The Dynamic Nature of Teachers' Framing of the Problem of Student Mathematical Difficulty

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Abstract: Teachers' deficit perspectives often inhibit effective teaching with students from non-dominant backgrounds. However, research often assumes teachers' perspectives are relatively consistent and stable. This paper begins to challenge this assumption for pre-service teachers by documenting a paradigmatic case of one pre-service secondary math teacher's sensemaking around the problem of student mathematical difficulty during field experiences. By examining how this teacher expressed causal reasoning about this problem during an interview, shifts in the teacher's framing of this problem between productive and unproductive frames with respect to equity are apparent. These findings suggest that teacher education could support teachers to cue productive frames rather than replace unproductive frames.

Teachers' everyday classroom experiences are an important source of learning for teachers. As such, teacher field experiences are often considered one of the most valuable parts of teacher preparation, influencing teacher quality and preparedness (Boyd et al., 2009). In particular, field experiences can be an important way for teachers to develop skills in working with students from backgrounds different than their own (Ronfeldt, 2015). Ideally, field experiences can help challenge many teachers' deficit views of underperforming students, and help teachers begin to learn how to support all students to be successful in classrooms. However, without proper support, these experiences could instead reinforce deficit perspectives about students (Erickson, 2009).

This paper aims to contribute to the literature on teacher field experiences by highlighting a cognitive perspective on teachers' learning from experience during their teacher preparation. This challenge is a persistent problem of practice for mathematics teachers (Lampert, 2001), and one that is particularly important for equity (Jackson et al., 2017). Therefore, this paper provides an important perspective on a pervasive and significant challenge in teacher preparation of how to support teachers to productively negotiate the challenge of student difficulty. By conducting an in-depth paradigmatic case involving one teacher, this study is able to provide insight into the complicated sensemaking that is likely undertaken by many teachers in field placements.

Teachers' deficit- and asset-based perspectives toward students

There is a long history of research about teachers' deficit-based beliefs or perspectives toward student capabilities (Delpit, 1995). A deficit stance toward students is typically defined as teachers focusing on what capabilities students *do not* have, including lack of experiences, skills, knowledge, temperament, and motivation. In contrast, the literature suggests that an asset-based perspective toward student capabilities, highlighting what students *do* have, is supportive of teaching that promotes equity (Bartell et al., 2017). For example, it is important to re-position deficits from a structural and historical perspective, highlighting the ways that systems and experiences bring about inequities (Hand et al., 2012). Research on pre-service and in-service teachers has shown that both types of teachers commonly hold deficit-based perspectives (Sleeter, 2001).

Teachers' asset- or deficit-based perspectives impact teaching practice and student opportunities to learn (Wilhelm et al., 2017). These perspectives about students have been shown to influence teaching through teachers' positionality in the classroom (Wager, 2014), teachers' noticing (Hand, 2012), how teachers position students in the classroom (Cohen & Lotan, 1995). Of particular importance to teachers' practice is the phenomenon of student difficulty. At any point in time, some students will have greater success than others for a variety of reasons. Scholars suggest that in classrooms that promote equity, all students should be provided a classroom environment and support that allows them to be successful, which depends on the strengths and needs of particular students (Bartell et al., 2017). Therefore, student difficulty is not fixed (i.e. who has difficulty changes over time), such that student difficulty is not a direct result of relatively stable characteristics (e.g., race/ethnicity, SES).

Theoretical framework for teachers' perspectives toward students

Although the idea of teachers' deficit-based perspectives and their importance are pervasive in the literature, they have been conceptualized in ways that differ based on how fixed or stable the perspective is, and how closely tied it is to classroom practice. This paper uses the construct of *framing* to investigate teachers' perspectives towards students, which allows for flexibility in teachers' perspectives and is closely tied to practice. It differs from the construct of teacher beliefs, which are typically viewed as a relatively stable or fixed construct and difficult to change or influence (Fives & Buehl, 2012). Using the construct of framing allows this work to empirically

investigate whether teachers' framing is dynamic or flexible, and to look at the relation of framing to things outside of teachers' classroom practice, such as how they decide what kinds teaching positions they want.

At its core, frames are thought of as ways that people organize their experience in the world (Goffman, 1974). An individual can frame an activity, essentially asking the question of "what is going on here?", and a problem can be framed in different ways that reflect different understandings of the problem (Snow & Benford, 1988). In the case of problem framing, frames can be diagnostic, identifying the cause or blame for a problem, or prognostic, identifying a solution to a problem and strategies for enacting it. Framing has been applied to education more recently, looking both at the framing of activities in classrooms (Russ & Luna, 2013), as well as how teachers and others frame problems that come up in practice (Park et al., 2013).

The problem of student difficulty has been used as a way to understand in-service teachers' deficit-based perspectives in both collaborative settings (Louie, 2016) and interviews (Jackson et al., 2017). Scholars suggest that productive framings of the problem of student difficulty attributes it to instruction or schooling opportunities (e.g. those which can be manipulated), rather than inherent traits in students, their families, or communities (Jackson et al., 2017). Framing the problem of student difficulty in term of instruction reflects a broader category of *social frames*, or frames that highlight social factors that influence student success. Schooling opportunities relate to a broader category of *structural and historical frames*, or frames that highlight how school or societal structures and history influence student success. Both Louie (2016) and Jackson et al. (2017) found teachers use both productive and unproductive frames (Jackson et al. (2017) term "mixed"), suggesting teachers' deficit-based perspectives can be dynamic. However, Jackson et al. (2017) find evidence of mixed diagnostic framing in the majority of teacher interviews, but rarely observed mixed prognostic framing, which could be more likely for in-service teachers with more stable instructional practice than pre-service teachers.

The different frames teachers use, as evidenced in prior research, are primarily defined by their attributions. Therefore, this paper analyzes teachers' frames through their *causal reasoning about students*. Teachers' causal reasoning about students is defined as times when teachers identify explanatory factors (i.e. causes) that lead to particular outcomes (i.e. effects) about students (Dyer & Kaliski, 2016). An explanatory factor can be an event or state that can vary, either naturally or through interventions, that is identified by the teacher and linked to the outcome(s). In some cases, causal reasoning includes conditions or contexts under which the causal relationship holds (i.e. moderators), but these conditions are not the central factors or causes in the relationship identified. In terms of causal reasoning, the problem of student difficulty appears as an outcome of teachers' causal reasoning. Using the lens of causal reasoning, this analysis will look at the explanatory factors used, as well as the conditions and other outcomes related to student difficulty. In addition, this perspective allows for an analysis of multiple explanatory factors, that may interact with one another in complex ways. Based on the literature's definition of productive framing, productive causal reasoning identifies explanatory factors that are about instruction or schooling (i.e. instructionally-relevant), but also recognizes the role that structural and historical factors play as important conditions or contextual factors in causal reasoning.

Methods

This study uses a paradigmatic case approach (Pavlich, 2010) to show consequential aspects of teachers' framing of student difficulty through the pivotal case of Mark. Mark was a secondary mathematics pre-service teacher at a university teacher preparation program in a large suburban metropolitan area in the Midwest. The program that Mark attended, similar to many teacher preparation programs, included courses specific to teaching mathematics, as well as separate courses on the social context of education. Mark, along with other secondary mathematics teachers in the program, was exposed to reform-oriented conceptions of mathematics instruction through coursework, which included mediated field experiences. The program also has a field placement component in which teachers are matched with a cooperating teacher to observe and eventually complete their student teaching requirements. Mark completed his field placement in a high school that served students from diverse racial, linguistic, and socioeconomic backgrounds. As a part of his field placement, Mark taught classes in both lower and higher tracks, exposing him to a wide variety of students.

Mark had numerous experiences to engage in practical inquiry and reflection around teaching and learning, including his teaching during his field placement. In particular, Mark and the other teachers completed a series of video reflection assignments designed to focus the teachers on students' substantive mathematical thinking during the field placement seminar. Substantive mathematical thinking was a concept defined and developed collectively during the seminar. Substantive mathematical thinking included deep thinking such as mathematical reasoning, sense-making, and novel problem solving instead of more routine types of thinking such as memorization or applying a known procedure. Contrary to reform visions, mathematics classrooms often involve little substantive thinking on the part of students, and even when that thinking happens it is often not made visible. Therefore, the video reflection sequence was designed to focus teachers on this aspect of classrooms and

develop this aspect of their teaching over time. The teachers were asked to capture short 4-6 minute video clips that showed students engaging in substantive mathematical thinking at multiple points during their field placement. The teachers also analyzed the student thinking during their selected clips, and reflected on how this process helped them learn about their teaching and their students. This experience likely focused Mark and the other pre-service teachers on students' mathematical thinking, an important component of the mathematical preparation of teachers. The aim of this paper is not to analyze the impact of this or other opportunities for practical inquiry on Mark's thinking. Instead, these opportunities provide the backdrop to analyze teacher thinking that is likely to occur in other contexts.

The data for this paper come from a design-based research study investigating the video-based reflection sequence during field placement. The primary data used for this study come from a videotaped interview with Mark shortly after his field placement ended. The interview was completed with Mark and the other pre-service mathematics teachers that were in the field placement seminar, and was designed to capture the teachers' experiences with the video reflection sequence, as well as the role of student thinking in their visions of effective mathematics teaching and their future career plans. In addition to the interview, data were collected during the field placement seminar. These data include video and written work from the course sessions, assignments completed for the video reflection sequence, which included video Mark captured of his field placement classroom that provide a window into his teaching. In the analysis that follows, the interview data is the primary source of analysis, while the other data sources are used to provide context for the interpretations of the interview data.

Analysis

Mark's interview was of immediate interest from the moment it was collected, which was detailed in analytic memos. Although the focus of the interview centered around student mathematical thinking, the problem of student difficulty or struggle dominated the conversation during the interview unexpectedly. This surprise led to the focus of analysis on how Mark framed the problem of student difficulty in his field experiences, as well as the focus on uncovering the different frames used during the interview. As such, the analysis examines what different frames Mark uses for the problem of student difficulty and how he uses them in his narrative accounts of his field experience. Potential explanations for the different frames used are discussion, but the analysis aims to be descriptive rather than explanatory.

To analyze the different ways the problem of student difficulty is framed, this study qualitatively analyzed Mark's causal reasoning about students, similar to Dyer and Kaliski (2016). The interview was transcribed to facilitate comprehension, but all analysis was done directly with the video data in order to take into account for the full range of communication Mark used (e.g. tone, gaze). The first pass of analysis identified the portions of the interview when Mark discussed student mathematical thinking and the problem of student difficulty, either in his field experience or more generally. Second, the portions in which Mark discussed the problem of student difficulty were separated into distinct units based on changes in framing (Russ & Luna, 2013). These shifts between frames typically corresponded either with a change in the outcome being explained, or in the explanatory factors that were used to explain the outcome. The causal reasoning was then described in each of the units to facilitate analysis by listing the outcomes, explanatory factors, and conditions or context identified by the teacher. Finally, themes among the units of distinct frames were examined. This was guided by previous literature suggesting that frames that focused on inherent traits of students, families, or communities were different from frames that focused on instruction or schooling opportunities (Jackson et al., 2017).

Findings and discussion

The findings first present the problem that Mark identified related to student difficulty, which is the problematic outcome that he explains through causal reasoning. This outcome remains fairly constant through the interview, although Mark provides additional details at several points during the discussion. In contrast, Mark's explanation of this outcome (i.e. the explanatory factors he uses to explain it) shift during the interview. Therefore, the different explanatory factors, or frames, are presented and unpacked.

The problem of student difficulty with substantive mathematical thinking

The central problem Mark discussed in this interview was that of having his students engage in substantive mathematical thinking. When asked what kinds of thinking Mark considered to be substantive mathematical thinking, he provided a response in line with the conception developed during the course, such as saying, "students wrestling with some idea or concept…[after] that initial disequilibrium they wrestle with it they try to explain it they try to generalize it." Mark also considered substantive student thinking as an important part of his vision of an ideal mathematics classroom, for example, saying, "I think that's how learning happens. I think, you want to tap in as much as possible." Later, when asked about the practicality of that vision, he claimed that, "with the

common core…that's going to be different there's going to be a lot more room for substantive thinking." These comments, along with the complete absence of any uncertainty during the interview and the seminar course, suggest that Mark had an understanding and commitment to substantive student mathematical thinking in line with goals set for pre-service mathematics teachers.

Despite Mark's vision of a classroom built around substantive student mathematical thinking, he identified a problem he faced of having his students engage in this type of thinking. Mark first introduces this problem when he was asked, "was there anything that you think made it difficult for you to capture clips in your classroom?" He responded that the capturing was not the challenge, but it was challenging to "have the student thinking" in his classroom. He goes on to include a comparison between the class chosen for the videotaping assignments, for purely practical reasons, and his other classes. He says, "my honors Algebra two class, there was a lot more student thinking, a lot more of it was visible. In [the class videotaped] to be honest, like there wasn't that much student thinking." This comparison features prominently throughout the rest of the interview.

Student-focused and student behavioral frames

One of the ways that Mark explains the problem of student difficulty with substantive mathematical thinking is through explanatory factors having to do with students or groups of students. By itself, this frame is fairly rare, happening only twice during the interview. The primary example of this frame comes after a probing question that asked Mark why he thought it was more difficult to have substantive student thinking in his "low-level" class. He responds by talking about students' motivation,

> They weren't interested in thinking. Like these are low-level students. Uh, they're in the- they're taking this class as a graduation requirement. Um, most of them like literally try to get a sixty percent and pass like, when they get a you know sixty-two percent on the final like they're high fiving each other, that type of thing.

In this section, Mark makes generalized claims about students in his "low-level" class focusing on their interest and their motivation. It is striking that this frame uses language reified in schools that connects to structural components of the school. For example, by labeling the students as "low-level," rather than just the class name, Mark is applying the structure of tracking to label his students. This way of labeling students mirrors previous research on teachers' collaborative conversations that found that these labels constrain opportunities for teacher learning with respect to equitable reform-oriented math instruction (Louie, 2016). In addition to labeling students, Mark also connects "taking this class as a graduation requirement" very explicitly to student behavior around assessment. The other instance of a student-focused frame uses specific student behaviors when Mark says, "most of the kids are asleep half the time that type of thing." These responses are particularly vivid for an interview context, suggesting that these frames may be well-developed, even if infrequent.

Mark's student-focused frames clearly align with a deficit-based perspective in which he focuses on the deficiencies in students' motivation, interest, and behavior. The way Mark talks about students essentializes them as either "low-level" or "high-level" students, and never considers individual students. Additionally, Mark's focuses on student traits or characteristics that he sees as fixed, although he also mentions student behavior, which may be more malleable. Interestingly, all of these frames were diagnostic rather than prognostic, providing additional support for the conclusion that these frames are limiting. In sum, these frames are likely unproductive for developing teaching practice that promotes equity because they are used as deficit-focused perspectives.

Teacher-focused frames

Mark also frames the problem in terms of himself as the teacher. Some of these frames include elements about the particular students, but Mark's personal characteristics are the focus of the causal explanation, such that factors related to students are better modeled as conditions or context rather than the main causal relationship. Teacher-focused frames highlight an explanatory factor that is relatively stable or difficult to change instead of instructional frames, which introduce explanatory factors about teaching practice that are dynamic.

The primary teacher-focused frame Mark uses positions the problem of student difficulty is one of misalignment. Mark considers his strengths or skill set in comparison to the type of students he teaches. This frame focuses on Mark's characteristics as a teacher, but relies on conditions or context about student characteristics. Mark first uses the alignment frame when comparing the success between his honors and "low-level" classes, saying, "[the honors classes were] more aligned with, you know my experience and my personal skill set." In a later instance, Mark expands on this idea of misalignment, connecting it to his "natural" strengths,

> I feel like it's just so not aligned with my strengths. And like I could force it to happen but that would be like, you know me trying to be, I don't know, like a musician or you know…I realized like how not good I am at it and how not naturally aligned to my strengths it is.

This time when expressing the idea of misalignment, Mark relies much more heavily on conceptions of his fixed ability as a teacher by using words like "naturally aligned" and how he talks about forcing himself to be able to have his "low-level" students engage in substantive thinking. This idea of "forcing" highlights a prognostic frame that is not productive in solving the problem of student difficulty, which appears to be closely tied to the diagnostic frame of misalignment. Interestingly, this misalignment frame is different from frames Horn (2007) found in relation to the mismatch problem: students' labels as "low" were framed as unprepared for challenging work. In this frame, the mismatch is between the teacher and students, instead of the class or work and students.

In addition to the misalignment teacher-focused frame, Mark briefly introduces his own expectations of students. In this instance, he considers an alternate explanation for his current practice, "maybe I acted differently because of my own expectations blah blah blah." The way Mark finishes this response suggests that he does not take this frame seriously. However, this frame introduces a complexity in how his expectations, a somewhat fixed characteristic, would influence his actions as a teacher. This response indicates that Mark is able to use this frame, but does not seems to find it useful or a compelling way to make sense of his experiences. However, this frame shows meta-cognitive awareness that the frames he uses constrain his ability to solve the problem at hand.

Instructional frames

In contrast to teacher-focused frames that highlight teacher characteristics, instructional frames focus on how teaching practice relates to the problem of student difficulty with substantive mathematical thinking, highlighting teacher actions rather than characteristics. Mark used instructional frames frequently during the interview, and used a variety of different perspectives on his instruction, including a focus on his current practice and how his practice would develop.

Mark's frames focused on his current instructional practice often highlighted how he conceptualized "connecting" with students as a part of his teaching, and how he found this aspect difficult. For example, Mark explains the difference in how he connects with student as a part of his teaching with his two groups of students,

> With the more advanced students, I have a much better idea of where they're coming from… when I sit there lesson planning…I can get inside their heads you know see "okay if I do this this and this, like this is what's going to happen," and then when I try it that's what happens. Um, with the with the first period class…it was just so foreign to me like, I, I had no idea what was [going on in their head], I couldn't connect with them at all…I would plan something, like "if I do this and this and this like you know this is going to happen." And it didn't happen at all. Or like you know when I ask them a question like nobody says anything, that type of thing.

This quote shows how for Mark, "connecting" with students was in part mathematical, and intimately tied to the practice of anticipating student thinking. In fact, this work has many similarities with how researchers conceptualize the work of building on students' cultural mathematical knowledge bases (Bartell et al., 2017). The detail with which Mark discusses this explanatory factor is particularly striking because he uses specific details several times, first by mentioning the activities he engages in when connecting to students, and second when he mentions asking a question that no students respond to.

In contrast to the specificity seen in the frames about current instructional practice, when Mark frames the problem of student difficulty in terms of his development as a teacher, he typically uses much less specificity. In these instances, Mark typically uses prognostic frames, and highlights how the problem may get better as his teaching becomes more effective over time. For example, he says, "how do you get students like that to like really want to like engage with and like think about this kind of stuff? I don't know…I don't know how to do that yet." In this instance, Mark is much more specific about the component of teaching that is needed, how to "get students like to that to really want to engage," which suggests he is looking for a prognostic framing. However, he does not include any specifics about how that might happen over time, just that he does not know how to do that *yet*. Other instances of the developmental framing were similar, often alluding to the fact that his missing skills would likely develop over time, but not specifically how that would happen.

Structural and historical frames

The final type of frame Mark uses considers structural and historical explanations for the problem of student difficulty with substantive mathematical thinking. Previous literature suggests that these frames are productive,

and can be difficult for teachers to adopt (Louie, 2016). Mark's use of these frames is relatively minor in the interview, but represent another component of variability in his framing.

Mark's use of structural explanations focused on school structures that contributed to the problem of student difficulty. First, Mark labels the class as "really challenging, period one low level class," and then shifts immediately to a new frame about student behavior, saying, "right, most of the kids are asleep half the time, that type of thing." In this instance, rather than labeling *students* in his explanatory factors (i.e. a student-focused frame), he labels *classes*, a school structure. He first describes the class as "challenging," appealing to the idea that the problem is his to solve, but also serving as a label for the class. He shares that it is a "period one low-level class," providing labels attached to the class common in high school. A "low-level" class highlights the role of the tracking structure in how he labels the students, which appeals to stratification based on ability or previous performance. The "period one" label highlights the impact of the time of day on the challenge of the class, which he then expands on highlighting student behavior by saying, "most of the kids are half asleep." In effect, this instance seems to function more as an introduction to student labels or behaviors used later, such as "low-level."

In the other frame about school structure, Mark draws on the idea of mismatch, similar to his teacher-focused frame on the misalignment between his skills and students. He says, "the amount of material…they had to meet, um, versus how much ability they had, there was a mismatch." This frame is more explicitly connected to student traits, and uses the word "ability," which is often associated with deficit-based perspectives. As opposed to the earlier misalignment frame, this mismatch frame is very similar to what Horn (2007) found to be unproductive. However, Jackson et al. (2017) suggest that frames considering schooling are productive. Due to the similarities and potential connections to unproductive teacher-focused misalignment frame, these data suggest that framing the problem of student difficulty in terms of schooling is not necessarily productive.

Mark also uses historical frames of the problem of student difficulty. These frames focus on students' previous experiences in school. For example, Mark considers whether students' experiences with his cooperating teacher may have contributed to the problem of student difficulty, "there was definitely some inertia going on…when I was observing [my cooperating teacher], I would like make all these notes like 'oh my gosh like why is she doing it this way like these kids aren't thinking at all.'" Interestingly, Mark connects this idea of "inertia" in students' experiences to his own expectations as well, saying, "because of that precedent I kind of felt like, well okay like you know, I guess I can go back to what she was doing." However, Mark ends this instance with uncertainty about the different explanatory factors by questioning, "I don't know how much of that is like, my own expectations in my head versus what the students are used to." This instance, highlighting the historical explanation including both teacher and student expectations, shows significant insight on the part of Mark that is typically considered productive for promoting equity (Hand et al., 2012; Jackson et al., 2017; Louie, 2016).

Summary of Mark's frames and connection to his teaching and career trajectory

Mark's use of frames suggests a high degree of fluidity between frames (see Table 1). Mark uses a wide variety of different deficit-based and asset-based frames, despite their contradictions. He also switched between them rapidly, without prompting from the interviewer. The most dramatic instance may be the frame starting at 9:45 in which Mark starts by framing the problem in terms of student interest and ability, then transitions to a prognostic, developmental frame about instruction, to a prognostic frame about current instructional practice. This fluidity is notable and could reflect the early stage of his professional career. Future research could compare the degree of fluidity with in-service teachers since it was not examined in previous work (Jackson et al., 2017; Louie, 2016).

Despite the wide variety of ways that Mark frames the problem of student difficulty with substantive mathematical thinking, Mark relies on particular frames when discussing his development as a teacher and his choice of what teaching position he looked for and accepted. Mark discusses his reaction to the problem of student difficulty during his field experience, saying, "In the beginning like I tried really hard in first period to try to get that same [student thinking]…Um, to be honest like after a while I kind of gave up because it wasn't working…I recognize that's kind of bad." In this quote, Mark shares that he stopped attempting to get his "low-level" class to engage in substantive mathematical thinking because his attempts were not "working." Mark's attempts in the beginning of his field placement suggest that he used to rely on an instructional explanation for student thinking, but over time he may have started to rely on less productive frames, resulting in him "giving up."

Mark's explanation of his career trajectory shows a similar pattern, but explicitly relies on the teacher-focused frame around misalignment. Mark explains his choice to look for teaching positions working with higher-achieving students, saying, "I feel like my strengths would [be] better, you know, aligned with the higher-level students, so that's what I was looking for [in a teaching position]." This explanation draws on the same language as the teacher-focused misalignment frame, suggesting that this frame may have higher status or importance for Mark than the other frames.

Table 1: Chronology of Mark's Different Frames for the Problem of Student Difficulty. Solid lines indicate the presence of an interview prompt or unrelated discussion; dashed lines indicate uninterrupted change in frames

Start	Type	Examples of Primary Explanatory Factors
07:38	Instruction – Developmental	"I'm not yet a great teacher," "I'm not super great at that yet"
08:36	School Structure	"challenging class," "period one low-level"
08:44	Students - Behavior	"kids are half asleep"
08:54	Teacher – Misalignment	"[the honors classes were] more aligned with, you know my experience and my personal skill set"
09:45	Students – Traits	"they weren't interested in thinking, these are low-level students"
10:01	Instruction – Developmental	"how do you get students like that to like really want to like engage with and like think about this kind of stuff?", "I don't know how to do that yet"
10:17	Instruction – Current Practice	"trying to motivate them," "get them to see like why what we're doing...is important to their future success," "I just don't know how to connect with these kids"
11:30	Instruction – Current Practice & Teacher – Expectations	"maybe I acted differently because of my own expectations blah blah blah"
13:14	Instruction – Current Practice	"I have a much better idea of where [the advanced students are] coming from," "I have no idea what's going on inside [the low-level students'] heads"
14:05	Instruction – Developmental	"over time like I'm sure I'll get better whatever"
14:09	Instruction – Current Practice	"right now it was just so foreign to me," "I couldn't connect with them at all"
17:29	Teacher – Expectations & Historical – School Experience	"I kind of saw my mentor teachers doing the same," "I kept like that expectation," "I don't think I would have felt comfortable [otherwise]," "I don't know how much of that is like, my own expectations in my head versus what the students are used to"
19:14	School Structure – Misalignment	"the amount of material…they had to meet, um, versus how much ability they had, there was a mismatch"
23:58	Instruction – Current Practice	"an ineffective teacher"
24:53	Instruction – Developmental	"maybe in a number of years [I would be] noticeable better"
25:19	Instruction – Current Practice	"right now I still don't feel super well prepared to be a great teacher to those students."
36:53	Teacher – Misalignment	"if I had to do it like could I do it yeah probably," "it's just so not aligned with my strengths," "I realized like how not good I am at it and how not naturally aligned to my strengths it is"

Conclusions and implications

The wide variety of frames used in a single interview, almost always unprompted from the interviewer, suggests that pre-service teachers' framing of the problem of student difficulty can be very dynamic. The teacher used both productive and unproductive frames, such that he appeared to hold both deficit- and asset-based perspectives towards students at the same time despite potential inconsistencies. As such, teachers' perspectives may be better modeled by constructs that incorporate flexibility, such as framing, rather than constructs that assume more stability, such as beliefs. Despite this flexibility, Mark relied on the unproductive misalignment frame when describing his decision to "give up" on his "low-level" students and seek a teaching position working with high-achieving students. This result suggests that frames can be consequential and may have different "strengths."

The findings also suggest a shift in designs for pre-service teacher learning. Because Mark could use both productive and unproductive frames, Mark may in fact have some resources or "raw material" in order to productively negotiate the problem of student difficulty with substantive mathematical thinking. Teacher preparation could focus more on supporting teachers like Mark to apply or cue productive frames to make sense of classroom experiences, as well as see how they are powerful for supporting student success. Finally, this case highlights how focusing on orienting teaching toward student mathematical thinking does not necessarily lead to more equitable outcomes. In fact, Mark's intense focus on substantive student thinking, supported by his teacher preparation program, may have led him to notice and frame the problem of student difficulty in unproductive ways. Future research should investigate how and when focusing on student thinking is associated with asset- versus deficit-based perspectives toward students.

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Acknowledgements

This material is based upon work supported by the National Science Foundation Graduate Research Fellowship Program under Grant No. DGE-0824162. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the NSF.