Integrating Literature in Mathematics: A Teaching Technique for Mathematics Teachers

The integration of content areas is not a new concept (Moyer, 2000). Integration is promoted by many teacher educators because of its benefits for learners of all ages and backgrounds (Burns, 2005; Douville, Pugalee, & Wallace, 2003; Pica, 2002). For example, bilingual students benefit from integration of content areas because of the natural repetition and contextualized scaffolding of key vocabulary and concepts (Mohr, 2004). Oftentimes, however, content areas (e.g., mathematics, science, social studies) are taught in isolation and not integrated. The high stakes-testing climate encourages attempts to parcel out knowledge into decontextualized bits and pieces, which can undermine critical thinking as well as cross-curricular connections (Bossé & Faulconer, 2008; Cobb, 2004; Czerniak, Weber, Sandmann, & Ahern, 1999).

Literacy in general, but reading in particular, is important across the content areas. Mathematics teachers who integrate literature into mathematics recognize that mathematical understanding involves reading and writing. Conversely, mathematical reasoning and problem solving can be found in authentic reading and writing materials (Moyer, 2000). The National Council for Teachers of Mathematics (NCTM, 2000) Principles and Standards for School Mathematics suggested that mathematics connections to other disciplines and real-life experiences within mathematics classrooms give students a greater command of mathematics and advised teachers to plan lessons that integrated mathematics with other subject areas and real-life content. For contemporary literacy educators, there has been a consistent and ardent appeal to integrate reading and writing across various content areas. For mathematics educators and professional organizations, the integration of reading and writing are promoted but are often presented simply as “tools for learning and understanding” mathematics (Draper & Siebert, 2004, p. 928). Undoubtedly, there is confusion regarding the goal of integrating literacy and mathematics instruction. Bossé and Faulconer (2008) summarized this uncertainty as reading and writing about mathematics versus reading and writing in mathematics. In their study, Draper and Siebert advocated partnerships between literacy and mathematics educators that promote “meaningful literacy instruction” in mathematics education. Ideally, these collaborations could promote not only the use of reading and writing to gain mathematical understanding but also using mathematics as a means by which to become more proficient in reading and writing, especially reading and writing that pertains to mathematics.

Project Creating Independence Through Student-Owned Strategies (CRISS), a successful educational reform in Montana (Santa, 1996), was an attempt for school districts to change their focus from rote memorization to deep learning of content area subjects, including mathematics for secondary students by developing mathematical concepts through the use of reading, writing, listening, and discussing mathematical concepts. Mink and Fraser (2005) adapted Project CRISS for the elementary school level and renamed it Project Science and Mathematics Integrated with Literacy Experiences (SMILE). Through the implementation of Project SMILE in fifth-grade mathematics classrooms studied, researchers were able to investigate the classroom environment and students’ attitudes toward reading, writing, and mathematics by providing teachers with five professional development sessions and by asking teachers to implement what they learned in these sessions in their own mathematics classrooms. They found that Project SMILE, just like Project CRISS, helped increase students’ interest and confidence in learning mathematics. In addition, they observed that the teachers became more secure with teaching mathematical content and began using children’s literature in their lessons.
Proficiency in the area of literacy is critical in the understanding of all content areas, including mathematics. In fact, lack of literacy proficiency with mathematics-related texts has been cited as a reason for poor performance in the area of mathematics (Mink & Fraser, 2005). Research indicated that in the area of mathematics, U.S. teachers were not proficient in integrating content areas, instead relying mostly on lecture, worksheets, and textbook problems to teach students mathematics (Hiebert et al., 2003; Wallace & Clark, 2005). This stands in direct opposition to mathematics reforms (NCTM, 2000) that promoted a more constructivist stance in the teaching and learning of mathematics and encouraged students to ask questions and investigate the world around them.

Draper (2002) referred to mathematics and literacy as “inseparable” in constructivist classroom settings. One way to promote reading and writing within the content area of mathematics is by creating print-rich environments, explicitly teaching text structure, and by addressing relevant vocabulary (Bossé & Faulconer, 2008). For middle-school and young children in particular, the vivid pictures found in some books can function as important concrete instructional materials in the learning and understanding of mathematics (Miller, 1998; Moyer, 2000). Rushton and Larkin (2001) stated that symbolic representations like letters and numbers were better learned if they could be linked or connected to vivid visual images such as pictures. Children’s books can be helpful not only in developing understandings about vocabulary and text structure but also in conceptualizing abstract mathematical concepts.

Despite the many benefits of cross-content integration, there exists a great “need for professional development that assist teachers in changing their conceptual perspectives to integration while also building pedagogical knowledge related to integration of science, mathematics, and literacy” (Douville et al., 2003, p. 388). There are numerous opportunities to expound upon and investigate mathematical knowledge and understanding through reading and writing. However, in many elementary and secondary schools, mathematics and literacy instruction is oftentimes separated into two distinct areas without much overlap. Similarly, many preservice teachers do not have opportunities to see content integration and are not specifically taught how to integrate curricular content during their teacher training programs. The challenge, then, is to prepare mathematics teachers to integrate mathematics and literacy in a way that not only promotes students’ understandings and appreciation of reading and writing but also deepens mathematical conceptualization.

References


