2019

Planning with curriculum materials: Interactions between prospective secondary mathematics teachers' attention, interpretations and responses

Lorraine Males
University of Nebraska-Lincoln, lmales2@unl.edu

Ariel Setniker
University of Nebraska–Lincoln, asetniker2@unl.edu

Planning with curriculum materials: Interactions between prospective secondary mathematics teachers' attention, interpretations and responses

Lorraine M. Males and Ariel Setniker

University of Nebraska–Lincoln
Department of Teaching, Learning, and Teacher Education,
214 Henzlik Hall, Lincoln, NE 68588-0355, USA

Corresponding author — L. M. Males

Email – lmales2@unl.edu (L. M. Males); asetniker2@unl.edu (A. Setniker)

Abstract
This paper reports a study of four prospective secondary mathematics teachers' (PSTs) attention to different sets of curriculum materials when planning lessons. Specifically, it addresses how this attention interacted with their interpretations of and responses to the materials and how the curriculum elements and format of each set of materials influenced the interaction. Attention, interpretations, and responses were analyzed by capturing quantitative data from eye tracking glasses the PSTs wore and qualitative data from coding the transcripts from two staged planning interviews. Results indicate that PSTs' interpretations and responses were initiated by their attention and that the curriculum elements and format of each set of materials influenced this attention. The authors conclude with implications for curriculum development and teacher education.

Keywords: Curriculum materials use, Curricular noticing, Curricular attention, Secondary mathematics prospective teachers, Planning, Eye tracking

---

Published in *International Journal of Educational Research* 93 (2019), pp 153–167.
doi 10.1016/j.ijer.2018.09.016

Submitted 2 April 2018; revised 19 September 2018; accepted 24 September 2018; published 16 November 2018.

1. Introduction

Using curriculum materials is an integral part of what it means to learn and teach mathematics given the fact that over 80% of teachers in the U.S. report using some kind of curricular program for mathematics instruction (Banilower et al., 2013). Despite this widespread use, we still know little about how teachers learn to use curriculum materials, particularly at the early stages of this learning (i.e., preservice education). Furthermore, we do not fully understand how the design of different curriculum materials (i.e., structure, format, approach) influences this use. We begin to address this gap by situating our study within the field of curriculum ergonomics (see Choppin, Roth McDuffie, Drake, & Davis, this issue), focusing on how prospective teachers (PSTs) engage with curriculum materials and how curriculum design may influence this engagement. We specifically connect to the notion in curriculum ergonomics that teachers have relationships with and capacities for using curriculum materials and describe these relationships and capacities and the influence of the materials on these relationships and capacities by engaging PSTs in staged planning interviews while they wore eye tracking glasses. In the next section, we describe the rationale for studying planning and prospective teachers' use of curriculum materials.

2. Prospective teachers' planning and use of curriculum materials

One of the first out-of-classroom activities that PSTs engage in when learning to teach which is linked to improving teaching (Morris, Hiebert, & Spitzer, 2009) is planning. However, research indicates that novice teachers can be overwhelmed by planning (Kaufmann, Johnson, Kardos, Liu, & Peske, 2002). This feeling may be exacerbated by the complexities of using curriculum materials because despite the widespread use of mathematics curriculum materials in U.S. schools, curriculum use has been an often-neglected topic in preservice teacher education (Ariav, 1991; Drake, Land, & Tyminski, 2014; Shulman, 1986).

Despite the fundamental role curriculum materials hold in learning and teaching mathematics, research shows that PSTs may not get many opportunities to learn to use them in their preparation programs. In fact, research done in the late 80s indicated the message from teacher educators was that to be a good teacher, you should not use curriculum materials (i.e., textbooks and teachers' guides), but instead develop your own curriculum (Ball & Feiman-Nemser, 1988). This message was perpetuated by the notion that the textbooks that were available to elementary mathematics teachers at the time were not suitable due to their emphasis on computation and practice and their limited opportunities for students to engage in problem solving.

Regardless of whether this evaluation of curriculum materials was accurate, Ball & Feiman-Nemser found that since textbooks were used in most PSTs' classrooms, the message to abandon textbooks may have inadequately prepared elementary PSTs to teach. During student teaching these PSTs struggled to teach with and without textbooks.

Although there has been an increase in the number of available mathematics textbooks that emphasize problem solving and exploration (e.g., "Standards-based textbooks" Stein, Remillard, & Smith, 2007), PSTs may still have difficulties using these materials due to the lack of opportunities to learn to use them from the teacher's perspective in teacher education programs. For example, Tyminski, Land, and Drake (2011) found that elementary PSTs tended to read and evaluate lessons from the student perspective, focusing on aspects that students would find fun, rather than on aspects that would prove useful for them as teachers. PSTs need opportunities to learn to read, understand, evaluate, and adapt curriculum materials (Drake et al., 2014; Remillard & Bryans, 2004). Furthermore, research indicates that in general people have cognitive biases that lead them to misinterpret new information. Specifically, a person has a confirmatory bias if he or she misinterprets ambiguous evidence as support for a hypothesis they have about the world (Rabin & Schrag, 1999). According to Rabin and Schrag (1999), for teachers, this might be misreading a student's performance as evidence that supports their initial assessment of that student. This same bias may be happening when PSTs look at curriculum materials. We know that PSTs often prefer conventional materials because they look familiar. For example, Lloyd and Behm (2005) found that when PSTs analyzed lessons from different curriculum materials they looked for aspects that were familiar, leading them to misinterpret lessons. That said, we have limited insight into how these PSTs first approached those materials and what their process of looking for familiar aspects entailed. As teacher educators, understanding how PSTs first interact with materials is critical in developing the opportunities and tools we need to prepare PSTs to learn to read and use in curriculum materials "in ways that support them in acquiring the knowledge needed for teaching" (Drake et al., 2014, p. 153).

2.1. Theoretical perspectives on curriculum materials use

Over the last few decades, efforts have been made to develop research-based descriptions or models for how teachers use curriculum materials (Lloyd, Cai, & Tarr, 2017). Although researchers around the world have come to describe this use in different ways (e.g., Brown & Edelson, 2003; Brown, 2009; Choppin, 2009; Gueudet & Trouche, 2009; Lloyd, 2008a, 2008b; Pepin, Gueudet, & Trouche, 2013; Remillard & Bryans, 2004; Sherin & Drake, 2009), what these descriptions have in common is the premise that curriculum use involves some kind of interaction between teachers and the materials. For example, Remillard (2005) describes this interaction as a participatory one where the influence is bi-directional, meaning that the teacher influences the materials and the materials influence the teacher. This participatory relationship is further emphasized by Gueudet and Trouche (2009) who suggest that teachers engage with materials in what they call a documentational genesis. This documentational genesis involves two processes: instrumentation, a process by which the curriculum materials influence what and how teachers use resources in the design and enactment of instruction and instrumentalization, a process by which the curriculum materials are influenced by the teacher.

In the next sections we describe research on teachers' use of curriculum materials and propose a framing that draws on the work in noticing in order to gain insight into the processes involved when teachers engage in this participatory relationship with their materials.

2.2. Mathematics teachers' curriculum use

With a surge of new reforms and an advent of curriculum materials in the 1990s that were qualitatively different than those that came before, curriculum materials and their use became a site for research (Lloyd et al., 2017; Stein et al., 2007). This research has focused not only on describing written curriculum materials, but also on understanding the influence these materials have on student learning, and to a lesser extent, teacher learning. Building on the notion that curriculum materials are transformed through a series of temporal phases (Stein et al., 2007), research in the last two decades has focused on understanding the teacher-intended and enacted curriculum. Although researchers argue (e.g., Remillard & Heck, 2014) that the enacted curriculum has the most direct influence on students' mathematical experiences and ultimately what they learn, both the written and teacher-intended curriculum (or the teacher's plan) influence the enacted curriculum. It is within the enacted curriculum or the "design-in-use" (Pepin et al., 2013) phase that teachers draw on the plan that they developed when interacting with the written curriculum. In fact, the transformation between written and intended is critical because it is within this transformation that important variations in written curriculum get introduced. These variations shape the opportunities and experiences students have and therefore ultimately shape what students learn. The critical role of the teacher in these curricular transformations has spurred studies of teachers' use of curriculum materials.

This research provides us with insight into what teachers do with curriculum materials. Early research suggested that teachers' use of materials was rather dichotomous, meaning that teachers either followed or subverted curriculum materials when planning and enacting instruction (Remillard, 2005). Recent research has offered a more nuanced description of use. For example, Brown (2009) characterized use as either offloading, adapting, or improvising. While we might consider offloading and improvising to be similar to following and subverting respectively, the finding that teachers also adapt materials indicates that use is not dichotomous, but rather there is more of a give and take between teachers and curriculum materials. In addition, researchers have aimed to describe the processes that teachers engage in when using materials. For instance, Sherin and Drake (2009) found that there was a pattern to the interpretive activities that teachers engaged in when using curriculum materials. These patterns were consistent for individual teachers and across multiple teachers and could be described by the following three interpretive activities: reading, evaluating, and adapting. As teachers interacted with curriculum materials they read in order to take in the information found in the materials, they evaluated the materials and the "lesson-in-progress," and they adapted materials based on their reading and evaluations of the materials and classroom events.

What this work emphasizes is that teachers' use of curriculum materials may be described by a process of interaction with those materials. Hence, we situate our study within the sociocultural perspective (Vygotsky, 1978; Wertsch, 1991, 1998) and interpret curriculum materials as a tool that may be employed in various ways to contribute to instruction in a classroom. Specifically, we use the construct of curricular noticing (Dietiker, Males, Amador, & Earnest, 2018) to describe these interactions. This construct draws on the extensive work in noticing (Mason, 2002), which has proven to be a useful theoretical construct for examining and improving the work of teaching (e.g., Sherin et al., 2011).

3. Curricular noticing

The concept of noticing is not unique to the study of teaching. Although noticing is something that we do all of the time, Mason (2002) argues that in a profession we are "sensitised to notice certain things" (p. xi). It is these things that we notice that serve the basis of our professional vision (Goodwin, 1994), or our way of organizing events that we see. Mathematics educators have become increasingly interested in exploring noticing as both a way of understanding what it means to teach mathematics and as a tool in developing mathematics teachers (e.g., Schack, Fisher, & Wilhelm, 2017; Sherin et al., 2011). Drawing on Goodwin's (1994) concept of professional vision, van Es and Sherin (2002) have done some of the most extensive work in noticing. They define three key aspects of noticing: (a) identifying what is important or noteworthy about a classroom situation; (b) making connections between the specifics of classroom interactions and the broader principles of teaching and learning they represent; and (c) using what one knows about the context to reason about classroom interactions. As with others who have studied noticing, the key is understanding how teachers make sense of complex classroom situations.

Drawing on this work, Jacobs, Lamb, and Philipp (2010) focus on a particular classroom situation: that of working with children's mathematical thinking. They dub this "specialized type of noticing" (p. 171) the professional noticing of children's mathematical thinking. They describe the expertise involved in this noticing to include "a set of three interrelated skills: attending to children's strategies, interpreting children's understandings, and deciding how to respond on the basis of children's understandings" (p. 172).

We argue as Jacobs et al. (2010) did about teachers interacting with student thinking - that teachers' interactions with curriculum materials require a special type of noticing. We call this noticing curricular noticing (Dietiker et al., 2018). Drawing on the work in professional noticing of children's mathematical thinking, we describe curricular noticing as the set of skills that constitute the curricular work of mathematics teaching, namely: curricular attending, curricular interpreting, and curricular responding. Curricular attending involves "viewing information within curriculum materials to inform the teaching and learning of mathematics" (Dietiker et al., 2018, p. 525)., curricular interpreting involves making sense of that to which is attended, and curricular responding involves making curricular decisions based on the interpretation of curriculum materials. Fig. 1 depicts the Curricular Noticing Framework.

Although these definitions seem to presuppose a sequence, we argue that the process may not unfold in a strictly linear fashion. For example, while a response is dependent on a curricular interpretation of that to which a teacher attended, an interpretation may trigger a teachers' attention, or a decision to respond in a particular way may result in the teacher attending to something new. In this paper, we focus solely on curricular attending, and therefore describe it in more detail in the next section. We do this for multiple reasons. First, curricular attending serves as the starting point of curricular noticing, meaning in order to make a curricular interpretation or

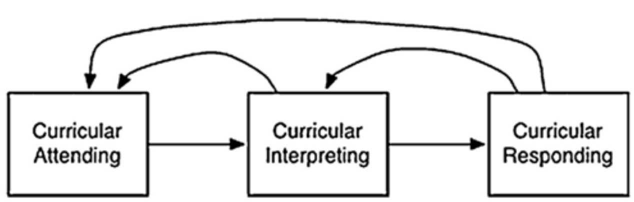

Fig. 1. The Curricular Noticing Framework (Dietiker et al., 2018).

response, one must have attended to the curriculum materials. Second, due to difficulties in capturing attention (e.g., how do we know what a teacher actually looks at), we know less about curricular attending.

While there are many aspects that teachers might attend to when interacting with curriculum materials, we recognize that it is not practical to expect them to attend to everything in a set of materials. However, understanding what it is that teachers attend to is critical in understanding how teachers interact with curriculum materials. Research suggests that teachers may attend to curriculum materials in very intentional ways, reading for specific ideas, activities, and questions (Choppin, 2011) and that this attention may be influenced by a teacher's *curriculum vision* or their sense of where the curriculum materials are going and an understanding of the particular kinds of learning and teaching practices described in the curriculum materials (Drake & Sherin, 2009). For prospective teachers who have yet to develop their curriculum vision and have had few experiences with curriculum and students, it is unclear what their first interactions might look like with curriculum materials. This, in turn, makes it difficult for teacher educators to design experiences for PSTs to engage with curriculum materials.

4. Purpose and research questions

The purpose of this study is to describe PSTs' attention to different sets of curriculum materials when planning lessons, including what curriculum elements they attend to and for how long and how their thoughts and plans interact with this attention. Specifically, we address the following questions:

When planning lessons using given curriculum materials with different designs:

1 What curricular elements do PSTs attend to, when do they attend to these elements, and for how long do they attend to these elements?
2 To what extent do PSTs' curricular interpretations and curricular responses interact with their attention?
3 To what extent do *curriculum elements and format* of each set of curriculum materials influence PSTs' attention?

By curricular elements we mean distinguishable parts of the curriculum materials, such as sentences, phrases, representations (e.g., graphs, tables, equations), and images within the teacher and student lesson materials. We intentionally chose to use the word element rather than feature because in curriculum materials features often include multiple sentences or paragraphs. Using curriculum element as our unit of analysis allowed us to obtain a more complete picture of teachers' interactions. For example, something such as the "Suggested Lesson Activity" may contain multiple paragraphs, each with multiple sentences. Breaking a lesson into elements allowed us to describe the attention, interpretations, and responses to each of the pieces of the suggested lesson activity rather than just to this feature as a whole.

By format we refer to the way things are organized and how they look. This would include the location of teacher and student materials, or what Beyer, Delgado, Davis, and Krajcik (2009) call the "embeddedness" of teacher supports. A text that has embedded supports integrates teacher support within the directions and content for enacting activities found in the student text. Texts that have this organization often have material intended for the teacher and the student on separate pages. This is in contrast to texts that have a "non-embedded" organization, in which teacher support is close to, but separate from student activities. Texts with this organization often have the material intended for the teacher and student on the same page. In addition, format would also include aspects such as color, font, and placement of curriculum elements on the page.

5. Methods

5.1. Participants

Participants for this study were four prospective teachers enrolled in a secondary (ages 12–18) mathematics teacher education program at a large university in the United States. These specific PSTs were included in the study because they were the four students out of a cohort of 18 students admitted to the program that volunteered to participate. Prior to the study, each PST had taken at least 21 credits of mathematics including three semesters of calculus, linear algebra, abstract algebra, and geometry. At the time of the study, all four students had been admitted to the teacher education program, but had not yet begun the professional coursework, which includes among other education and mathematics courses two semesters of mathematics teaching methods, a semester-long teaching practicum in schools, and a semester-long student teaching experience. Therefore, at the time of the study these PSTs had very little experience interacting with curriculum materials as a teacher or with planning lessons.

5.2. Data collection

Three researchers conducted two semi-structured staged planning interviews (Males et al., 2016; Roth McDuffie, 2015; Reinke & Hoe, 2011) with each PST, providing them lesson materials from two different curricular programs (described in the next section) for each. In a staged planning interview, teachers are asked to produce a hypothetical lesson plan. In order to mitigate the influence of planning with one set of materials over planning with the other, the two interviews were done at least one week apart. In addition, across our four PSTs we alternated the order in which the planning was done, meaning that two participants planned first with one set of materials and the other two planned first with the other set.

5.2.1. Curriculum materials

In order to gain insight into how the design of the curriculum materials influenced PSTs' use, we chose to use curriculum materials that had different curriculum elements and formats. Specifically, we asked PSTs to use CPM Educational Program Algebra Core Connections (Dietiker, Kysh, Sallee, & Hoey, 2014) henceforth referred to as CPM and Pearson Education, Inc. Algebra I Common Core (Charles et al., 2015) henceforth referred to as PEI.

We specifically chose these two curricular programs because they represent the two types described by Stein et al. (2007), Standards-based and Conventional, and have different curriculum elements and formats. The Standards-based CPM is formatted with embedded supports (Beyer et al., 2009), having three full teacher pages followed by five student pages. Curriculum materials that provide embedded supports integrate supports within the directions and content for enacting activities found in the student text. The Conventional PEI on the other hand is formatted with non-embedded supports, having nine pages that included reduced student pages with teacher materials wrapped around those pages. In non-embedded texts, supports are close to but separate from student activities. According to Beyer et al. (2009), curriculum materials with embedded supports may be influential in helping teachers develop the kind of integrated understanding needed to promote student learning. For example, Schneider and Krajcik (2002) found that teachers who read embedded notes intended to support their own understanding of strategies were able to support students in using these strategies. In addition, asking PSTs to plan using these two different texts could provide insight into how having teacher and student content on the same or different pages influences PSTs' interaction with the materials.

Finally, in order to mitigate the influence of mathematical topics on planning, we chose to keep the topic consistent across the two sets of materials. While we recognize that mathematical topics may be approached differently in different texts and that this likely influences how teachers plan, keeping the topic consistent allowed us to focus more on the curriculum elements and format. We chose the topic of slope because it is a topic that most PSTs feel comfortable with and would encounter in their future teaching.

5.2.2. Staged planning interview procedures

In order to capture PSTs' attention, we asked them to wear Tobii Pro Glasses 2 (Tobii Technology, 2018a), a wearable eye tracking device. The device is comprised of a head unit that is attached to a recording unit that connects to a laptop running the glasses controller software. The head unit (i.e., glasses), captures what the subject sees and records this and the subject's voice using four eye cameras, a gyroscope, an accelerometer, and a microphone. The glasses also come with a series of corrective lenses for use with participants that require them.

After explaining the interview procedures to PSTs, including telling them what lesson they would be using from the materials, we asked them to put on the eye tracking glasses and we calibrated them. This involved having the teacher look directly at a card with a bullseye on it. Once PSTs were looking at the bullseye the researcher hit the calibrate button. This entire process typically took less than 30 s. Once the glasses were calibrated the researcher could see what the PSTs were looking at in real time on the laptop, indicated by a circle that moved as the PSTs' eyes moved.

We then provided teachers with a single-sided color copy of both the teacher and student materials for the lesson they would be using. We asked teachers to imagine that these were newly adopted materials and to use the materials as a resource to plan an ideal lesson, meaning that they did not need to adhere to any requirements. We asked them to produce a written or typed plan. During the interview, the researchers remained silent.

In addition to the eye tracking video, we also recorded all interviews using a second video camera that was focused on the PST. All written materials, including the written or typed plan, any additional written work, and the student and teacher pages of the curriculum materials were collected.

5.3. Data analysis

All documents were scanned and the documents and the video recording from the camera focused on the PST's face was uploaded to a shared drive. The glasses recording and images of each of the curriculum pages were imported into Tobii Pro Labs (Tobii Technology, 2018b). Finally, the glasses recording and transcripts were imported into NVivo11 Plus, a qualitative analysis software program.

5.3.1. Analyzing curricular attention

To address our first research question, we analyzed the glasses recording. We used Tobii Pro Labs to map the gaze data recorded by the glasses to each of the curriculum pages. This allowed us to generate a variety of metrics including how many times and for how long PSTs visited (or looked at) the curriculum elements (referred to as Areas of Interest in Tobii Pro Labs) and visualizations, such as heat maps that illustrate the absolute visit count on each curriculum page across teachers. We describe Areas of Interest in the next section. In addition, we used the timecodes on the video to generate attention timelines, or timelines that illustrate when PSTs were attending to student and teacher materials (i.e., looking anywhere on the student or teacher pages) and when they were not attending to the curriculum materials (i.e., looking at their written lesson plan, at the interviewer, or at other places in the room).

5.3.2. Areas of interest

Tobii Pro's Areas of Interest (AOI) feature allowed us to designate our curricular elements. First, we dragged a box over a portion of text on a curriculum page and named it. See Fig. 2.

We chose to use a small grain size and then use the tag feature to group Areas of Interest together to form our curriculum elements. For example, on the PEI page in Fig. 2, we chose to create multiple AOIs for "Problem 1," but for analysis purposes, we used tags to combine these AOIs into the group of curriculum elements called "Problem 1".

5.3.3. Analyzing curricular interpretations and responses with respect to attention

To address our second question, we first coded each PST's transcript for their interpretations and responses. We assigned an Interpret code to an excerpt of the transcript when a PST made sense of the curriculum materials for planning purposes. These interpretations were related to three areas: the curriculum itself (e.g., the trajectory, structure, format), students (e.g., approaches or difficulties they may have), or the mathematics (e.g., working out solutions). We assigned a Respond code when teachers made a curricular decision related to what to include (or not to include) in their plans. This included deciding to use something from the materials as is, adapt it, not use it at all, or to supplement something not in the materials.

To address the extent to which each PST's attention interacted with their interpretations and responses, we examined their thought processes via idea units. Each time a PST focused on one big idea in their staged planning interview, we defined this as an idea unit. For example, idea units included discussion around one specific exercise, commentary around the structure or style of the curriculum materials as a whole, or selection of homework exercises. Within these idea units we identified idea sequences by recording the sequence of attention, interpretations, and responses. For example, when Fay discusses her thoughts around the problems following the introductory problem in the PEI lesson we generated the idea sequence in Fig. 3.

Fay first attended to the problem provided, decided to supplement with new problems, attended again, interpreted that the book did not cover what

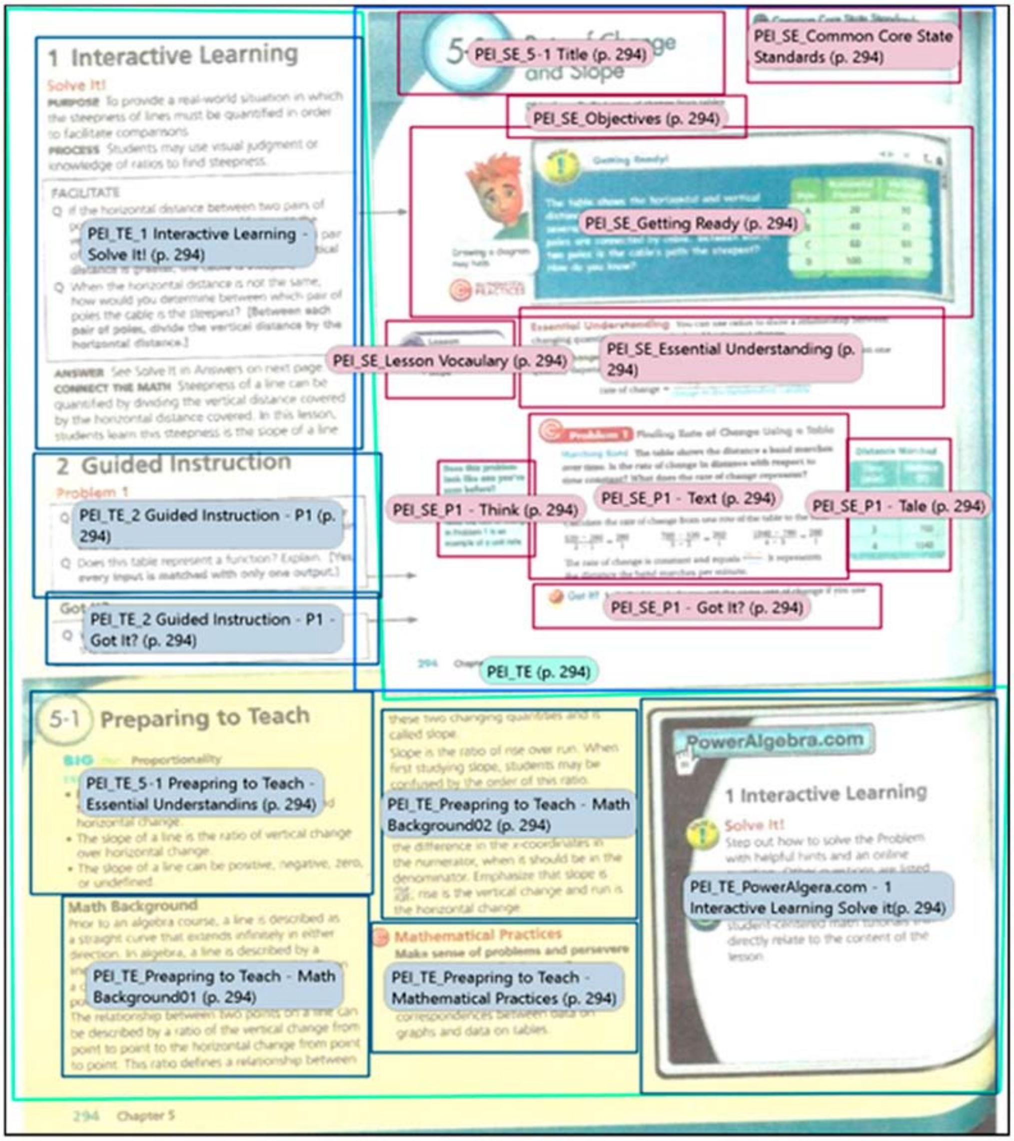

Fig. 2. Areas of Interest on PEI p. 294.

she wanted, attended yet again, reading the exercise more thoroughly, and then decided to use the exercise as provided (along with the supplements she had written down earlier in the sequence). Following this, Fay moved on to a new idea and thus we defined the next idea sequence of her planning period.

Fig. 3. Example of Idea Sequence.

5.3.4. Analyzing the influence of curriculum elements and format

Finally, we used the analyses we employed to address the first two research questions to describe to what extent the curriculum elements and format of each set of curriculum materials influenced PSTs' attention. We looked for similarities and differences that our analyses presented by curriculum.

6. Results

In this section, we present our results. First, we begin by presenting a broad view of attention across the planning session including describing how long each PST spent planning each lesson and how much of this time was spent attending to the curriculum elements. Second, we illustrate how PSTs' attention unfolded across the planning session including how they switched between attending to student and teacher materials and how their interpretations and responses interacted with their attention. Third, we describe each teacher's attention to the specific curriculum elements in each set of materials, including how many times and for how long they attended to each element. In each section, we highlight similarities and differences across curriculum materials.

6.1. Attention to curriculum materials across the planning session

Table 1 illustrates the range of times spent planning and attending to the materials by PST and curriculum. On average, PSTs spent 42 min planning CPM lessons with Fay spending the least amount of time (24 min) and Cody and Wren spending the most (51 min). PEI was similar, but with a slightly lower average planning time of 39 min. Fay, once again, spent the least amount of time planning her lesson (20 min), but with PEI the longest lessons were planned by Stanley and Wren at 53 and 55 min, respectively. The average planning time across the two sets of curriculum materials was similar for

Table 1. Total Time Planning and Attending to Curriculum Materials (in minutes) by PST.

	CPM		*PEI*	
PST	*Planning*	*Attending to Curriculum Elements*	*Planning*	*Attending to Curriculum Elements*
Cody	50.58	17.28 (34%)	28.27	11.99 (42%)
Fay	23.43	11.24 (48%)	20.23	12.69 (63%)
Stanley	40.97	19.77 (48%)	53.37	18.01 (34%)
Wren	50.83	17.59 (35%)	54.65	16.65 (30%)
$\bar{x}$	41.45	16.47 (40%)	39.13	14.84 (38%)

each PST, however PSTs such as Cody and Stanley had differences greater than 10 min, with Cody spending 22 more minutes planning with CPM than with PEI and Stanley spending more than 12 min planning with PEI than with the CPM lesson.

This table also indicates, with only one exception (Fay's planning with PEI), that PSTs spent less than half of their planning time attending to the curriculum elements in either set of materials. Sometimes this was as low as 30%. This means that during planning more time was spent attending to other things including the written lesson plan or looking at other things in the room, such as the interviewers or objects around the room. In the next section, we describe when attention occurred across the planning session for each set of materials and how this interacted with PSTs' interpretations and responses.

6.1.1. Attention, interpretations, and responses

Fig. 4 illustrates each PST's attention to the curriculum materials for CPM (top) and PEI (bottom) across the planning sessions. The black portions indicate times when the PST was not attending to the curriculum materials (e.g., looking at their lesson plan or other things in the room) whereas blue and yellow indicate attention to the student and teacher materials, respectively.

The attention timelines show that PSTs were shifting frequently between attending to student and teacher materials, with 40–85% of their attention time for both sets of materials devoted to student materials. When planning with both sets of materials, all PSTs, except for Cody, spent more time attending to student rather than teacher materials. Cody was the opposite, spending more time attending to the teacher materials in both planning sessions. Looking across the curriculum materials, the timelines illustrate that PSTs shifted between teacher and student more frequently for PEI and that they attended for shorter amounts of time before switching compared to CPM. Wren had an unusual amount time not attending to the materials at the end of his PEI planning period because he chose to rewrite his lesson plan to be more legible.

While attending (blue and yellow in the figure), PSTs were simultaneously interpreting (i.e., making sense of) and responding to the curriculum materials (i.e., deciding what to put in their lesson plan). For instance, for three of the four PSTs, we see heavy concentrations of attention in the beginning of the CPM planning periods. Our idea sequences indicate PSTs were attempting to make sense of the unfamiliar format and content of the materials, often looking back at preceding portions of the text and spending considerable amounts of time interpreting. For example, during this time, PSTs were interpreting the reason for what seems to be provided answers in the student portion of the materials, such as Grant who states "I'm assuming that this... they ask me to write an equation at the top that represents the table below.

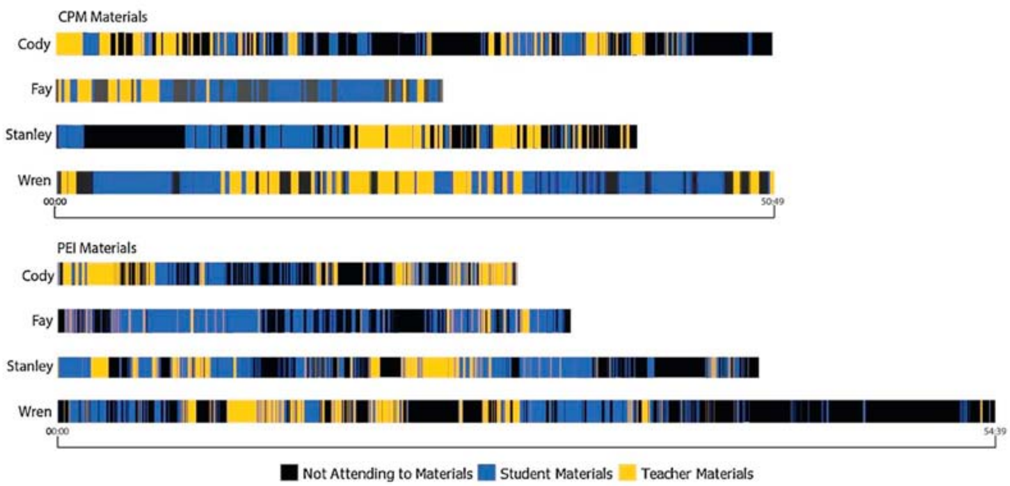

Fig. 4. Attention across the Planning Session by Curriculum and PST.

But then they give me the equation?" Over the course of two and a half minutes, he comes to the realization that the bolded answers are not included in the materials given to the student. The unfamiliar content also seemed to require more attention and interpretation. For example, Cody, who spent 22 more minutes planning his CPM lesson than his PEI lesson, struggled to make sense of the lesson, specifically what was meant by a title pattern. At the beginning of his planning sessions, after reading the introduction in the teacher materials and the first problem in the student materials, he spent more time searching for information from the teacher materials (yellow in his timeline) and working out his ideas on his scratch paper (black in his timeline) as seen in Fig. 5.

Cody first thought that tiles meant a grid of some sort. Then he drew what appears to the left in the figure followed by what appears to the right as he said "So they want to look at tiles... something like that...I see they're trying to bring in some physical type of thing... but to me a normal grid just kind of makes more sense so I'd probably just keep going with the x y axis."

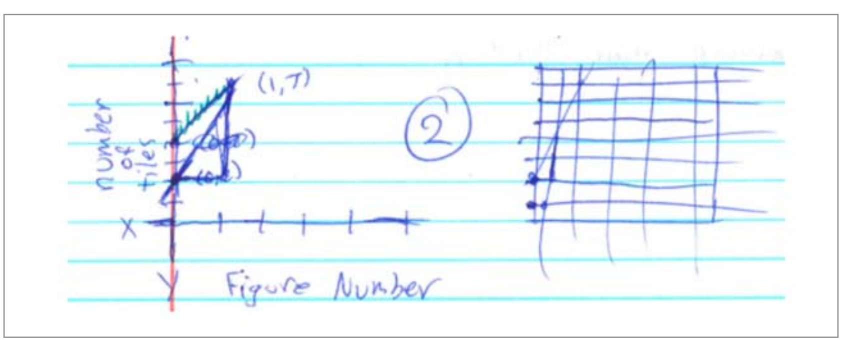

Fig. 5. An excerpt from Cody's scratch paper.

Towards the end of the CPM planning periods, PSTs went back to portions they had initially attended to, attending again and then interpreting the intended trajectory or concept before deciding to respond based on the alignment of the perceived structure with their own beliefs on how a lesson on slope should carry out. For example, at the end of his CPM planning period, Cody who struggled earlier, says "This makes me feel like this turns slope – a twenty minute type of thing you could teach...but it seems like an easier concept and they are taking it and expanding it super long."

In contrast, during PEI planning, we see heavy concentrations of attention throughout the entire planning period for each PST. Examining the idea sequences, we see that many more responses are made, along with interpretations, in the beginning half of these periods as compared to PSTs planning with CPM where responses were made towards the end of the planning periods. The most common interpretations involved PSTs making sense of the introductory slope problem and deciding quickly to adapt or supplement this because it was not "real-world" enough or approached in the way they would like, such as Stanley who says

> "...But that's not how I would actually solve that problem in the real world. Because really you just want to take 1 over 0.25, equals 4. 4 over 1 equals 4. 7 over 1.75 equals 4. Use those comparisons. I know these are mathematically equivalent, but this is just a little more roundabout and confusing."

Additional interpretations focused on the difficulty of various exercises for students followed by responding with which problems to assign (or not) for class or homework.

6.1.2. Idea sequences

Our idea sequences indicated that PSTs began to work with new ideas by attending, meaning each of our idea sequences began with an Attend code. We also saw that, particularly for CPM that attending to one curriculum element often led to attention (or repeated attention) to other elements. For example, after reading briefly through the CPM teacher materials around Problem 2–12, when attending to the student materials, Cody interprets Problem 2–12 saying it "seems kind of obvious." He then initially responds by deciding not to use the problem in his plan. However, he goes back to the teacher materials and attends to the suggestions for Problem 2–13 and he notices that the problems are linked and 2–12 provides valuable experience, so he decides to use both problems.

Our analysis also indicated that idea sequences were longer in duration across PSTs for certain curriculum elements. For example, when PSTs began to select homework exercises to assign, they thoroughly read each suggested homework exercise before making decisions, or went back and forth on their selections. Specifically for PEI as a resource, PSTs also had long idea sequences around the introductory slope problem. This involved PSTs making sense of this problem and deciding they wanted a more real-world problem to introduce the concept, rather than something so computational in nature.

Finally, idea sequences were different across materials. The average duration of the sequences were longer when PSTs were planning with CPM versus PEI. In addition, when planning with CPM, in the first half of their planning period, PSTs had many more idea sequences that only involved Attend and Interpret codes (21 out of 53 idea sequences across all PSTs), while with PEI there were many more Respond codes in the beginning of the planning periods (32 out of 49 idea sequences across all PSTs). This means that PSTs made planning decisions more quickly in their planning period for PEI than they did for CPM. In the next section, we describe attention to each of the curriculum elements in more detail.

6.1.3. Attention to curriculum elements

Each set of curriculum materials was comprised of more than 30 individual curriculum elements. In this section, we describe the attention to these elements by examining how many times PSTs visited these elements and how long they spent during these visits. Due to the vast number of elements we chose to combine them in sensible ways in our tables.[1] We use *Front Matter* to describe text intended to frame the lesson such as the title, topic, objectives, standards, materials, mathematical background, and any additional text to the teacher or students, such as CPM's Guiding Questions. This is followed by *In-Class Activities* which includes expository text and examples and problems or exercises intended for students to complete in class and the teacher suggestions that accompany these problems and exercises. Finally, we include *Homework* and *HW & Additional Strategies* for homework problems and suggestions for how to use these homework problems and any additional strategies provided to teachers, such as CPM's Team Strategies and Universal Access.

6.1.3.1. Number and duration of visits to CPM curriculum elements. The CPM lesson was comprised of 35 curriculum elements (18 on student pages and 17 on teacher pages). Across PSTs, all curriculum elements in CPM were visited at least once by at least one PST. Fig. 6 depicts heat maps that illustrate what curriculum elements were visited more frequently than others.

Across PSTs, the most frequent visits to the CPM Student Materials were to: a) Problem 2–11, specifically the portions that depicted the answer and

1 For a complete list of duration (in seconds) for individual elements, see Tables A1–A4 in Appendix A.

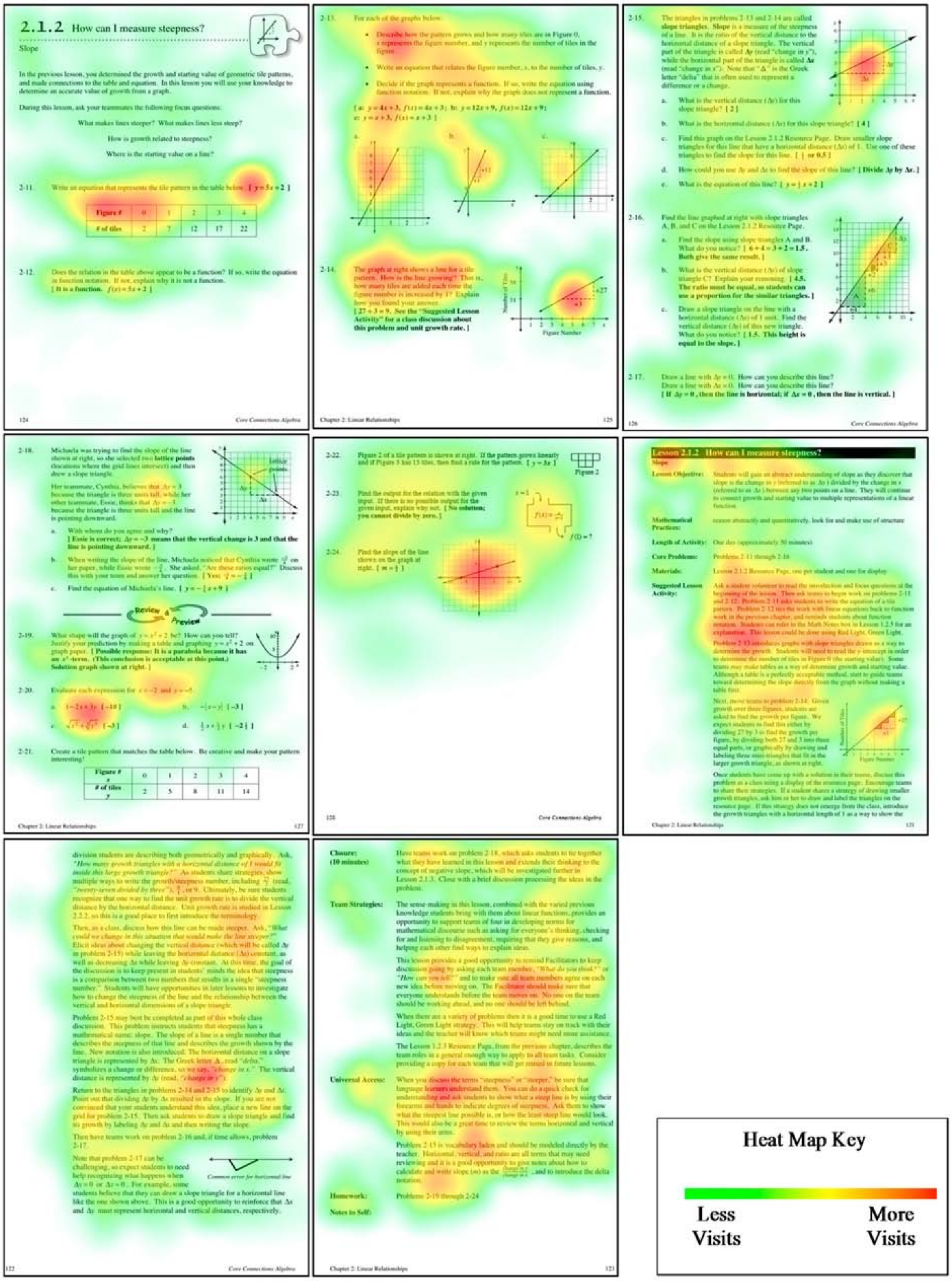

Fig. 6. Heat Maps Depicting the Absolute Visit Count Across All Four PSTs for CPM.

the label of "Figure #" and the "0" in the table, b) Problems 2–13 and 2–14, specifically the graphical representations in these two problems, c) Problem 2–20 including the portion of the problem that indicates what the problem is being evaluated for "$x = 2$ and $y = 5$" and parts a and c, and d) the graph in Problem 2-24. In the teacher materials, the numbers of visits were greatest to: a) the first paragraph of the Suggested Lesson Activity that contains teacher guidance for Problems 2–11 and 2–12, b) the beginning of the paragraph that discusses 2–13, c) the portion of the Suggested Lesson Activity on the second teacher page related to 2–15 that provides a discussion of notation, specifically that we read y as "change in y," d) the Team Strategies portion that discusses the role of the facilitator, and e) a portion of the Universal Access section that discusses the terms 'steep' and 'steeper' and what one might do for language learners.

Table 2 illustrates the length of time (in seconds) that each PST spent visiting the curriculum elements on the CPM pages. On average, PSTs spent more time on In-Class Activities. Specifically, they spent the longest time visiting Problems 2–11, 2–13, and 2–15 in the student materials at 59, 72, and 60 s respectively and visiting the Suggested Lesson Activity for Problems 2–11 and 2–12 (combined) and 2–14 and 2–15 (combined). If we combine the duration visiting Problems 2–11 and 2–12 and Problems 2–14 and 2–15 in the student materials as they were combined in the teacher materials, on average PSTs spent the longest duration visiting these four problems in both the student and teacher materials.

6.1.3.2. Number and duration of visits to PEI curriculum elements. The PEI lesson was comprised of 34 curriculum elements (17 on student pages and 17 on teacher pages). Like CPM, all curriculum elements in PEI were visited at least once by at least one PST. Fig. 7 depicts heat maps that illustrate what curriculum elements were visited more frequently than others.

As with CPM, the heat map in Fig. 7 illustrates across PSTs that there were more visits to certain curriculum elements. In the In- Class Activity portion

Table 2. Total Time (in seconds) Attending to Curriculum Elements on CPM Pages by PST.

	Student Materials			*Teacher Materials*		
PST	*Front Matter*	*In-Class Activities*	*Homework*	*Front Matter*	*In-Class Activities*	*HW & Additional Strategies*
Cody	33	375	8	233	344	44
Fay	38	255	111	9	232	28
Stanley	38	431	140	18	423	136
Wren	103	639	94	36	154	30
$\bar{x}$	53.00	425.00	88.25	74.00	288.25	59.50
s	28.94	138.95	49.16	92.31	103.02	44.60

Fig. 7. Heat Maps Depicting the Absolute Visit Count Across All Four PSTs for PEI.

Table 3. Total Time (in seconds) Attending to Curriculum Elements on PEI Pages by PST.

	Student Materials			*Teacher Materials*		
PST	*Front Matter*	*In-Class Activities*	*Home-work*	*Front Matter*	*In-Class Activities*	*HW & Additional Strategies*
Cody	6	268	12	143	167	122
Fay	21	495	120	11	54	59
Stanley	7	498	243	38	149	142
Wren	19	211	358	105	231	78
$\bar{x}$	13.25	368.00	183.25	74.25	150.25	100.25
s	6.80	130.07	129.84	52.41	63.38	33.21

of the student materials, the numbers of visits were greatest (red) to: a) the "Getting Ready" problem, b) portions of Problems 1 and 2 with the greatest number of visits to text of Problem 1 and the slope formula presented on the second page, c) the Key Concept which reiterated the slope formula on the third page, d) Examples 3 and 4 with greatest number of visits to the equations and graphs in these examples, and e) the first question in the Lesson Check. In the Homework portion of the student materials, the greatest number of visits was to questions 26–29 in the Apply section. In the Teacher Materials, the greatest numbers of visits were to: a) Guided Instruction for Problems 2 and 3, which includes information about the slope formula and questions to ask related to Problem 3, b) a portion of the Lesson Check that provided information about potential student difficulties with one of the questions in the section "Do you know HOW?" and c) the Assignment Guide in the Practice section which describes what level (i.e., basic, average, advanced) the exercises are. Although the Math Background and Essential Understandings sections of the Preparing to Teach section were not as common as the elements described above, these were more commonly visited than other elements.

Table 3 illustrates the length of time (in seconds) that each PST spent visiting the PEI curriculum elements. Like CPM, PSTs spent the longest time visiting the In-Class Activities with greatest durations on the Getting Ready, Problem 1, Example 2, and the Practice and Apply sections of the exercises, each garnering more than 50 s on average. Although PSTs spent less time, on average, on curriculum elements in the teacher materials, the longest duration was spent on the Interactive Learning portion of the teacher materials that discussed the Getting Ready problem from the student exposition.

7. Discussion

Investigating the interactions that PSTs had when planning with two sets of curriculum materials provided insight into the capacities of PSTs to plan lessons using different materials and provided a glimpse, albeit a small one, into the relationships PSTs may have been developing with the various sets of materials. We did this by describing PSTs' attention to different sets of curriculum materials when planning lessons, including what curriculum elements they attended to and for how long and how their interpretations and responses interacted with this attention. Specifically, for each PST we described the attention across the planning session by analyzing quantitative data captured from eye tracking glasses the PSTs wore while planning and qualitative data from coding the transcripts from each of two staged planning interviews. We then used these results to examine to what extent the curriculum elements and format of each set of curriculum materials may be influencing PSTs' attention. In this section, we summarize our results, offer potential conclusions, and provide implications for curriculum development and teacher education.

7.1. Planning time and attention to curriculum elements

PSTs spent, on average, 41.45 min planning with CPM and 39.13 min planning with PEI and of that time 38–40% of it was spent attending to the materials. Even when planning with curriculum materials much of their time was spent attending to other things, such as their written plan, scratch paper, or looking at other things in the room. With respect to individual curriculum elements, PSTs attended to all elements in each text, with the exception of a few homework problems (Cody) and the lesson topic (Fay, Stanley, and Wren) in CPM and the Homework Check (Fay and Wren) and the Lesson Check (Fay, Stanley, and Wren) in PEI. However, the number of visits and the duration of these visits indicate that the PSTs attended more to certain portions of each text when planning. As evidenced by the heat maps and duration tables, we found that PSTs attended more to problems, exercises, or examples that included mathematical representations, such as graphs, tables or equations in both texts. In addition, on average, the PSTs spent more time attending to the beginning of the suggested lesson activity and portions of the Team Strategies and Universal Access in the CPM teacher materials and the introductory slope problem and the slope formula in the PEI student materials and the notes for an example related to finding slope and the assignment guide in the PEI teacher materials. Sometimes it was clear that the PSTs' lack of understanding/ experience with curriculum materials influenced their attention. For example, one of the curriculum elements in

CPM that got the most attention was the portion of Problem 2–11 in the student materials that included the answer. Since PSTs were given the materials from the teacher binder, the answers were provided for each problem on the student materials. All four PSTs wondered whether students were being provided with the answer. As PSTs progressed through the materials they decided that these were provided for the teacher however, this is evidence of how reading curriculum materials as a teacher is not straightforward. In contrast, one PEI element that was attended to frequently was the slope formula presented in the student materials. This element, unlike the CPM element that was unfamiliar, was quite familiar to the PSTs and most of them liked this, such as Fay who added this to her lesson plan stating, “Slope equals the vertical change over the horizontal change, equals rise over run. Okay. I like that.” Another potential reason for attention to particular curriculum elements (either multiple visits or longer durations) is that once a PST made a decision to include something in their plan they needed to look at it more frequently to either transcribe it into their plan directly or make some decisions about how to include it in their plan.

7.2. Attention, interpretations, and responses

Before PSTs decided what to include (or not include) in their lesson plans they attended to the materials. This was evidenced by each of our idea sequences beginning with an attend code. When PSTs made decisions about what to include in their plans we sometimes saw that their decisions changed when they attended further to the materials or re-attended to elements they had already attended to. For example, Cody’s attention to the teacher notes for Problem 2–13 triggers his re-attention to Problem 2–12, resulting in deciding to include 2–12 in his plan after originally making a decision not to.

Further, our analysis indicates that the curriculum elements and format may have influenced PSTs’ idea sequences. First, we found that the average duration of idea sequences was longer for CPM than it was for PEI. Second, we found that in the first half of the CPM planning sessions more idea sequences comprised only Attend and Interpret codes, meaning that PSTs made less decisions for how to respond early on in their planning. In contrast, PEI idea sequences contained Respond codes throughout the entire planning session. These results may be due to the unfamiliar nature of the CPM materials or the embedded format. For instance, one PST commented that she felt like she had to read the entire CPM teaching suggestion due to its “paragraph format.” The familiarity of PEI may have made it easier for PSTs to decide to respond in particular ways. For example, Cody claimed to feel more confident in planning from PEI, stating, “I mean, it’s the way I learned, so of course, I have some bias [laughter]. But it just seems– it’s weird to say, but it seems more accessible to me…" In addition, PEI's non-embedded format, with teacher notes wrapped around the student pages, may have made for quicker decisions to respond.

7.3. Implications

This study has implications for curriculum development and teacher education. First, it is likely that format (embedded versus non-embedded) influences attention. The PSTs in our study tended to switch more quickly between student and teacher materials, not spending much time on either at one time when the materials were non-embedded. They also tended to make quicker decisions about what to include in their lesson plans when the materials were non-embedded. This may result in important teacher suggestions being missed or not understood. Although all elements were attended to in each text, some of this attention was severely limited to less than a few seconds. It is likely difficult for teachers to interpret and respond to curriculum materials to plan and enact instruction if they have not attended to the curriculum materials. Therefore, optimizing attention to critical curriculum elements should be a goal of curriculum development.

Second, this study emphasizes what Drake et al. (2014) advocate for. PSTs need opportunities to learn to use curriculum materials by interacting with different types of curriculum materials. This study provided evidence that PSTs do not interact with curriculum materials in the same ways and that their attention to curriculum materials may be shaped by the ways in which they make sense of that to which they attend to. Also, this study emphasizes the fact that PSTs need to learn to read curriculum materials. It is a skill to know what is intended for students and teachers in a set of materials and how to move between materials intended for students and teachers. PSTs need opportunities with a variety of curriculum materials to develop these skills.

Acknowledgments — We carried out the research reported in this article at the University of Nebraska-Lincoln with support from the CPM Educational Program (#96531). The opinions expressed here are those of the authors and do not necessarily reflect the views of the Program. We acknowledge the significant contributions of Matt Flores and we thank the prospective teachers that participated in the study. We presented some parts of this analysis at the 2017 CPM National Conference and the 2018 Conference of the Association of Mathematics Teacher Educators.

References

Ariav, T. (1991). Growth in teachers' curriculum knowledge through the process of curriculum analysis. *Journal of Curriculum and Supervision, 6*(3), 183–200.

Ball, D. L., & Feiman-Nemser, S. (1988). Using textbooks and teachers' guides: A dilemma for beginning teachers and teacher educators. *Curriculum Inquiry, 18*, 401–423.

Banilower, E. R., Smith, P. S., Weiss, I. R., Malzahn, K. A., Campbell, K. M., & Weis, A. M. (2013). *Report of the 2012 national survey of science and mathematics education.* Chapel Hill, NC: Horizon Research, Inc.

Beyer, C. J., Delgado, C., Davis, E. A., & Krajcik, J. (2009). Investigating teacher learning supports in high school biology curricular programs to inform the design of educative curriculum materials. *Journal of Research in Science Teaching, 46*, 977–998.

Brown, M. W. (2009). The teacher-tool relationship: Theorizing the design and use of curriculum materials. In J. T. Remillard, B. A. Herbel-Eisenmann, & G. M. Lloyd (Eds.). *Mathematics teachers at work: Connecting curriculum materials and classroom instruction* (pp. 17–36). New York: Routledge.

Brown, M. W., & Edelson, D. (2003). *Teaching as design: Can we better understand the ways in which teachers use materials so we can better design materials to support changes in practice? Research Report.* Center for Learning Technologies in Urban Schools (Northwestern University).

Charles, R. I., Hall, B., Kennedy, D., Bellman, A. E., Bragg, S. C., Handlin, W. G., et al. (2015). *Algebra I common core.* Saddle River, NJ: Pearson Education Inc.

Choppin, J. (2009). Curriculum-context knowledge: Teacher learning from successive enactments of a standards-based mathematics curriculum. *Curriculum Inquiry, 39*(2), 287–320. https://doi.org/10.1111/j.1467-873X.2009.00444.x

Choppin, J. (2011). The impact of professional noticing on teachers' adaptations of challenging tasks. *Mathematical Thinking and Learning, 13*, 175–197.

Dietiker, L., Kysh, J., Sallee, T., & Hoey, B. (2014). *Algebra core connections.* Sacramento, CA: CPM Educational Program.

Dietiker, L., Males, L. M., Amador, J., & Earnest, D. (2018). Curricular Noticing: A framework to describe teachers' interactions with curriculum materials. *Journal for Research in Mathematics Education, 49*, 521–532.

Drake, C., & Sherin, M. G. (2009). Developing curriculum vision and trust: Changes in teachers' curriculum strategies. In J. T. Remillard, B. A. Herbel-Eisenmann, & G. M. Lloyd (Eds.). *Teachers at work: Connecting curriculum materials and classroom instruction* (pp. 321–337). New York: Routledge Taylor, and Francis.

Drake, C., Land, T. J., & Tyminski, A. M. (2014). Using educative curriculum materials to support the development of prospective teachers' knowledge. *Educational Researcher, 43*(3), 154–162. https://doi.org/10.3102/0013189X14528039

Goodwin, C. (1994). Professional vision. *American Anthropologist, 96*, 606–633. https://doi.org/10.1525/aa.1994.96.3.02a00100

Gueudet, G., & Trouche, L. (2009). Towards new documentation systems for mathematics teachers? *Educational Studies in Mathematics, 71*, 199–218.

Jacobs, V. R., Lamb, L. L. C., & Philipp, R. A. (2010). Professional noticing of children's mathematical thinking. *Journal for Research in Mathematics Education, 41*(2), 169–202. https://doi.org/10.2307/20720130

Kaufmann, D., Johnson, S. M., Kardos, S. M., Liu, E., & Peske, H. G. (2002). "Lost at sea": New teachers' experiences with curriculum and assessment. *Teachers College Record, 104*(2), 273–300.

Lloyd, G. M. (2008b). Teaching high school mathematics with a new curriculum: Changes to classroom organization and interactions. *Mathematical Thinking and Learning, 10*(163-), 195.

Lloyd, G. M. (2008a). Curriculum use while learning to teach: One student teacher's appropriation of mathematics curriculum materials. *Journal for Research in Mathematics Education, 39*, 63–94.

Lloyd, G. M., & Behm, S. L. (2005). Preservice elementary teachers' analysis of mathematics instructional materials. *Action in Teacher Education, 26*(4), 48–62.

Lloyd, G. M., Cai, J., & Tarr, J. (2017). Issues in curriculum studies: Evidence-based insights and future directions. In J. Cai (Ed.). *Compendium for research in mathematics education* (pp. 824–852). Reston, VA: National Council of Teachers of Mathematics.

Males, L. M., Flores, M., Ivins, A., Smith, W. M., Lai, Y., & Swidler, S. (2016). Planning with curriculum materials: An analysis of teachers' attending, interpreting, and responding. In M. B. Wood, E. E. Turner, M. Civil, & J. A. Eli (Eds.). *Proceedings of the 38th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education* (pp. 81–88).

Mason, J. (2002). *Researching your own practice: The discipline of noticing.* Routledge.

Morris, A. K., Hiebert, J., & Spitzer, S. M. (2009). Mathematical knowledge for teaching in planning and evaluating instruction: What can preservice teachers learn. *Journal for Research in Mathematics Education, 40*(5), 491–529.

Pepin, B., Gueudet, G., & Trouche, L. (2013). Re-sourcing teachers' work and interactions: A collective perspective on resources, their use and transformation. *ZDM—The International Journal of Mathematics Education, 45*, 929–943.

Rabin, M., & Schrag, J. L. (1999). First impressions matter: A model of confirmatory bias. *The Quarterly Journal of Economics, 114*, 37–82.

Reinke, L., & Hoe, N. (2011). *Characterizing the tasks involved in teachers' use of curriculum. Paper Presented at The 2011 Annual Meeting of the American Educational Research Association*. Retrieved May 3, 2016 from http://www.gse.upenn.edu/icubit/dissemination [Cited with permission of first author] .

Remillard (2005). Examining key concepts in research on teachers' use of mathematics curricula. *Review of Educational Research, 75*(2), 211–246.

Remillard, J. T., & Bryans, M. B. (2004). Teachers' orientations toward mathematics curriculum materials: Implications for teacher learning.

Journal for Research in Mathematics Education, 35, 352–388. https://doi.org/10.2307/30034820

Remillard, J. T., & Heck, D. J. (2014). Conceptualizing the curriculum enactment process in mathematics education. *ZDM, 46*, 705–718. https://doi.org/10.1007/s11858-014-0600-4

Roth McDuffie, A. R. (2015). *Case studies of teachers' perceptions of the Common core State standards for mathematics and use of curriculum materials. Paper Presented at The 2015 Annual Meeting of the American Educational Research Association* Retrieved May 2, 2016 from the AERA Online Paper Repository.

Schack, E. O., Fisher, M. H., & Wilhelm, J. (2017). *Teacher noticing: Bridging and broadening perspectives, contexts, and frameworks.* New York: Springer.

Schneider, R. M., & Krajcik, J. (2002). Supporting science teacher learning: The role of educative curriculum materials. *Journal of Science Teacher Education, 13*(3), 221–245.

Sherin, M. G., & Drake, C. (2009). Curriculum strategy framework: Investigating patterns in teachers' use of a reform-based elementary mathematics curriculum. *Journal of Curriculum Studies, 41*(4), 467–500. https://doi.org/10.1080/00220270802696115

Sherin, M. G., Jacobs, V. R., & Philipp, R. A. (Eds.). (2011). *Mathematics teacher noticing: Seeing through teachers' eyes.*. New York: Routledge.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4–14. https://doi.org/10.3102/0013189X015002004

Stein, M. K., Remillard, J., & Smith, M. S. (2007). How curriculum influences student learning. In F. K. Lester Jr (Ed.). *Second handbook of research on mathematics teaching and learning* (pp. 319–369). Reston, VA: National Council of Teachers of Mathematics.

Tobii Technology, Inc. (n.d.).Tobii Pro Glasses 2. Falls Church, VA, United States.

Tobii Technology, Inc. (n.d.).Tobii Pro Labs [Computer Software]. Falls Church, VA, United States.

Tyminski, A. M., Land, T. J., & Drake, C. (2011). Elementary preservice teachers' critiques, comparisons, and preferences in examining Standards-based curricular materials. In L. R. Wiest, & T. Lamberg (Eds.). *Proceedings of the 33rd Annual Meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education.*

van Es, E. A., & Sherin, M. G. (2002). Learning to notice: Scaffolding new teachers' interpretations of classroom interactions. *Journal of Technology and Teacher Education, 10*, 571–596.

Vygotsky, L. S. (1978). *Mind in society.* Cambridge, MA: Harvard University Press.

Wertsch, J. V. (1991). *Voices of the mind: A sociocultural approach to mediated action.* Cambridge, MA: Harvard University Press.

Wertsch, J. V. (1998). *Mind as action.* New York: Oxford University Press.

Appendix A follows.

Appendix A

Table A1. Total Time (in seconds) Attending to Curriculum Elements on CPM Student Pages by PST.

	Front Matter			*In-Class Activities*								*Homework*						
PST	*Ti*	*I*	*G*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*R*	*19*	*20*	*21*	*22*	*23*	*24*
Cody	6	12	15	174	40	99	59	1	2	0	0	0		1	3	0	4	
Fay	4	13	21	60	8	18	1	118	29	13	8	4	15	8	4	8	8	64
Stanley	3	8	27	46	20	130	49	80	42	15	49	1	34	27	10	6	21	41
Wren	15	27	61	86	38	127	36	142	94	25	91	10	17	32	7	6	12	10
$\bar{x}$	7	10	22	59	18	72	28	60	30	10	28	3	14	14	5	4	9	22
s	5	8	18	54	14	45	21	55	31	9	33	3	14	14	4	3	8	24

Ti=Lesson Title; I=Lesson Intro; G=Guiding Questions; R=Review & Preview Title.

Table A2. Total Time (in seconds) Attending to Curriculum Elements on CPM Teacher Pages by PST.

	Front Matter							*In-Class Activities*						*HW & Additional Strategies*			
PST	*Ti*	*To*	*O*	*P*	*L*	*C*	*M*	*11+ 12*	*13*	*14+ 15*	*16*	*17*	*Cl+ 18*	*H*	*N*	*TS*	*UA*
Cody	21	14	107	29	11	15	36	179	57	99	2	2	5	1	1	7	35
Fay	0		4	0	1	1	3	41	32	152	1	5	1	1	0	10	17
Stanley	0		2	4	2	3	7	53	55	240	10	26	39	2	1	74	59
Wren	3		13	9	5	2	4	31	7	98	3	12	3	2	0	11	17
$\bar{x}$	4	2	18	7	3	3	8	51	25	118	3	10	10	1	0	25	27
s	7	5	37	10	4	5	12	54	20	68	3	9	14	1	0	29	21

Ti=Lesson Title; To=Lesson Topic; O=Objectives; P=Mathematical Practices; L=Length of Activity; C=Core Problems; M=Materials; Cl=Closure; H=Homework; N=Note to Self; TS=Team Strategies; UA=Universal Access.

Table A3. Total Time (in seconds) Attending to Curriculum Elements on PEI Student Pages by PST.

	Front Matter						*In-Class Activities*							*Homework*			
PST	*Ti*	*S*	*O*	*G*	*E*	*V*	*1*	*2*	*KC*	*3*	*4*	*CS*	*LC*	*P*	*A*	*C*	*L*
Cody	5	0	1	21	46	1	58	61	4	15	25	5	32	5	6	0	1
Fay	12	2	7	103	54	3	88	98	18	37	59	31	4	46	68	6	0
Stanley	4	1	2	45	13	1	74	26	9	63	33	9	225	85	141	17	
Wren	14	3	2	45	18	1	23	54	17	29	19	3	2	167	167	23	1
$\bar{x}$	9	2	3	54	33	1	61	60	12	36	34	10	20	55	96	7	1
s	4	1	2	30	18	1	24	26	6	18	15	14	20	78	63	11	1

Ti=Lesson Title; S=Standards; O=Objectives; G=Getting Ready; E=Essential Understandings; V=Lesson Vocabulary; KC=Key Concepts; CS=Concept Summary; L=Lesson Check; P=Practice; A=Apply; C=Challenge; L=Apply What You've Learned.

Table A4. Total Time (in seconds) Attending to Curriculum Elements on PEI Teacher Pages by PST.

	Front Matter			*In-Class Activities*								*HW & Additional Strategies*					
PST	*E*	*B*	*MP*	*G*	*1*	*2*	*KC*	*3*	*4*	*CS*	*LC*	*A*	*H*	*MP*	*L*	*ME*	*PA*
Cody	65	60	18	58	19	28	11	13	7	11	20	14	4	7	6	65	26
Fay	8	2	1	21	17	9	1	2	2	1	1	30		12		6	11
Stanley	18	19	1	37	16	2	7	13	41	7	26	39	8	35		46	14
Wren	20	82	3	39	3	83	6	33	58	6	3	48		2		24	4
$\bar{x}$	28	41	6	39	14	30	6	15	27	6	9	23	1	6	2	35	14
s	22	32	7	13	6	32	4	11	23	4	9	21	2	5	3	22	8

E=Essential Understandings; B=Math Background; MP=Math Practices; G=Getting Ready; KC=Key Concepts; CS=Concept Summary; LC=Lesson Check; A=Assignment Guide; H=Homework Check; L=Apply What You've Learned; ME=More Examples & Answers; PA=Power Algebra.com.