Chapter 15
Linking Practices and Standards to Strategies that Enhance Writing for Students With Disabilities

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ABSTRACT

Because mathematics and language are interconnected, often students are asked to "explain" their answers or "justify" their choices. It is critical that students are able to verbally express their thoughts, as this is considered an "authentic practice of the discipline." The Standards for Mathematical Practice require that all students be able to make sense of problems, and also communicate both in writing and orally; skills which the communication standard has promoted for over two decades. Moreover, in the case of SWDs, those who are dually identified often show more confidence when asked to write their logic, as opposed to speaking. This chapter, therefore, explores strategies that will assist and allow students to exhibit their acquired knowledge through their writing skills in mathematics and enable the building of their confidence when explaining their logic and reasoning – especially those with diverse learning needs.

INTRODUCTION

In a reflective editorial, Cai and his colleagues (2020) declare, "Maximizing *learning* for every student has long been and continues to be a critical and challenging goal for teachers and researchers" (p. 12). Today's mathematics classroom is riddled with guidelines and principles from various sources such as *Principles and Standards for School Mathematics* (NCTM, 2000), *Common Core State Standards*

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for Mathematics (NGACBP/CCSSO, 2010), and *Standards for Preparing Teachers of Mathematics* (AMTE, 2017). When we consider our students with disabilities (SWDs), we also incorporate and lean heavily upon the tenets of Universal Design for Learning (UDL; CAST, 2018) for methods of reducing academic barriers that diverse students face in inclusive classroom settings (Root et al., 2022). UDL "does not separate students with disabilities and assume that their fundamental needs and/or learning processes are different from those of students without disabilities. Instead, UDL is focused on learner variability…" (Lambert, 2020, p. 4), and thus, offers a support system not only to SWDs, but also multilingual learners (MLs).

According to UDL (CAST, 2018), there are three networks within the brain that function together and contribute most to learning. The recognition network comprises multiple means of representation that provide options for perception, language and symbols, and comprehension; while the strategic network allows for action, expression and communication, and executive function as means of action and expression. The process of writing – the focus of this chapter – combines these two networks, requiring both the knowledge of words and phrases that comprise language. This method of communication also involves the ability to connect and express terms in meaningful ways that are appropriate for a given context. In addition, because writing also "presents an opportunity for the student to go back and examine his or her mathematical thinking" (Bixby, 2018, p.144), this communicative mode embraces the third UDL network, affective, by providing an option for a student to self-monitor and regulate their progress as a mean of action (CAST, 2018).

Because mathematics and language are interconnected (Lim & Pugalee, 2004), often students are asked to "explain" their answers or "justify" their choices. This, of course, can be done symbolically and visually; however, it is critical that students also are able to verbally express their thoughts via oracy or literacy, as this is considered an "authentic practice of the discipline" (p.2). NCTM (2020) purports, "When students are challenged to think and reason about mathematics and to communicate the results of their thinking to others orally or in writing, they learn to be clear and convincing" (p.60). The Standards for Mathematical Practice require that all students be able to reason abstractly and quantitatively, construct viable arguments, attend to precision, and express regularity (NGACBP/CCSSO, 2010). All of these functions involve students' abilities to communicate both in writing and verbally, skills which the Communication Standard (NCTM, 2000) has promoted for over two decades.

In the case of SWDs, those who are dually identified – classified as both English language learners and students receiving special education services (Lei et al., 2020) – often show more confidence when asked to write their logic, as opposed to speaking. This can be due to students placing higher priority on the linguistic and interactive scaffolds and supports during instruction, rather than the mathematics itself. Lei and colleagues (2020) defined *linguistic scaffolds* as "effective and responsive support for students' language output performance, which requires teachers to use language that is comprehensible to students when providing them with new and more sophisticated knowledge" (p. 127) and *interactive scaffolds* as " a strategic back-and-forth between teachers and students or among students to facilitate comprehension of content and related language use." Thus, it is critical that emphasis be placed on writing in mathematics not just for general education students, but those with diverse needs. After all, "Students who have opportunities, encouragement, and support for speaking, writing, reading, and listening in mathematics classes reap dual benefits: they communicate to learn mathematics, and they learn to communicate mathematically (NCTM, 2000, p.60).