Making Connections: Mathematics and Literature

Sherry Matheson

When teachers begin their careers, they often do not stray far from the same path of instruction that they themselves followed as students. In the late 1950s, *mathematics* was not a curricular focus for primary students—*arithmetic* was. Computations completed quickly and correctly earned high praise and high marks for students. Teachers believed that in order to acquire high marks, successful students sat quietly at their own desks and practised addition and subtraction facts and memorized multiplication tables. If a student was not achieving at a satisfactory level, more practice was assigned.

For the first 25 years of my career, in my own primary classroom, I taught my students in the manner that I had been taught in the late 1950s. I was probably not alone—other teachers might also have continued to follow methodology from an earlier era.

When I focused on creating yearly plans of instruction in mathematics for my students, I considered the order of the concepts that I would teach. I ensured that, at the Grade 3 level, the students had opportunity to learn or perhaps actually memorize the basic addition and subtraction facts to 18 before they were introduced to double-digit addition and subtraction. Adding and subtracting without regrouping were to be successfully accomplished before regrouping was introduced. Other areas of mathematics instruction, such as measurement, geometry and graphing, were separate units of instruction that would be inserted into the final months of the school year, if time allowed. Problem solving, too, was a separate unit, taught in isolation just before the provincial achievement tests in June.

I had not considered that the problems that were presented should reach the students at the level at which they were currently constructing their own understanding of the mathematics being taught. I had not thought through the connection between the computation and the contemplation of the solution. I had not considered that the problems must scaffold from the students' prior knowledge and move into the next level of investigation or that they must represent what is important about mathematics and be part of real-world situations. Because the correct answer was the ultimate prize, I did not consider that successful mathematicians engage and delight in the opportunity to ponder, discuss and work strategically through solutions, often finding success because of the failures they experienced.

In the last five years, in an attempt to create a more child-centred and problem-based mathematics program in my own primary classroom, I began to attend professional development opportunities that brought the curriculum changes into focus and highlighted how the mathematical concepts to be taught were intertwined and should scaffold into new learning at higher grade levels. In the workshops, I discovered activities that could be incorporated into all my classes. When a presenter read aloud a children's story and demonstrated how the language of the story could introduce a rich problem into the mathematics being discussed with the students, I began to make connections myself. I recognized the power of story to clarify the language needed in the understanding of mathematics. The area of greatest comfort and strength throughout my teaching career had always been language learning. Through stories of any and every kind, long and short, imaginative, fanciful, endearing or bewitching, I could bring to life any concept that I was meant to teach. Perhaps I could use story in my mathematics classroom.

Using the children's story from the workshop in my own classroom, I marvelled at the students' conversations and attempts to collaboratively try to solve the problem posed. The air was electric with the students' excitement and engagement. The challenge that now faced me was not *whether* to change my teaching methodology to reflect a major shift in

understanding of how students best engage in mathematics learning. Instead, the challenge was *how* to engage the students in meaningful investigations and bring meaningful problems and rich mathematical language into the classroom.

The use of literature-based instruction in classrooms to support young children's literacy is relatively new, having been introduced into schools after a shift away from basal reading programs. The availability of high-quality literature; the whole-language movement, in which students are read to every day; the use of literature as the basis of reading instruction; and collaborative reading, writing and discussions about the learning have been identified as characteristics of literature-based instruction (Morrow and Gambrell 2001).

Moyer (2000) suggests that language and mathematics instruction for young children not be separated: "Both literature and mathematics help us to organize and give order to the world around us" (Moyer 2000, 248). Literature assists in the development of mathematical communication as students negotiate what they are learning through talking to each other, talking to their teacher and talking to themselves.

Literature in the mathematics classroom provides a meaningful context for students to explore number sense, problem solving and real-world applications of mathematical concepts and to make connections between mathematics and problems that might be experienced in their own lives (Whitin and Wilde 1992). The use of children's literature in a mathematics classroom gives students opportunities to demonstrate how mathematics is meaningful in the everyday things they do, whether it be purchasing a treat at a store or setting the table for extra guests at dinner. The power of literature-based instruction is that the story becomes a shared experience, a jumping-off place to start their conversation. The language of mathematics can be experienced and meaning attached to it more readily through the context of story.

Teachers of mathematics can employ a variety of strategies that are commonly used in literature-based instruction—for example, using large-format books to point out features to the entire class, using shared reading to show how to read a text and understand its features and vocabulary, or using guided reading to give small-group differentiated instruction on the use of a strategy are all strategies to bring children's literature to the forefront in mathematics learning. Elementary classrooms usually dedicate a portion of a wall or bulletin board to display a collection of words being learned. The words are organized, usually alphabetically, and are displayed in large letters so that students can easily read them. A separate area of the classroom could be dedicated to a math word wall; the words could be organized by mathematical concepts being studied. If words that have already been studied are visible, the students are reminded of the terms and more likely to use them in their discussions and writing.

Many teachers, especially in elementary school classrooms, have a strong literature-based background for teaching the language arts curriculum. Using reading and comprehension strategies when teaching mathematics will focus the learning on the comprehension and fluency of mathematics:

- In *reading,* teachers often ask students to make predictions about what might come next; in *math,* they can ask students to make estimates before solving a problem.
- In *reading*, writing and oral communication are important aspects of instruction; in *math*, having students write down and discuss their ideas can help them develop, cement and extend their understanding.
- In *reading*, teachers do not expect children's writing to be identical, even when writing about the same topic; in *math*, teachers can encourage different methods for reasoning, solving problems and presenting solutions.
- In *reading*, vocabulary instruction is integral; in *math*, teachers can start a word chart for math terminology, consistently use correct math vocabulary and encourage children to do the same.
- In *reading*, read-aloud books provide students with common experiences from which they can learn; in *math*, many children's books provide stimulus for problem-solving. (Burns 2005, 2–3)

Knowing that my own area of comfort and strength throughout my teaching career has always been language learning, I feel empowered by the potential to use children's literature to bring literature-based instruction into mathematics. Students can come to recognize and understand mathematical terms through children's literature and the rich problem-based potential of story.

I recognize that, when looking for stories to use in mathematic instruction, I should consider the notion that "mathematical responses emerge naturally" (Shih and Giorgis 2004, 328). When I reflect on the story *Beezus and Ramona* (Cleary 1955), which I read aloud to my class this past school year, I realize that the story contains opportunities to bring mathematics alive through the problems that Ramona created in her everyday antics with her sister. In the chapter

"A Party at the Quimbys'," Ramona invites her entire playschool group to her house for a party, but she has not told her mother! The students arrive in the rain. How many boots would that have been? They ate applesauce and fig newtons for snack. How many fig newtons are in a carton and how many cartons would it have taken to feed the entire group? Mother was curling her hair when the children arrive. Only half her head was in pincurls. What would Mother's head have looked like? The children made a parade and blew whistles, tooted horns, banged drums and waved flags. How many of each would be needed? When Mother asks Ramona what she should do with her for being naughty, she answers that she should be locked in a closet for a million years. How old would she be when she was allowed to come out?

The illustrations in children's literature tell the story in the same manner as the words. I recognize that I could challenge students to tell their own story through the use of pictures to which mathematical language is added. This is an area where technology, which is one of the tools students use to learn and problem solve, could assist with visualization. If students are exploring the concepts of whole numbers to 10, they can use a digital camera to capture images that correspond to the number; the images could include words, numerals or groups of objects. The story created with the use of images and the language of mathematics could be shared with the class on a Smart Board or with parents by e-mail.

Journal entries, written explanations and poetry are potential avenues for exploring the relationships of different mathematical concepts through writing. Using Brown's (1949) *The Important Book* as a model, students could share their own understandings of a mathematical concept using the language of mathematics. For example, in a lesson on money, the first line written would emphasize the most important aspect of money. The following lines would share other aspects of the concept and the final line would reiterate the most important aspect as defined by the student. Writing in the mathematics classroom creates the potential for assessing concepts in both language arts and mathematics.

At the beginning of the 20th century, John Dewey stated, "If we teach as we taught yesterday, we rob our children of tomorrow."[1] The words ring true today, at the beginning of the 21st century. I realize that the use of children's literature in the mathematics classroom does not eliminate the need for specific mathematics instruction, but there is a place for the use of children's literature in the mathematics classroom. The two methodologies can be balanced in the mathematics classroom in the same way that whole-language and phonics-based instruction now coexist in the balanced literacy approach to language learning instruction. I can use the knowledge I possess in language arts to serve the needs of students learning mathematics.

Note

1 Quoted at http://powpak.lakeview.k12.oh.us/powpak/data/tech/files/techquotes.pdf (accessed January 10, 2012).

References

Brown, M W. 1949. *The Important Book.* New York: Harper.

Burns, M. 2005. "Building a Teaching Bridge from Reading to Math." *Leadership Compass* 3, no 2: 1–3. Available at www.mathsolutions.com/documents/2006_Building_Bridge.pdf (accessed January 10, 2012).

Cleary, B. 1955. *Beezus and Ramona.* New York: Harper.

Morrow, L, and L Gambrell. 2001. "Literature-Based Instruction in the Early Years." In *Handbook of Early Literacy Research*, ed S Neuman and D K Dickson, 348–60. New York: Guilford.

Moyer, P S. 2000. "Communicating Mathematically: Children's Literature as a Natural Connection." *Reading Teacher* 54, no 3: 246–55. Available at www.jstor.org/pss/20204901 (accessed January 10, 2012).

Shih, J C, and C Giorgis. 2004. "Building the Mathematics and Literature Connection Through Children's Responses." *Teaching Children Mathematics* 10, no 6: 328–33.

Whitin, D J, and S Wilde. 1992. *Read Any Good Math Lately? Children's Books for Mathematical Learning, K–6.* Portsmouth, NH: Heinemann.

Sherry Matheson is a Grade 2/3 teacher at Jean Vanier Catholic School in Sherwood Park, Alberta. She has recently completed a master of education in elementary mathematics education at the University of Alberta.