

## Chapter 8

# A Genre–Based Approach to Improving Students’ Mathematical Writing: Practical Support for Educators

**Lauren Haggis**

*South Australia Department for Education, Australia*

**Tutita M. Casa**

*Department of Curriculum and Instruction, Neag School of Education, University of Connecticut,  
USA*

### **ABSTRACT**

*This chapter introduces the resources and practical guides that the South Australian Department for Education has developed to support teachers to teach writing in mathematics classrooms and develop their understanding of the types of writing mathematics students should be proficient in. Developing this understanding has the potential to improve classroom practice and positively impact learning outcomes for students in both writing and mathematics. This chapter may offer insights for other jurisdictions seeking to support the teaching of mathematical writing.*

### **INTRODUCTION**

The notion that “writing is another important component of the discourse” (National Council of Teachers of Mathematics [NCTM], 1991, p. 34) is one that continues to be emphasized in mathematics education policies across various nations. The *Australian Curriculum*, for example, calls for learning programs that provide opportunities for students to “communicate their thinking, reasoning and solutions to problems using appropriate mathematical language, notation and symbology” (Australian Curriculum, Assessment, and Reporting Authority [ACARA], 2022b, p. 12). Similarly, in the United States, the *Common Core State Standards for Mathematics* (National Governors Association Center for Best Practices and the

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Council of Chief State School Officers [NGA Center and CCSSO], 2010b) emphasizes how “students at all grades can listen or read the arguments of others” (p. 7), with the English language arts companion (2010a) promoting writing arguments and informative pieces across subject areas and grades. Similarly, the Canadian province of Ontario notes how “as students engage in reasoning, teachers further encourage them to pose questions, make conjectures, and justify solutions, orally and in writing” (Ministry of Education, 2020, p. 74) to attend to the mathematical processes emphasized in their current curriculum guide.

Despite these policies calling for students to write mathematically, there continues to be a lack of guidance for teachers about how to support students to engage in this practice (Powell et al., 2017). Therefore, Morgan’s (1998) longstanding question about whether the writing students complete in mathematics represents their understanding remains. If teachers are unsure about how to introduce students to mathematical writing and help them understand the characteristics of high-quality texts, practitioners and researchers will be limited in relying on students’ writing to advance student learning of content and the valued ways of communicating in the mathematics discipline.

One way to support the implementation of mathematical writing is from a policy perspective considering all grade levels. The reach of such policies depends on local governance structures. For example, American states have the constitutional authority to oversee their education systems, and each state dictates the extent to which school districts employ their own policies. Hawaii includes only one school district (Our Statewide School District, n.d.) whereas Connecticut includes multiple districts (ConneCT Kids, n.d.). The sizes of the districts vary, with some only having one elementary and one middle school, and high schoolers going to a regional school alongside students from other districts. In South Australia, the Department for Education is responsible for teaching and learning policy in the approximately 500 public schools in the state. Regardless of the governance structures, educators seeking to develop policy need to consider the implications of writing mathematically within their context to account for the ways in which teachers interpret and implement such guidance. Minimally, policies should account for the age of the students being taught and the teachers’ responsibilities for teaching subjects in addition to mathematics where disciplinary-specific writing is also required.

This chapter represents longstanding efforts, beginning in 2014, by the South Australian Department for Education to support the teaching of writing in mathematics classrooms across Years 1 to 10, which are students ranging approximately in ages 5 to 15. To date, four sets of maps have been produced that detail the genres students are most frequently asked to produce. In this sense, genre refers to the goal-oriented social practices that have been developed to help achieve certain writing purposes (Martin & Rose, 2008) rather than a category of literature (e.g., romance, mystery). The mathematics genre maps have been developed to identify writing characteristics critical to the discipline of mathematics and how we envisioned students’ writing developing in complexity over the years of schooling. When these efforts began, there was limited literature defining what mathematical writing should entail and a lack of research on how students’ writing develops in complexity across grade levels. The department’s initial efforts only covered procedural writing and did not expand on the purpose of mathematical writing nor did it surface the link between oral language, writing, and mathematical thinking.

The latest version of the genre map, presented later in this chapter, represents a collaboration between Lauren, who oversees literacy policy for secondary schools in South Australia, and Tutita, a faculty member at the University of Connecticut, who was invited to present at the South Australian Department for Education’s online Literacy Summit in 2022. Tutita’s presentation emphasized the ways mathematical writing supports the development of students’ mathematical reasoning. Lauren and her colleagues

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