

July 2017

How Preservice Teachers Make Meaning of Mathematics Methods Texts

Shelly Sheats Harkness

University of Cincinnati, shelly.harkness@uc.edu

Amy Brass

University of Melbourne, amberbrass@yahoo.com

Recommended Citation

Harkness, Shelly Sheats and Brass, Amy (2017) "How Preservice Teachers Make Meaning of Mathematics Methods Texts," *International Journal for the Scholarship of Teaching and Learning*: Vol. 11: No. 2, Article 17.

Available at: <https://doi.org/10.20429/ijstl.2017.110217>

How Preservice Teachers Make Meaning of Mathematics Methods Texts

Abstract

Mathematics methods texts are important resources for supporting preservice teachers' learning. Methods instructors routinely assign readings from texts. Yet, anecdotally and also based on reading compliance literature, many students report that they do not read assigned readings. Within this paper we briefly describe the findings from a survey of 132 mathematics methods instructors about their customary use of texts and focus more closely on interviews of 16 preservice and first-year teachers about the reading strategies they used while reading methods texts. Research questions addressed the following: What strategies do preservice teachers use to make meaning of mathematics methods texts? What recommendations do preservice teachers suggest for instructors about the usage of texts? Findings suggest that most preservice and first-year teachers, at first, hesitated, not seeming to understand the first question and then struggled to explain their strategies. According to preservice and first-year teachers, instructors need to: balance reading with other ways to interact with the texts; discuss text readings in class; give them a purpose for reading; and, hold them accountable for the readings. Perhaps, both general content area literacy strategies and disciplinary literacy strategies need more emphasis in methods coursework.

Keywords

literacy; mathematics; preservice teachers; methods texts

Creative Commons License



This work is licensed under a [Creative Commons Attribution-Noncommercial-No Derivative Works 4.0 License](https://creativecommons.org/licenses/by-nc-nd/4.0/).

How Preservice Teachers Make Meaning of Mathematics Methods Texts

Shelly Sheats Harkness¹ and Amy Brass²

¹*School of Education, University of Cincinnati, Cincinnati, OH 45221, USA*

²*Graduate School of Education, University of Melbourne, Melbourne, Victoria, AU*

Mathematics methods texts are important resources for supporting preservice teachers' learning. Methods instructors routinely assign readings from texts. Yet, anecdotally and also based on reading compliance literature, many students report that they do not read assigned readings. Within this paper we briefly describe the findings from a survey of 132 mathematics methods instructors about their customary use of texts and focus more closely on interviews of 16 preservice and first-year teachers about the reading strategies they used while reading methods texts. Research questions addressed the following: What strategies do preservice teachers use to make meaning of mathematics methods texts? What recommendations do preservice teachers suggest for instructors about the usage of texts? Findings suggest that most preservice and first-year teachers, at first, hesitated, not seeming to understand the first question and then struggled to explain their strategies. According to preservice and first-year teachers, instructors need to: balance reading with other ways to interact with the texts; discuss text readings in class; give them a purpose for reading; and, hold them accountable for the readings. Perhaps, both general content area literacy strategies and disciplinary literacy strategies need more emphasis in methods coursework.

INTRODUCTION

"...the textbook is meant to be a support...but I don't think that anyone learns well from, um, big book stuff" (Participant #8).

The use of texts in mathematics methods courses is pervasive. Yet, anecdotally, we have evidence that some students "scan, skim, browse" or do not read assigned texts. When this occurs and classroom discussions are focused on the text assignments then opportunities for meaningful conversations, reflecting, and group and individual learning are diminished. Burchfield and Sappington (2000), surveyed 910 college students in 40 introductory or graduate psychology courses and found, "... on average, about a third of the students will have completed their text assignment on any given day" (p. 59). If reading non-compliance by the majority of students, enrolled in the same course, tends to become the norm then they may surmise that reading assigned texts is optional rather than critical or mandatory for learning (Burchfield & Sappington). Instructors may not institute practices (e.g., quizzes; reminders to read; use of the text to emphasize ideas in class) that will motivate students to read (Gurung & Martin, 2011).

In spite of this, the issue may be more complex than holding students accountable. Hoeft (2012) used likert-type surveys to assess the factors that "First Year Seminar" university students ascribed to reading noncompliance. Students who self-reported noncompliance suggested: "... schedules that didn't allow time for reading, social life that comes before reading, dislike of reading of any kind, lack of interest in the topic, and laziness" (p. 11). This is concerning because, as Shenkman (2002) noted, the more we read in content area texts the more proficient we are at extracting information and then understanding the content.

Another layer of complexity suggests that reading noncompliance might also be "... the result of poor reading comprehension and poor textbook reading skills" (Ryan, 2006, p. 138). Ryan's research focused on determining the effectiveness of three different strategies for homework

assignments with 124 students in three sections of introductory psychology. Ryan used one strategy per section: 1) "global" assignments (read an entire chapter) with planned reading quizzes; 2) "focused" homework worksheets ["find important information in the textbook and reinforce comprehension through personal examples" (p. 136) and turn the worksheets in for a grade] with check minus, check, or check plus grading; and, 3) "focused" homework with extensive written comments/feedback. All three strategies were given the same weight – 25% – of the total course grade. The students in the "focused" homework with extensive teacher comments performed "the best" on the midterm and final exams (Ryan).

Perhaps, the assumption that college students know how to read and make meaning of text is untrue and teaching students how to read the textbook should be an important objective in college courses (Ames, 1997). Furthermore, the notion that preservice teachers, because they take content area and disciplinary literacy courses, are supposed to be experts in literacy, especially reading, is also feasibly false.

When four "new" English and four "new" mathematics teachers were paired in a "reading apprenticeship model" in order to support each other through journals and logs, Donahue (2003) determined that these participants, "... might have been concluding that text [rather than other forms of interactions] was always inappropriate or less efficient for building knowledge. This misunderstanding might have resulted from another misunderstanding – the persistent separation of learning from reading, the hard-to-dislodge view that reading is somehow passive or 'less' than other forms of learning" and "... teacher educators must help prevent new teachers from creating a false dichotomy between reading and learning in a subject area" (Donahue, p. 34). Is this perception by preservice teachers another contributing factor to reading noncompliance in methods courses?

Content-area literacy courses typically focus on general literacy strategies that could work in any content

area whereas disciplinary literacy or mathematical literacy requires “comprehension and application of mathematics through reasoning, thinking, and interpreting through problem solving so that students engage in application of mathematical knowledge rather than rote learning” (Colwell & Enderson, 2016, pp. 63-64; De Lange, 2003). Preservice teachers should be knowledgeable in both types of literacies before they graduate and become classroom teachers. In fact, we contend they should be readers and writers.

This research builds upon previous research in the form of survey data collected from 132 members of the Association of Mathematics Teacher Educators (Harkness & Brass, in press). Methods course instructors reported they used texts: to stimulate in-class discussions (n=106); as resources for activities for preservice teachers to explore in the methods courses and/or for preservice teachers to use in field placements (n=101); for background information (n=97); and, as examples of more contemporary teaching and curriculum (n=73). Methods course instructors reported the use of the following “literacy strategies, reflection strategies, etc.” to help preservice teachers engage with the readings and texts: discussions – whole class, small group, online, and student-led (n=64); reflections – written, provided with specific prompts, and in journals (n=61); literacy strategies – jigsaw, think-pair-share, and graphic organizers, to name the most cited (n=30); connections – via video, task or in-class activity, field placement, pK-12 student work (n=25); and, questions to guide students’ reading (n=19). Some of these questions “to guide reading” might have fit within the “reflection” category, making reflections the most common usage (n=80). These responses gave us a general sense for how methods instructors used texts and helped their students engage with those texts. However, to build on this research we interviewed 16 preservice and first-year teachers in order to address the following research questions: What strategies do preservice teachers use to make meaning of mathematics methods texts?; and, What recommendations do preservice teachers suggest for instructors about the usage of texts? The results are described within this paper.

LITERATURE

Content-area or General Literacy

In regards to content-area literacy, Alvermann (2002) noted, “... young people’s literacy skills are not keeping pace with societal demands of living in an information age that changes rapidly” (p. 189). Additionally, popular culture “suggests that the [content literacy] strategies may need to be refocused to better help youth employ the skills and strategies they already possess rather than assuming that youth need help learning skills such as purpose setting, skimming or scanning, and notetaking” (Moje, McIntosh, Kramer, Ellis, Carrillo, & Callazo, 2004, p. 62). The skills and strategies they already have include understanding music, print magazines, news media, television, and movies (Moje et al., 2004). Yet, some texts require academic literacy and other texts and situated contexts require different reading skills (Barton, Hamilton, & Ivanic, 2000).

In regard to academic literacy, Buehl (2011) alleged, “... many students do reading to get work done rather than

engage in reading to understand” (p. 32) and described this type of reading as “pseudoreading.” Students skim for answers, process information on a surface-level, and then read and forget what they read (Buehl) which describes reading without comprehending. Buehl attributed this to the notion that students have not been taught comprehension through the use of general literacy strategies. This is compounded in “transmission classrooms” where both teachers and texts are considered the dispensers of knowledge (Alvermann, 2002). When classrooms are “participatory” rather than transmission, students co-create knowledge with the teachers and “students use texts as tools for learning and constructing knowledge” (Alvermann, p. 202).

Focusing on research regarding preservice teachers’ beliefs about reading and writing, Draper, Barksdale-Ladd, and Radencich (2000) used surveys (n=26) and conducted interviews (n=24). When asked to describe literacy strategies they planned to implement in their future classrooms, those who self-identified as “readers and writers” and those who self-identified as “nonreaders and nonwriters” wrote or talked about vague literacy strategies and provided no specific details about how they would implement them. Additionally, none of the preservice teachers articulated any concrete plans for reading instruction that would cultivate “a love of reading or writing” with their future students. Yet, even “nonreader and nonwriter” preservice teachers wanted their future students to love reading and writing and seemed to embrace a philosophy of, “do as we say – not as we do” (p. 199).

Disciplinary Literacy

Few mathematics teachers model traditional reading and writing instruction; rather, the majority focus on vocabulary, showing examples, and leading students through practice exercises (Siebert & Draper, 2008). More specifically, the typical approach to literacy instruction in mathematics includes: “Step 1. Identify the texts that are to be read and written during the lesson.; Step 2. Identify the literacies – the specific ways that texts are to be read and written – that are required during the lesson.; Step 3. Develop a [sic] instructional plan that makes explicit the texts and literacies and allows students to develop these literacies through participation in mathematical processes” (Siebert & Draper, 2012, pp. 185-186). Step 2 seems to make text usage procedural. However, Step 3 assumes that students will be “doing” mathematics through: problem solving, using representations, making connections, reasoning and proof, and communication (NCTM Process Standards). Step 2 and Step 3 appear at odds with each other. Yet, reading and writing in mathematics means employing two languages simultaneously (Phillips, Bardsley, Bach, & Gibb-Brown, 2009). The ways in which mathematics texts are organized are unique; the writing and examples are succinct (Phillips et al.). Furthermore, there may be “overlap” in the definitions for vocabulary words (Barton & Heidema, 2002); for example, words like plane, difference, and point have different meanings within and outside of mathematics.

General Literacy Strategies

A search for “literacy strategies” literature unveiled numerous manuscripts with authors suggesting countless strategies for making meaning of text. Both Tovani (2004) and Bean (1997) advocated teaching a few key strategies rather than many strategies. Yet, no authors seemed to agree on the key strategies.

In order to address high school students’ dismal test scores, Fisher, Frey, and Williams (2002) worked with teachers who identified seven instructional strategies that, “... would permeate the school at every level” (p. 70). Professional development focused on seven strategies: “read-alouds (or shared reading); K-W-L charts; graphic organizers; vocabulary instruction; writing to learn; structured notetaking; and, reciprocal teaching” (p. 71). As a result of the focus on these seven strategies student achievement scores improved (Fisher et al.). Read alouds or “close reading” by teachers has been recommended by Moje and Speyer (2008) as a way to engage students. K-W-L charts help students organize their thinking by posing the questions: What do you know about the topic?; What do you still want to know about the topic?; and, What did you learn about the topic? K-W-L charts were suggested by other researchers as well (Phillips et al., 2009; Bean, 1997).

Reciprocal teaching, described as a strategy advocated by Carter (1997) and Palincsar and Brown (1984), was implemented at the high school when students worked in groups. Use of reciprocal teaching, which is based on an expert-novice model, resulted in significant achievement gains for seventh and eighth grade “poor comprehenders” in a previous study by Palincsar and Brown. Teachers guided and scaffolded students in the use of four reciprocal teaching activities: summarizing; questioning; clarifying; and, predicting. The students were encouraged to practice their reciprocal teaching in small groups or with teacher assistance before implementing the four activities unaided.

Palincsar and Brown (1984) based text comprehension on the combination of three primary factors: “considerate texts” which are coherent and appropriate for the reader; congruity between the reader’s prior knowledge and the text content; and, the reader’s use of active strategies to enhance understanding and retention. They did not elaborate on the use of “active strategies.” However, more recently, Buehl’s (2011) list of the characteristics of proficient readers, Seven Comprehension Processes, could be considered active, or cognitively-engaged, strategies: make connections to prior knowledge; generate questions; visualize and create sensory mental images; make inferences; determine importance; synthesize; monitor; and apply fix-up strategies. Buehl referred to rereading and “hitting the pause button” (p. 64) as essential strategies. Rereading was a strategy suggested by others (Alvermann, 2002; Tovani, 2004).

Answering questions, generating questions of oneself, and creating dialogue with the text were also recommended by others (Alvermann, 2002; Bean, 1997; Fisher et al., 2002; Keene & Zimmerman, 2007; Harvey & Goudvis, 2000; Tovani, 2004). Along these lines of questions/questioning, Fang and Schleppegrell (2010) proposed “functional

language analysis” as an approach to teaching disciplinary literacy. The three key elements of functional language analysis and the questions to ask oneself while reading for comprehension include: “Content (What is going on in this text? Who does what to whom, how, when, and where?); Organization (How is this text organized?); Style/voice (How does the author of this text interact with the reader? What is the author’s perspective?)” (Fang & Schleppegrell, 2010, p. 593).

Similarly, literacy strategy experts also suggest using discussions to make meaning of text (Alvermann, 2002; Tovani, 2004), creating graphic or semantic organizers (Alvermann, 2002; Wandersee, 1988), and emphasizing new vocabulary through prefixes and roots, word walls, etc. (Alvermann, 2002; Fisher et al., 2002; Phillips et al. 2009). Wandersee (1988) noted that creating conceptual maps is more beneficial than outlining. Tools for strategy-use include sticky notes and highlighters (Tovani, 2004).

Literacy strategy research with mathematics preservice teachers is sparse. In fact, we found only one study conducted by Bean (1997). The ten preservice teachers in this study used 14 different strategies for their microteaching (Bean, 1997). Six used graphic organizers and five used anticipation-reaction guides. All other strategies (writing roulette, verbal-visual, word map, study guide, prereading questions, analogical study guide, text preview, KWL, fictionary, jigsaw, parallel notes, and bingo game) were used by either one or two preservice teachers. The two mathematics preservice teachers used: fictionary (a game in which students attempt to define obscure words), graphic organizer, and Bingo game.

A professional development program for secondary mathematics and science teachers focused on integrating literacy practices. Researchers, Adams and Pegg (2012), conducted 98 classroom observations over two academic years. They noted the literacy strategies that teachers used but delved deeper into how these 26 teachers enacted the strategies in their classrooms. Adams and Pegg identified two contrasting patterns of literacy strategy enactment, Rehearsal and Reorganization. Teachers who enacted the Rehearsal pattern primarily used literacy strategies to “revisit and rehearse content” and with the goal of “acquisition of an accepted body of knowledge” (p. 154). When teachers enacted the Reorganization pattern students were encouraged to “do their own thinking or develop more personal meanings and connections with the material” and with a goal of “developing deeper conceptual understanding” (p. 154). Additionally, Adams and Pegg identified a third enactment which they termed Transitional. Teachers who enacted a Transitional pattern incorporated both Rehearsal and Reorganization patterns and, typically, a mismatch occurred between the teachers’ goals and the strategy enactments. “The particular ways teachers enacted literacy strategies were influenced by multiple factors, including the teachers’ learning goals ... prior teaching practices, and pressures resulting from limited classroom time” (Adams & Pegg, 2012, p. 158). For these reasons, professional developers must consider factors other than merely knowledge of literacy strategies (Adams & Pegg). We assert that this is mostly likely true for teacher educators as well. Just because preservice teachers have been taught literacy strategies does not mean that the ways

that preservice teachers enact them align with their goals for students' learning of mathematics and science.

THEORETICAL/CONCEPTUAL FRAMEWORK

This work has been informed by two supporting frameworks: symbolic interactionism (Denzin, 1992) and student voice (Cook-Sather, 2006).

We approached the research through the lens of symbolic interactionism. The three core principles of symbolic interactionism are: (1) people respond to things based on meanings they create; (2) these meanings unfold within their social interactions; and, (3) "meanings are modified through an interpretive process which involves self-reflection" (Denzin, 1992, p. xiv). Hence, we aimed to understand the preservice and first-year teachers' meanings from their descriptions of experiences while making sense of mathematics methods texts. Rather than ask "why" questions, symbolic interactionists ask "how" questions. These "how" questions are then reported within the context of participants' past experiences. Within this manuscript we report those past experiences with the use of direct quotes captured during the interviews.

We felt that collecting data from the preservice and first-year teachers and then reporting our findings using their words would allow us to acknowledge, honor, and respect the role that they played in framing our research. "[No] clear and definite conception exists for 'student voice'" (Cook-Sather, 2006, p. 359) although particular words – "rights"; "respect"; and, "listening" – surface repeatedly when researchers describe its use. Voice can denote participants merely expressing their points of view on a topic or it can move beyond to participants actively engaging in generation of knowledge and action or praxis. For researchers, such as ourselves, the use of voice data through interviews provided the potential to reposition our participants so that they would: shape power dynamics; garner respect; and, challenge us to listen (Cook-Sather, 2006). We concur with Bishop (1993) who acknowledged the dangers of using "student-vacant" research projects to inform our instruction because, as teacher educators, our ultimate goal was that this research would cause us to think deeply about the use of texts in our mathematics methods courses.

However, as Cook-Sather (2006) cautioned, researchers must refrain from the monolithic tendency to report our findings as though one "single student voice" exists for all participants. There is "danger" in placing our participants' responses into isolated categories of experience as this can produce a subtle form of silence (Hadfield & Haw, 2001). Therefore, we chose to report our findings without "overlooking essential differences among students, their perspectives, and their needs" (Cook-Sather, p. 369).

METHODOLOGY

Procedures

We were interested in understanding how preservice and first-year teachers interacted with their mathematics methods texts and used a qualitative design which allowed us to immerse ourselves in the interview data and to be open to participants' insights. While the use of retrospective interviews is sometimes criticized as being the

least likely type of interview "...to provide accurate, reliable data for the researcher" (Fraenkel & Wallen, 2000, p. 510), we trusted our participants' memories to be accurate based on their perceptions of the mathematics methods course(s), the texts used, and the ways in which their instructors used those texts.

We realize that our analysis, as with most qualitative research, provides conclusions that are suggestive rather than definitive. The results are not generalizable, but transferable. Transferability is a process requiring reflective action by consumers of research: 1) the reader first conceptualizes the setting of the study; and, 2) using reflection, the reader considers the consequences of applying the findings to a different context (Greenwood & Levin, 2005). Similarly, Polit (2010) noted that with transferability:

The researcher's job is to provide detailed descriptions that allow readers to make inferences about extrapolating the findings to other settings. The main work of transferability, however, is done by readers and consumers of research [emphasis added here]. Their job is to evaluate the extent to which the findings apply to new situations. It is the readers and users of research who "transfer" the results. (p. 1453)

Participants

To examine different perspectives, we sought participants who would be or were teaching various grade levels. The 16 participants were preservice and practicing teachers from elementary (grades Kindergarten-6), middle (grades 4-9), and secondary (grades 7-12), and they were selected through a convenience sampling process (Creswell, 2012). We invited former students and/or contacted our colleagues who suggested their former students. Shelly interviewed eight participants from a large Midwestern city – two preservice secondary teachers, two preservice middle grades teachers, two first-year secondary teachers, and two first-year middle grades teachers. Amy interviewed eight participants from a large Southwestern city – three preservice elementary teachers and five first-year elementary teachers. While all 16 participants were from the United States, participants' literacy backgrounds and coursework varied.

All of the secondary preservice and first-year teachers (Participants #1-4) were required to take one 3-credit course, *Disciplinary Literacy in Secondary Schools*. All of the middle childhood preservice and first-year teachers (Participants #5-8) were required to take at least four literacy courses – a minimum of 12 credit-hour reading instruction which included 3 credit-hours of phonics – because of a state licensure reading mandate. The required course titles for the middle childhood program were: *Foundations of Literacy; Reading Instruction using Literature; Phonics*; and, *Disciplinary Literacy*. Elementary preservice and first-year teachers (Participants #9-16) took the following courses: *Foundations of Structured English Immersion; Structured English Immersion for Linguistically Diverse Learners; Language Method Management and Assessment; Language Literacy 1 in Elementary Schools*; and, *Language Literacy 2 in Elementary Schools*. The Structured English Immersion

courses were mandated as part of state licensure. The completion of these courses meant preservice teachers received an English immersion endorsement to work with English Language Learners as part of the Elementary Education licensure. Additionally, research-based systematic phonics instruction was included in the language literacy courses.

Data Collection and Analysis

In order to facilitate this collaborative research, we sought a reliance agreement between our two institutions with Amy's institution being the Internal Review Board of record and Shelly's institution being the relying institution. Semi-structured, retrospective interviews were conducted in one-on-one settings. With participants' permissions, these interviews were audio recorded and later transcribed. Demographic data questions and 12 open-ended questions were included in the interview protocol [see Appendix A]. For the purposes of examining how participants made meaning of mathematics methods texts and their suggestions for instructors regarding the usage of texts, we focused on participants' responses to Question #8 (What strategies do you or did you use to make meaning or understand the text(s)?) and Question #9 (What would you like to tell instructors/professors about using texts in their mathematics methods courses?) of the protocol.

After the interviews were transcribed, we created a large spreadsheet to capture the participants' responses. The spreadsheet contained a row for each of the 16 participants and columns for their demographic data and responses to each of the interview questions. Formatting the spreadsheet in this way afforded us the opportunity to examine each participant's responses to all of the questions as well as to examine all participants' responses to each of the questions. Using a grounded theory constructivist design, we focused on the meanings and insights given by participants in the study rather than using a priori categories (Creswell, 2012). Themes emerged "out of the data rather than being imposed on them prior to data collection and analysis" (Patton, 1990, p. 390). During researcher conversations through Skype, we used *in vivo* coding techniques by creating labels for categories phrased in the words of our participants to see emerging themes.

FINDINGS

Analysis of the preservice and first-year teachers' responses to interview questions #8 and #9 follow.

Self-reported Literacy Strategies

Nine of the 16 participants seemed to struggle, at least at first, to answer interview Question #8: What strategies do you or did you use to make meaning or understand the [methods] text(s)? The written responses alone do not do justice to the interrogatives, hesitations, pauses, and stops apparent when listening to the audio of the participants' voices. Below are participants' verbal responses and our interpretations of their nonverbal responses inserted in brackets:

- #1: This one I wasn't sure but [stops].
- #3: Using my own strategies? [seems confused]

- #6: So I don't know if I really fully understand this question but I said for the most part I feel like VDW [Van de Walle text] is a very friendly and readable text. It's not like just [stops].
- #7: Of a text I'm reading? [confused expression]
- #9: Hmm ... I don't know if I can name a specific strategy ...
- #10: Connections for my learning? [needs clarification]
- #12: While I was reading it? Like how did I apply it to me?
- #15: [Hesitates] Like as far as answering the daily reading questions?
- #16: Like, other than the questions that you sent home for us to answer? [needs clarification]

After initial clarifications for some participants, they described strategies they used to make meaning of their methods texts. The most frequently used strategy they reported was taking notes (n=10). #6 said, "I'm someone that when I read I have to jot down notes or I might forget it even if it is interesting information. So I'll jot down key ideas." Seven participants described highlighting and/or underlining the text while reading. #3 took notes on a cell phone or computer. However, #2 noted, "I'm really bad at highlighting cause I tend to highlight everything... So, I'm also not great at reading comprehension so it actually takes me a while to read and actually construct meaning." Similarly, #8 said, "But, you know, if you have a page full of underlines you don't know what is what. So then I started to highlight things, key words and ideas, and then I realized I was highlighting too much." Attempting a (mathematical) strategy or "working it out" was another way the participants (n=3) described their strategies. Two mentioned outlining and two voiced their use of mapping. #8 pronounced, "...the thing about these semantic maps is it's not like an outline so I don't have to read an outline. It's more like I'm looking at a picture and looking at the, um, looking at the connections between and of the concept and so it makes it [stops]. It makes it much more appealing to review." Additionally, three participants (#2, #6, and #11) said they sometimes had to reread text. Individual participants also referred to "reading in chunks" (#2), "question myself as I'm reading" (#14), "seeing if I noticed any patterns [in the mathematics tasks]" (#12).

Some participants were not tentative about portraying their reading difficulties:

- "A lot of times I find myself, just, I don't remember what I just read. I've gone for like three pages ..." (#2).
- "Because I mean I wouldn't say I don't like to read. Well, I guess I can't say I don't like to read. I like the information that comes from reading. So reading is one of those necessary evils..." (#8).
- "Because I know there were often times where I just read one entire chapter and I was like, 'I don't know what I just read.'" (#15)

- “Just reading it didn’t help me a lot.” (#16)

Participants also described the benefits of writing reflections from prompts and classroom discussions of the text assignments. #3 said, “...I think our discussions in class helped to make meaning out of the text as well. So if I had notes prepared in advance then I could kind of be a little bit more of a participant in the discussion...” and #9 noted, “I don’t [know] if I can name a specific strategy, but I think just reading it and then doing the reflections.”

Suggestions for Instructors

Participants offered suggestions for instructors that aligned with suggestions that researchers have proposed. The following themes emerged from their words.

Balance reading with ways to interact with the texts. Participants described the text as a resource to be used along with other tools for helping them make meaning of it. #13 said, “...definitely to use the variety ... it [the text] was a good pick to use as a resource and have as a resource as we were learning ... And then incorporating things, like using PowerPoints, but effectively, again, making them like interesting ... videos, visuals, online manipulatives and the actual text.” Focusing on the mathematics within the text, #1 remarked, “I learn more by doing math and by more interactive than just reading.”

Discussions are important. Several participants talked about the in-class discussions that occurred after the text readings were assigned. #7 stated, “What did you get from it and I’ll tell you what I got from it and then us coming to a concise conclusion on what we got from it together and this is how we can use these things [in the textbook readings].” #2 perceived “actually discussing has a lot more meaning to me” than just reading the text. However, #4 suggested that “you’d get nothing out of the conversation” if you didn’t read the text.

Give students a purpose for reading. Participants wanted a purpose for reading assignments. For example, #5 noted, “So I think if the professors are assigning the work, they need to give a [stops], or assigning readings there needs to be a purpose instead of just like, read this.” #10 said, “You know, use an activity that you find in the book in your placement,” referring to an assignment where preservice teachers were required to choose an activity from the text, implement it while in their field experiences, and then write about using it.

Hold preservice teachers accountable for readings. The quote above by #10 could also relate to this suggestion. Other participants noted, “So I think it [the reading guides] held us more accountable for reading it. They would say they were going to collect them sometimes and then never did. So that’s also a good trick to always have” (#6) or “I think everyone needs to be held accountable, because ultimately we’re doing this for the students. And...and this is just another part of our responsibility as teachers is to know what we’re teaching and this is just another way of us just building that foundation. And if we choose not to do that, then it’s not fair to any of the other students we decide to teach later” (#15). #9 adamantly said, “...because you got [sic] to make sure they are doing, because I can tell you straight up that a

lot of people didn’t read...So, I would say an accountability system” is needed. At least three other participants used words which described holding preservice teachers accountable.

Specific/other ideas. Some participants gave specific advice about using reading guides with one or two questions and/or reflective prompts prior to reading. #10 said, “I would say quiz them. Honestly. Quiz them, like ‘What was an activity that you learned about?’ This could be construed as holding students accountable but with a specific strategy to do so. Two participants advocated for instructors referencing it more (#1 and #14). #14 noted, “Encourage students to bring it to class everyday not just on this day or this day, because then it becomes a lost artifact and just sits there.” #12 had a lengthy response, “Do more than a Blackboard post to demonstrate understanding...a way that you could do it would be to have the students do a quick reflection, a quick summary of what they know for you, to turn in...” and, “I would say break up the reading. Because if it’s small pieces of reading at a time it’s more likely to get done than assigning like 5 chapters at once...” Similarly, participant #9 requested, “...keeping it [the reading assignments] manageable.” Finally, (#16) offered, “Have students respond to it somehow. Even if it’s like...I don’t know, just a couple questions that are printed or like...I don’t know, write a summary...Like, ‘What are the three most important things you learned from this’ and then have students talk about it in class.” Again, this could be a suggestion for holding preservice teachers accountable and/or making a purpose of the reading. Therefore, there was some overlap in these suggestions.

DISCUSSION

More than half of the participants, preservice and first-year teachers, many whom successfully completed numerous literacy courses at the tertiary level, struggled to verbalize the strategies they used to make meaning of texts. Perhaps, as Buehl (2011) noted they used “pseudoreading” strategies, such as skimming for answers, processing information on a surface-level, and reading and forgetting what they read in order to half-heartedly complete the assigned readings prior to class. This speculation is based on the idea that they, indeed, completed the assigned readings. We know reading compliance rates reported for college students is quite low; only about one-third complete reading assignments (Burchfield & Sappington, 2000). If a third of the participants were completing the reading but some of these participants were “pseudoreading” it is no wonder that they struggled to answer the interview question. Additionally, if participants were “pseudoreading” it is likely that their learning about mathematics education was impacted, both in their individual readings of the text as well as during in-class activities and discussions based on readings from the text. This indicates a devaluing of the text as an important resource for supporting preservice teachers’ learning. Feasibly, on a deeper level, some participants espoused a false dichotomy view (Donahue, 2003) between learning and reading. In fact, #16 said, “Just reading it [the text] didn’t help me a lot.” And, #9 said she would not read

unless the professor held her accountable for the reading assignments.

Unsurprisingly, the most frequently used reading strategies that participants reported using included: taking notes (n=10); and, highlighting/underlining (n=7). These data support the claims made by Wandersee (1988) and Weinberg, Wiesner, Benesh, and Boester (2012). However, some participants expressed trepidation about what to highlight/underline and how much to highlight/underline. Their concerned statements might indicate that they were moving towards reading with more proficient strategies. For example, #2 described his progression from using highlighting and taking notes of what he highlighted to creating semantic maps:

It's been a process of revision. I think I started off I would, um, underline things. But, you know, if you have a page full of underlines you don't know what is what. So then I started to highlight things [key words, new ideas] and then I realized I was [still] highlighting too much ... [moved to highlighting] "as little as possible" or "everything important" and then rewriting it [note taking] ... [and now] takes the notes and creates a semantic map ... It's kind of a picture of understanding where you start in the middle with a concept and you branch out into subgroups and then you have ideas of those subgroups branched out from there. And that's been, that's been the most beneficial way for me to learn, um, at least up to this point.

Some participants, like #2 above, described more proficient reading strategies. Perhaps we could tap into and leverage their knowledge through the use of reciprocal teaching activities (Buehl, 2011; Carter, 1997; Fisher et al., 2002).

Responses to the interview question about participants' suggestions for instructors included: 1) balance reading with other ways to interact with the texts; 2) discuss text reading assignments in class; 3) give students a purpose for reading; and, 4) hold students accountable for the readings. With regards to the first suggestion, does balancing reading with other ways to interact with text, again, suggest some participants see a contrast between reading and learning? If so, why is it that their literacy coursework has not helped them move beyond this distinction? How can we help them reconsider this false dichotomy (Donahue, 2003)? We must dispel the notion that reading is "less" than other forms of learning. But how?

Concerning the second suggestion, discussions are important based on a social constructivist view of learning (Vygotsky, 1978) and "participatory" rather than transmission classrooms encourage students to use texts as tools for learning and constructing knowledge (Alvermann, 2002). However, do students become reliant on those discussions and less willing to make sense of the text on their own? It seems we want them to do both, make sense of and reflect on the readings prior to and then again during the in-class discussions.

With respect to the third suggestion, researchers (Tovani, 2004; Ryan, 2006) have advocated giving students a purpose for reading assignments. Recall Ryan's (2006)

research in which she compared midterm and final exam results for students in three different control groups: 1) "global" assignments (read an entire chapter) with planned reading quizzes; 2) "focused" homework worksheets ["find important information in the textbook and reinforce comprehension through personal examples" (p. 136) and turn the worksheets in for a grade] with check minus, check, or check plus grading; and, 3) "focused" homework with extensive comments/feedback written on what they submitted. Students who were in the third group outperformed the students in the other groups. Does a focused homework assignment decrease "pseudoreading" or encourage it? It most likely depends on the types of questions asked and comments/feedback written by the instructor.

Finally, as to the fourth recommendation by participants, how might we hold students accountable? Focused homework assignments (Ryan, 2006) would be one way, but this is time-consuming for instructors with large class loads. Weinberg et al. (2012) suggested instructors ask students "to use textbooks in multiple ways and then clearly communicate their expectations" (p. 168). Some participants recommended quizzes. However, do quizzes also promote "pseudoreading?" Do they send messages of reading to complete a quiz, emphasizing that reading is "one of those necessary evils," as describe by participant #8, or reading for the purpose of learning and reflecting upon the mathematics methods textbook in ways that promote a love of reading (Draper et al., 2000) and learning?

LIMITATIONS

The small number of participants, 16, was a limitation of this study. However, we were purposeful in inviting both preservice teachers in their final year of coursework and first-year teachers to participate who were or had been in a variety of licensure programs - early childhood, middle, and secondary. Participants were enrolled in or completed their coursework in large, urban, research-intensive universities. Participants from smaller or private university programs might have very different experiences with literacy coursework and/or how they make meaning of texts and their recommendations for instructors. Furthermore, even though most of these students completed multiple literacy courses, it is possible that they had never considered how they, personally, made meaning of text, rather how to help their future students make meaning of text.

IMPLICATIONS FOR FUTURE RESEARCH

Future research should address some of the limitations listed above. Studies that report literacy strategies that are successful with preservice teachers in mathematics methods courses are needed. For one such study, Coffey and Billings (2008/2009) described their work with classroom teachers to help the teachers make sense of "scholarly reading" (p.269), a "particular genre of reading" (p. 268). They asked teachers to identify "Text-to-Problem (Doing Math), Text-to-[NCTM] Standards (Teaching Math), and Text-to-Teaching (Teaching in General)" connections while reading and reported the strategy, "... represents a small step in

meeting the demand to improve teachers' ability to engage in professional development through reading" (p. 274). Additionally, Colwell and Enderson (2016) advocated for disciplinary literacy moved to methods courses. Can this be effective if methods instructors are unfamiliar with both general literacy and specific mathematical literacy strategies?

CONCLUSION

As Fang and Schleppegrell (2010) suggested mathematics texts are multisemiotic: "Mathematical texts draw on two different 'languages' – natural language and mathematics symbolic language – in conjunction with visual representation through graphs, diagrams, and other visual elements (O'Halloran, 2005)" (p. 90). We maintain that, perhaps, *mathematics methods texts* are also multisemiotic. Because methods texts contain research, learning theories, narratives of classrooms, mathematics content, mathematical activities, and more, preservice teachers must comprehend natural language, academic language, and mathematical language in order to make meaning of these texts. If we continue to use texts in our mathematics methods courses then we bear some responsibility in helping preservice teachers make meaning of those multisemiotic texts. It follows that we must also find ways to encourage a love a reading and dispel the notion that reading is less than other forms of learning.

REFERENCES

- Adams, A. E., & Pegg, J. (2012). Teachers' enactment of content literacy strategies in secondary science and mathematics classes. *Journal of Adolescent & Adult Literacy* 56(2), 151-159.
- Alvermann, D. E. (2002). Effective literacy instruction for adolescents. *Journal of Literacy Research* 34(2), 189-208.
- Ames, C. (1997). The enhancement of student motivation. In M. L. Maehr & D. A. Kleiber (Eds.), *Advances in motivation and achievement: Enhancing motivation* (pp. 123-145). Greenwich, CT: JAI Press.
- Barton, M. L., & Heidema, C. (2002). *Teaching reading in mathematics* (2nd ed.). Aurora, CO: Mid-continent Research for Education and Learning.
- Barton, D., Hamilton, M., & Ivanic, R. (2000). (Eds.) *Situated literacies*. New York: Routledge.
- Bean, T. W. (1997). Preservice teachers' selection and use of content area literacy strategies. *The Journal of Educational Research*, 90(3), 154-163.
- Bishop, W. (1993). Students' stories and the variable gaze of composition research. In S. I. Fontaine & S. Hunter (Eds.), *Writing ourselves into the story*, (pp.197-214). Carbondale, IL: Southern Illinois University Press.
- Buehl, C. (2011). *Developing readers in the academic disciplines*. Newark, DE: International Reading Association.
- Burchfield, C. M., & Sappington, J. (2000). Compliance with required reading assignments. *Teaching of Psychology*, 27(1), 58-60.
- Carter, C. J. (1997). Why reciprocal teaching? *Educational Leadership*, 54(6), 64-68.
- Coffey, D. C., & Billings, E. M. H. (2008/2009). Teachers as lifelong learners – The role of reading. *Teaching Children Mathematics*, 15(5), 267-274.
- Colwell, J., & Enderson, M. C. (2016). "When I hear literacy": Using pre-service teachers' perceptions of mathematical literacy to inform program changes in teacher education. *Teaching and Teacher Education*, 53, 63-74. DOI: <http://dx.doi.org/10.1016/j.tate.2015.2011.001>
- Cook-Sather, A. (2006). Sound, presence, and power: "Student voice" in educational research and reform. *Curriculum Inquiry*, 36, 359-390.
- Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research, Fourth edition*. Boston, MA: Pearson.
- De Lange, J. (2003). Mathematics for literacy. In M. Niss (Ed.), *Quantitative literacy and mathematical competencies* (pp. 75-89). Princeton, NJ: National Council on Education and Disciplines.
- Denzin, N. K. (1992). *Symbolic interactionism and cultural studies*. Maldin, MA: Blackwell.
- Donahue, D. (2003). Reading across the great divide: English and math teachers apprentice one another as readers and disciplinary insiders. *Journal of Adolescent & Adult Literacy*, 17(1), 24-37.
- Draper, M. C., Barksdale-Ladd, M. A., & Radencich, M. C. (2000). Reading and writing habits of preservice teachers. *Reading Horizons* 40(3), 185-203.
- Fang, Z., & Schleppegrell, M. J. (2010). Disciplinary literacies across content areas: Supporting secondary reading through functional language analysis. *Journal of Adolescent & Adult Literacy*, 53(7), 587-597.
- Fisher, D., Frey, N., & Williams, D. (2002). Seven literacy strategies that work. *Educational Leadership* 60(3), 70-73.
- Fraenkel, J. R., & Wallen, N. E. (2000). *How to design and evaluate research in education, Fourth edition*. Boston, MA: McGraw Hill.
- Greenwood, D. J., & Levin, M. (2005). Reform of the social sciences and of universities through action research. In Denzin, N. K. & Lincoln, Y. S. (Eds.), *The Sage handbook of qualitative research* (pp. 43-64). Thousand Oaks, CA: Sage Publications.
- Gurung, R. A. R., & Martin, R. C. (2011). Predicting textbook reading: The textbook assessment and usage scale. *Teaching of Psychology*, 38(1), 22-28.
- Hadfield, M., & Haw, K. (2001). 'Voice', young people and action research. *Educational Action Research*, 9(3), 485-502.
- Harkness, S. S., & Brass, A. (in press). Selecting and using mathematics methods texts: Nontrivial tasks. *The Mathematics Educator*.
- Harvey, S. & Goudvis, A. (2007). *Strategies that work: Teaching comprehension for understanding and engagement*. Portland, ME: Stenhouse.
- Hoelt, M. E. (2012). Why university students don't read: What professors can do to increase compliance. *International Journal for the Scholarship of Teaching and Learning*, 6(2), Article 12.
- Keene, E. O., & Zimmermann, S. (2007). *Mosaic of thought: The power of comprehension strategy instruction* (2nd ed.). Portsmouth, HN: Heinemann.

- Moje, E. B., McIntosh K. C., Kramer, K., Ellis, L., Carrillo, R., & Collazo, T. (January/February/March 2004). *Reading Research Quarterly* 39(1), 38-70.
- Moje, E. B., & Speyer, J. (2008). The reality of challenging texts in high school science and social studies: How teachers can mediate comprehension. In K. a. Hinchman & H. K. Sheridan-Thomas (Eds.), *Best practices in adolescent literacy instruction* (pp. 185-211). New York: Guilford.
- O'Halloran, M. K. (2005). *Mathematical discourse: Language, symbolism, and visual images*. London: Continuum.
- Palincsar, A. S., & Brown, A. L. (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities. *Cognition and Instruction* 1(2), 117-137.
- Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). Newbury Park, CA: Sage.
- Phillips, D. C. K., Bardsley, M. E., Bach, T., Gibb-Brown, K. (2009). "But I teach math!" The journey of middle school mathematics teachers and literacy coaches learning to integrate literacy strategies into the math instruction. *Education*, 129(3), 467-472.
- Polit, D. F. (2010). Generalization in quantitative and qualitative research: Myths and strategies. *International Journal of Nursing Studies*, 47, 1451-1458. DOI: 10.1016/j.ijnurstu.2010.06.004.
- Ryan, T. E. (2006). Motivating novice students to read their textbooks. *Journal of Instructional Psychology*, 33(2), 136-140.
- Shenkman, H. (2002). Reading, learning, and thinking seminars: A template for faculty training. *Learning Abstracts, League for Innovation in the Community College*, 5(1).
- Siebert, D., & Draper, R. J. (2008). Why content-area literacy messages do not speak to mathematics teachers: A critical content analysis. *Literacy Research and Instruction*, 47(4), 229-245.
- Siebert, D., & Draper, R. J. (2012). Reconceptualizing literacy and instruction for mathematics classrooms. In T. Jetton & C. Shanahan (Eds.) *Adolescent literacy in the academic disciplines: General principles and practical strategies* (pp. 173-198). New York, NY: The Guilford Press.
- Tovani, C. (2004). *Do I really have to teach reading? Content comprehension, grades 6-12*. Portland, ME: Stenhouse Publishers.
- Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.
- Wandersee, J. H. (1988). Ways students read texts. *Journal of Research in Science Teaching*, 25(1), 69-84.
- Weinberg, A., Wiesner, E., Benesh, B., & Boester, T. (2012). Undergraduate students' self-reported use of mathematics textbooks. *PRIMUS: Problems, Resources, and Issues in Mathematics Undergraduate Studies*, 22(2), 152-175.

APPENDIX A

Textbook Interview Protocol

Demographic data:

- What year are you in the program? Or what year are you in your teaching career?
 - What field experiences, student teaching, or classroom teaching have you had?
 - What literacy or literacy in the content area [mathematics] courses did you take during your teacher preparation courses? Explain.
1. What were the main themes and ideas you took from your methods course(s)?
 2. Did the text(s) you used in the course support these themes/ideas? Why or why not?
 3. Tell me about the textbook that you used in your methods course(s). (Possible follow up- question: Was your copy of the textbook an electronic textbook or a hardcopy textbook?)
 4. Now consider texts in a more broad sense so that texts include print, videos, graphs, conversations, etc. Tell me about how you used these types of texts in your methods course(s).
 5. How did the mathematics methods course instructor/professor require or encourage you to use the text(s)?
 6. Do you still own the text(s)? If so, do you use it (them) or reference it (them)? How? [Give an example?]
 7. In your opinion, what topics were most beneficial to you as a future mathematics teacher? From your classroom experience, what topics do you wish would have been added?
 8. What strategies do you or did you use to make meaning or understand the text(s)?
 9. What would you like to tell instructors/professors about using texts in their mathematics methods courses?
 10. How did the texts you used in methods courses make you think about “how to teach?”
 11. Considering your experience in the classroom(s) during and after your methods course(s) do you feel that texts can tell you “how to teach?” Why or why not?
 12. Is there anything else you’d like to share?