

Chapter 6

Mathematical Writing, Teacher Noticing, and Text Clubs

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ABSTRACT

This chapter explores how using explanatory mathematical student writing artifacts can be used to position teachers to attend to, interpret, and respond to student mathematical thinking from an iterative and engaged stance. This chapter argues that as conceptualizations of teacher noticing shift from a view that is linear and detached to a view that is iterative and engaged, a corresponding shift should occur in the learning to notice activities that pre-service teachers engage in. The chapter proposes the idea of text clubs, and explores, with two illustrative examples, how pre-service teacher discussions that center explanatory mathematical student writing artifacts offer a potential alternative to the predominant role of video clubs that center teaching video artifacts, and how this approach may support the advancement of new paths for mathematical writing research.

INTRODUCTION

For more than a decade, many mathematics teacher preparation programs have focused on developing pre-service teachers' noticing practice. Teacher noticing is the ability of teachers to see and make sense of events within their classroom (Erickson et al., 1986; Mason, 2002), or more specifically, the ability to attend to, interpret, and decide how to respond to such events (Jacobs et al., 2010). Studies have shown that teacher noticing is an essential practice of teaching (Jacobs & Spangler, 2017), that expert teachers

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are more skilled at noticing than novice teachers (Mason, 2002), and that a teacher's ability to notice can be developed (van Es & Sherin, 2002). As such, teacher noticing is now a major trend within mathematics education research (Yig, 2022). However, despite the rich body of teacher noticing research, surprisingly little of this literature has involved mathematical writing (some exceptions to this are described in Bywater et al., 2019; Magiera & Zambak, 2021; Monson et al., 2020) despite the fruitful insights into student thinking that mathematical writing - especially explanatory mathematical writing - often afford teachers (e.g., Bicer et al., 2013; Dacey et al., 2018). The predominant artifact used for teacher noticing has been video recordings of classroom teaching, and teachers typically participate in "video clubs" in which they watch video recordings of themselves or others teaching, while reflecting on or discussing what they notice in the video (e.g., van Es & Sherin, 2002). In addition to video, or instead of, "written work" artifacts have been used as the focus of the noticing discussions (e.g., Fernández et al., 2012; Goldsmith, & Seago, 2011; Selmer et al., 2022; Simpson & Haltiwanger, 2017). However, in most studies, mathematical written work artifacts consist of paper on which students write numbers, symbols, and diagrams, but rarely explanatory text. The absence of mathematical explanatory writing within the teacher noticing literature might not be surprising given that explanatory writing still occurs infrequently in mathematics classrooms (Kosko, 2016) despite its well documented benefits (Bicer et al., 2018). Recognizing the importance and absence of explanatory mathematical writing, the objective of this chapter is to explore:

1. How the inclusion of mathematical explanatory writing within teacher noticing practices can help enrich the teacher noticing literature and offer potential solutions to the challenges emerging within teacher noticing research, and
2. How the techniques used to promote teacher noticing can also be used to support the implementation of mathematical writing in classrooms.

BACKGROUND

Explanatory Mathematical Writing

This chapter focuses on *explanatory mathematical writing*. Different types of mathematical writing are identified based on the purpose of the writing activity (Casa et al., 2016). For explanatory mathematical writing, the purpose is to articulate ideas for someone else, typically a teacher or peers. This stands in contrast to other types of writing such as exploratory writing which gives students opportunities to write to themselves to make sense of a problem or their own ideas, argumentative writing which intends to support an understanding of the reasoning and evidence for mathematical concepts, and mathematically creative writing which aims to extend or apply student thinking in new ways. These different types of writing play different roles during instruction. For example, exploratory writing may be more appropriate at the beginning of a problem-solving cycle and explanatory writing near the end. In this chapter, we focus on the student explanatory mathematical writing that occurs after students complete a task or a lesson that provides opportunities for them to explore a mathematical idea (Martin, 2015; McCormick, 2010).

While empirical research about non-mathematical writing is extensive (Juzwik et al., 2006), studies about mathematical writing of any type are limited (Powell et al., 2017). Where they exist, they typically examine the use of journal writing or learning logs at the end of class periods and over multiple weeks,

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