Using Storytelling
to teach mathematics concepts

MARY BARR GORAL and **CINDY MEYERS GNADINGER** share their experiences in using storytelling as a powerful catalyst for young children's mathematical learning.

Young students often struggle with abstract concepts in mathematics, causing primary teachers to continue to search for ways to help teach such concepts. *Principles and Standards for School Mathematics* (NCTM, 2000) recommends using concrete models and physical materials before moving on to more abstract ideas. However, some children still have difficulties understanding concepts even with the help of manipulatives. How can teachers supplement the use of manipulatives to help boost children's understanding in mathematics? Zemelman, Daniels, and Hyde (1998) recommend that students discuss, write, read, and listen to mathematical ideas in order to deepen their understanding of difficult concepts. Using storytelling as a catalyst to mathematics instruction is one enjoyable and versatile method to do just this.

Storytelling appeals to children's imaginations and emotions and helps make learning more meaningful. When children listen to stories, they create mental images that belong to them, connecting the content to something personally significant. According to Steiner (1997), young children are in the age of imagination, and because of this, our teaching must be delivered to them through images. Other writers and educational researchers also refer to image making as a powerful tool in children's learning. Miller (2002) writes about how proficient readers construct meaning. One of the most important strategies that these readers use is the creating of visual images. Kurtz and Ketcham (1994)

Queen Arithma's Party

by Mary Goral

Once upon a time a long, long time ago in the land of Htam, lived a queen. Her name was Queen Arithma. Queen Arithma was a good leader. Her loyal subjects loved her and knew her well. In fact, there were three things about Queen Arithma that everyone knew. The first thing was that she loved mathematics and was an excellent problem solver. Second, she loved parties — the bigger the better. And finally, she hated winter. The ice, snow and blowing winds made her sad and depressed.

Upon awakening one cold and dreary winter's day, the queen knew she needed to do something to lift her spirits. She thought and thought and finally came up with a brilliant idea. She would have a party! This would not just be any party. Queen Arithma decided that this party would be a costume ball and that she would invite everyone she knew. She wanted this to be the biggest party she had ever given.

Early the next morning, the queen called her assistants to her study. There she told them about the party. The first task was to make a list of everyone the queen knew. The assistants wrote and wrote and finally by the end of the day, they had finished the list. This list was so long it trailed off the big writing desk and went all the way to the door.

The next morning the queen's assistants arrived in the study. Their task for the day was to begin making invitations. This was hard work, because all the invitations were made by hand. The assistants worked all day. By the end of the day they had finished making invitations for only half the list. On the third day, the assistants arrived early in the queen's study to finish the work. Again, they wrote and wrote. By the end of the day they had finished all of the invitations and the queen congratulated them on a job well done.

The following morning the queen began to count the invitations. They were heaped on her study table, but she knew she must begin, because her trusted friend Gwendolyn was to arrive at noon to collect the invitations and deliver them. Queen Arithma began to count. She reached 52 when someone knocked on the door. After the queen had attended to the person at the door, she went back to counting, but unfortunately she forgot where she was and had to begin again. This time she counted to 77 when there was another interruption. The queen was beginning to get very frustrated. Again, Queen Arithma started counting from the beginning. This time she only reached 19 when she was interrupted again.

When the queen went to the door, she was surprised to see Gwendolyn standing there. Could it be 12:00 noon already? The queen immediately told her friend that she was not finished counting and asked if she had any ideas to help. Not surprisingly, Gwendolyn was flattered. Queen Arithma was known throughout the land for her love of mathematics and her ability to solve problems. Gwendolyn thought for a short time, and then asked the queen if she ever counted by 10s, because that is what she did when she had a large number of items to count.

Queen Arithma was delighted and asked Gwendolyn if they could begin counting by 10s at once. However, Gwendolyn said that before they began counting, they needed to bundle the invitations in some way. She asked if the queen had three different colours of ribbon in her study. The queen found red, blue and green ribbon tucked away in her desk. Gwendolyn suggested they tie the bundles of 10s with red ribbon, and when they got 10 bundles of 10, they would bundle those in blue ribbon. The remainder of the envelopes they would tie together in green ribbon, but they would need to indicate the number of individual ones left over by writing that number on a separate piece of paper.

At last they began to count. In no time at all, Gwendolyn and Queen Arithma had counted and bundled all of the invitations on the table. Counting by 10s and grouping the invitations together in bundles made the work so much easier! In the end, there were 5 bundles tied with blue ribbon, 7 bundles tied with red ribbon, and 4 invitations left over tied with a green ribbon. How many invitations did Queen Arithma have in all? (574)

believe "stories are the vehicle that moves metaphor and image into experience" (p. 17).

Many teachers currently read picture books to their students as a way to introduce a new concept in mathematics. Reading stories and storytelling are both valid ways to communicate stories to children. However, Raines and Isbell (1994) note that storytelling is more personal as the storyteller can match the story to the audience, use constant eye contact, and make adjustments and clarifications when necessary to enhance understanding, whereas when reading from a book, the reader is focused on the text and written word, and can only periodically make eye-contact with the listener.

This article describes how storytelling can be used to introduce difficult mathematics concepts to students in primary classrooms and includes a vignette from two researchers. Egan (1986) proposes restructuring the primary curriculum to include storytelling based on the premise that the mind organises best in story form. This story and others like it offers creative options to help our children understand mathematics better.

Mary and Cindy's story

Mary and Cindy, university researchers, shared the story of "Queen Arithma's Party" in a first-grade classroom. These first graders had worked on place value through their morning calendar routine. Prior to our visit

we spoke with the teacher about the children's knowledge of place value. She explained that the children had been introduced to ones and tens, but did not have much experience with the hundreds place and suggested that the majority of the students were still in the developing stage in their understanding of place value.

Upon our arrival, the first graders were invited to the carpet, a common place for story time. Mary sat in the rocker and explained to the children she wanted to tell them the story of Queen Arithma.

While Mary told the story the children appeared to listen intently as they maintained eye contact with her and sat very still. Several times through the telling of the story a student would ask a question. For example, one student raised her hand and asked what an invitation was. A few times children smiled and laughed in response to the story.

After the tale was told we asked the children to make personal connections (Keene & Zimmerman, 1997) to the story. One student shared with the class a time when she went to a party and discussed the fact that many people were invited. We then reviewed what Queen Arithma's problem was and how she
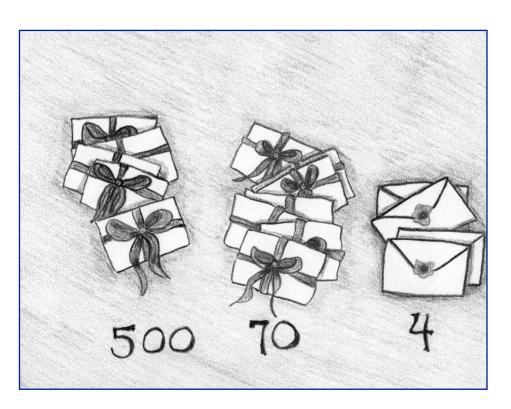

Queen Arithma (artwork by Anne Warren)

solved the dilemma. The students were asked to go back to their tables and were given directions for their sorting activity. Practicing the skill of sorting is important for young children. Reys, Lindquist, Lambdin, Smith, and Suydam (2004) state that "the most important purpose of this practice…is that it shows children how an unknown quantity can be organised into a form that can be interpreted by inspection" (p. 171).

Each table was asked to work as a team to sort a stack of "invitations" (envelopes) into ones, tens and hundreds and tie them with the appropriate coloured ribbon just as the characters in the story did. The class reviewed which colour ribbon was used for the ones, the tens and the hundreds in the story, and this reminder was written on the board. Each group was provided a basket containing approximately 100–125 envelopes and more than enough coloured ribbon to bundle the envelopes accordingly.

Students began working at their tables counting and sorting the invitations. One table divided up their tasks and had each group member individually count invitations. They encountered a problem when one person counted by tens, one person counted by ones, and another tried to count by hundreds. They soon

Queen Arithma's envelopes (artwork by Anne Warren).

realised that their original plan would not work. Mary asked the group, "Why do you think your plan isn't working?"

With a puzzled look, one child asked, "Is it because we're all counting at once?"

Mary then asked, "How did Queen Arithma and Gwendolyn count their invitations?"

After a pause, the child said, "Oh, they worked together and counted by tens."

With assistance from Mary, the group reorganised their plan and completed the task appropriately. Several other students raised their hands and asked questions. For example, Jared's group began counting out the bundles of tens, and tied the blue ribbon around ten bundles to represent a hundred. Afterward, they began counting the remainder of the envelopes and put them into bundles of tens.

At this point Jared looked up and asked, "I don't get it, what do we do with the ones?"

Cindy suggested that the group keep working and she stated to Jared and his group, "Keep going and you'll see what happens." She sat with the group and watched them count the remainder of the envelopes into tens.

Carley counted the last of the envelopes and said to her group, "Uh-oh, we only have seven."

The children all looked over at Cindy and then Jared shouted, "Oh! I know, those are the ones!"

Although the first graders did not have extensive experience with the hundred's place and were still in the beginning stages of their

understanding of place value, each group solved the problem of counting and bundling the invitations correctly. Using storytelling appeared to help children deepen their concept of place value by connecting it to an experience. Even though the experience was a fantasy story, the person in the story had a real problem that needed to be solved and using place value helped solve the problem. Furthermore, future problems involving place value can be connected to the story, thus giving everyone a common image/experience from which to work. According to the NCTM (2000) *Principles and Standards for School Mathematics'* Number and Operations Standard, instructional programs from pre-kindergarten through grade two should enable all students to use a variety of models to develop beginning understandings of place value and the base ten number system. Although storytelling is not considered to be a "model", it is considered as another pedagogical technique that can enhance the understanding of abstract mathematics concepts. Furthermore, NCTM (2000) states in their Communication Standard that, communicating, talking, listening, and writing about mathematics are essential components in learning mathematics.

Summary

Storytelling is a powerful tool that can bring rich, vibrant, meaningful and lasting images to children. Furthermore, stories have a unique and powerful way of connecting people. According to Kurtz and Ketcham (1994), "Of all the devices available to us, stories are the surest way of touching the human spirit" (p. 17). In storytelling, there is a coming together, a removal of boundaries so to speak, and a total concentration and absorption of the spoken word. Students need multiple methods to help them understand abstract mathematics concepts. Because communication is one of NCTM's (2000) key standards, it is important to practice the art of communication in a number of ways. Listening to a story, and participating in a problem solving activity related to the story helps reinforce this standard. Using stories is yet another pedagogical tool to help our students connect to the mathematics they need to learn.

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Editors' note:

An excellent compliment to this article is *Chapter 10: Story-shell frameworks* of the following Australian resource (now out of print): Lovitt, C. & Clarke, D. (1992). *The Mathematics Curriculum and Teaching Program (MCTP), Activity Bank 2.* Carlton: Curriculum Corporation.