

Chapter 14

Mathematical Writing and English Language Learners: Strengths-Based Instructional Strategies

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ABSTRACT

The purpose of this chapter is to examine the role of mathematical writing to enhance mathematics instruction for students bureaucratically labeled as English Language Learners (ELLs) and multilingual students. The chapter addresses the specific needs of these students and focuses on two major claims: first, mathematical writing is useful for ELLs learning mathematics, and second, mathematics instruction for ELLs should support them to generate mathematical claims and provide opportunities for them to revise their work. The claims are illustrated using data from a dissertation study that examined how multilingual students learned mathematical arguments in a classroom that used mathematical writing and conferencing. This chapter per the author frames mathematical arguments using proof schemes and Toulmin's model and takes a strengths-based approach to instruction. The final section suggests directions for future research and focuses on expanding beyond writing as an individual exercise.

The product of mathematical activity might be justified with a deductive proof, but the product does not represent the process of coming to know. (Lampert, 1990, p.30)

It is worth noting that the roots of “prove” come from “to probe,” meaning “to test the validity of.” Thus the maxim “the exception proves the rule” is not an oxymoron, but a correct statement: “The exception probes (the truth of) the rule” and finds it wanting. (Schoenfeld, 2009, p.xvi)

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INTRODUCTION

Teachers are increasingly called on to incorporate writing in mathematics instruction (Common Core State Standards Initiative, 2017; Leinwand et al., 2014). Unfortunately, many teachers of mathematics feel ill-prepared to teach writing and assign writing less than teachers in other disciplines (Applebee & Langer, 2011; Powell et al., 2017). This is a problem because mathematical writing is known to support metacognition and learning (Bangert-Drowns et al., 2004; Pugalee, 2004). For students who are multilingual, bilingual, or learning English, the problem is worse. Teachers often hold deficit views of these students (Faltis & Valdés, 2016; Flores & Rosa, 2015), feel unprepared to teach them mathematics (de Araujo et al., 2018), and curricula do not, generally, provide the kinds of supports necessary for their success (de Araujo & Smith, 2022). Multilingual students and English Language Learners (ELLs) represent populations of students who would benefit from access to mathematical writing (NASEM, 2017) but are not likely to have opportunities to engage in the practice.

The purpose of this chapter is to examine the use of mathematical writing to enhance mathematics instruction for multilingual students and ELLs. Throughout this chapter, I will use the term “ELL” even in the presence of abundant critique for this term. Terms such as “ELL,” “Limited English Proficient,” “English as a Second Language,” and “English Learner” are inherently deficit oriented as they focus on what students “lack” (de Araujo et al., 2018; Walqui & Bunch, 2019), privilege the language of instruction (Barwell et al., 2017), and reflect social hierarchies (Faltis & Valdés, 2016; Flores & Rosa, 2015). At the same time, “ELL” is a term that is commonly used by states, districts, and practitioners, so I will use it with the full recognition of its limitations and critiques. Unfortunately, different states and localities define and redesignate students labeled “ELL” inconsistently. So, an “ELL” in one locality might not be designated an “ELL” in another. Consequently, I will use the term “ELL” to include any student who ever held that label, students who have been screened and deemed “Initially Fluent,” and other multilingual students (including bilinguals) who might benefit from additional language support.

Here, I discuss some of the educational context that surrounds ELLs, including demographic information, theoretical assumptions about learning language and mathematics that foreground the strengths ELLs bring to the classroom, and how to use argumentative and informative/explanatory writing (Casa et al., 2016) to support ELLs to generate mathematical claims and engage in reasoning when writing arguments. The chapter is intended to support teachers, teacher leaders, administrators, researchers, and other stakeholders who seek to improve educational opportunities in mathematics classrooms for K-12 students bureaucratically labeled as “English Language Learners” (ELLs).

This chapter presents research results and data from the author’s dissertation study (Huitzilopochtli, 2022). The study took place in a bilingual charter school in an agricultural community in California’s Central Valley. Many of the students attended the bilingual school where instruction took place in Spanish and English since kindergarten. While language designations of individual students might have shifted during their years of schooling (e.g., some students were redesignated from ELL to “Fluent English Proficient”), these students can be considered “ELLs” for the purposes of this chapter.

This chapter is organized into four major parts. First, I describe some characteristics and background information about ELLs. Secondly, I discuss the role of mathematical writing and the recommendations for instructional practice. In the third section, I describe and illustrate how to use mathematical writing to support ELLs to:

1. Generate mathematical claims

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