Pre-service and first-year teachers' transactions with mathematics pedagogy textbooks

As transações de futuros e jovens professores com manuais de pedagogia matemática

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Abstract. Despite the ubiquitous use of pedagogy textbooks within teacher education programs, research examining the relationships between pre-service teachers and their pedagogy textbooks is scarce. This study draws on Rosenblatt's (1982) transactional theory of reading to explore how pre-service teachers and first-year teachers transact with mathematics pedagogy textbooks. We interviewed sixteen participants – seven pre-service teachers and nine first-year teachers – about their transactions with mathematics pedagogy textbooks, how instructors encouraged participants' transactions with these textbooks, and the messages participants received from the textbooks. Results suggest that supporting pre-service teachers with textbook use is crucial for them to make connections between textbooks and the broader educational landscape. The results also uncovered tensions between participants' perceptions of textbook information and their own classroom experiences. We suggest future research to explore approaches that foster transactions to help pre-service teachers negotiate and question textbooks in stronger ways.

Keywords: pre-service teachers; first-year teachers; mathematics education; textbook use; transactional theory of reading.

Resumo. Apesar da omnipresença de manuais de pedagogia nos cursos de formação inicial de professores, é escassa a investigação focada nas relações de futuros professores e de novos professores com os seus manuais de pedagogia. Este estudo baseia-se na teoria transacional da leitura de Rosenblatt (1982) e explora o modo de transação de futuros professores e de novos professores com os manuais de pedagogia matemática. Entrevistámos dezasseis participantes – sete futuros professores e nove novos professores –

acerca das suas transações com os manuais de pedagogia matemática, como os professores encorajaram as transições dos participantes com esses manuais e que mensagens receberam os participantes desses manuais. Os resultados sugerem que apoiar os futuros professores através do uso de manuais é crucial para que possam realizar conexões entre os manuais e o panorama educacional mais amplo. Os resultados também revelaram tensões entre as perceções dos participantes sobre a informação dos manuais e as suas próprias experiências em sala de aula. Sugerimos para investigação futura a exploração de abordagens que favoreçam transações de modo a ajudar os futuros professores a negociar e a questionar os manuais de formas mais significativas.

Palavras-chave: futuros professores; novos professores; educação matemática; uso de manuais; teoria transacional da leitura.

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And looking through the textbook now, especially with those strategies chapters, drives me crazy, because I could have made so much more use of it than I did (participant 14).

Introduction

As reported in Harkness and Brass (2017b), mathematics teacher educators struggle with the selection of textbooks for mathematics pedagogy courses and also with the role that textbooks should play in helping to influence pre-service teachers' learning. Pre-service teachers are often expected to engage in textbook assignments and reflect upon what they learn *before* they come to class. Therefore, reading compliance is important for socially constructed learning to take place in our classrooms. Yet, based on both anecdotal evidence and research about reading compliance (Brost & Bradley, 2006; Burchfield & Sappington, 2000; Gooblar, 2014; Gurung & Martin, 2011; Hoeft, 2012; Sappington, Kinsey, & Munsayac, 2002) this expectation is not typically a reality.

Most studies of reading compliance, to date, have been conducted in the field of psychology. For example, Burchfield and Sappington (2000) administered a surprise quiz to 910 students in 40 introductory psychology courses and found that, "on average, about a third of the students will have completed their text assignment on any given day" (p. 59). "Most" college students who responded to the National Survey of Student Engagement (2000) indicated that they did not complete course reading assignments. Students in Brost and Bradley's (2006) case study reported that they typically read "some" or "most" of the assigned readings for their philosophy course but rarely "all" of the readings. More recently, findings for a study conducted by Hoeft (2012) revealed that

students in two sections of First Year Seminar at a small two-year liberal arts university reported a reading compliance rate of about 46% but only about 55% of the students who indicated compliance demonstrated the "most basic level of comprehension" of the reading material. Comparably, Sappington et al. (2002) found a positive correlation between students' reading compliance based on quiz scores and their exam grades. It is evident that many students simply do not read assigned textbook selections, and there are studies that indicate reasons for the noncompliance.

Reasons for reading the textbook given by students included: personal desire to learn (Brost & Bradley, 2006); "… a preference of highly produced texts" (Gurung, Landrum, & Daniel, 2012, p. 95) or texts with high-quality visuals, photographs, research examples (Gurung & Martin, 2011); and required use by the instructor (Gurung & Martin, 2011). In contrast, reasons for not reading textbooks given by students included: time (Brost & Bradley, 2006; Hoeft, 2012); difficulty of the reading text (Brost & Bradley, 2011); and social life that was more important, dislike of any and all reading, lack of interest in the topic, and "laziness" (Hoeft, 2012).

We believe that reading textbooks is an essential component of education pedagogy courses. Textbook assignments can be used to introduce and reinforce concepts and ideas important to developing pedagogical knowledge and pedagogical content knowledge. They can also be used to help pre-service teachers reflect upon and create their own philosophies of teaching and learning as they begin to establish their own teaching identities. To get a better sense of how to connect these visionary uses with how students in our mathematics pedagogy courses actually used the textbooks, we decided to interview pre-service and first-year teachers about how they read and used mathematics pedagogy textbooks as pre-service teachers. In this paper, we discuss the results of these interviews.

Conceptual framework

When examining how our participants read and used their mathematics pedagogy textbooks as pre-service teachers, we framed our study through the transactional theory of reading (Rosenblatt, 1982), which focuses on the contributions of the reader as well as the contributions of the text. Within the transactional theory of reading, both the reader and the text are transformed during the reading (Rosenblatt, 1985). That is, the reader constructs meaning through the text, and the text is a reader-specific creation from that specific reading and interpretation. In other words, the text and the knowledge constructed from the text rely on the reading being:

> a particular event involving a particular reader at a particular time under particular circumstances. Hence, we may make different meanings when transacting with the same text at different times. And different readers may make different defensible interpretations of the same text. (Rosenblatt, 1991, p. 445)

Unlike an interaction with a text, which involves the reader looking "only at the text and the author's presumed intention" (Rosenbatt, 1982), a transaction with a text is a two-way process where each reader frames the text within his or her own interpretation and experiences. The transactional theory of reading acknowledges that the reader also brings something to the text.

Remillard (2012) also informed our work as we connected the transactional theory of reading (Rosenblatt, 1982) with readers of mathematical pedagogy textbooks. Remillard drew on Roesnblatt's theory by examining in-service teachers' transactions with mathematical curriculum materials. Like Rosenblatt's (1991) assertion that readers use past experiences to make meaning when transacting with a text, Remillard posited that when teachers transact with curriculum materials they "enter this transaction with their own expectations, beliefs, and routines that shape their modes of engaging" (p. 120). Similarly, we wanted to honor the ways in which our participants' transactions with mathematics pedagogy textbooks were shaped by their expectations and beliefs.

Review of literature

Textbook messages and authority

Herbel-Eisenmann (2007) used a discourse analytic framework to examine the relationship between the "voice" in a Grade 7 textbook and ideologies reflected in the *Principles and Standards for School Mathematics* (NCTM, 2000). While the *Principles and Standards for School Mathematics* (NCTM) emphasizes the importance of human agency in mathematics by positioning students to actively construct conceptual understandings in mathematics, Herbel-Eisenmann found that the role of humans was masked in the textbook. Similarly, Brass (2016) used discourse analysis, drawing on Herbel-Eisenmann's framework, to examine the messages sent to pre-service teachers by a mathematics pedagogy textbook. Brass posited that different verbs within pedagogy textbooks position pre-service teachers as "students" (actions requiring specific outcomes to tasks typically completed by students), "future teachers" (actions pre-service teachers will take in the classroom), or "learners" (actions used by both "students" and "future teachers" to develop an understanding of mathematics education). While all of these different verbs are important, Brass contended that an emphasis on "future teacher" verbs was crucial to positioning pre-service teachers in a way that included them in the mathematics education community.

Herbel-Eisenmann (2007) and Herbel-Eisenmann and Wagner (2007) also noted that the authoritative nature of the textbook concealed human agency in mathematics, instead presenting mathematics as certain and absolute. Similarly, Smitherman (2006) posited an absolutist view of mathematics was exhibited in mathematics pedagogy textbooks. As Smitherman analyzed ten different mathematics pedagogy textbooks, she noted that modern, rationalist ideas were presented about mathematics education

in nine out of the ten textbooks. For Smitherman this meant that textbook authors "perpetuate the idea that imitation implies understanding, transfer of understanding is possible, universal truths exist without question, and students are predictable in how they learn, based on cause-effect relations" (p. 69). The human agency of mathematics and mathematics learning was concealed through the authoritative undertone of these pedagogy textbooks. Additionally, this view of mathematics conflicts with ideologies of mathematics learning often discussed and promoted in mathematics pedagogy courses.

Furthermore, Smitherman's (2006) analysis of mathematics pedagogy textbooks found that "the conversations in these texts [were] one-sided and unilateral" (pp. 63-64). For example, when these textbooks defined mathematics, the opinions and ideas held by the pre-service teachers were never acknowledged in any of the textbooks. In this case, these textbooks assumed no need for pre-service teachers to transact with the textbook. This emphasized the authoritative nature of the textbooks, in which "the authors of these texts [were] trying to create a particular way of conceiving math" (p. 65).

Readers' relationships with textbooks

Issues of power related to the authoritative nature of textbooks can influence transactions with textbooks (Brass, 2016; Haggarty & Pepin, 2002; Herbel-Eisenmann, 2007; Herbel-Eisenmann, 2009; Herbel-Eisenmann & Wagner, 2007; Mesa & Griffiths, 2012; Remillard, 2012; Smitherman, 2006; Weinberg & Wiesner, 2011). Few studies have examined relationships between instructors, learners, and textbooks in higher education settings, and the focus of these studies have centered on textbook use in content mathematics courses (e.g., calculus, algebra, mathematics for elementary teachers, discrete mathematics, etc.), not pedagogy courses (Lithner, 2003; McCrory & Stylianides, 2014; Mesa & Griffiths, 2012; Weinberg & Wiesner, 2011; Weinberg, Wiesner, Benesh, & Boester, 2012).

A textbook's authoritative nature creates a conflict that Weinberg and Wiesner (2011) described as they applied reader-orientated theory to tertiary calculus textbooks. There are three types of readers central to reader-oriented theory: the intended reader (the image of the reader the author has), the implied reader (the qualities needed to read the text in the way the author intended), and the empirical reader (the actual reader). As explained by Weinberg and Wiesner, textbook authors typically envisage readers that employ active reading strategies as they transact with the textbook (implied readers) and readers that are part of the mathematics community (intended readers). This creates a tension with the authoritative nature of textbooks that conveys a specific "truth" of mathematics to empirical readers (actual readers). This "truth" does not rely on a learner's transaction with the textbook, but rather implies that there is only one appropriate meaning for learners to absorb from the textbook.

This "truth" may not match the perceptions of the empirical (actual) readers as they transact with the textbook, because the actual readers of the textbook may differ from

the target audience (implied readers and intended readers). When looking at teachers' transactions with mathematical curriculum materials Remillard (2012) asserted that, much like textbooks, curriculum materials are:

> designed with a target audience in mind. These materials work best when the audience *is* who the designers intend and behaves as the designers expect it to. To be successful, the materials must enlist the teacher in being part of that target audience. (p. 120, emphasis in original)

Making meaning from a textbook and the tensions that exist between the different readers in reader-oriented theory can also be influenced by how the reader reads and the strategies that he or she uses while reading. In their study of undergraduate students' uses of textbooks for introductory mathematics classes, Weinberg et al. (2012) found that many students reported using textbooks "in ways that [were] not consistent with the intended goals conveyed by the text structure" (p. 166). This might be expected when using the lens of the transactional theory of reading. Rosenblatt (1982) maintained that transactions take place between the reader and the artifact (textbook), not with the authors' intentions. Further, Rosenblatt honored the individuality of the reader by explaining that although authors may have a plan, authors have no way of knowing how a reader will transact with the book. Thus, a conflict between the intended reader (the reader the author envisions), the implied reader (the qualities needed to read the text in the way the author intended), and the empirical reader (the actual reader) is once again evident.

This conflict is further emphasized by Weinberg et al.'s (2012) finding that "while [undergraduate students] believe they are using their textbooks to get a better understanding of their class materials, they do not see developing an understanding of the 'big ideas' as leading to success in mathematics" (p. 169). Wandersee (1988) also found this to be the case when he looked at how undergraduate, teacher-education majors read textbooks. In Wandersee's study, only 6% of respondents indicated that they tried to link prior knowledge with concepts addressed in the textbook. Rather than use the textbook as a means to increase understanding about "big ideas", Wandersee found that "students are more likely to alter their study strategy in response to the kind of test they expect than to alter it for different types of subject matter" (p. 77). Thus, the empirical reader (actual reader) is not interested in obtaining all of the ideas the authors hope the intended reader (the image of the reader the author has) acquires through reading textbooks, and the transaction with the textbook is being shaped by the assessment practices and formats.

Instructors' relationships with textbooks

Additionally, Weinberg et al. (2012) found that tertiary students are more likely to use their textbooks when they feel that they are asked to do so by their instructors; that is, "textbook use appears to be connected to their perceptions of instructor expectations" (p. 165). Yet, in their study of ways textbooks contribute to university faculty instruction,

Mesa and Griffiths (2012) saw a difference in how instructors used textbooks with students depending on if instructors classified students as "undergraduate students" or "math students". Mesa and Griffiths found that instructors designated "undergraduate students" as those students taking mathematics classes to fulfill a requirement or taking remedial courses. Alternatively, "math students" were honors students or in mathematics courses for upper division or graduate students. "Instructors' relationship with 'math students' was generally quite distinct from their relationship with '[undergraduate] students'…Instructors appeared to be more inclined to teach 'math students' to read the textbook" (Mesa & Griffiths, p. 96). Furthermore, Mesa and Griffiths found that instructors expected "math students" to go beyond using the textbook for homework and examples but did not expect the same from "undergraduate students". This stance, when combined with the role of teachers as mediators of the text as discussed by Haggarty and Pepin (2002), emphasizes how teachers control the ways textbooks are used in the classroom. Haggarty and Pepin suggested that teachers:

> decide which textbook to use; when and where the textbook is to be used; which sections of the textbook to use; the sequencing of topics in the textbook; the ways in which pupils engage with the text; the level and type of teacher intervention between pupil and text; and so on. (p. 572)

Thus, instructors can choose to use a textbook differently depending on how they classify students, and as Mesa and Griffiths (2012) contended, a "direct consequence of the different schemes that instructors have for using the textbook…results in different opportunities for these students to learn" (p.101).

Although instructors use textbooks for different purposes (Haggarty & Pepin, 2002¸ Mesa & Griffiths, 2012), the utilization of textbooks can provide a picture of the different learning opportunities afforded to students. Furthermore, the purposes of textbooks can differ with what course they are being used for (e.g., mathematics content in K-12, mathematics content at the tertiary level, pedagogical course, etc.). Harkness and Brass (2017b) surveyed 132 mathematics teacher educators to examine how mathematics pedagogy textbooks were selected and how those textbooks were used with pre-service teachers. Participants in this survey indicated that textbooks were mainly used in mathematics pedagogy courses to stimulate in-class discussion, as a source for activities, for background information, and for examples of more contemporary teaching/curriculum. In using the mathematics pedagogy textbooks for these purposes, mathematics teacher educators also reported a wide range of strategies for helping pre-service teachers transact with the textbooks. The most common strategies reported in this survey were discussion, reflection, literacy strategies, making connections to the reading, and using questions to guide reading and/or answer from the reading.

There are various ways textbooks are used in all levels of education, yet there is a lack of information surrounding pedagogy text utilization at the tertiary level. In order to understand how to encourage pre-service teachers' transactions with textbooks and how to best use textbooks in our pedagogy courses, we conducted a study in which we

interviewed pre-service and first-year classroom teachers to answer the following research questions: How do pre-service teachers transact with their mathematics pedagogy textbooks?; How do their instructors/professors encourage them to transact with these textbooks?; and, What messages do pre-service teachers receive about how to teach from their transactions with textbooks?[1]

Methodology

The nature of our research questions afforded us the opportunity to use a constructivist design (Charmaz, 2006) within a grounded theory approach (Merriam, 2009). This approach does not dismiss the role of the researcher in the process (Creswell, 2012). The researcher allows questions about the data to emerge throughout the research process and makes conclusions about the in-progress or evolving codes throughout the data collection and analysis (Charmaz, 2006) while crafting a working or tractable theory. Based on these tenets of the constructivist design, initially, without the use of *a priori* propositions, we created a semi-structured interview protocol with 12 questions that would help us understand how pre-service and first-year teachers transacted with their textbooks in mathematics pedagogy courses. Within this article, we refer to all participants as "pre-service teachers" when describing events that took place in mathematics pedagogy courses to acknowledge that all participants were pre-service teachers when transacting with the textbook during those events.

In order to garner perspectives from participants who would be or were teaching a range of diverse grade-levels, we decided that Amy would interview pre-service and first-year elementary teachers (grades Kindergarten-8) about their transactions with textbooks when they were pre-service teachers. Shelly would interview middle level and secondary pre-service and first-year teachers (grades 4-9 and grades 7-12 respectively) about their transactions with textbooks when they were pre-service teachers. Amy interviewed three pre-service elementary teachers and five first-year elementary teachers; Shelly interviewed two pre-service middle level teachers and two pre-service secondary teachers. Additionally, Shelly interviewed two first-year middle level teachers and two first-year secondary teachers. This gave us a total of 16 participants who were chosen through a convenience sampling process (Creswell, 2012). We invited former students or contacted colleagues who recommended their former students. The eight participants interviewed by Amy were from a large Southwestern city and the eight participants interviewed by Shelly were from a large Midwestern city, all 16 from the United States. Additionally, all participants were attending or formerly attended one of two large public research universities in their respective cities or regions. Table 1 (below) captures demographic data about the participants.

Table 1. Participants' demographic data

Participant	First-Year (FY) or Pre-Service Teacher (PT)	Midwest (MW) or Southwest (SW)	Female (F) or Male (M)	Race/Ethnicity	Grades Licensed to Teach
#1	PT	MW	F	Caucasian	7-12
#2	FY	MW	F	Caucasian	4-9
#3	PT	MW	F	Caucasian	4-9
#4	FY	MW	F	Black	4-9
#5	PT	MW	M	Black	4-9
#6	PT	MW	M	Caucasian	7-12
#7	FY	MW	F	Caucasian	7-12
#8	FY	MW	M	Caucasian	7-12
#9	FY	SW	F	Caucasian	K-8
#10	PT	SW	M	Caucasian	K-8
#11	FY	SW	F	Unknown	K-8
#12	FY	SW	F	Caucasian	K-8
#13	PT	SW	F	Caucasian	K-8
#14	PT	SW	F	Caucasian	K-8
#15	FY	SW	F	Filipino	K-8
#16	FY	SW	F	Caucasian	K-8

The participants who were elementary pre-service and first-year teachers were required to take one elementary mathematics pedagogy course as part of their degree. Within this course, *Elementary and Middle School Mathematics: Teaching Developmentally* (van de Walle, Karp, & Bay-Williams, 2013) was used as the textbook, and various mathematics education articles supplemented the textbook. The van de Walle et al. textbook was also used in the pedagogy courses taken by the participants who were middle school pre-service and first-year teachers. These participants took four mathematics pedagogy courses as part of their degree: a course specifically related to teaching numbers and number sense in middle schools, one specifically related to teaching algebra in middle schools, one specifically related to teaching geometry in middle schools, and a general middle school mathematics pedagogy course.

Articles and other professional books were used to supplement the textbook in these courses. There were three mathematics pedagogy courses required for our participants who were secondary pre-service and first-year teachers: introductory pedagogy for secondary mathematics, intermediate pedagogy for secondary mathematics, and advanced pedagogy for secondary mathematics. *Teaching Secondary and Middle School Mathematics* (Brahier, 2013) was the textbook used for all of these courses; again, various articles supplemented the use of this textbook.

Semi-structured, retrospective interviews were conducted in one-on-one settings. The use of retrospective interviews can generate some criticism, because interviewers try to get participants to remember and then reconstruct past experiences from memory. Although these interviews are the least likely type of interview, "… to provide accurate, reliable data for the researcher" (Fraenkel & Wallen, 2000, p. 510), the nature of our research questions required us to use retrospective interviews. However, we trusted that the participants' memories were accurate based on *their* perceptions, which were their realities.

The interview protocol included demographic data questions, 11 open-ended questions, and one final question, "Is there anything else you'd like to share?" The themes of the open-ended questions of the interview included: the main ideas participants took away from their mathematics pedagogy courses and if the textbook supported those ideas; participants' descriptions of the texts and the strategies they used to make meaning of the texts; participants' views on how their instructors encouraged them to use the texts; and messages they received from the texts. During the interview, we did not make participants aware of the meaning of "transactions", because we wanted participants to share their own processes and interpretations without worrying about the term "transactions". Each interview lasted about one-half of an hour, and these interviews were audio recorded and later transcribed.

Again, the goal was to use interview data to build a working or malleable theory through a "constant comparative method" of analysis (Corbin, Strauss, & Strauss, 2008, p. 30). Using the transcripts, we created one very large spreadsheet with rows for each of the 16 participants and columns for demographic data and their responses to each of the 12 interview questions. The data in this spreadsheet were then analyzed individually by both authors. The format of this spreadsheet helped us look at each participant's responses to all of the questions and to also look at all participants' responses to each of the questions. After our individual analyses, we met via Skype™ over many months in order to create *in vivo codes*, labels for categories that were phrased in the exact words of the participants. Finally, within a continuous cycle of analysis and revision we then created themes that emerged from the *in vivo codes*. The grounded theory approach allowed us to focus on the meanings ascribed by the participants in the study (Creswell, 2012) and capture their experiences with textbooks in mathematics pedagogy courses. Grounded theory "gives preference to the data and the field under study as against theoretical assumptions" (Flick, 1998, p. 41). Yet, as with most qualitative research, we acknowledge that our conclusions are suggestive rather than definitive.

As previously discussed in this section, the use of retrospective interviews may be considered a limitation to this study. We chose to use retrospective interviews, because in most cases the researchers were the instructors for the pedagogy courses taken by the participants. Although this afforded us knowledge of the participants, the pedagogy course(s), and the textbooks used, we acknowledge that this could also be considered a limitation to the study. However, as Charmaz (2006) noted, within a constructivist approach our roles as instructors and researchers should be acknowledged and respected, not dismissed. Additionally, the small number of participants could be considered another limitation to the study.

Findings

When exploring how pre-service teachers and first-year teachers transacted with mathematics pedagogy textbooks, we asked participants about their use of the textbooks including strategies participants employed to transact with the textbooks and how textbook use and transactions were influenced by instructors/professors. Also, as a way of examining how our participants thought about and transacted with the mathematics pedagogy textbooks, we explored the messages the textbooks sent our participants about 'how to teach'.

Strategies used to transact with textbooks

Participants were asked about the strategies they used to transact with the textbooks, specifically the strategies they used to make meaning of the textbooks. Most participants indicated that taking notes about the reading was the most common strategy (n=10) used for comprehending the information from the text. As one participant explained, "I'm someone that when I read I have to jot down notes or I might forget it even if it is interesting information" (participant 3). Highlighting or underlining important information was also a common strategy used by about half of participants (n=7). Other participants, however, discussed their difficulties with highlighting. "I'm really bad at highlighting, [because] I tend to highlight everything" (participant 6). Another participant expressed his difficulty with highlighting by saying, "…then I realized that I was highlighting too much. And I was like why am I highlighting anything? I just might as well just read this whole text" (participant 5).

Additionally, 25% of participants (n=4) indicated that they tried to make connections when transacting with the text. For example, one participant made meaning of the textbook by "seeing if I noticed any patterns in this class, to other classes that I had taken before, referencing other materials, or just asking questions" (participant 12). Other transaction strategies included trying out or practicing strategies (n=3), re-reading (n=3), summarizing information (n=3), and reflecting on the information (n=3).

Influences from instructors/professors

The strategies that participants used to transact with the pedagogy textbooks may have been influenced by the ways in which the mathematics pedagogy course instructor/professor required or encouraged participants to use the textbook. When asked to identify ways that they were required or encouraged to use the textbook by instructors and/or professors, 75% of participants reported that they had been required or encouraged to read the textbook (n=12).

Most participants (n=10) also indicated that textbooks were used for out-of-class assignments, which were related to the readings, such as questions and/or reflections. As one participant remembered, "Do[ing] pre-reading before class and then [doing] reading response questions…allowed me to just feel comfortable with what we were doing that day" (participant 15). Another participant described how these out-of-class assignments were used to prepare for in-class activities by stating:

> We were encouraged to read from it but also take notes, and we would have reflective assignments about the text. How do you see yourself using this? And then we would come into class and do those role-playing activities with the text. (participant 2)

In-class questions and activities contributed to how their instructors/professors required or encouraged textbook use for about half of the participants (n=7). For example, activities from the textbook were used in class as learning experiences and as sources for discussion. Textbooks were also used as participants answered questions in class about different instructional strategies and other pedagogical considerations.

Discussion was also mentioned by about half of the participants (n=7): "We did a lot of discussion with one another on it and a lot of reflecting. I mean, I feel like [the textbook] was a pretty useful tool in our class. We used it quite a bit" (participant 12). Other common responses for how the instructors/professors required or encouraged participants to use textbooks were through quizzes (n=5), references to the textbook(s) in class (n=5), and as a foundation for lesson/unit plans (n=4).

Messages from pedagogy textbooks

Mathematics pedagogy courses often focus on pedagogical skills and knowledge, pedagogical content knowledge, and how students learn in order to help pre-service teachers develop teaching strategies aligned with these areas. Yet, when we asked participants if they felt that textbooks could tell them "how to teach," about half of the participants (n=7) did not think the textbook could do this. Six participants gave mixed responses (yes and no), and three participants reported that pedagogy textbooks could tell them how to teach.

Throughout these responses, four themes emerged that described participants' views related to if textbooks could tell them "how to teach".

Textbooks as a platform for reflection. One theme focused on using textbooks as a platform for reflection on teaching. One participant said:

> Texts can kind of guide you in the right direction and sort of get you to reflect on your own teaching practices. It's very just reflective…like what would it look like in my classroom? Can I get my students to the same endpoints using those methods? (participant 2)

Yet, another participant viewed this question in a more personal way and stated:

> I think it's beneficial to have texts to give you a solid, to give you a concrete example of what someone else thinks and I think those are beneficial because thinking about other people's thinking is as important as thinking about your own thinking…How can you teach people to teach when teaching is such a personal thing…I think that you have to find your own connections with everything. (participant 5)

Both of these quotes from participants emphasize the connections pre-service teachers make between the information in the textbook and their own teaching practices. Yet, when asked in the preceding interview question about how the textbooks they used in their mathematics pedagogy courses helped them think about how to teach, only one participant's response mentioned the textbook providing a reflective component.

Experience is the best teacher. Another theme that emerged was that textbooks cannot tell you how to teach, because experience is the best teacher. As one participant described:

> But, when you're in the thick of it, that's when you really learn, I think, you know experimenting and using the ideas that you have, bringing them into the classroom is the most effective. So, kind of a combination of both, but I don't think the book alone can tell you how to teach. (participant 9)

This feeling was echoed by other participants, including one who explained:

> I feel like [the textbooks] can't [tell you 'how to teach']. I definitely think they help…But actually being up in a classroom and teaching and getting the feedback from your students, I think that's going to teach you the most. (participant 13)

Perhaps, being in the classroom is when it becomes "real" to pre-service teachers. In fact, when asked about how the textbooks used in the mathematics pedagogy courses helped her think about how to teach, one participant shared, "I didn't think about how to teach. That's why I think it was such a shock for me going into my 5th grade [placement] classroom" (participant 14).

All students are different. School students also played a role in whether or not the participant thought that pedagogy textbooks could tell him or her "how to teach". Thus, the third theme that developed from participants' responses was that textbooks did not

tell them "how to teach," because all students are different. Interestingly, most of the participants expressing this view were first-year teachers. The response of only one pre-service teacher fell into this theme. That participant said:

> I think the text tries to tell you how to teach and it gives you strategies but a lot of teaching is based on your students and every student learns differently…I think it gives you a general overview and best practices but every teacher is gonna [sic] have to change their teaching for the students that they have in their classroom. (participant 1)

One of the first-year teachers whose response fit this theme expanded upon the notion of knowing your students to knowing the community of students:

> There are so many different parts to teaching. There's knowing your kids… So, in the most straightforward sense, no, I don't think [the textbook] can teach you how to teach…This textbook is for, you know, just a general population of elementary and middle school teachers but we all go off into our own types of communities. (participant 11)

Textbooks do not reflect reality. The final theme that emerged through participants' responses to these two interview questions concerned the differences between the textbook and the reality of teaching. Participants often commented that textbooks represented a "perfect world" of teaching. As one participant explained, "I feel like textbooks can be very idealistic or optimistic and everything's going to go well and the students are going to get it" (participant 12). This sentiment was echoed in several responses from participants, particularly those participants who were first-year teachers. According to one of the first-year teachers, "How did [the textbook] make me think about how to teach? I think the way that it made me think isn't like reality once you start doing it" (participant 16). This is troubling, particularly if it impacts how teachers view their preparation. "You're not going to get a textbook situation in your teaching environment…it's a completely different world when you step into the classroom versus reading a book…I felt almost unprepared for the real world" (participant 4).

Discussion and implications

The results of our interviews with pre-service and first-year teachers emphasize the complex relationships between tertiary students and their mathematics pedagogy textbooks. Our participants' responses indicated that most of them sought to make meaning from the textbooks by taking notes (n=10) or highlighting/underlining (n=7) information from the textbooks. This illustrates a one-way interaction between the reader and the textbook, not a transaction (Rosenblatt, 1985). The participants were only being conditioned by the textbooks through extracting information from the textbooks, instead of using their past experiences and prior knowledge to also shape their experiences

with the textbooks.[2] Only 25% of our participants explicitly described their attempts to transact with their textbooks through making connections with information in the textbook (n=4). Wandersee (1988) also found a low number of participants (6%) in his tertiary content textbook usage study who attempted to link information presented in the textbook to prior knowledge. Based on the results of our interviews, in combination with Wandersee's study, we suggest further study on ways to foster pre-service teachers' transactions with pedagogy textbooks that leverage their experiences in classrooms, as mathematics teachers, and as mathematics students.

Weinberg et al. (2012) also found that "there [was] a lack of agreement among students about what their instructors expect them to do with their textbooks" (p. 167). We found that same lack of agreement between the results of interviewing pre-service and in-service teachers who had taken pedagogy courses and the results of surveying mathematics pedagogy course instructors (Harkness & Brass, 2017b). About half (n=7) of the pre-service and in-service teachers we interviewed reported that discussions were used as a way that instructors encouraged use of the textbook. Yet, when mathematics educators were asked how textbooks were used in their pedagogy course(s), discussions accounted for about 80% of responses (n=106). Instructors being more explicit about the role of the textbook may help to decrease this discrepancy.

While being more explicit about our textbook use is suggested, we also want to position our pre-service teachers in a way that leads to them having more ownership in negotiating and transacting with textbooks. Smitherman's (2006) analysis of mathematics education pedagogy textbooks found that "conversations in these texts [were] one-sided and unilateral" (pp. 63-64). As we seek to utilize textbooks within our pedagogy courses, we want pre-service teachers to construct ideas about teaching mathematics and to have a voice in this process. As Mesa and Griffiths (2012) explained, "The instructors (and students) can use the textbook as intended by the authors totally, partially, or not at all in order to develop an instrument out of the textbook that fulfills their own needs" (p. 88). How can we leverage our mediation of textbooks in a way that empowers pre-service teachers? How can we encourage our pre-service teachers to engage with textbooks in meaningful ways, to develop a sense of ownership in their transactions with textbooks, and to encourage an authentic accountability with the work done with textbooks? We suggest further study into strategies we can use to help pre-service teachers engage with the textbooks and how we can best implement them in our courses.

As tertiary students engage with textbooks in their pedagogy courses, messages sent to these students through the textbooks should also be considered. Surprisingly, approximately 81% of participants (n=13) either did not think pedagogy textbooks could tell them how to teach or were mixed in their responses. Only three participants indicated that pedagogy textbooks could tell them how to teach. While the authoritative nature of textbooks is often considered when studying textbooks (Brass, 2016; Haggarty & Pepin, 2002; Herbel-Eisenmann, 2007; Herbel-Eisenmann, 2009; Herbel-Eisenmann & Wagner, 2007; Smitherman, 2006; Weinberg & Wiesner, 2011), participants in this study did not seem to heed the assumed authority of the textbook on how to teach.

Based on participants' responses and the themes that emerged through them, we suggest that pre-service teachers view teaching in a more personal manner than portrayed through pedagogy textbooks. Many viewed teaching as complex and multi-faceted, and the authority of the textbook conflicted with this view. While the textbook was influential in providing some participants with ideas about the different ways students learn and think about mathematics, several participants also felt tensions between the portrayal of classrooms within the textbooks and their own classroom experiences. These tensions highlight the conflict between the authoritative nature of textbooks, where there is usually just one way to look at the information presented, and pre-service teachers' transactions when reading the textbooks, where the reading of the textbook can change depending on the particular reader, the particular time, and the particular circumstances. Further, we hypothesize that these tensions stem from the Platonist view that textbooks present about math and mathematics education (Herbel-Eisenmann, 2007; Smitherman, 2006). If, as Smitherman posited, the notions that shape pre-service teachers' expectations about what it means to teach mathematics within textbooks include that replication is possible and predictable cause-effect relationships exist, then participants might be led to think that the textbook represents a "perfect world" of teaching.

The tension between the presentation of classrooms in the textbook and the participants' classroom experiences may also be the result of a misalignment between the intended reader, the implied reader, and the empirical reader (Weinberg & Wiesner, 2011). The participants being the actual readers of the textbooks (the empirical readers) may not match the profile of the readers the authors envision (the intended reader) and/or may not possess the qualities needed to read the text in the ways the authors intend (implied reader). This mismatch may occur because mathematics pedagogy textbooks often present information framed by a vision of how the authors want a mathematics classroom to be, and the authors may picture readers ready to embrace this vision. Yet, this vision can often seem idealized and frustrating to pre-service teachers, who may find it hard to live up to that ideal. How can we, as teacher educators, embrace this tension and honor the individual transactions our pre-service teachers have with textbooks? Likewise, what skills do pre-service teachers need to read the textbook in a way that lessens this tension? What additional classroom experiences might they need? What are our roles as mathematics teacher educators to lessen this tension? What are the pre-service teachers' roles? How can we foster self-confidence in pre-service teachers' perceptions of mathematics education and provide a stronger avenue to help them voice those perceptions? Perhaps, these are other questions that need further research in order for the intended, implied, and empirical readers to align when facilitating the use of pedagogy textbooks in our mathematics pedagogy courses.

That being said, we posit that these tensions signify positive aspects in our participants as readers of textbooks. The results of our interviews also suggest that participants leaned towards a critical stance when they indicated that textbooks could not tell them how to teach. This questioning of textbooks is something we should promote in our pedagogy courses.

Textbooks influence both pre-service teachers and instructors of mathematics pedagogy courses. We do not want to downplay their use or their importance in our courses; there is valuable information that comes from textbooks. We want to position the textbook as a source of information, not *the* source for information. Helping the students in our pedagogy courses to question and negotiate the information presented in the various textbooks helps us to privilege their individual transactions with the textbook. Furthermore, if we allow these tensions and classroom experiences to be exposed and discussed, we help pre-service teachers create their own texts (e.g., discussions, lessons/activities, reflections and connections, etc.). We want to nurture pre-service teachers' ideas as they transact with textbooks while also positioning pre-service teachers in ways that value their contributions and evolve notions of teaching and learning.

Conclusion

The relationships between pre-service teachers, the instructors of pedagogy courses, and pedagogy textbooks are complex and often work together to shape pre-service teachers' teaching identities as well as their ideologies of teaching. While our study focused on pre-service and first-year teachers' transactions with mathematics pedagogy textbooks, we believe the results and implications of our study are useful to teacher educators for other pedagogy courses as well to encourage rich, meaningful transactions between pre-service teachers and textbooks. Results of our interviews suggest that pre-service teachers are transacting with mathematics pedagogy textbooks in ways that are not particularly meaningful, mostly by taking notes or by highlighting/underlining. It is important to examine our own practices as mathematics teacher educators to encourage pre-service teachers to transact with the textbooks in deeper ways by helping them make connections, and this is an area for future study. Fostering these connections may help pre-service teachers and first-year teachers negotiate classroom environments in stronger ways and help them question the differences between the textbook and their perceptions. As teacher educators, it is crucial that we support pre-service teachers as they read textbooks, transact with textbooks, and connect information presented in textbooks to their own experiences.

Notes

[1] While participants included first-year and pre-service teachers, all participants were asked about their transactions with textbooks as pre-service teachers.

[2] For a more extensive discussion on the strategies participants used to extract information from textbooks, also see Harkness and Brass (2017a).

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