences may be linked to the decision to stop planning the student-led Do Now. Indeed, following this conversation, we always presented the Do Now solutions instead of the students, which, as direct instruction, was an activity implemented with the intent to convey information to students without building on their ideas.

***Grade changes.*** Beginning in week 9, I began to perform grade modifications (see Table 5 in Appendix B for a description of this practice, which I viewed as counter-productive to responsive teaching). I discussed and wrote about making changes to grades in 64% of the remaining weeks of the semester after never mentioning it in the first 9 weeks. The same day in which I received James’ email about student performance, I discussed making changes to students’ grades with my co-teacher. I had the following conversation as my co-teacher and I sat by my computer and tried making changes to students’ grades using grading software:

*Co-teacher:* Do we want to just say assignments are 35 percent, to make it easier? Tests and projects are 35 and quizzes are 30. Oh, do we want to call Do Nows as the 5 percent instead? So we added the 5 percent to the assignments, so maybe make that 30 percent again? Would that help?

*Me:* Let's see. (Makes the change in the gradebook software.) It's about the same. Right?

That hasn't changed at all. We could also think about dropping the lowest test grade or something like that. That's kind of a big—

*Co-teacher:* But we don't have a lot of tests. I almost don't want to do that, but if...

*Me:* Yeah, I don't want to either. Ok. Mmm... I also think that if we're drastically changing their grades, we need to do it more gradually, or else James will be like, 'You just changed the grades so that you're not in trouble; they're not actually learning.'

(Conversation with co-teacher, March 13<sup>th</sup>).

Perhaps because James' feedback did not focus on responsive practices, but instead on interventions that would lead to increasing students' grades (e.g., by contacting parents), I reacted primarily by making changes to their grades. I was worried about how James might perceive this ("I also think that if we're drastically changing their grades, we need to do it more gradually, or else James will be like, 'You just changed the grades so that you're not in trouble; they're not actually learning'") but seemed to feel as though we needed to take immediate action ("well, that's something"). That I did not promote practicing responsive teaching shows that I also felt the influences of an expectations mismatch and a lack of flexibility; I felt that the only option I had was deciding to directly change their grades because I did not believe I could adapt the course to better meet their needs.

In summary, a lack of flexibility and an expectations mismatch appeared to impact some shifts in practice: I decided to move away from flipped learning and towards increased direct instruction, while occasionally deciding to incorporate students' ideas as part of the instruction. When a lack of flexibility and an expectations mismatch worked in conjunction with counter-

productive supervisor feedback, I described additional shifts as I decided to eliminate the student-led Do Now and to make grade modifications. I also planned smaller changes in practice, such as trying cold-calling and splitting the class as part of instruction. Therefore, it appears that an expectations mismatch, a lack of flexibility, and counter-productive supervisor feedback may have had an impact on the decisions I made around how to respond to students' ideas.

### **Discussion**

The intent of this paper was first to identify influences that may have affected my decisions around implementing responsive teaching practices and then explore the possible impact of these influences on my decisions to implement responsive teaching practices in my first year of teaching. In this section, I will summarize the three influences' impact on my decisions around attending and responding to students' mathematical thinking and compare these results to prior research.

#### **Deciding to Attend to Students' Mathematical Ideas**

As shown in the results section, my decisions around attending to students' ideas—as illustrated in my descriptions and interpretations of their ideas in my log, emails, and conversations—changed to become somewhat more negative throughout the course of the semester.

Teachers often need long-term professional development to learn how to attend to students' ideas (Bautista et al., 2014; Jacobs et al., 2010). This is especially true for beginning or pre-service teachers (Amador et al., 2016; Kilic, 2016; Star & Strickland, 2008). Interestingly, I continued to intermittently attend to my students' ideas throughout the semester despite reducing decisions to respond to students' ideas productively. This suggests that it may be harder for external influences to hinder teachers' implementation of attending to students' ideas compared

to the same influences to hinder teachers' responding to students' ideas. These results are similar to Franke et al.'s (2001) follow-up study on their Cognitively Guided Instruction PD program. As described previously, the authors found that many of the teachers who participated in their program still attended to students' ideas years after the workshop ended (Franke et al., 2001). However, only a subset of teachers responded to their students' ideas in a meaningful way (Franke et al., 2001).

This is not to say that the influences had no impact on how I attended to students' ideas, as I did become increasingly negative in how I described their thinking. Sense-making theory describes that the messages one receives from one's environment may iteratively cause change in practice (Coburn, 2004). Drawing from sense-making theory, my interpretations from the influences made me increasingly aware of what I was expected to have students achieve, namely, an understanding of rigorous material as represented by a passing grade in the class. I received this message frequently, especially once I began receiving supervisor feedback. As this awareness increased, I began using more negative phrases describing students' ideas, perhaps because I felt a lack of autonomy to act upon what I had noticed. As such, the ways in which I attended to students' thinking shifted over time, perhaps based on iterative interactions with the influences.

### **Deciding to Respond to Students' Mathematical Ideas**

A lack of flexibility and an expectations mismatch may have influenced three changes in how I made decisions around responding to students' ideas in the first four weeks of the semester: I planned to stop using flipped learning, planned to increase the amount of direct instruction, and occasionally decided to incorporate students' ideas in direct instruction. When all three influences were present, I decided to halt student presentations of the Do Now at the

board and instead planned to present it myself. I also decided to make grade modifications. Finally, I decided to try cold-calling and splitting the class into two groups for instruction, although these practices were reported to a lesser extent.

In the context of sense-making (Coburn, 2004) and decision-making theory (Schoenfeld, 2010), I began the year with several resources, including my own mathematical knowledge and my understanding of responsive teaching practices. As I attended to students' ideas and decided appropriate goals based on those ideas, I initially decided upon goals that aligned with my responsive teaching resource. However, based my interpretation of messages (or influences) I received from the environment, specifically an expectations mismatch, lack of flexibility, and counter-productive supervisor feedback, I may have developed a new resource: context-specific teaching practices. This resource was comprised of my interpretations of what it meant to teach in this specific place; to adhere to the curriculum rather than to adapt my interpretations of students' beliefs, and to adopt teacher-centered practices such as lecturing. As such, my decisions when planning how to respond to students' ideas became aligned with my interpretations of the influences, rather than with the reform I had hoped to implement. This finding connects with prior research, which has documented that there are often discrepancies between the beliefs that a teacher holds and the practices they implement (Karaagac & Threlfall, 2004; Raymond, 1997; Schoenfeld, 1998). This has prompted researchers to argue that teachers' beliefs are contextualized (Cooney, 1985; Schoenfeld, 1998; Skott, 2009).

**Connections to policy research.** Coburn (2004) found that four influences—congruence of policy with a teacher's beliefs, intensity of the messaging around the policy, pervasiveness of messaging around the policy, and voluntariness of implementation—appeared to impact whether teachers implemented the reform with fidelity. Coburn (2004) found that teachers were more

likely to implement reforms when they aligned with their beliefs. However, both Coburn (2004) and Anderson (2017) found that while teachers infrequently implemented reforms that did not align with their beliefs, when they did so, they “were more likely to do so in ways that pushed their thinking or caused them to reorganize their practice in more substantial ways” (p. 228). In this case, my reform practice was responsive teaching. However, I interpreted the messages, or influences, I received as not aligned with the reform I had hoped to practice. Perhaps consequently, I made decisions that did not align with the responsive teaching reform. This case differs from Anderson (2017) and Coburn (2004) in that the reform and influences were from two different sources (my own educational experiences and from the school I taught in), instead of both originating from either the district or state. Hence, these results offer a complementary case to Coburn (2004) and Anderson (2017) in that they illustrate what may happen when a reform does not align with the messages, or influences, that appear to affect decision-making.

The decisions I made as the semester progressed can also be compared to earlier research documenting the negative impacts national, state, and local policies may have on teacher affect and the choices they make in the classroom (e.g., Apple, 1986; Ballet et al., 2007; Calderhead, 2001; Cobb et al., 2018; Craig, 2004; Cuban, 2007; Neumann, 2016; Valli & Buese, 2007). More specifically, teachers may use teacher-centered activities to cope when they feel as though they have too much to teach in a certain window of time (Cuban, 1986). This appeared to be the case here: the near-continuous presence of an expectations mismatch and a lack of flexibility perhaps influenced me to move away from the student-centered practices I had initially incorporated into my classroom and towards teacher-centered practices.

Most literature regarding accountability describes policy’s impact on student outcomes, teacher affect, or on notions of de-professionalization of the teaching profession (Apple, 1986;

Cobb et al., 2018; Neumann, 2016). While researchers have begun to examine how accountability measures may impact teacher roles or actions in the classroom (e.g. Neumann, 2016; Valli & Buese, 2007), policy influences on responsive teaching is relatively under-explored (Cobb et al., 2018). Therefore, this study contributes to the literature in part by illustrating a specific example of influences stemming from district policies on teacher practices.

**Supervisor feedback.** Previous research has highlighted the importance of having strong networks of support to implement feedback (Blanton & Kaput, 2008; Towers, 2008). These networks of support should include fellow teachers, such as Candice, and school leaders, such as James, as a broader network is necessary to support teachers' professional development (e.g., Blanton & Kaput, 2008; Cobb & McClain, 2001). In this case my network was not supportive of responsive teaching practices, as I interpreted James and Candice's feedback to be against (e.g., gradual release) or irrelevant (e.g., contacting parents) to responsive teaching. That the majority of their feedback did not align with responsive practices is not surprising; Sharpe et al. (2018) found that even with professional development, school leaders had difficulty identifying responsive mathematical teaching practices. While Sharpe et al. (2018) suggested this problem could be partially addressed by asking school leaders with mathematical backgrounds to give feedback, both supervisors in this study had mathematical backgrounds and nevertheless encouraged practices that did not align with or were irrelevant to responsive teaching. Therefore, these data suggest that a mathematical background is insufficient to ensure that supervisors can give appropriate feedback to support responsive mathematical teaching.

Researchers have documented useful techniques for supervisors to utilize when giving feedback, such as instructional rounds (e.g. City, 2009), and have noted that feedback can lead to positive changes in practice (Gregory, Allen, Mikami, Hafen, & Planta, 2014; Malu, 2015). More

specifically, Towers (2008) found that when first-year teachers tried to implement inquiry-based teaching, which has many similarities to responsive teaching, they felt more comfortable when doing so in a supportive environment. However, in this case feedback was often given electronically with little subsequent discussion. James pointed out that half of my students should not have failing grades, and my interpretation of his feedback was effective in that I made the changes—improvement in student grades—that he requested, but likely not in the manner that my supervisor would have liked. This case illustrates the possible power that supervisor feedback has and may be a cautionary tale about how teachers' interpretations of feedback may be quite different from what a supervisor may have had in mind.

As a first-year teacher, I may have been especially susceptible to peer and supervisor influence. As Towers (2008) demonstrated, first-year teachers may struggle to implement innovative practices they learned in school if their network does not support them. This study builds upon Towers' (2008) work that was completed at the elementary level by showing that similar trends may exist at the high school level.

**Connections between the three influences.** Neumann (2016) argued that it is important to consider multiple influences when exploring why changes may occur in classrooms, as it will provide a more holistic view of the data. In this way, my results highlight the possible impact of three influences on how I decided to respond to students' mathematical ideas. Because previous research has not considered these three influences simultaneously, this study contributes initial insights into how these influences may impact first-year teachers.

### **Implications and Limitations**

At the turn of the century, Ball and Cohen (1999) called for systemic change; arguing that teacher education programs needed allow teachers to “thoughtful and challenging work” (p. 6)



that aligned with reform practices such as responsive teaching. They also suggested that professional development be meaningful and sustained, rather than disjointed workshops that present the latest educational fad. Finally, and perhaps most relevant here, Ball and Cohen (1999) wrote:

Teacher education also would have to become sufficiently powerful to immunize teachers against the conservative lessons that most learn from practice [if teachers are to be successful in implementing reform practices]. Until practice has changed, most intending teachers would arrive in their professional education having learned didactic conceptions of learning and teaching as students. And once finished with their professional education, those same teachers' experience in school would reveal the difficulty of sustaining thoughtful work when surrounded with more traditional colleagues, administrators, and parents. Teacher education would have to become an agent of professional countersocialization, no easy task." (p. 6)

In my case, I would argue that I had a quality undergraduate and graduate education that centered around student thinking and was part of sustained professional development. However, as the results indicate, an expectations mismatch, lack of flexibility, and counter-productive supervisor feedback upon entering my new workplace seemed to hamper my decisions around implementing responsive teaching practices. My experience speaks to Ball and Cohen's (1999) call for teacher education to "immunize" teachers against the experiences they will have upon entering a school district; while I while I began the semester with a strong belief that it was important to attend to students' thinking and bring their ideas into the fabric of my classroom. However, it did not take long for my practices to be altered to conform with the status-quo. College faculty and PD facilitators should consider including training to support teachers'

implementation of these new practices in their classrooms after their program has concluded. More research is needed in this regard as well; we need to determine how to better support pre-service teachers as they enter the workforce and in-service teachers as they learn new skills. This is critical if we hope to bring change to classrooms.

My analysis revealed three influences—an expectations mismatch, lack of flexibility, and counter-productive supervisor feedback—that stemmed from my interpretations of explicit and implicit district policy and interpretations of messages I received from my supervisors. These interpretations may have led me to change my classroom in ways that the district and my supervisors may not have intended; for instance, James likely would have disapproved of my decision to make grade modifications. However, most of the messages I received regarding the influences were via email or rumor from other teachers. As such, districts and schools should consider how their messages are sent, and that their messaging may have unintended consequences for teachers.

As this is a case study, it is necessarily limited in scope. I considered three influences that were present in the data—an expectations mismatch, a lack of flexibility, and counter-productive supervisor feedback—and their possible impact on whether and how I decided to attend and respond to my students' ideas. However, many other possible influences may have impacted my actions that I did not explicitly write about or discuss, such as my teaching relationship with my co-teacher, content knowledge for teaching, my own prior experiences with mathematics, gender, age, and my lack of teaching experience. I aimed to draw attention to the influences that appeared most frequently in the data, but this was not done with the intent to ignore other influences. In addition, a focus on policy runs the risk of reducing my agency in my classroom.

To this end, I emphasize that as a first-year teacher I did not feel as though I had much agency; nevertheless, I am responsible for the instructional decisions I made.

### **Conclusion**

The purpose of this paper was to examine one semester of my first year of teaching to identify the influences that may have impacted my decisions around the practice of responsive teaching. I identified three influences—a lack of flexibility, an expectations mismatch, and counter-productive supervisor feedback—that may be associated with how I decided to implement responsive teaching. I argue that the three influences appeared to impact both how I decided to attend to students' ideas and the ways in which I decided to respond to students' ideas over time.

As I began the semester with the intent to implement activities and practices consistent with responsive teaching, this study speaks to how an expectations mismatch, a lack of flexibility, and counter-productive supervisor feedback may challenge teachers as they make decisions planning to implement responsive teaching. As a result, more research is needed to better support teachers as they attempt to integrate training they have received into their classrooms.

## References

- Achinstein, B., & Ogawa, R. (2006). (In)Fidelity: What the resistance of new teachers reveals about professional principles and prescriptive educational policies. *Harvard Educational Review, 76*(1), 30-63.
- Adelman, C. (1975). The function of classroom observation within the methodology of the Ford teaching project. *British Educational Research Journal, 1*(2), 42-43.
- Amador, J., Carter, I., & Hudson, R. (2016). Analyzing preservice mathematics teachers' professional noticing. *Action in Teacher Education, 36*(4), 371-383.
- Amador, J., Estapa, A., de Araujo, Z., Kosko, K., & Weston, T. Eliciting and analyzing preservice teachers' mathematical noticing. *Mathematics Teacher Educator, 5*(2), 158-177. <http://www.jstor.org/stable/10.5951/mathteaceduc.5.2.0158>
- Ainley, J., & Luntley, M. (2007). The role of attention in expert classroom practice. *Journal of Mathematics Teacher Education, 10*, 3-22.
- Anderson, E. (2017). Accommodating change: Relating fidelity of implementation to program fit in educational reforms. *American Educational Research Journal, 54*(6), 1288-1315. DOI: 10.3102/0002831217718164
- Apple, M. W. (1986) *Teachers and texts. A political economy of class and gender relations in education* (London, Routledge).
- Ball, D. (1990). Reflection and deflections of policy: The case of Carol Turner. *Educational Evaluation and Policy Analysis, 12*(3), 263-275.
- Ball, D. L. & Cohen, D. K. (1999). Developing practice, developing practitioners: Toward a practice-based theory of professional education. In G. Sykes and L. Darling-Hammond

- (Eds.), *Teaching as the learning profession: Handbook of policy and practice* (pp. 3-32). San Francisco: Jossey Bass.
- Ball, D. L., Thames, M., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education*, *59*, 389-408. DOI: 10.1177/0022487108324554
- Ballet, K., Kelchtermans, G., & Loughran, J. (2006). Beyond intensification towards a scholarship of practice: analyzing changes in teachers' work lives. *Teachers and Teaching*, *12*(2), 209-229. DOI: 10.1080/13450600500467415
- Bautista, A., Brizuela, B. M., Glennie, C. R., & Caddle, M. C. (2014). Mathematics teachers attending and responding to students' thinking: Diverse paths across diverse assignments. *International Journal for Mathematics Teaching & Learning*.
- Blanton, M. & Kaput, J. (2008). Building district capacity for teacher development in algebraic reasoning. In J. J. Kaput, D. W. Carraher, & M. L. Blanton (Eds.), *Algebra in the Early Grades* (pp. 361-288). New York, NY: Routledge.
- Boaler, J. (2008). When politics took the place of inquiry: A response to the National Mathematics Advisory's panel review of instructional practices. *Educational Researcher*, *37*(9), 588-594.
- Bochner, A. (2000). Criteria against ourselves. *Qualitative Inquiry*, *6*(2), 266-72.
- Borko, H., & Livingston, C. (1989). Cognition and improvisation: Differences in mathematics instruction by expert and novice teachers. *American Educational Research Journal*, *26*, 473-498.
- Bray, L., & Russell, J. (2018). The dynamic interaction between institutional pressures and activity: An examination of the implementation of IEPs in secondary inclusive settings.

*Educational Evaluation and Policy Analysis*, 40(2), 243-266. DOI:  
10.3102/0162373718756189

Calderhead, J. (2001). International experiences of teaching reform. In V. Richardson (Ed.), *Handbook of research on teaching* (4<sup>th</sup> ed., pp. 777-800). Washington, DC: American Educational Research Association.

Charmaz, K. (2014). *Constructing Grounded Theory* (2<sup>nd</sup> Ed.). SAGE Publications: London.

Cobb, P., Jackson, K., Henrick, E., & Smith, T. (2018). *Systems for Instructional Improvement* (1<sup>st</sup> Ed.). Harvard Education Press: Cambridge, MA.

Cobb, P., Jackson, K., Henrick, E., & Smith, M. (2018). Investigating and supporting Instructional improvement. In P. Cobb, K. Jackson, E. Henrick, T. Smith (Eds.), *Systems for Instructional Improvement: Creating Coherence from the Classroom to the District Office* (pp. 1-14). Cambridge, MA: Harvard Education Press.

Coburn, C. (2004). Beyond decoupling: Rethinking the relationship between the institutional environment and the classroom. *Sociology of Education*, 77(3), 211-244.

Cohen, D., & Mehta, J. (2017). Why reform sometimes succeeds: Understanding the conditions that produce reforms that last. *American Educational Research Journal*, 54(4), 644-690.  
DOI: 10.3102/0002831217700078

Cooney, T. (1985). A beginning teacher's view of problem solving. *Journal for Research in Mathematics Education*, 16(5): 324-336.

Correnti, R., & Rowan, B. (2007). Opening up the black box: Literacy instruction in schools participating in three Comprehensive School Reform programs. *American Educational Research Journal*, 44(2), 298-339. DOI: 10.3102/0002831207302501

- Craig, C. J. (2004). The dragon in school backyards: The influence of mandated testing on school contexts and educators' narrative knowing. *Teachers College Record*, 106(6), 1229–1257.
- Cuban, L. (1986). Persistent instruction: Another look at constancy in the classroom. *Phi Delta Kappan*, 68(1), 7–11.
- Cuban, L. (2007). Hugging the middle: Teaching in an era of testing and accountability, 1980–2005. *Education Policy Analysis Archives*, 15(1), 1–27.
- Denshire, S. (2013). Autoethnography. *Sociopedia*, 1-12. DOI: 10.1177/205684601351
- Dutton, J. & Dukerich, J. (1991). Keeping an eye on the mirror: Image and identity in organizational adaptation. *The Academy of Management Journal*, 34(3), 517-554.
- Elliott, J. (1991). *Action research for educational change*. Buckingham, England: Open University Press.
- Fennema, E., Carpenter, T., Franke, M., Levi, L., Jacobs, V., & Empson, S. (1996). A longitudinal study of learning to use children's thinking in mathematics instruction. *Journal for Research in Mathematics Education*, 27(4), 403-434.
- Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry*, 12(2), 219-245. DOI: 10.1177/1077800405284363
- Frank, K., Zhao, Y., Penuel, W., Ellefson, N., & Porter, S. (2011). Focus, fiddle, and friends: Experiences that transform knowledge for the implementation of innovations. *Sociology of Education*, 84(2), 137-156. DOI: 10.1177/0038040711401401812
- Franke, M. L., Carpenter, T., Levi, L., & Fennema, E. (2001). Capturing teachers' generative change: A follow-up study of professional development in mathematics. *American Educational Research Journal*, 38(3), 653-689.

Hargreaves, A. (1992). Time and teachers' work: An analysis of the intensification thesis.

*Teachers College Record*, 94(1), 97-108.

Horn, I., Kane, B., & Garner, B. (2018). Teacher collaborative time: Helping teachers make sense of ambitious teaching in the context of their schools. In P. Cobb, K. Jackson, E. Henrick, T. Smith (Eds.), *Systems for Instructional Improvement: Creating Coherence from the Classroom to the District Office* (pp. 93-112). Cambridge, MA: Harvard Education Press.

Jacobs, V. & Empson, S. (2016). Responding to children's mathematical thinking in the moment: an emerging framework of teaching moves. *ZDM*, 48, 185-197. DOI 10.1007/s11858-015-0717-0

Jacobs, V., Lamb, L., Philipp, R. (2010). Professional noticing of children's mathematical thinking. *Journal for Research in Mathematics Education*, 41(2), 169-202.

Karaagac, M., & Threlfall, J. (2004). The tension between teacher beliefs and teacher practice: The impact of the work setting. In M. J. Høines & A. B. Fuglestad (Eds.), *Proceedings of the 28th conference of the international group for the psychology of mathematics education* (Vol. 3, pp. 137-144). Bergen, Norway: Bergen University College.

Kemmis, S., & McTaggart, R. (1982). *The action research planner*. Geelong, Victoria: Deakin University Press.

Kilic, H. (2018). Pre-service mathematics teachers' noticing skills and scaffolding practices. *International Journal of Science and Mathematics Education*, 16, 377-400. DOI 10.1007/s10763-016-9784-0

Lampert, M. (1990). When the problem is not the question and the solution is not the answer: mathematical knowing and teaching. *American Educational Research Journal*, 27(1), 29-63.



- Lampert, M., & Ball, D. L. (1998). *Teaching, multimedia, and mathematics: Investigations of real practice*. New York: Teachers College Press.
- Levin, D., Grant, T., Hammer, D. (2012). Attending and responding to student thinking in science. *The American Biology Teacher*, 74(3), 158-162.
- Mason, J. (2002). *Researching your own practice: The discipline of noticing*. London, UK: Routledge Farmer.
- Miron, L., & Lauria, M. (1998). Student voice as agency: Resistance and accommodation in inner-city schools. *Anthropology and Education Quarterly*, 29(2), 189-213.
- National Governor's Association Center for Best Practices & Council of Chief State School Officers. (2010). *Common Core State Standards of Mathematics*. Washington DC: National Governor's Association Center for Best Practices & Council of Chief State School Officers.
- NCTM. (2000). *Principles and Standards for School Mathematics*. NCTM. Reston, VA: National Council of Teachers of Mathematics.
- NCTM. (2014). *Principles to Actions: Ensuring Mathematical Success for All*. Reston, VA: National Council of Teachers of Mathematics.
- Newmann, F. (1990). Higher order thinking in teaching social studies: A rationale for the assessment of classroom thoughtfulness. *Journal of Curriculum Studies*, 22(1), 41-56.
- Neumann, J. (2016). Examining mandated testing, teachers' milieu, and teachers' knowledge and beliefs: Gaining a fuller understanding of the web of influence on teachers' classroom practices. *Teachers College Record*, 118(020304). 1-50.

- Porac, J., Thomas, H., & Baden-Fuller, C. (1989). Competitive groups as cognitive communities: The case of Scottish knitwear manufacturers. *Journal of Management Studies*, 26(4), 397-416.
- Raymond, A. (1997). Inconsistency between a beginning elementary school teacher's mathematics beliefs and teaching practice. *Journal for Research in Mathematics Education*, 28(5), 550-576.
- Schack, E. O., Fisher, M. H., Thomas, J. N., Eisenhardt, S., Tassell, J., & Yoder, M. (2013). Prospective elementary school teachers' professional noticing of children's early numeracy. *Journal of Mathematics Teacher Education*, 16, 379-397.
- Schoenfeld, A. (1998). Toward a theory of teaching-in-context. *Issues in Education*, 4(1).
- Schoenfeld, A. (2010). *How we think: A theory of goal-oriented decision making and its educational applications*. New York City, New York: Routledge.
- Schoenfeld, A. (2011). Toward professional development for teachers grounded in a theory of decision making. *ZDM*, 43, 457-469. DOI: 10.1007/s11858-011-0307-8
- Sharpe, C., Larbi-Cherif, A., Henrick, E., Cobb, P., & Smith, T. (2018). District instructional leadership. In P. Cobb, K. Jackson, E. Henrick, & T. Smith (Eds.), *Systems for Instructional Improvement: Creating Coherence from the Classroom to the District Office* (pp. 179-193). Cambridge, MA: Harvard Education Press.
- Sherin, M. G., Russ, R., & Colestock, A. (2011). Accessing mathematics teachers' in-the-moment noticing. In M. Sherin, V. Jacobs, & R. Philipp (Eds.), *Mathematics Teacher Noticing: Seeing Through Teachers' Eyes* (pp. 79 - 133). New York City, New York: Routledge.

- Sherin, M. G. & van Es, E. (2009). Effects of video club participation on teachers' professional vision. *Journal of Teacher Education*, 60, 20-37.
- Shulman, L. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4-14.
- Skott, J. (2009). Contextualizing the notion of 'belief enactment.' *Journal of Mathematics Teacher Education*, 12, 27-46. DOI 10.1007/s10857-008-9093-9
- Spillane, J. & Zeuli, J. (1999). Reform and teaching: Exploring patterns of practice in the context of national and state mathematics reforms. *Educational Evaluation and Policy Analysis*, 21(1), 1-27.
- Star, J., Lynch, K., & Perova, N. (2011). Using video to improve preservice mathematics teachers' abilities to attend to classroom features: A replication study. In M. Sherin, V. Jacobs, & R. Philipp (Eds.), *Mathematics Teacher Noticing: Seeing Through Teachers' Eyes* (pp. 117- 133). New York City, New York: Routledge.
- Star, J. & Strickland, S. (2008). Learning to observe: Using video to improve preservice mathematics teachers' ability to notice. *Journal of Mathematics Teacher Education*, 11, 107-125. DOI 10.1007/s10857-007-9062-7.
- Towers, J. (2008). Living ethically in the classroom: Enacting and sustaining inquiry. *The journal of educational thought*, 42(3), 277-292. <http://www.jstor.org/stable/23758498>
- Townsend, A. (2014). Weaving the threads of practice and research: Reflections on fundamental features of action research. In F. Rauch, A. Scuster, T. Stern, M. Pribila, & A. Townsend (Eds.), *Promoting Change through Action Research* (pp. 7-22). Boston: Sense Publishers.
- U.S. Department of Education. (2002). *No Child Left Behind: A Desktop Reference*. Jessup, MD: Education Publications Center, U.S. DOE.

- Valli, L., & Buese, D. (2007). The changing roles of teachers in an era of high-stakes accountability. *American Educational Research Journal*, 44(3), 319-558.  
<https://www.jstor.org/stable/30069427>
- Van Es, E. (2011). A framework for learning to notice student thinking. In M. Sherin, V. Jacobs, & R. Philipp (Eds.), *Mathematics Teacher Noticing: Seeing Through Teachers' Eyes* (pp. 134-151). New York City, New York: Routledge.
- Van Es, E. & Sherin, M. (2002). Learning to notice: Scaffolding new teachers' interpretations of classroom interactions. *Journal of Technology and Teacher Education*, 10, 571-596.
- Van Es, E. & Sherin, M. (2008). Mathematics teachers' "learning to notice" in the context of a video club. *Teaching and Teacher Education*, 24(2), 244-276.
- Williamson, P., Bondy, E., Langley, L., & Mayne, D. (2005). Meeting the challenge of high-stakes testing while remaining child-centered: The representations of two urban teachers. *Childhood Education*, 81(4), 190-195.

**Appendix A**

Table 4

*16 Themes that Emerged from Initial Coding and the Categories that they Formed from*

Theme 1: Adapting Curriculum or Assessments

Description: Writing or discussion related to making changes to the curriculum or assignments.

<u>Category</u>	<u>Example</u>
Addressing Low Test or Quiz Scores	Co-teacher: So, um, nineteen percent average. What should we do? Researcher: We could scale it. (Conversation)
Content Difficulty Adjustments	Researcher: I don't know how [I] could water [the test] down that much more. (Conversation)
Omitting and Shifting Course Content	Co-Teacher: And then, so we'll just completely skip sequences and series? Researcher: Yeah... I mean, there might be time at the end of ext week maybe, but I think it might be better to continue to emphasize what they've already learned. (Conversation)

Theme 2: Beliefs

Description: Writing or discussion related to my beliefs about how students should learn and engage with mathematics.

<u>Category</u>	<u>Example</u>
Beliefs about learning	Researcher: I guess what I-- I don't mean that I don't totally believe in learning styles, cuz I definitely believe that some people have preferences. I just think that it's way more complicated than that. (Conversation)
Grading beliefs and challenges	I wish I had toned down more aspects of the test because the students bombed-- the highest grades were in the 40s. I'm not entirely sure how we'll address that, but many students are currently failing since we entered the limits test grade :-/ (Log)
Dissonance in Teaching Philosophies	Afterwards we had a brief discussion about the progression of the class (I recorded some of it). I brought up the fact that I think they need more practice with solving, but [my co-teacher] is convinced that they really can't solve, so it's more important for us to focus on the "big concept" of logarithmic functions. I would feel okay about this if I believed that in two weeks more than 5% of our students would be able to identify a log function, but we didn't do any real-world applications to show in a "big concept" way why logs are useful, which I think would have helped. Instead, we focused a lot on the properties but didn't give them quite enough practice to temporarily master the algorithms to solve. I feel like this is the worst of both worlds. (Log)
Goals for Next Year	Although I do think that the kids will do nothing if given the choice, I do think that a decent amount of the apathy/"laziness" in the class is due to not

understanding the material and feeling so behind that they don't want to engage. I think if we can somehow "babystep" it more, then it might help them. I don't know exactly how to do this and still cover the curriculum...

Theme 3: Changes Based on Students' Ideas

Description: Writing or discussion about making changes to instruction based on specifically identified student ideas.

<u>Category</u>	<u>Example</u>
Using Student Ideas in Instruction	This was a struggle because of the $x^4$ —one of the students recalled that the square root of $x^4$ can be rewritten as square root of $x^2 \cdot x^2$ , and so I went with that because that is a more mathematically rigorous way to explain (rather than saying, just divide the exponent by 2 and put $x^2$ in the a spot). (Log)
Adjusting Lesson Based on Student Needs	I didn't anticipate how many students wouldn't know what $1E-5$ means on a calculator so we had to briefly go over scientific notation, and I may have put just a few too many values. (Log)

Theme 4: Classroom Management and Accountability

Description: Writing or discussion related to how to manage students' behavior in the classroom and hold them accountable for their actions.

<u>Category</u>	<u>Example</u>
Exploring Rationale Behind Student Actions	Researcher: I think [the student] was also getting confused about the grading policy and was getting frustrated that I wouldn't give him credit for doing the assignment after it was already due, and then he was just mad about the test revisions. (Conversation)
Problem-Solving Student Behavior	Researcher: Yeah. Did you, in any of your classes, talk about how to deal with students who have high levels of frustration, who give up almost immediately? Co-Teacher: That would be very useful. I don't know if there is any research on there about effective practices, but it is challenging sometimes when kids look at a problem, give up right away, and then blame you. It's happening in this class. Also somewhat in our class too. (Conversation)
Description of Student Behavior	The students were on full-scale revolt today when they realized that we entered their test grades into powerschool. The majority of them are now failing. (Log)

Theme 5: Co-Teaching

Description: Writing or discussion about co-teaching in general.

<u>Category</u>	<u>Example</u>
Dividing Work	Researcher: How did you want to divvy up grading and prep for next week? I know you've done all of the grading so far so I don't mind taking care of the finals; I'm planning on doing the quiz corrections as well. (Email)
Praise for Work	Researcher: I think [the quiz] is a little long but the questions are great! (Email)

Special Education Co-Teacher: You-- and, if you continue with inclusion Math 11, I'm probably going to see them in inclusion Math 11 next year. I have on my case load I have two sophomores- I was like, oh my God, I have them their sophomore year, and then I'm going to have them their Junior year, and I am going to have their senior year because I am the only one that has the math upper levels. I think I drank that night. (Conversation)

Theme 6: Developing Classroom Culture

Description: Writing or discussion related to developing a more collaborative and productive classroom culture.

Category

Example

Building Relationships with Students

Co-Teacher: You know, the first day [another teacher] says that he always starts with a get-to-know-you, blah, blah, blah, which is good for the relationship part of the four Rs, um, but I'm kind of thinking that we're good that we didn't do that since we lost so many days already. So it's nice when you have repeat students though, so you already know them-- you know, building relationships. (Conversation)

Peer Feedback

Researcher: Yeah, and then maybe make them like, comment on each other's or something. (Conversation)

Increasing Student Interactions

Researcher: Yeah, I guess we'll see. [One of our students] has been doing so well lately! I wish that I had put more energy into her at the beginning because I think she could have passed. (Conversation)

Theme 7: Developing Lessons or Units

Description: Writing or discussion related to creating lessons or units to later use with students.

Category

Example

Assessments

Co-Teacher: This is what I threw together [attachment: Math11 Test 1.docx]. We could use it as a test or as practice (and change the title). We could give them a just-like if we want to do it as practice Monday, or maybe just take an example of each section. Let me know what you think. (Email)

Course Content  
Developing Course Content

Researcher: So for tomorrow, I had created a matching activity I had hoped to do today... (Email)

Lesson Planning

Researcher: Also, for tomorrow—were you thinking of running the matching activity again near the beginning of class? We could give them the jokesheet afterwards—it starts off with problems they could just use their circles for, such as  $\cos(30)$  or something like that, and then there are a couple at the end that would require subtracting or adding 360 to be able to find them on the circle, which might lead to a nice discussion. And then tan? Or radians? If we did tan tomorrow, then we could perhaps do the other thing I attached for homework (feel free to modify or reject). (Email)

Macro-Level Material Development	<p>Researcher: Alternatively, before we dive into more quadratics, [another teacher] did a lot on transforming other functions such as <math>f(x)=\sqrt{x+2}</math> or something like that-- perhaps we should do that and then finish up quadratics? (Email)</p>
Material Delivery	<p>[My co-teacher] said something along the lines of, "I like this packet system. It's like we're writing a whole textbook. Of course, the problem with writing a whole textbook... [is that it takes a lot of time]." That is a general complaint held by most of the teachers here; because of the iPads, we don't have textbooks and so we have to generate a lot of our own materials. That is a lot of work as a first-year teacher, but it will get better next year. (Log)</p>
Sources of Course Material	<p>Co-Teacher: Um, so I can do the Frair Model rule by four, and then... do we, I mean, some of them we could even like, steal off the internet, like kuta has some good stuff. (Conversation)</p>
Specific Math Problems	<p>Researcher: So... I'm just seeing what I have from last year. I... started off with a, "You know that the number of people affected by a virus doubles every week," Uh... I had them fill out a table and sketch a graph. (Conversation)</p>
Syllabus and Class Rules	<p>Co-Teacher: Do you give a lot of homework? Nightly homework?                  Researcher: Um... I... I dunno. I definitely give more homework to the sophomores because they do it. (Conversation)</p>
Teaching Techniques	<p>Researcher: Yeah, I mean, what we could even do is, how I usually run my classes is I am almost never at the board, which is one of the reasons why I do my Do Now and usually the last problem-- we don't have to do it this way, but usually the last problem on the Do Now but usually the last problem leads into the lesson so that I don't expect them to be able to do it. So then I'll put up an example and then I'll give them whatever they're doing that day and then they'll do it and um, I'll put up a couple more examples throughout when I see that they've reached a certain point, so what we could do is if we had a space for an example but didn't actually do it, and if we noticed that oh, if most of the kids are here and some are not there yet, well they could still look and they could put the example up but they would write it into the notes. (Conversation)</p>

Theme 8: Discussing Student Thinking

Description: Writing or discussion related to students' ideas. This theme includes moments where I talk about student thinking in a more negative sense (as in, what they do not understand), because I still was analyzing a specific area of understanding.

Category

Example

Alternate Solving Methods

Co-Teacher: So we had two substitutions, two, um, graphing, and two word problems. That's like, 30 points right there. And it's like, write the equation given the following information.. so we need the equation. No one's getting the equation. Slope form-- not written correctly, so they lost points because they couldn't do slope. Um, domain, range, there are still a couple of errors, like--



some people did guess and check for the word problem, but since they didn't create the systems of equations which is what we said to do... (Conversation)

Reflection of Instruction on General Student Thinking  
 I talked about that one but honestly, didn't do a very good job. I feel as though I don't think about GCF in a way that is easily accessible to kids (I think about distributing back and "what number needs to go on the outside to get the coefficients we see on the inside?" rather than about common factors, which is easier I think)... when I walked around later, students seemed baffled by both [my and my co-teacher's] presentations. I suppose it's good that we're equally incoherent but in different ways? :-/ (Log)

Specific Areas of Difficulty  
 Researcher: Yeah, I had just seen that [a student] had tried them all; I didn't look closely enough to see that she had messed up.  
 Co-Teacher: Yeah, but because it's a cubic there are three real roots, the options that we gave provided two of the roots, but they should have been able to break it down (Conversation)

Specific Student Thinking or Understanding  
 Another student had the basic idea (as in, she knew where to locate sine and cosine on the unit circle) but her unit circle was filled out incorrectly, so her answers were incorrect. She also seemed to be having trouble with the csc and sec; when I asked her questions (what is csc? she looked it up. How does it relate to sine? What is  $\sin(60)$ ? and so on) then she was able to do that particular problem, but I think there were too many steps that she was unsure of to be able to do that on her own. :-/ (Log)

Theme 9: Expectations Mismatch

Description: Writing or discussion related to the perceived mismatch in what I thought was appropriate for my students to attempt versus what was expected of them.

Category

Example

Non-Mathematical Skills Students Struggle With

Co-Teacher: Yeah, it's like, a lot of those kids have FA'd too, a lot of freshmen, so it's just.. the vastness of abilities. (Conversation)

Mathematical Skills Students Struggle With

Some students still don't know how to add fractions; I bet if I asked them to add fractions on a quiz some of them wouldn't get it right :-/ So they disengage because they don't know how to do it. Of course, there's no chance for them ever understanding it if they disengage, so I don't really know what the solution is until their algebra I (and pre-algebra!) are stronger. (Log)

Theme 10: Imbalance of Power within Co-Teaching Dynamic

Description: Writing or discussion where either my co-teacher or I expressed feeling as though the other person had more power in the co-teaching dynamic.

Category

Example

Co-Teacher Take-Over of Lesson

However, because I don't have a smartboard one of us had to run the computer and the other lead the activity. One guess who ran the computer. I felt a bit like the assistant on Wheel of Fortune rather than a co-teacher... (Log)

Good Cop/Bad Cop [My co-teacher] made a comment under his breath like, "And now you're giving him a coloring book after I took away his iPad? Definitely good cop." He was mostly joking, but it's something to be aware of. I need to make sure that [my co-teacher] doesn't do all of the discipline... I know that I'm more lax than him and let kids get away with stuff; conversely, I think he sometimes can be too rigid. (Log)

Theme 11: Interactions with Other Teachers or Courses

Description: Writing or discussion related to interacting with other teachers or perceptions of how they run their versions of Math 11.

<u>Category</u>	<u>Example</u>
Comparing Classes	Researcher: When I look at what [another teacher] does, she gives so much work and I don't know how... I just don't know how she gets them to do it. (Conversation)
Instruction Influences	Co-Teacher: Um, something I saw Elena Rose do, which we could do, um... she gave her students like a packet of work to kind of teach themselves something. (Conversation)
Interactions with Other Teachers	Co-Teacher: I really didn't do anything in [another teacher's] class, I kind of wanted to, but it was hard to get my fit in there. Researcher: Yeah, I-- it would be hard to work because he has such a dominant personality. (Conversation)

Theme 12: Lack of Flexibility

Description: Writing or discussion related to a perception that I am not allowed to teach in the way I would like, specifically regarding making changes to the curriculum to fit the needs of my students.

<u>Category</u>	<u>Example</u>
Course Pace	Researcher: Which, if we could spend more time on any of these one concepts it would be a really interesting thing to talk about with the kids. (Conversation)
School Math Curriculum Challenges	Researcher: Mmmhmm. And it's hard because, like, the FST curriculum is garbage. Let's just.. let's spend 5 minutes on something, then 5 minutes on something else, and then just scrape the surface on all these things; I don't like it. (Conversation)
Time and Scheduling	Researcher: Yeah, if the term doesn't get extended it probably is pointless, um, we do also need to do limits, which connects very well to rational functions, so... and we had talked originally about doing limits first, um, rather than throwing them at the end of trig, I don't know if you remember, but if we don't get to rational functions before the test we could briefly talk about them and talk about limits and then go into trig. (Conversation)

Theme 13: Negative Supervisor Feedback

Description: Writing or discussion related to reflections on negative feedback received from my supervisors.

<u>Category</u>	<u>Example</u>
Observations	Tuesday was a big day. It was the day of my planned observation by James, my primary evaluator. (Log)
Reflections on Supervisor Comments	<p>Researcher: James also said, and I didn't want to say it in front of [our student], but he was just-- he reiterated that he knows that our students are like, pretty low-skill and challenging, so he like-- just reiterated that he knows that that's the way it is.</p> <p>Co-Teacher: It's just-- when he, when he puts the message like that without actually, he's never actually talked to me about it or any of my responses (conversation)</p>
Possible Responses to Supervisor	<p>Co-Teacher: Like, I feel like I haven't done my message back to James, I want to be able to be like, "So Corinne and I talked, these are some things we're putting into place, but I also want to talk about the demographics of the class. During the Do Now, while you were in the bathroom, I went around and said, 'What's an x-intercept?' Two students couldn't answer that! Two students couldn't tell me what an x-intercept is!" So I don't even know what to say in my thing, like, "This is something we discussed at the beginning of the semester, but it's also something that should have been mastered in Advanced Algebra and Algebra I."</p> <p>Researcher: So I would maybe say, like you could present that, but I would maybe say something like, "I would love to hear any suggestions you have for closing these gaps" or something like that. I would maybe not even call them gaps because that's kind of a negative phrase. Maybe have a euphemism. (Conversation)</p>

Theme 14: Reflections on Course Structure and Content

Description: Writing or discussion about how I felt about the ways in which I organized the course and the ways I approached the content.

<u>Category</u>	<u>Example</u>
Comparing Assessment Problems to Content Covered	And what they did well on, aka the stuff from Monday, wasn't really on the quiz. Or rather, [my co-teacher] put harder versions of those things on the quiz. (Log)
Comparing Content Taught to Experience	Researcher: Yeah, I think when I was learning transformations in school we did a lot of just weirdly shaped functions that weren't going on for forever, they were like, a squiggle. We had to move it. (Conversation)
Comparing Course Goals to Reality	Co-Teacher: Umm, yeah. So Monday we could do synthetic division. Um, I know we said we were going to do weekly quizzes and we haven't really; we started to do them. But it's just, with all the weird stuff, with all the snow days and such, this quarter has felt really messed up. (Conversation)

- Critiquing Daily Course Structure  
 Co-Teacher: That might be good, cuz I think there's a lot of gaps, so revisiting that. I think one thing is like, if we do three problems and three people presenting, then all of a sudden that's like, half a class.  
 Researcher: No, it's true, it needs to be shorter. (Conversation)
- Reflecting on Course Assignments  
 Researcher: Yeah. They just... there's something about the transformations that they just don't get. I don't know if I made it... maybe I should have made it more procedural, I guess, but... (Conversation)
- Reflecting on Course Changes for Next Year  
 Researcher: Anyways, I wonder what we might do to make the content more engaging to get students to try more problem-solving. Whether it's more games, having students put stuff on the board, group discussion, etc., but I think that the college-level kids won't do enough straight-up practice problems for them to understand the material, and I think that's especially true when we make the jumps between problems as big as we've made them. (Email)

Theme 15: Student Ability and Engagement

Description: Writing or discussion about how to better engage students in the class.

- | <u>Category</u>           | <u>Example</u>  |
|---------------------------|---|
| Specific Student Critique | Researcher: Yeah, no, we can definitely alternate. I don't mind having like-- [that student] doesn't bother me.. most, most of the time. He was getting kind of annoying the other day.<br>Co-Teacher: Was it a day that ended in 'y'? (Conversation)   |
| Student Course Affect     | Researcher: I did some [projects with my sophomores], but there just wasn't enough time. I feel like projects are a fun thing and these kids [in my prior Math 11 class] just don't deserve it. I put a lot of effort into doing what I thought were really engaging activities and I felt like I got kind of burned and I think that's why I got kind of bitter. Like, you can do some interesting word problems with logs and stuff and they weren't interested. (Conversation) |
| Student Engagement        | When [we] finally showed the general algorithm, I think most of the students weren't paying attention anymore-- and they caught on right away once [we] did another example, because actually applying the change of base formula is really easy. (Log)   |

Theme 16: Teacher Feelings

Description: Writing or discussion about feelings related to content, students, and in general (happiness, sadness, etc.)

- | <u>Category</u>                | <u>Example</u>  |
|--------------------------------|---|
| Teacher Feelings about Content | Co-Teacher: I find [trig proofs] fun. To me, it's like a puzzle, but to them, I don't think...<br>Researcher: I think you have to have like, a really deep understanding of algebra for it to be a puzzle, and they just don't have... (conversation) |

Teacher Feelings in General	Co-Teacher: I was like, this is probably not going to be a good observation, but.. yeah, I was just so burned out. (Conversation)
Teacher Feelings about Students	Researcher: Yeah, I left early yesterday. I was like, exhausted and super-cranky. And then I felt better by the end of the night, but I was like, "I don't want to do anything at all." Co-Teacher: Yeah. These people wear us down (Conversation)

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**Appendix B**

Table 5

*Activities and Practices Related to Responding to Students' Mathematical Thinking*

<u>Activity</u>	<u>Description</u>	<u>Relationship to Responsive Teaching</u>
Student-Led Do-Now	Students were asked to write and present problems at the beginning of class.	<i>Productive:</i> because students were asked to share their process and solutions, I may have been better able to attend to their ideas and respond to them through follow-up questions.
Flipped Learning	Students were given notes/examples to engage with at home and then practiced additional examples in class.	<i>Productive:</i> because students were able to work on problems in class, I could work 1-1 with students to attend to their ideas and respond individually to their questions.
Individual Practice	Students worked individually on problems following direct instruction.	<i>Productive:</i> Like flipped learning, individual practice gave me the opportunity to work 1-1 with students to attend to their ideas and respond individually to their questions and ideas.
Incorporating Students' Ideas into Direct Instruction	Using students' suggestions for ways of solving to shape lecture, rather than following a more efficient/traditional solving method.	<i>Productive:</i> Using students' ideas to shape instruction is an essential aspect of responsive teaching.
Cold-Calling	Calling on students to ask them questions during direct instruction.	<i>Productive:</i> By asking students to share their answers or ideas, we can better attend to their ideas during instruction.
Stations	Students worked in groups through a series of practice problems.	<i>Productive:</i> While this kind of activity does not build on students' ideas, by having them work in groups, I may have been better able to attend to the ideas they had because they were discussing ideas and solutions with their peers.
Split Class	Students were split into two groups. I instructed one group and my co-teacher instructed the other.	<i>Productive:</i> By splitting the class into two halves and teaching one half, I may have been better able to attend to my group of students because there were fewer students to interact with.
Inquiry-Based Activity	Students engaged with technology or other media to engage in sense-making.	<i>Productive:</i> Allowing students to explore a topic instead of telling them how to proceed made it possible for me to solicit their observations and build on their observations

<p>Adjusting Assignment or Lesson Based on Student Progress (Practice)</p>	<p>This practice revolved around reducing the rigor (level of difficulty) or quantity of an assignment or slowing down the pace of class passed on perceived student understanding of material.</p>	<p>to make sense of the mathematical topic we were learning.</p>
<p>Asking Students to Post Solutions on the Board</p>	<p>Students were randomly selected to write solutions on the board following direct instruction and practice.</p>	<p><i>Productive:</i> While reducing the rigor or length of a lesson or assignment does not build on student ideas, it does reflect that I was attending to my students' understandings of a topic.</p>
<p>Teacher-Led Do Now</p>	<p>My co-teacher or I presented the problems students completed at the beginning of class.</p>	<p><i>Productive:</i> Similar to the student-led Do Now, this gave me an additional opportunity to attend to students' ideas by examining their processes and solutions.</p>
<p>Direct Instruction (1-2 examples)</p>	<p>My co-teacher or I would present 1 or 2 examples to the class with little input, then continue individual or group work.</p>	<p><i>Counter:</i> Without asking students to present their work, a teacher-led Do Now does not allow for me to attend to their ideas about the problems they attempted.</p>
<p>Direct Instruction (entire lesson)</p>	<p>Teacher-led lecture with little to no student input.</p>	<p><i>Counter:</i> Lecturing students does allow the opportunity to build on their ideas.</p>
<p>Changing Students' Grades (Practice)</p>	<p>This practice focused on instances where I made changes to students' grades to make it appear that they understood the material.</p>	<p><i>Counter:</i> Lecturing students does not afford the opportunity to either attend to their ideas or to build on their ideas as part of the lecture.</p>
		<p><i>Counter:</i> Changing students' grades was based not on students' understanding of a topic, but instead to help them pass the class with a cursory understanding of the content. This suggests a mindset counter to responsive teaching because the goal is to help students process material as quickly as possible, rather than basing the class on their ideas.</p>

Appendix C

Extended Version of Table 2

Presence and Absence of Influences and of Activities and Practices Related to Responding to Students' Ideas

	Week																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
<i>Influences</i>																							
Expectations Mismatch	■	■			■	■	■	■	■	■		■	■	■	■	■	■	■	■		■	■	■
Lack of Flexibility	■	■			■	■	■	■	■	■		■	■	■	■	■	■	■	■		■	■	■
Mentor and/or Supervisor Feedback					■	■	■	■	■	■		■	■	■	■	■	■	■	■		■	■	■
<i>Activities and Practices Productive to Responding to Students' Ideas</i>																							
Individual Practice	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Flipped Learning	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Student-Led Do Now	■	■	■	■	■	■	■	■	■	■													
Adjusting Assignment or Lesson Based on Student Progress		■	■	■	■	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■
Incorporating Students' Ideas in Direct Instruction								■	■	■													
Inquiry-Based Activity			■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■	■
Split-Class								■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Stations								■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Asking Students to Post Solutions on the Board								■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Cold-Calling								■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
<i>Activities and Practices Counter to Responding to Students' Ideas</i>																							
Direct Instruction (with the intent of giving 1-2 examples)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Direct Instruction (entire lesson)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Reducing Rigor of Assignments								■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Teacher-Led Do Now	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Note: Shading indicates that the influence, activity, or practice was mentioned in the conversation, log, or email data in the week indicated. Activities and practices are sorted first by whether they were productive or counter-productive to responding to students' ideas, and then sorted by first presence in the semester. Greyed-out weeks were school vacations.