LITERACY TEACHERS' BELIEFS ABOUT DATA USE AT THE BOOKENDS OF ELEMENTARY SCHOOL

ABSTRACT

The purpose of this investigation was to explore elementary teachers' beliefs about data and data use. Archived data from 2 research projects were used to address the following research questions: What are kindergarten and fifth-grade literacy teachers' beliefs about data and data use? What functions do the beliefs serve in teachers' actual use of data? Using a multicase study approach, 2 research teams carried out qualitative data analysis. Findings revealed that kindergarten and fifth-grade teachers held similar "macro" beliefs, and these beliefs were shaped and contextualized in response to their settings. The study's implications suggest that teachers' beliefs about data are influential in what teachers actually view as data and in the ways they put data to use to address students' learning needs.

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RESEARCHERS have long explored the relevance of teachers' beliefs as related to teaching practice (see Fives & Buehl, 2012; Pajares, 1992). Emerging from this work is the foundational perspective that teachers' beliefs are not a singular unidimensional construct. Rather, beliefs are situated in domains and contexts. Moreover, teachers have beliefs about a variety of things that may or may not influence their professional work (Pajares, 1992). With the advent of data use, teachers' beliefs about assessment, data, and the use of data should be explored in the same ways researchers have investigated teachers' beliefs about

content (e.g., science [Wallace, 2014] and mathematics [Lui & Bonner, 2016]), learners (e.g., students with autism spectrum disorder [Chung et al., 2015]; gifted learners [Moon & Brighton, 2008]; English-language learners [Lucas, Villegas, & Martin, 2015]), teaching (e.g., constructivist practices [Fives, Lacatena, & Gerard, 2015]), and their own ability/motivation (e.g., self-efficacy [Klassen & Tze, 2014]; goal orientation [Butler, 2007]).

The task of exploring teachers' beliefs about data use is complicated because data are also domain, content, and context specific. Inquiry into beliefs about data use begs initial questions of what data, from where, to be used by whom? Literacy instruction dominates the work of most elementary teachers, yet this work shifts dramatically as learners move from prereading in kindergarten to independent reading as a tool for further learning in the upper elementary grades (e.g., grade 5). Beliefs about the specific data considered in the domain of literacy and the context of specific grades may support or hinder teachers' ongoing professional practice. The ways these beliefs function, that is, what they do in teachers' self-systems, may have a substantive influence on how, when, and whether teachers engage in pragmatic and thoughtful data use to make sense of students' learning needs.

In this study, we engaged in a multicase investigation to explore the role of elementary teachers' beliefs about data and data use. Teachers' beliefs influence their work when beliefs function as filters, frames, and/or guides (Buehl & Beck, 2015; Fives & Buehl, 2012, 2017); therefore, understanding teachers' beliefs about data and data use in the context of literacy and how these beliefs function can inform the extant theory on data use, as well as provide insights to develop contextually rich professional development interventions for teachers.

Review of Relevant Literature

The extant literature on teachers' beliefs reveals that beliefs serve specific functions in the self-system (Bandura, 1997). The research, theory, and practice in teachers' data use to inform instruction has also blossomed. In the sections below, we describe these two areas of literature and attend to the context of literacy instruction at the beginning and end of elementary school. We bring these fields of research together to highlight the specific need for the current research.

Teachers' Beliefs

Beliefs are a system of integrated connected perspectives, conceptions, and values held by teachers. Within teachers' self-system, beliefs conceptually serve as filters, frames, and guides (Fives & Buehl, 2012, 2017). As filters, beliefs influence both what and how information is perceived, such that new information may be targeted or overlooked, clarified, or clouded (Fives & Buehl, 2017). When beliefs act as filters, they are typically implicit and therefore require targeted efforts to unearth and examine their effects. Beliefs functioning as frames provide a context for conceptualizing a particular problem or task, providing an intentional boundary space on what teachers include or exclude in their decision making. In contrast to filters,

as frames, beliefs are generally explicit, yet teachers may overlimit or overextend the task such that important beliefs for the task may be excluded. As guides, beliefs have a direct influence on actions, through the establishment of expected standards for performance. Because beliefs functioning as guides have a direct influence on practice, it is important for teachers to recognize their internal guides and make sure that their beliefs are aligned with their practice.

Teachers' Beliefs about Data and Data Use

A substantial body of research points to the role that beliefs play in the recognition of data and data use. For example, according to Coburn and Turner (2011), beliefs play an instrumental role in the act of administrators noticing data (i.e., filters; see, e.g., West & Rhoton, 1994), in the ways in which data are interpreted (i.e., frames; see, e.g., Ikemoto & Marsh, 2007; Kerr, Marsh, Ikemoto, & Barney, 2006; Young & Kim, 2010), and in how data are translated into actionable instructional steps (i.e., guides; see, e.g., Coburn, Honig, & Stein, 2009; Means, Padilla, DeBarger, & Bakia, 2009). Although some of this research focused on teachers, the majority of the work centered on school leaders/administrators within schools and districts. Jimerson (2014), however, proposed a framework describing how teachers think about data and data use based on their personal beliefs. This framework acknowledged that teachers' thinking about data is based in assumptions, definitions, and beliefs about data and data use, and that these ideas are "abstracted from one's experiences" (Spillane & Miele, 2007, p. 50). Although the research on which the framework was conceptualized is limited (i.e., one school district in Texas), Jimerson posited that one's beliefs, although not static, are rigid, often failing to acknowledge data that contradicts or challenges one's preconceived beliefs, something Spillane and Miele termed "selective attention." This notion of selective attention was also found in Lortie's (1975) classic sociological study of classrooms where teachers attended selectively only to evidence that supported their self-image as teachers. The literature on data use in combination with Jimerson's proposed framework suggests three common influences on teachers' beliefs surrounding data use: personal, cultural, and political.

Personal influences. One influential personal factor noted in the literature on teachers' beliefs is their sense of self-efficacy for data literacy. Data self-efficacy was defined by Dunn, Airola, Lo, and Garrison (2013, p. 90) as "teachers' beliefs in their abilities to effectively analyze and interpret student data in order to successfully connect or apply their interpretations of data findings to classroom instruction and to improve student learning." Dunn and colleagues, in their development of an instrument designed to measure data-driven decision-making self-efficacy and anxiety with more than 1,700 teachers in one U.S. state, reported that teachers' perceptions about their ability to successfully analyze and interpret student data (called "interpretation") was distinctively different from their ability to make data-informed instructional decisions (called "application"). Moreover, limited data literacy knowledge and skills and how to align pedagogical decisions with the analysis of data can also potentially increase teachers' anxiety. Through analyzing transcripts of teachers' data meetings, Timperley (2009) found that many lacked the pedagogical content knowledge to translate the results from analyzing data to instructional maneu-

vers. Furthermore, anxiety created because of low self-efficacy resulted in teachers struggling to use data effectively. Documenting this struggle, very few researchers reported on studies wherein teachers made actual rigorous instructional changes based on the analysis of data. However, researchers whose studies suggested that teachers had made instructional changes based their studies on self-report data rather than others' direct observations and examination of classroom practices (e.g., Blanc et al., 2010; Hoover & Abrams, 2013).

Cultural influences. Having a culture of inquiry also influences teachers' beliefs about data use. A culture of inquiry empowers teachers to follow the data trail to get to the root cause of an issue rather than limiting the use of data to the issue at hand. However, this type of culture requires a high degree of trust among participants, meaning that the findings from the analysis and interpretation of data will not result in professional harm, particularly harm in terms of evaluative judgments about instructional practices (Copland, 2003; Marsh, 2012; Tschannen-Moran & Woolfolk-Hoy, 2001). Another cultural influence with connections to teachers' beliefs is a school climate supportive of the social nature of data use. Collaborative practices found in the literature associated with data use revolve around the use of professional learning communities (PLCs; sometimes referred to as "data teams"; e.g., Datnow, Park, & Kennedy-Lewis, 2012; Farley-Ripple & Buttram, 2014; Huguet, Farrell, & Marsh, 2017) and coaching (Marsh, Bertrand, & Huguet, 2015; Marsh, McCombs, & Martorell, 2010).

PLCs/data teams. The collaborative nature of PLCs is due in part to the contribution that individual teachers make to the group based on their respective strengths (e.g., content, pedagogy [Putnam & Borko, 2000]). Although teachers typically work alone in their classrooms and are the sole decision maker in those settings, effectively working in PLCs requires that any potentially contrasting and conflicting views about data and data use must be reconciled to leverage the power of data for instructional improvements. During these interactions, individuals with conflicting beliefs about data may have different interpretations of the same data (Coburn et al., 2009; Hallett, 2010) and suggest different implications for the data findings (Coburn et al., 2009). Drawing from a multisite study focused on data use, Datnow et al. (2012) concluded that the social interactions among teachers were influential in the use of student data. Other studies have had similar findings to those of Datnow and colleagues (e.g., Farley-Ripple & Buttram, 2014; Huguet et al., 2017; Marsh & Farrell, 2015; Muñoz & Branham, 2016).

Coaching. Another common potential factor influencing teachers' beliefs about data and data use is the instructional coach. Although the research specifically investigating a coach's influence on teachers' beliefs about data and data use is limited, Means and colleagues (2009) found that coaches provided the primary leadership for teachers in using data for classroom applications. Using a mixed-methods design to investigate instructional coaching within a PLC framework in eight middle schools in Florida, Lockwood, McCombs, and Marsh (2010) found that the majority of coaches reported spending at least 6 hours every 2 weeks on analyzing data to guide teachers' instructional practices or training teachers on how to analyze the data. Furthermore, Marsh et al. (2010) also found that teachers who received more support regarding data reported more instructional changes. Although these findings are not directly related to teachers' beliefs, given the reported data focused on the coach's

efforts, one could hypothesize that the coach's efforts surrounding data use with teachers might play a role in influencing teachers' beliefs about data and data use.

Political influences. Authority is power (Coburn & Turner, 2011). In educational organizations, the higher the position one holds, the greater power one has. School principals can have an impact on the development of teachers' beliefs (e.g., Kerr, et al., 2006; Ross & Gray, 2006; Turnbull, 2002) and can play a key role in shaping positive organizational climates and instructional settings (e.g., Leithwood & Jantzi, 2006). Thus, it stands to reason that principals can have a substantial influence on teachers' beliefs around data and data use. In climates that are heavily focused on external accountability policies, teachers' beliefs about data and its uses differ from climates where the principal serves as an interpreter and mediator of accountability policies (e.g., Leithwood, Steinbach, & Jantzi, 2002; Yoon, 2016).

With respect to teachers' assessment practices and data use, there is much to learn in understanding the challenges presented for teachers to use data in meaningful ways. Better understanding of teachers' beliefs about assessment, data, and data use through the perspective of belief functions may provide teacher educators the opportunity to develop beliefs and context-sensitive interventions and pedagogies to foster belief development or change.

Data Use Context: Literacy Instruction at the Bookends of Elementary School

According to reading experts, effective literacy instruction integrates skills-based and knowledge-based instruction, with the focus of instruction changing from early elementary grades to upper elementary grades (e.g., Chall, 1995; National Reading Panel, 2000). For example, in K–2 classrooms, the literacy focus is on developing the knowledge and strategies to help students become accurate readers by strategically focusing on phonemic awareness, phonics, "sight" words, vocabulary, and oral comprehension; in the upper grades, the focus is concentrated on fluency, vocabulary, and comprehension. We situated our investigation at the "bookends" of elementary school to explore teachers' beliefs about data use across the different instructional targets given the changing focus of instruction. Because using data to guide instruction is considered essential for literacy instruction (see Chall, 1995), understanding teachers' beliefs about this practice at the beginning and end of elementary school may help to explain differences in practice.

Literacy in kindergarten. Kindergarten classrooms are sights for the development of foundational reading skills and ability. Developmental steps in learning to read involve a movement from awareness of the alphabet to the ability to read in context (Morris, Bloodgood, Lomax, & Perney, 2003). Seven developmental capabilities frame the movement from awareness of letters to reading. These include alphabet knowledge, beginning consonant awareness, concept of word in text, spelling with beginning and ending consonants, phoneme segmentation, word recognition, and contextual reading (Morris et al., 2003). Kindergarten students are expected to develop alphabet knowledge and "proficiency in letter discrimination, letter naming, and letter-sound correspondences" (Piasta & Wagner, 2010, p. 8). The need to attend to these specific developmental steps in learning to read, in addition to other literacy standards, leads to unique instructional goals and expectations for kindergarten teachers that are vastly different than expectations in later years. The Common

Core content standards (Common Core State Standards Initiative, 2018) for foundational skills in reading identify four sets of standards with multiple substandards addressing print concepts, phonological awareness, phonics and word recognition, and fluency. By grade 2, the number of standards related to foundational reading skills drops to two: (*a*) phonics and word recognition and (*b*) fluency.

Literacy in grade 5. In fifth grade, the construct of reading is no longer focused on acquiring the basic skills needed to access written text, as most students have already developed these abilities (Guo, Connor, Yang, Roehrig, & Morrison, 2012). In fifth grade, the focus and purpose of reading transitions to using reading as a tool for learning, a transition that is difficult for many students (Chall, 1967, 1995; Shanahan & Shanahan, 2008). Reading proficiency in fifth grade "requires strategic and flexible use of academic knowledge, strategies, inferencing, and other higher-order cognitive resources" (Guo et al., 2012, p. 17). The nature of reading changes across the bookends of elementary school, and so does the amount of explicit instructional time. For instance, in one study of reading instruction in primary grades, most of the academic instructional time was dedicated to language arts instruction (Connor, Son, Hindman, & Morrison, 2005). In contrast, an investigation of fifth-grade instruction found that only half of the academic time was spent on language arts instruction (Pianta, la Paro, Payne, Cox, & Bradley, 2002). In fifth grade, students are expected to learn by reading content-specific texts. However, the skills needed to engage in this practice have to be explicitly taught and teachers need to recognize that knowledge of the content itself can play a key role in these students' reading comprehension (e.g., Connor et al., 2012; Cromley & Azevedo, 2007).

These differing expectations of and for reading across the elementary years require changes in teachers' approach to instruction and may lead teachers to develop different beliefs about the nature of literacy and what it means to assess students' literacy skills and abilities, thus influencing teachers' beliefs about data and data use.

Research Questions

1. What are kindergarten and fifth-grade literacy teachers' beliefs about data and data use?
2. What functions do these beliefs serve in teachers' data use?

Method

We present a multicase study (Stake, 1995) of teachers' beliefs about data use. Specifically, we offer an instrumental case analysis of the phenomenon of interest—teachers' beliefs about data use—and this served as the primary content of each case (Stake, 1995). The import of context for teaching literacy in kindergarten and fifth grade led us to the decision to approach this investigation as an instrumental multicase study wherein the cases were kindergarten teachers' beliefs about data use and fifth grade teachers' beliefs about data use. We engaged in a cross-case

analysis to explore the richness of the teachers' experiences, the manifestation of beliefs in each case, and the comparisons across the cases.

This work evolved over 3 years and across two independent research teams (New Jersey and Virginia). Both teams separately received funding from the Spencer Foundation for a special research program, "Evidence in the Classroom," to explore data use in classrooms. As part of this grant program, the Spencer Foundation organized and facilitated meetings twice a year of all grant recipients to describe and discuss each other's research progress and findings. Through these formal and informal conversations, our research teams (New Jersey and Virginia) began to find commonalities in our respective data sets. This ultimately led to a new set of shared research questions that we felt could be answered by looking across the contexts of kindergarten and fifth grade and the states of New Jersey and Virginia. We found that teachers from these bookends of elementary school provided compelling insights into these teachers' beliefs about data and data use.

Thus, this instrumental multicase study may be considered a form of secondary data analysis in that we explored new questions using data initially collected for another purpose (Glaser, 1962). In our discussion of the research methods, below, we acknowledged that data were gathered differently for each original study and recognize the limitations that this may have had on our work. However, our analysis of the wide variety of data types gathered across these contexts allowed for more opportunities to triangulate our findings and establish confirmability for findings based on the combined data.

Participant Selection

We purposefully selected four teachers from each context whose data we analyzed for this investigation. In the original study of the New Jersey team, participants were selected based on their expertise in classroom assessment as determined through Palmer, Stough, Burdenski, and Gonzales's (2005) two-gate process for identifying expert teachers (i.e., minimum of 3 years' experience and recommendation from a legitimate source such as a supervisor or principal). The Virginia team mined their participant pool for teachers who met these conditions as well; however, in the Virginia context, the team members served as the legitimate source to recommend expertise. To further limit our participant pool, each team attempted to select teachers who taught in the same school. Doing this allowed us to delve deeply into the school contexts as we examined the data and considered how teachers in the same context demonstrated similar or unique beliefs.

Instructional Contexts

The kindergarten teacher participants were from the state of Virginia, and the fifth-grade teachers were from New Jersey. In Virginia, literacy instruction typically occurred in a 90-minute block, with students grouped based on their performance on a state formal literacy assessment, given three times a year (fall, winter, and spring). Instruction took the form of rotating centers that lasted approximately 10–17 minutes each. One of the literacy centers was led by the teacher who facilitated instruction with a small group of students sitting at a kidney-bean-shaped table.

The other students engaged in a variety of literacy-based activities at the other centers (e.g., literacy computer program; word sorting activity; worksheets focused on the "letter of the day"; and a writing center). Parent volunteers or the teacher's aide typically facilitated activities at the sorting or writing centers. Some days the school reading specialist would come in and work with a small group of students (fewer than five), or pull them out, giving them a "double- or triple-dose" of literacy instruction for the day.

In New Jersey, the literacy standards for grade 5 included expectations for reading, writing, speaking/listening, and language use. Students completed a yearly standardized exam intended to measure progress on these skills. Students were grouped flexibly, informed by district literacy assessments, classroom assessments, and the teacher's knowledge of his or her students. In the classrooms observed, literacy instruction was offered in a 90-minute block. Instruction took the form of whole-class instruction, teacher-student independent and small-group conferences, independent work, and collaborative activities (e.g., paired reading). The schools offered pull-out support for struggling and English-language learners.

Participants and School Contexts

The four female kindergarten teachers ranged in age (24–46 years) and experience (4–25 years), and all held a bachelor's degree in education (see Table 1). Three teachers, Alice, Carol, and Sarah, taught at the same school, Perkins Elementary. Perkins Elementary was located in a small (population about 21,000) mid-Atlantic city (average household income for 2015 was $47,470, which was below the state average).[1] According to the school quality report, the school enrolled 487 K–5 students, 99 of whom were kindergarten students. The school's ethnic/racial makeup was 58% White; 17% Black, 11% Hispanic, 12% two or more races, and 2% other. Nine percent of students had disabilities, 36% were economically disadvantaged, and 8% were English-language learners.

The fourth kindergarten teacher, Jodie, was the oldest and had the most experience of the group of teachers. Jodie taught at Rogers Elementary, which was in a rural setting outside an urban ring in a mid-Atlantic city (average household income for 2015 was $118,075). According to the school quality report, the school enrolled 438 K–5 students, with 59 in kindergarten. The school's ethnic/racial makeup

Table 1. Thumbnail Sketch of Participants

Alias	Age	Gender	Years Teaching	Education
Kindergarten, Virginia:				
Alice	24	Female	4	BA elementary education
Carol	31	Female	7	BA elementary education
Sarah	38	Female	16	BA early/middle education (K–8)
Jodie	46	Female	25	BA elementary education
Fifth grade, New Jersey:				
Chelsea	29	Female	4	MA teaching
Wendy	≅60	Female	11	MA education after a career in business
Daphne	25	Female	4	BA plus additional coursework
Martin	34	Male	12	MA plus additional coursework

was 72% White; 13% Black, 9% Hispanic, 3% two or more races, and 3% Asian. Twelve percent of students had disabilities, 26% were economically disadvantaged, and 6% were English-language learners.

The fifth-grade teachers in New Jersey ranged in age from 25 to 60 years and spanned 4–12 years of experience. All were White, and all but one were female. Three of the teachers held a master's degree (see Table 1). Chelsea and Wendy taught at Grant Intermediate, which provided instruction for children in grades 3–5. This school was located in a small, middle-class town (average family household income for 2017 was $95,114) in western New Jersey, close to the Pennsylvania border. According to the publicly available school report card, the school enrolled 345 students in the 2016–2017 school year and had a faculty-to-student ratio of 1:9. The school's ethnic/racial makeup included White (84.6%), Hispanic (9.2%), Asian (4.1%), Black (0.9%), Pacific Islander (0.3%), and two or more races (0.9%) students. A small portion (6.1%) of students were eligible for free or reduced-price lunch, 3.0% were identified as having limited English proficiency, and 18.9% were enrolled in special education programs.

Daphne and Martin taught at Bridgedale Elementary, a prekindergarten through fifth-grade school. Bridgedale Elementary was located in a small, middle-class town (average family household income for 2017 was $130,848) in eastern New Jersey close to New York City. According to the publicly available school report card, the school enrolled 361 students for the 2016–2017 school year and had a faculty-to-student ratio of 1:12. The school's student ethnic/racial makeup included White (55%), Asian (31%), Hispanic (6%), Black (2%), and two or more races (6%); 2.5% of students were identified as eligible for free or reduced-priced lunch, 2.6% of students had limited English proficiency, and 11.1% were classified and received special education services.

Data Sources and Collection

Research data used for this investigation were originally collected using multiple ethnographic field methods. It should be noted that for this investigation we analyzed only those data gathered from the eight teachers described above.

Virginia data. Several forms of data were collected in the Virginia site, including observations of formal teacher meetings, school leaders holding formal data meetings, classroom observations of reading instruction (observations were conducted with a formal protocol), and semistructured think-aloud interviews (TAs). When available, lesson plans were collected as secondary sources of data. All teachers engaged in three TAs focused on student data in the form of a formal state-approved early literacy assessment (Phonological Assessment Literacy Screening [PALS]) and student classroom work.[2] During TAs, teachers were prompted to share their interpretation of the data and the instructional implications of those interpretations. Each interview lasted between 20 and 35 minutes and were digitally recorded and professionally transcribed for data analysis. The research team conducted 23 classroom observations across the four teachers, with each observation lasting between 90 minutes and 3 hours. For most observations, there were two researchers in each classroom.

New Jersey data. Multiple sources of data were identified for the New Jersey site. All teachers engaged in an introductory interview (II) and a closing interview (beginning and end of school year) that lasted 60–90 minutes. These interviews focused on teachers' data-use practices and expectations and the supports teachers experienced in their school contexts. Data were also gathered during 8 weeks of intensive interactions in the schools. In 2-week cycles with each teacher, two members of the research team performed classroom observations and TA interviews as teachers engaged in data use. During the multiple TA interviews, teachers were prompted to describe their thinking while engaged in assessment activities such as evaluating student work, entering grades into a computer program, designing new assessments, and reviewing district data on students. That is, as teachers engaged in assessment-related activities, the researchers prompted them to elaborate and verbalize their thinking processes. This type of free-flowing thinking is one that without prompting may have otherwise remained internal. All interviews were transcribed for data analysis. Teachers were observed for 2 full class days during literacy instruction, and observational field notes were recorded, using an observation protocol, by two researchers at each site. Teachers completed a weekly online reflection of their classroom assessment activities. Finally, classroom artifacts in the form of student work, assignments, and rubrics were also gathered.

Analyses

For this investigation, the teacher was the key analytic unit, and we focused on instantiations of his or her beliefs. We conducted an initial line-by-line round of coding of all transcripts and observations to identify emergent categories (e.g., data use). In a second round of coding (i.e., axial coding), we sought connections among the categories identified in the initial round of coding. During this process, we read for the context in which the category was embedded (e.g., formal process), the ways in which the category was used (e.g., grouping of students), and the conditions that facilitated, or not, the use of the category (e.g., record-keeping process). All codes were presented and discussed in team meetings held via Google Hangout between the New Jersey and Virginia researchers.

During these team meetings, the importance of teachers' beliefs emerged as being relevant to their data use. As such, both teams engaged in a second round of independent coding based on our theoretically grounded conceptualization that beliefs can serve as filters, frames, and guides. Code development was comprehensive and iterative. Both teams conferred regularly with one another to consider terminology and definitions, and unpack each other's data, frequently referencing the literature for guidance. After codes for all data were agreed upon, they were aggregated across each teacher to generate working assertions reflective of belief functions in context. These working assertions then served as deductive codes for the final round of coding, looking for confirmability or disconfirmability of the working assertions (Miles, Huberman, & Saldana, 2014). To increase the trustworthiness of our analysis, we triangulated varied sources of research data, including observation records and classroom artifacts, with our working assertions (Creswell & Miller, 2000; Lincoln & Guba, 1985).

Findings

We found evidence suggesting that teachers' beliefs about data use functioned to filter, frame, and guide their perception, interpretation, and use of data. Moreover, beliefs manifested in unique ways at the bookends of elementary school (kindergarten and fifth grade). In the following sections, we describe the types of data-use beliefs held by kindergarten and fifth-grade teachers and the different functions those beliefs served. We present excerpts from teachers in both contexts to illustrate the ways in which their data-use beliefs were similar or not and the implications this had on their teaching practices.

Beliefs about Students in Context Serve as Filters

Recall that when beliefs function as filters, they serve as a cognitive shortcut that limits or focuses teachers' attention on particular aspects of their work, context, or the task at hand. As a result, filters can affect what and how teachers perceive information, or in this case, the data or assessment information they were presented with or analyzing. In our data, we observed that all teachers held beliefs about individual children that were used to filter their interpretation of the students' assessment data. Teachers' beliefs about individual students were holistic in nature and took into account student characteristics beyond academic performance. Moreover, these beliefs seemed to reflect a summation of individual assessments, observations, and interactions, experienced over time, and consequentially seemed to hold more power in teachers' interpretations of specific performance data. These filtering beliefs about students emerged in statements where teachers responded to assessment data based on their knowledge of students in ways that seemed to confirm those beliefs. Teachers also weighed their beliefs about students with their beliefs about the context of the assessment data in terms of the task and the content or curriculum. Below, we present examples of how beliefs functioning as filters were used by teachers in both contexts. Of note, the fifth-grade teachers seemed to temper their beliefs about students with their beliefs about content such that these were used in tandem to inform their analysis of student data.

Kindergarten: "I know my kids." Without exception, kindergarten teachers recognized the importance of developing their students' literacy skills and that learners came to school with varying levels of reading readiness (e.g., English-language proficiency; access to preschool education). Consequently, this belief of "knowing my kids" took priority over other forms of data and was influential in filtering teachers' subsequent interpretations. For example, Carol, a teacher at Perkins Elementary School, used her belief about individual students as a filter for her instructional decision making. During a discussion of how she formed student groups, she explained: "I know that Jason needs to be in my bottom group because even though he has 24 letter sounds, I know who he is, and I know he has to be in my bottom group" (TA, October 21). Carol had strong beliefs about Jason. So strong, that despite evidence of Jason's phonemic awareness, Carol's belief about "who he is" served to filter her interpretation of his skills, and this resulted in an instructional decision to place him in the group of low-performing students. In this example, Carol's confidence in her beliefs about Jason filtered how she analyzed and pro-

cessed the information from her assessment event. This had implications for her teaching practices and instructional responses to him.

We saw a similar reliance on teachers' beliefs about students in Alice's response to reviewing test scores from the PALS assessment: "So, in looking at these scores, I'm also thinking about what I've seen. One of these students (Julissa)—to me—even though she scored lower on the letter recognition, my opinion is that she's not a very strong test taker" (TA, October 20). Here, Alice's interpretation of Julissa's test score and, consequently, the conclusions she formed about her letter recognition skills, were filtered by her explicit belief that Julissa was not a strong test taker and her (Alice's) belief that the context of the assessment (formal test) may influence Julissa's performance. This belief about Julissa as a poor test taker acted as a filter, and resulted in Alice filtering in (and out) other data that emerged. Perhaps Alice's beliefs about Julissa were accurate, and therefore served as a practical heuristic for making this judgment. But it is also possible that Alice's belief led her to filter out contradictory data, and overestimate Julissa's letter-recognition skills. Consequently, Alice may have neglected to give Julissa the additional instructional support she may have needed to improve her letter-recognition skills.

Fifth grade: "I know my kids and content expectations." Fifth-grade teachers also used their beliefs about individual students in conjunction with their beliefs about content expectations to filter their interpretations of students' work or progress. This tempering of beliefs about the individual student with beliefs about content expectations was pronounced in Wendy's analysis of student work. Wendy had previously taught third grade in the same school before her move to fifth grade. When she expressed beliefs about the curriculum, she typically framed it on a longer trajectory from where a typical third-grade student would be on a skill (e.g., finding the main idea) to where a typical or a specific fifth-grade student should be.

Beliefs about kids and curriculum being used as filters were also demonstrated in Wendy's assessment of an on-demand timed student essay. Wendy's interpretation of this work was filtered by her beliefs about the student (Toby)—"he's organized but insecure"—and her beliefs about what should be expected in fifth-grade student writing. In the commentary below, we see that Wendy encouraged students to engage in prewriting (e.g., outlines, brainstorming, graphic organizers) before they started any written piece. We also see how she integrated her beliefs about a particular student, as an insecure student, with her beliefs about the curriculum.

> This is also pretty clever. . . . Toby, my man, I'm impressed. . . . And he's quite organized, but he's an insecure student. So here's why I say that. He's already doing his. We teach them to write an essay, [using what] I call [an] "I-GO," I graphic organizer. So he's already creating his I-GO himself. But . . . [reading the opening line of the essay] we consider this a lower level writer, when they start, when their hook is a question. That's third grade. I keep telling them that. Nothing wrong with it, but it's really third grade. You're in fifth grade now; you need to wean yourself off of the ask a question, you know, because it's . . . well, OK, but . . . flat . . . from a writing standpoint. (TA, January 5)

In this excerpt, we see how Wendy's belief about writing expectations from third to fifth grade and her beliefs about the student informed her initial reaction to Toby's work as "impressed." She was impressed that he was using the I-GO writing organizer on his own, and this supported her belief that he was an organized student. On the other hand, she also stated that she was disappointed that he was still using a question as a writing hook. Thus, there seemed to be a tempering of interpretations between student and curriculum.

In another example, Martin, an experienced fifth-grade teacher from Bridgedale Elementary, described how his beliefs about particular students were weighed against his beliefs about the importance of curricular topics. While evaluating students' Post-it note assignments, intended to assess students' demonstration of the skill of conflict identification, he stated:

> I'm not as concerned about Sara as I am with Mark and Jeffrey. They understand what conflict is, even though they're applying it incorrectly now. And I really need to think about that because, I think, on the spot, if somebody were to say, "OK, what do you do about that?" I don't know if I'd have a good answer for that right now. . . . I think we'd [teacher and students] sit at this table, and we would look at that [their written work], and I would make sure they could find the conflict and identify the conflict type and analyze the conflict within a shorter text, and then build off that. (TA, December 3)

In this excerpt, Martin indicated that he had a clear belief with respect to Mark and Jeffrey's knowledge of conflict and this belief filtered his interpretation of the results of the Post-it note assessment, which suggested the boys held a misunderstanding of the content. Simultaneously, Martin considered the curriculum, that is, his goals for students at this point in time. Although his analysis did not result in an immediate instructional response, his beliefs about knowing his students and the curriculum filtered his analysis and interpretation of these students' data.

Beliefs about "What Data Are Real" Serve as Frames for Data Use

In both cases, teachers' beliefs about data as "real" or as data that "count" seemed to frame the way they approached data use. When beliefs act as frames, they are typically explicitly enacted to help teachers define or limit the problem/ decision-making space. Thus, as frames, beliefs can help a teacher zoom in on a key issue or zoom out to consider a larger set of issues. The notion of "real data" emerged with respect to what the teachers valued in terms of valid or sound information about students' abilities. Beliefs that data that were real were often used to frame issues of practice; in contrast, data that were not real were ignored. Of note, across the cases, teachers' beliefs of what data were real seemed to be closely connected to their professional contexts. The kindergarten teachers in Virginia understood data to be real when it came from formal assessments. In contrast, the New Jersey teachers, although having access to formal assessment data, tended to recognize the data they collected from students directly as real. Next, we present examples from each context to demonstrate how beliefs about data being real served as frames in these teachers' data use.

Kindergarten: "Real data come from formal assessments." Approximately 99.8% of Virginia schools participated in voluntary use of the PALS for literacy assessment. Because the use of the PALS was common in Virginia, the resulting data reports were in the forefront of teachers' minds when they considered literacy data at the exclusion of other types of data. Thus, their belief that formal assessments yielded real data framed how they approached and understood data use. In fact, all four teachers mentioned explicitly using the PALS, and two teachers referred to the Ganske (2008) spelling assessment. For example, Alice stated, "We have, of course, the PALS, our Ganske spelling assessment, and the formal running records that we try to do on a regular basis" (II, February 11) when asked about what data she had. Carol offered a slightly more expansive notion of data, she stated: "Data to me is results I get from assessments, from running records, weekly spelling assessment, and PALS assessment, dictation. I define data as information I get from assessments" (TA, February 11). Notice, she included formal running records, weekly spelling tests as well as the PALS assessment. To her, data referred to the information she gleaned from assessments; thus, when explicitly considering data use, she framed the notion of data to include only physically recorded assessment data. She did this despite her active reliance on her general knowledge of students that filtered her analysis of students' assessment scores, illustrated in the previous section.

Jodie's belief that the concept of data referred to formal assessments emerged across multiple sources in our research data. Here are two quotes from Jodie (one from February and another from May). Notice how she focused on formally collected data in each instance: (*a*) "We don't collect a whole lot of formal data in kindergarten. We use the PALS and that's about it. Oh . . . IPAs. They're Integrated Performance Assessments" (TA, February 19); (*b*) "I have several forms of data that we've gathered over the past couple of weeks. Their fall PALS and mid-year PALS, as well as their Ganske that we did in December" (TA, May 2). In both of these quotes, we see a belief that data are only data if they are formal. Although in the first quote she hinted that there were other possible forms of data, perhaps informal data, her discussion emphasized that, for her, data in the context of data use were gathered through formal mechanisms.

Fifth grade: "Real data come from my assessments." Both New Jersey schools participated in some form of standardized assessment and had district-specific benchmark tests that teachers were expected to administer. However, there were differences in teachers' abilities to access these results. In Grant Intermediate School, students completed a computerized reading comprehension assessment that resulted in a Lexile reading score three times a year (September, December, and May). The computerized nature of the assessment meant that teachers could access students' scores immediately and look for any changes in reading level. However, in Bridgedale Elementary, access to formal district-level data were not readily available and consequentially the teachers saw these data as irrelevant to their work—that is, not real. Despite having immediate access to the reading comprehension test, the teachers in Grant Intermediate typically classified real data as the information they collected and evaluated in their own classrooms. They framed beliefs about data use from the perspective of using their own classroom assignments and observations as the data source from which instructional decisions were made. Chelsea, from Grant Intermediate, made the following statement with respect to reorganiz-

ing some of her reading groups: "So this go around, I made some changes [to the reading groups], and it was more based on my notes than [standardized test] scores. I have one girl, Lucy, who was in the lower group, she worked her butt off and she did so well [in class]. Her Lexile might still be low, but she's really getting this, so I bumped her up a group" (TA, December 3). In this statement, Chelsea established her own notes and observations as real data over the formal assessment of the reading comprehension test. This belief was then used to frame her examination of the task, reassigning students to reading groups, as one that was informed by her own notes and classroom data more so than what the test may or may not have revealed.

Daphne, from Bridgedale Elementary, also demonstrated a belief that real data were those she collected in her own classroom through formal and informal assessments, as she described: "So for English language arts, we rely heavily on student data based on conferring, since we use the readers and writers workshop model here. Our data are based on student conferring, one-on-one conferences, and group work. If I'm doing a quick type of informal assessment on the rug, for example, asking people to just turn and talk to their partners, and if I hear that people are really struggling to grasp that skill, then I'll quickly group the students together and confer" (II, October 15). When asked about data use, her belief that even informal questioning on the rug were a form of real data framed her understanding of what data were useful as part of her professional practice.

Both of these teachers believed that the data they gathered through classroom-level assessments were real, and that these data provided them with valuable information to use to make decisions about practice. In this way, these beliefs framed teachers' understandings of what data use was. While the kindergarten teachers emphasized formal assessments as real data, they did so in a very different context than the fifth-grade teachers. The messages the kindergarten teachers received in their school, district, and state emphasized data as standardized assessments. Certainly, the kindergarten teachers also collected classroom-level assessment data, but they did not conceive of these data as real when asked about data use. Thus, they did include these data in their conception of data use. Therefore, the distinction between these groups is not so much about what data they used to inform instruction, but rather how they interpreted the term *data*; as a code for formally gathered (typically formal standardized test data) or as a more fluid conception that emphasized their own classroom assessment activities. This belief then framed their data-use activities.

Beliefs about "How Data Should/Could Be Used" Serve as Guides

Recall that when beliefs are described as guides, they function as a directional system, like a guide dog for the blind or a docent through a museum, and/or as a standard for desired performance, like a measuring tape or fit model. In both instances, when beliefs function as guides, they have a direct influence on a teacher's actions (cognitive, behavioral, and/or emotional). The teachers in our sample revealed that their beliefs about how data could or should be used guided their actions around data use. Next, we present examples from the kindergarten and fifth-grade contexts to illustrate this point.

Kindergarten: "The main use of data is to reveal student deficits." Teachers' discussions of assessment were infused by their belief that data revealed which students were not progressing as expected, and that their work was to act like a detective, and find out what was missing that prevented students from moving forward. These beliefs guided how teachers recognized, considered, collected, and interpreted literacy data. For example, when analyzing the data from the PALS assessment, Carol's beliefs about the role of data led her to narrowly focus on a group of struggling students, instead of engaging in a holistic analysis of the assessment data. She stated in an interview, "Looking at who is more on the lower end of things. These two at the bottom, that have 12 and 13 lowercase letters, they need a lot of alphabet practice" (TA, February 11). Carol's belief that the purpose of data was to identify struggling students guided her interpretation of those assessment results.

Moreover, raw scores relative to a cut score by skill (e.g., concept of word) were associated with a stop-light analogy, and student performance was categorized as red (far below benchmark), yellow (below benchmark), or green (at or above benchmark). Teachers then offered students in each color band a corresponding lesson focused on that skill. Jodie, a kindergarten teacher from Rogers Elementary, explained her process for analyzing student data from the PALS assessments: "Where I would begin, obviously is, my eyes are gonna go straight for all the reds. . . . the red(s), obviously" (TA, October 13). Thus, her belief in the importance of these color bands served as a standard to guide her immediate action; that is, to address students in the red. The belief that the purpose of analyzing assessment data was to categorize students into color bands, and to then focus narrowly on students in the red band, was far more typical in these kindergarten classrooms than it was to use data meaningfully to inform instruction in nuanced ways, and these beliefs guided how teachers analyzed and interpreted their student-performance data.

Fifth grade: "The main use of data is to understand students' current performance in literacy." The fifth-grade teachers believed that data from their classroom assessments provided them with rich information to understand their students' strengths and weaknesses and could be used to strengthen and improve student learning. This belief then served to guide their interpretation, planning practices, and notions of data use. Evidence that fifth-grade teachers believed that data from their assessments helped them understand their students' literacy skills was evident in this excerpt from Daphne:

> I'm setting up a spreadsheet of just their names, and I'm going to put in the skill that we were using today about using context clues, and I'm going look through their exit slips. It's just each student's name, and then the second column's going to be the understanding of the definition of the word, and the third column is going to be the use of context clues. I will just write notes to myself. Because, like I said, this in turn will help me when I'm able to do small groups because I can see who needs what attention. So based upon what I see here, most students understood how to define the word. These students are having trouble using the context clues to support their ideas, which is definitely something we are trying to focus on. So when I go back to this lesson tomorrow, we are going to talk about the importance of having something to back up the idea their ideas. (TA, January 6)

When reviewing student work, Daphne actively looked for evidence of progress on the targeted skills (i.e., understanding and using context clues) as well as limitations in students' work. Her belief about the goal of data use; that is, to understand students' literacy progress, acted as a guide or standard for examining students' data. Moreover, she allowed her interpretation of these data to guide her decision making regarding instructional planning, such as when and what skills to reteach.

Thus, in the kindergarten and fifth-grade contexts, we see examples of how teachers' notions of data use were guided by their beliefs about the purpose of data use. For the kindergarten teachers, they believed that the purpose of data use was to reveal areas in which students' struggled, and to group them accordingly to target intervention. For the fifth-grade teachers, they believed the purpose of data use was to gather information about student progress, to help them determine next steps in instruction. Both groups of teachers' beliefs about the purpose of data use differed, and these beliefs guided their data-use practices accordingly.

Discussion

In this study, we engaged in a multicase investigation in Virginia and New Jersey to explore the role of kindergarten and fifth-grade teachers' beliefs about data and data use. Through our analyses, we found that teachers' beliefs influenced their practices through a variety of functions; that is, as filters, frames, and guides. In the extant literature on teachers' beliefs, ample consideration has been given to the content (i.e., beliefs about) and influence of teachers' beliefs on other outcomes (Fives & Buehl, 2012, 2017). However, when beliefs were explored for their functioning as filters, frames, or guides, the researchers focused mainly on the negative aspects of beliefs (e.g., racial bias [Jacoby-Senghor, Sinclair, & Shelton, 2016]; students with autism [Chung et al., 2015]). The findings from this study add to the current literature by providing more and less productive examples of teachers' beliefs about data use functioning as filters, frames, and guides. In fact, we noted several examples in which teachers' beliefs as filters, frames, and guides led teachers to nuanced and informed instructional responses.

Beliefs about students and context served as filters for these teachers and had an influence on how assessment data were interpreted. Beliefs acting as frames were noted in teachers' conceptions of what data were real, and beliefs acting as guides emerged in their perspectives of how data should/could be used, which had implications for their practice. For example, when teachers believed that real data were only from either formal assessment or classroom assessments, this limited their perspective on data use and, potentially, the benefits that could be achieved from a broader perspective of data.

Viewing these findings in light of the literature on political influences that principals and other school leaders (e.g., coaches) play in shaping the context, culture, and teachers' beliefs about data use, it is not surprising that the findings revealed differences in teachers' beliefs across the multiple school-site contexts. For instance, if a school administrator places greater emphasis on one type of data (e.g., formal assessment) over other types (e.g., student work), then it would be expected that teachers would filter what they view as data and how those data are

privileged. This suggests that any future work in teachers' use of data for instructional implications must include a parallel exploration of the interaction between teachers' practices of data use and the context in which they do their work.

Also salient for this investigation was the exploration of beliefs about data use at the bookends of elementary literacy instruction. Emerging from this work was the importance of the curricular context (grade level, cultural, political, geographic) in potentially influencing teachers' beliefs about data use. Of particular note was the teachers' ability to gather literacy data from students who could and could not yet read and write. In our analyses, we noted that the fifth-grade teachers gathered multiple forms of written data from their students and used these to assess comprehension and writing skills. In contrast, much of the data that kindergarten teachers relied on beyond the PALS was their own observations of students that may be ephemeral and reside in memory rather than documented for systematic analysis.

Limitations

First, our analysis relied on secondary data, initially collected to address a different set of research questions. As a result, we did not design our inquiry or data collection methods with the current study's aims in mind. Despite this, the phenomena of teachers' beliefs functioning as filters, frames, and guides was evident in both contexts. Using secondary data analysis can be a valuable method to researchers when the data are of high quality and appropriate for addressing the new research questions (Doolan & Froelicher, 2009). For us, the benefit of the secondary data analysis was that it allowed us to examine and interpret our data through a new lens, which added depth and understanding to our larger conceptualization of teachers' data-use practices. Second, our sampling procedures included the identification of teachers recognized as experts by an informed individual (i.e., principal, researcher), although there was variability with regard to the extent to which our participants were experts in data use or assessment more generally. Moreover, we questioned whether those who were charged with identifying experts (i.e., principal) had the knowledge and skills to do so reliability.

Implications

Teachers in both contexts held specific beliefs that influenced their data use through three functions: filters, frames, and guides.

Expose, Examine, and Evaluate Beliefs

Teachers' beliefs about their content and their students served to filter their data-use practices, such that their beliefs took precedence over the data available. As data use is instantiated in school contexts, efforts need to be made to help teachers expose their beliefs about students and content expectations so that these beliefs can inform interpretations of student data and be made explicit for questioning

by the teachers themselves. Teachers should trust their judgment of student performance, especially if those judgments are the result of trends or repeated student behaviors. Equally important, however, is ensuring that teachers do not rely solely on their judgments of student performance and ignore contradictory data that may lead to alternative interpretations. The tendency to ignore data to only substantiate prior beliefs is selective attention (Spillane & Miele, 2007), which hinders one's ability to see data through multiple lenses.

Data Must Be Believed to Be Used

When asked about their data-use practices, teachers placed different levels of confidence and meaning on various kinds of data. When they trusted that the data from assessments were valuable and informative to their teaching practices (i.e., real), they were much more willing to use that data either to frame their analyses of a particular student or to consider various pedagogical options. Alternatively, when teachers questioned the legitimacy or usefulness of particular data, they may have administered and graded the assessment, but they did not *use* the assessment in any way that was meaningful. The question becomes how to help teachers trust the data from their classroom assessments. It seems reasonable that if teachers had the conditional knowledge to know which assessments were appropriate to use and when, and they had the skills and expertise to design assessments that produced valid inferences, then they would be more likely to trust the data and interpretations gleaned from these assessments. As such, we advocate for increased attention during preservice teacher education and in-service professional development aimed at improving teachers' assessment literacy and data-use practices.

Beliefs about the Goals of Data Use Act as Guides

Teachers had strong beliefs about the purpose of data use in their classrooms, ranging from whether their goal was to identify limitations or understand progress in students' abilities. These beliefs about the purpose of data use influenced how teachers then used the data in their classrooms. Research is needed that explores teachers' conceptions of data and data use. Building on prior work, researchers can begin to tease apart the nuanced variations in teachers' beliefs about data and its use, and how beliefs interact with practices. These findings can be used to design interventions at the preservice and in-service level that target and expose teachers' beliefs and help teachers learn to distinguish instances in which they should trust their beliefs, and instances in which contradictory data are convincing enough to suggest an alternative response.

Conclusion

This investigation complements and extends the extant literature by examining kindergarten and fifth-grade teachers' beliefs about data use through the lens of belief functioning. Our findings suggest that teachers' beliefs about data use may be sensitive to their curricular and cultural context as well as related to their personal

stores of knowledge about data use, assessment, and literacy instruction. Better understanding how teachers view data use, and how these beliefs seem to shift from kindergarten to fifth grade, may provide important insights into how data-use initiatives can be enacted differently in those bookend contexts. Relevant to researchers and practitioners, our findings can be used to understand how teachers' beliefs filter, frame, and guide their data-informed decision making at the classroom level.

Notes

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1. Pseudonyms are used for all teachers and schools.
2. PALS was retrieved from https://pals.virginia.edu/.

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