FIRST IMPRESSIONS MATTER: AN ANALYSIS OF PROSPECTIVE TEACHERS' NOTICING OF CURRICULUM MATERIALS

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Given the ubiquity of curriculum materials and complexity of their usage, it is imperative that teacher education programs prepare prospective teachers (PSTs) to use curriculum materials. In this paper, we focus on what PSTs notice when they are interacting with curriculum materials, and how their initial impressions of curriculum materials influence their later understandings of curriculum materials. We found that PSTs' 20-second impressions may be indicative of their longer impressions of curriculum materials, which can include their preferences, values, beliefs, and approaches to using curriculum materials. We suggest that teacher educators expose PSTs to a variety of curriculum materials to better support PSTs in planning and enacting lessons.

Keywords: curriculum; preservice teacher education; teacher noticing; instructional activities and practices

Research indicates that teacher education programs need to do more to prepare teachers to learn to use curriculum materials in adaptive and flexible ways (Drake et al., 2014). Given that 88% of mathematics teachers reported having a designated commercially published textbook (Banilower et al., 2018) and that research on teacher-intended curriculum with prospective secondary teachers (PSTs) emphasizes the complexity of using materials (e.g., Lloyd & Behm, 2005; Van Zoest & Bohl, 2002), it is imperative that teacher educators support PSTs in learning to interact with curriculum materials. Furthermore, AMTE (2017) stresses the importance of preparing beginning teachers of mathematics to plan and use curriculum materials (Indicators C.2.2 and C.1.4) and for programs to provide opportunities to learn to teach mathematics (Standard P.3).

To leverage the potential of curriculum materials, Drake et al. (2014) advocate for PSTs to have more experiences reading, interpreting, analyzing, and making decisions about how best to use a variety of materials. This requires teacher educators to design experiences that draw on PSTs' knowledge and dispositions towards curriculum and extends this to productively engage them in interacting with materials. Our study is part of a larger research project intended to understand how PSTs learn to use curriculum materials and to develop methods for productively engaging PSTs in this learning. In this paper we focus on what PSTs notice when they are interacting with curriculum materials, and how their initial impressions of curriculum materials influence their later understandings of curriculum materials.

Theoretical Framing

We frame our study using two complementary theoretical perspectives, the perspective that there is a participatory relationship between teachers and curriculum materials (Remillard, 2005) and that teachers generate documents through documentation genesis (Gueudet & Trouche, 2009). To describe the ways in which teachers participate with instructional materials and develop documents through the processes of instrumentation and instrumentalization (Pepin, Gueudet, & Trouche, 2013) we use the Curricular Noticing Framework (Authors, year), which is

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informed by the work in the professional noticing of children's mathematical thinking (Jacobs, Lamb, & Philipp, 2010). Curricular noticing is comprised of three interrelated skills: Curricular Attending, Curricular Interpreting, and Curricular Responding, which "enable teachers to recognize, make sense of, and strategically employ opportunities available within their curriculum materials" (Authors, Year, p. x). Figure 1 depicts the relationships between these frameworks.

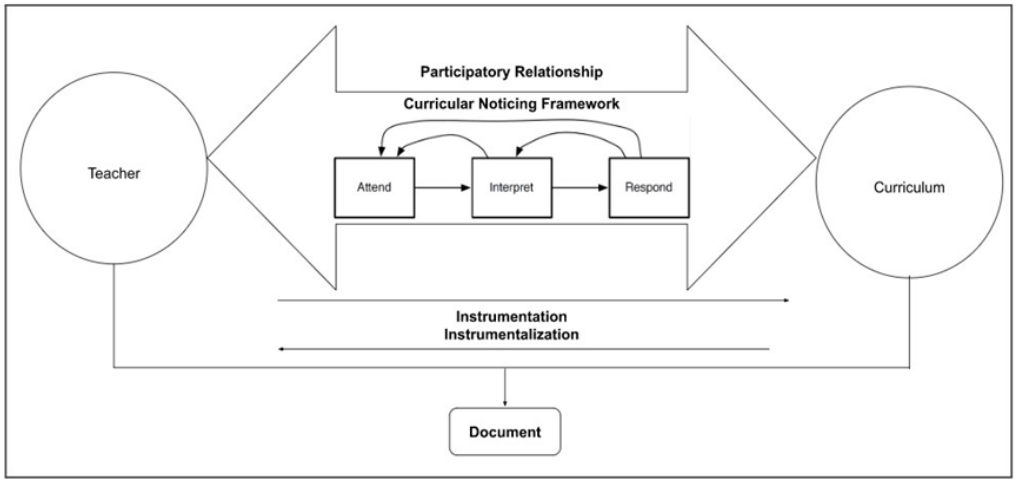

Figure 1: Relationships between Theoretical and Analytical Frameworks

Purpose of the Study

Our study focuses on PSTs' noticing of different sets of curriculum materials and aims to inform the work of teacher educators in developing ways to support PSTs to use curriculum materials with intentionality. We address the following questions:

1. What do prospective teachers notice when given the first page of a lesson from two different sets of curriculum materials for a short amount of time (i.e., what are their first impressions)?
2. How might prospective teachers' first impressions be related to their later understanding of the full lessons from both sets of curriculum materials?

Methods

Participants & Data Collection

The participants of the study were six PSTs enrolled in a 6-12 mathematics teacher certification program, either not yet enrolled in or enrolled in the first of two mathematics teaching methods courses. Note that all names are pseudonyms, and, in the results, we use the pronoun they to refer to each PST.

Each PST participated in a semi-structured interview which lasted approximately 45 minutes. We video-recorded the interviews using both a regular video camera facing the PST and eye-tracking glasses that the PST wore. See Figure 2 for images from the recordings. Note that the red circle indicates the PSTs gaze (I.e., what they were looking at).

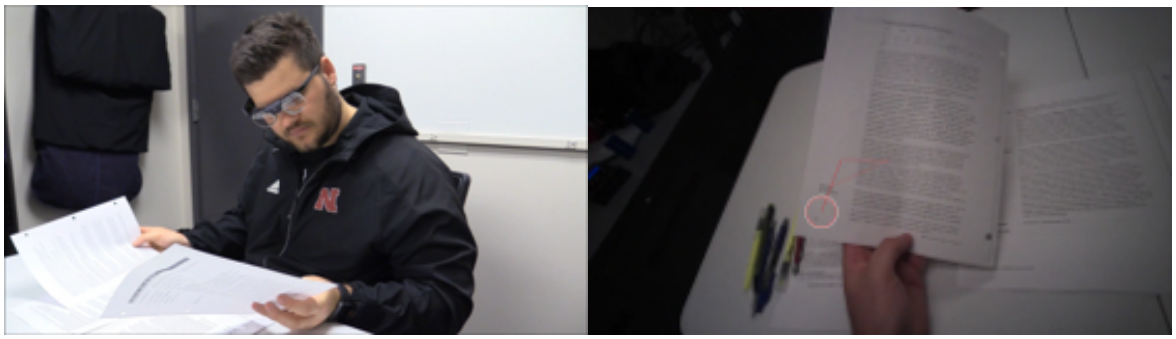

Figure 2: Images from the Video Recording from the Face Camera and Glasses

To address our research questions, we conducted two parts of the interview where we gave PSTs materials and asked them to talk aloud. For the first part, we gave them 20 seconds to describe what they noticed when we gave them the first page of a lesson from CPM Algebra Core Connections (Dietiker et al., 2014) [CPM] and then another 20 seconds when we gave them the first page of a lesson from Meaningful Math Algebra 1 (Fendel et al., 2014) [MM]. After each 20-second exposure, we asked each PST what they noticed. During the second part of the interview, we gave them an unlimited amount of time to look at the full lessons and compare. We then asked questions about what they noticed and their comparisons, including what they imagined might be supportive of both students and teachers.

Data Analysis

We imported the video produced by the eye tracking glasses into Tobii Labs analysis software. The eye-tracking glasses allowed us to see what PSTs were looking at during the semi-structured interviews and then utilize software to visualize what and how long they looked at various items (i.e., heat maps) and the order in which they looked at them (i.e., gaze plots). We also utilized the eye tracking video to open-code the verbal data--"identifying any segment that might be useful" (Merriam & Tisdell, 2016, p. 204), writing summaries of what PSTs noticed during both sections of the interview, and then consolidating our summaries into themes.

Results

Following analysis, we noticed connections across PSTs' 20-second exposures, their untimed comparisons, and the portion in which we asked them follow-up questions. Notably, PSTs had ideas in the initial 20-second portion of the interview that remained consistent or grew stronger in subsequent portions of the interview. Table 1 summarizes our findings.

Table 1: Summary of Findings

PST	Part I: 20 seconds		Consistencies Found between Part 1 & Part 2
	CPM	MM	
Eddy	Instructional; Student tasks and activities; Organized; Clear objective; Student engagement	Highlighted key concepts and vocabulary; Supportive of teachers; Learning goals; Instruction manual	Instruction manual; Student activities
Cam	Lesson goals	Organized; Lesson goals	Lesson goals
Jim	Organized; Wordy	Organized; Easy to read	Wordy; Easy to read

Andy	PST summarized lesson; Wordy; Difficult to discern what's going on; No visuals	PST summarized lesson; Lesson goal; Key words	Wordy; Visual representations; Key words
Mike	Clear lesson goals; Summary of the lesson; Lesson length	Clear; Not distracting; Concise; Easy to read	Clarity; Concise structure
Ken	Objective; Lesson length; Standards; Suggested activities	Lesson length; Materials needed; Lesson description	Lesson components & Structure

For each PST, we found consistencies between their first impressions (i.e., the 20-second exposure) and their later noticings. Some PSTs attended to formatting in the curriculum materials, either commenting on their own preferences or how different curriculum materials were formatted. Aspects of formatting that PSTs mentioned involved features such as how pages were organized, the number of words that they noticed, and how readable they felt the materials were. Specifically, PSTs noted features such as vocabulary words, the visuals that were present, and lesson goals/objectives/intent. In addition, we found that some PSTs were consistent in their noticings with respect to how they wanted to use the curriculum materials and the manners in which the lessons were organized and/or structured.

Overall, we found that each PST had at least one idea that they voiced during the first portion of the interview and preserved throughout the rest of the interview. Their idea was often something that they elaborated on in the later portion of the interview without prompting, as well as something that they emphasized as important to them when we asked them questions. In the next sections we describe the findings in more detail for each PST.

Eddy

Eddy's focus was on looking for activities students will do and how they will do them. They mentioned looking for "explicit instruction" and guidance related to leading discussions with students to support student learning. During the 20-second portion of the interview, Eddy's heat map indicated significant time spent on the CPM section about the suggested lesson activity, aligning with their desire to know what the teacher might be doing and how to develop the experience for students. Additionally, Eddy stated that MM, "read more like an instruction manual" during the 20-second portion of the interview. While comparing materials, Eddy stated:

> Um, this (CPM) lesson plan seems to not, uh, maybe I just haven't read it yet, but doesn't give like explicit instruction on like how the discussion is happening, whether it's like as a class or individually or like with a partner. And this one (MM) is a little more explicit and like having students work in groups and then later come together as a class. But I mean, it doesn't say that you can't do that, but this one seems very, uh, more, uh, straightforward in terms of just following instructions.

Cam

Cam noticed the goal/objective of each lesson in the initial 20-second portion of the interview, while reading more thoroughly, and after reading. After reading, Cam described how CPM and MM approached representing relationships, where they both did this, and how they had slight differences in their respective approaches. Cam mentioned CPM having more suggested activities for teachers, while MM seemed more formalized for establishing procedures and getting students to interpret what was happening in each visualization. During the 20-second exposure, Cam's gaze plot for CPM indicated looking at the lesson objective, moving to other portions of the page, and then re-visiting the lesson objective. This suggests Cam may have

engaged in sense-making while they were reading and potentially re-visited what they felt was important to understand the lesson. During questioning at the end of the interview, Cam talked about MM and how it aligned with what they felt was the intent of the lesson, saying:

> I think I mentioned this in an earlier question, but the intent it (MM) says it's setting the groundwork for students to learn techniques of graphing and making connections and graphs. So, it's not about regular rigorously graphing functions yet. It's about being able to look at a graph and get a general idea of what's going on and what the graph represents maybe without, you know, specific data points necessarily.

Jim

A prominent finding throughout Jim's interview was their focus on how "wordy" curriculum materials appeared. During the initial 20-second portion of the interview, Jim identified CPM as "wordy". In the latter portion of the interview, Jim noted that CPM "being so wordy can cause some confusion." Jim continued to emphasize wordiness after reading, describing how easy it was to read the materials and even comparing CPM's ease of reading to that of MM. Eye-tracking picked up on this theme of wordiness as well, as heat maps indicated flickering attention to the initial first page in CPM and more sustained reading in the first page of MM (see Figure 3).

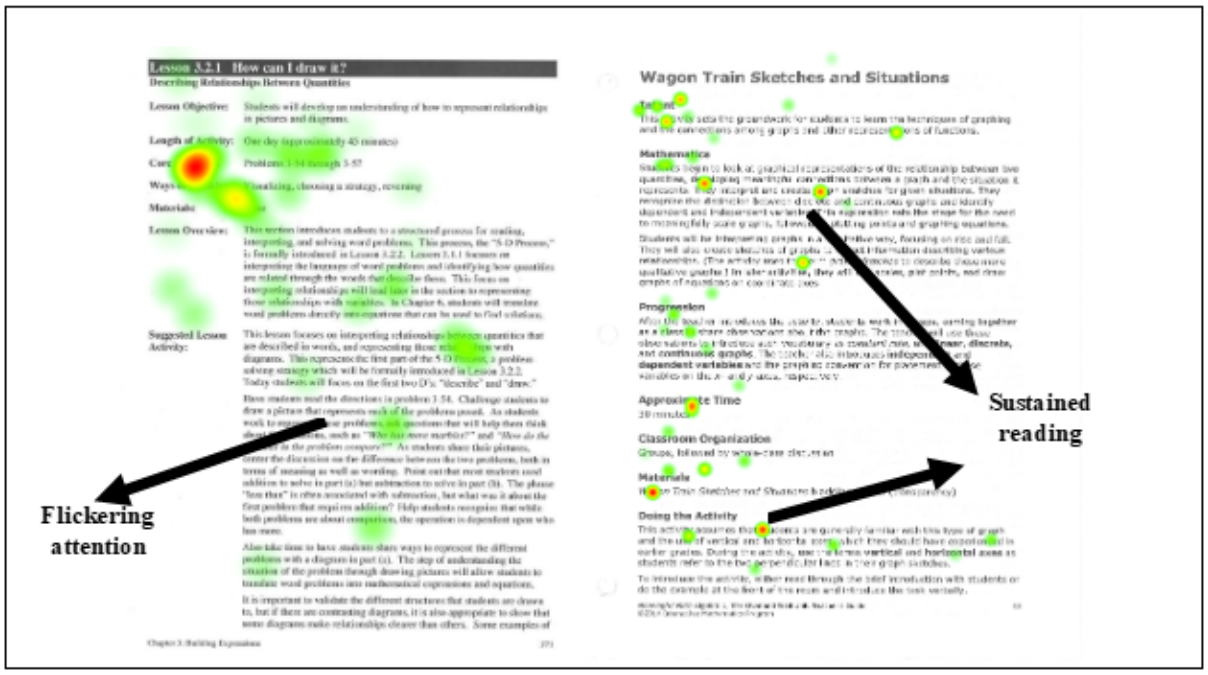

Figure 3: Heat Map of Jim's 20-second Exposure to CPM (left) and MM (right)

Andy

Wordiness was also attended to by Andy, as they stated after seeing CPM initially during the 20-second portion that it "was very wordy and it was hard to discern what was actually going on. It's kind of, yea, it wasn't easy to, there wasn't any pictures or anything. Okay. So, it was hard to figure out what's going on." Andy's challenges related to making sense of the lesson in CPM contrast with their sense making of MM. While comparing CPM and MM, Andy stated that MM

is, “a lot better than...” CPM because MM “...has questions for me and minimal text to talk about it,” whereas CPM is “too wordy.” Andy’s heat maps contrasted with Jim’s, even though they both had similar conclusions related to CPM being too wordy. Andy’s heat maps suggested a focused attention on one portion of the CPM text, possibly engagement in sense-making. We did not see with this MM, but instead saw smaller heat centers across the page, likely indicating sustained reading (see Figure 4). Large clusters of focused attention may be related to Andy’s impressions of wordiness and challenges to make sense of the curriculum material.

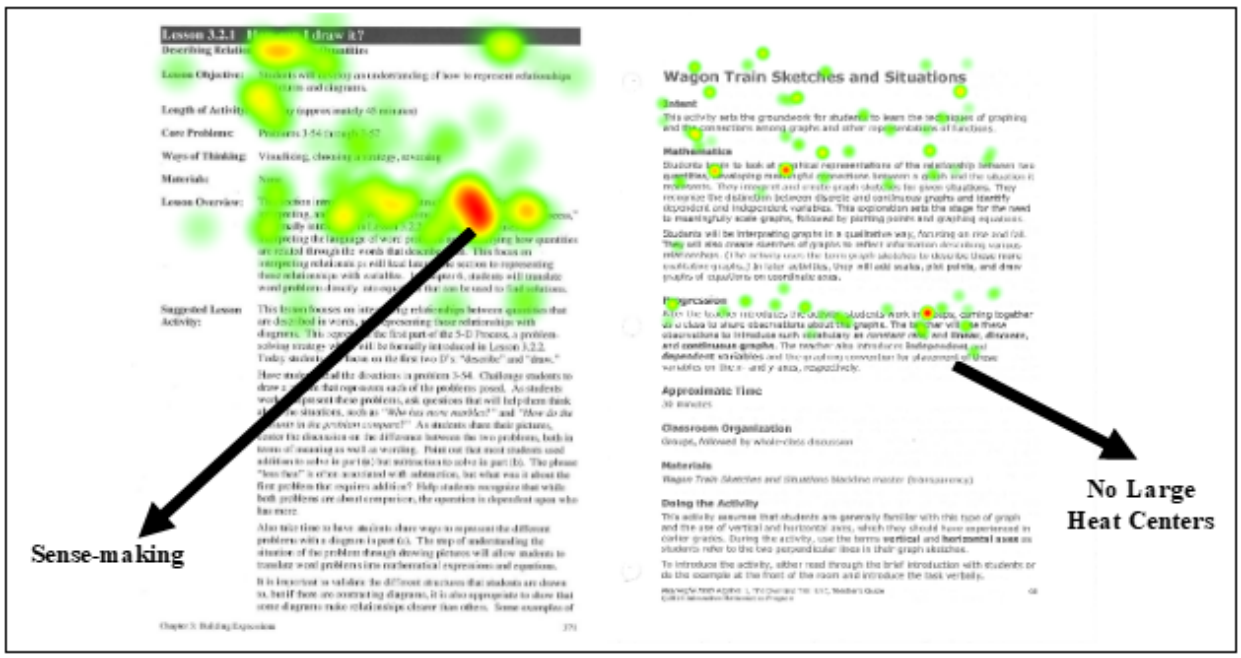

Figure 4: Heat Map of Andy’s 20-second Exposure to CPM (left) and MM (right)

In addition to wordiness, Andy also attended to key words. Andy noticed key words in MM during the initial 20-second portion of the interview, while comparing the materials, and later in the interview. Andy stated how helpful they found key words and that they find them to be something they need most in a lesson. Andy went on to state:

> I think (what) I need the most is just to be able to construct a lesson plan (that) is okay. The key words, the key terms, the key, uh, like discrete, continuous, dependent, independent, uh, words like that...The wagon train problem, um, or the questions are good examples and the key terms are good to keep in mind.

Mike

During Mike’s interview he noticed structure. In the 20-second portion of the interview, Mike emphasized a preference for clarity related to the lesson objective and concise summaries. Later on in the interview, Mike continued to emphasize structure and indicated that MM’s conciseness was more useful when preparing to teach a lesson, as compared to CPM. Mike’s gaze plots provided further evidence of this, indicating a linear progression through the CPM page, but returning to core problems and the lesson objective after already noticing the suggested activities section on the page. Mike’s gaze plot for MM, though, was completely linear with no

visual revisiting (see Figure 5). Mike's gaze plots may be a sign that conciseness, clarity, and ease of reading can be indicated through less visual revisiting.

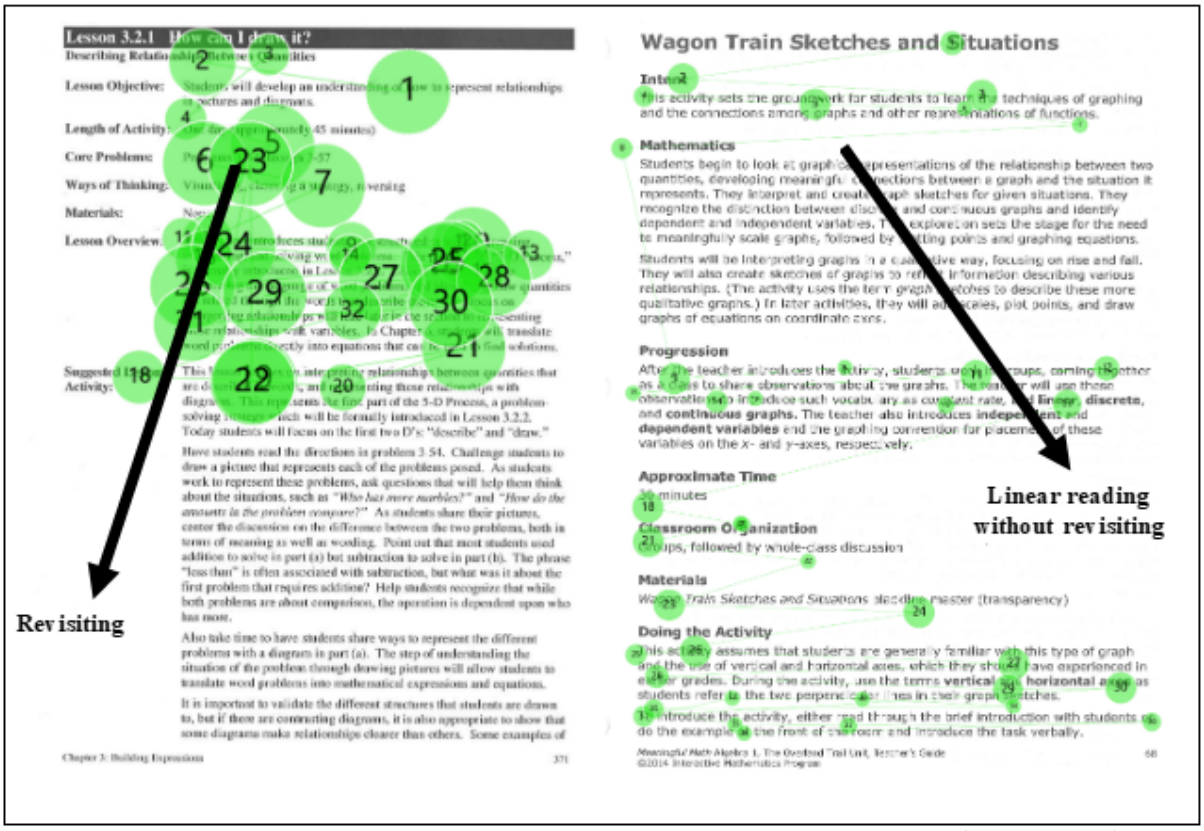

Figure 5: Gaze Plot of Mike's 20-second Exposure to CPM (left) and MM (right)

Ken

Ken noticed structure as well but had a different sense than Mike as far as what it meant. Ken emphasized an ability to identify various lesson components, such as lesson length, lesson objective, required materials, and what the teacher and students would be doing as indicated both verbally and with the eye-tracking glasses. In the latter portion of the interview, Ken was asked about what seemed important while comparing the lessons. Ken responded:

> Uh, the structure. So, like what would the teacher be doing was like the big thing, and like it was easy to find out what the teacher's doing in this one (CPM), cause, like, writes all of it down. But this one (MM), I'm still kind of trying to piece together what the teacher's exactly supposed to do.

Ken's sense of structure in identifying lesson components indicated a preference towards CPM, stating that MM's structure was confusing and that they would, "have to read it like word-for-word...(to) see exactly what the teacher is supposed to do."

Discussion

PSTs search for specific things when looking at curriculum materials related to their own preferences. When interpreting curriculum materials, they approach the materials in various

manners, looking for key words or concepts, as well as how they might facilitate or enact a lesson, treating the curriculum materials like an instruction manual. What PSTs look for, or attend to, when they look at curriculum materials is noticeable through eye-tracking technology, as indicated specifically by gaze plots and heat maps. Through interpretations of these tools, PSTs preferences and approaches are discoverable, as shown in features such as sustained focus on one area, revisiting other areas, rapid gazes, and linear progression through the materials. Overall, PSTs' 20-second impressions may be indicative of longer impressions of curriculum materials, which can include their preferences, values, beliefs, and approaches to using curriculum materials.

In the work of preparing PSTs to engage students and support learning, it is imperative that PSTs familiarize themselves with various curriculum materials. Awareness of different curriculum materials and familiarity with them can help PSTs understand various approaches to the teaching and learning of mathematics, as well as how they might plan for and enact lessons. In other words, preparing PSTs to plan with curriculum materials is essential to the future work of engaging students in their classrooms.

This work of exposing PSTs to different curriculum materials is important because PSTs make initial judgements which can be developed and sustained over time. Teacher educators have opportunities to discuss what PSTs notice in a safe, low-stakes environment, such as a methods course. Taking the time to do this work is important because PSTs have beliefs, values, and orientations to materials, which may or may not be aligned with engaging and supporting each and every mathematics learner. Helping PSTs work with curriculum materials might assist them in thinking through their personal judgements before making decisions related to curriculum materials, as well as help them plan lessons efficiently and effectively.

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