Teaching by Genre

Embracing a Diversity of Practices in Mathematics

Neither back-to-basics nor reform-oriented practices are sufficient by themselves for successful learning in math. Incorporating both approaches presents richer options for student learning.

By Amy Parks

For some time now, the math wars have pitted back-to-basics educators against those promoting reform-oriented practices. Some mathematicians and educators have argued that children need to practice time-tested algorithms in classrooms that use worksheets and have teachers who provide positive feedback for right answers and corrective feedback for wrong ones. Others have argued that children need to engage in meaningful discussions about problems that encourage invented algorithms or multiple solution paths (O'Brien 2007).

One result of this debate is the emergence of two mutually exclusive images of ideal classroom practice.

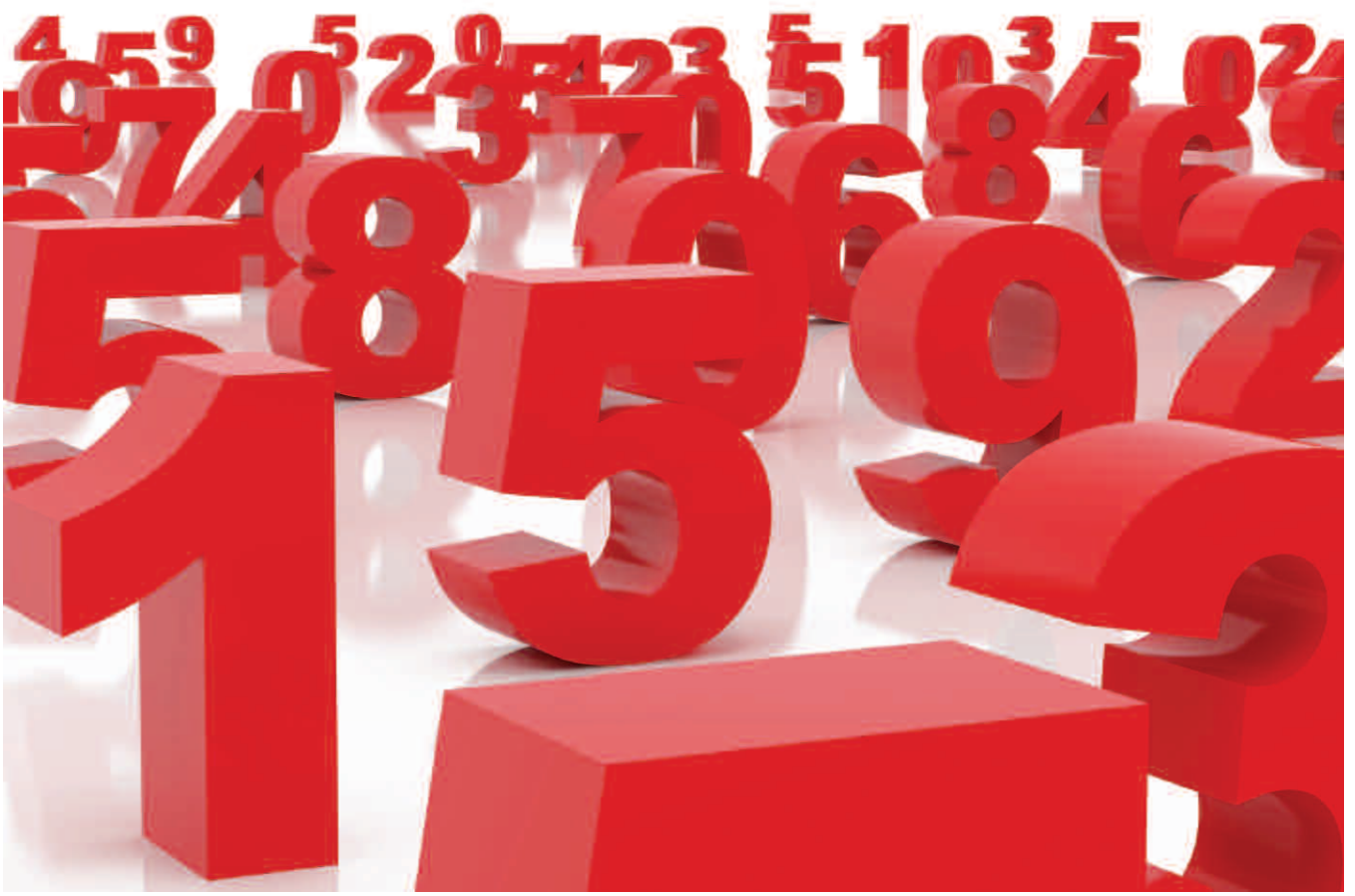

Image: JIunlimited.com/Pixland

In one, children sit in orderly rows, repeatedly computing the answers to similar problems until they achieve mastery. In the other, children engage in lively conversations over unusual bits of mathematics and concern themselves more with their own thinking and that of their classmates than with the production of right answers. In reality, most teachers' practices fall somewhere between these two extremes, including both episodes of shared problem solving and computational practice.

A classroom that offers students only discussions or only worksheets is shortchanging students who might be drawn to other genres and is presenting a narrow view of mathematics.

The mathematics education research community has tended to portray this diversity of practice as a problem to be corrected (Boaler 1998; Spillane 1999). However, including both reform-oriented and traditional teaching can be seen as a good thing – allowing more students to be successful and offering a broader image of mathematics in our world.

TEACHING GENRES

If we think of teaching strategies like genres of books, the need for variety becomes more apparent. You might love to read mysteries in bed before falling asleep, but if you want to impress your neighbors with your chocolate soufflé, you need to turn to another genre. Just as genres of books have different styles, different purposes, and different attractions for readers, so do genres of teaching (Bakhtin 1986). A classroom that offers students only discussions or only worksheets is shortchanging students who might be drawn to other genres and is presenting a narrow view of mathematics.

I saw the power of drawing on diverse genres of teaching during the year I spent observing Diana (a pseudonym), an experienced 3rd-grade teacher in an urban school. Diana, who has engaged in many professional development activities in mathematics, routinely draws from multiple genres in her classroom because she believes that these diverse experiences allow her children to engage with mathematics in multiple ways.

During the year I spent in her classroom, I saw students tackle problems in groups, explain their own invented algorithms, take timed tests on multiplication facts, answer fact-based questions in quick succession, chronicle multiple solution paths in their journals, work series of similar problems in the math books, and engage in mathematical debates.

Because Diana saw me as a representative of the university, she sometimes apologized when I visited during a more traditional activity, but I soon recognized that during these activities, different student voices dominated the classroom than those heard most frequently during more reform-oriented activities. As a result, I became interested in the different portrayals of mathematics in each of the genres present in Diana's classroom as well as the different opportunities available for student participation and success.

MATH GENRES

One of the most common genres in Diana's classroom was *Mathematical Discussions*. During these conversations, the object of discussion was generally a mathematical idea or process, rather than an answer. Diana frequently challenged students' answers by asking them to explain or by presenting counterexamples; and many students participated, sometimes talking to each other. Once, Diana pressed her children to think about whether the problem "25 + 27=" could be correctly solved by writing it as:

$$\begin{array}{r} 25 \\ 1 \\ +\ 27 \\ \hline \end{array}$$

rather than using the traditional algorithm, where the "1" is written on the top of the tens column. During this discussion, the following conversation occurred:

Diana: I'm going to call on someone, and it might not be someone with their hand up. It might be someone I'm curious about how they're thinking. Okay, Brian, I'm going to call on you. You have your hand up, but you have a puzzled look on your face. What do you think about this problem?

Brian: Um. . . you should switch them?

Diana: Why would you switch them?

Charlie: (calling out to Brian) It doesn't matter. It's just the same.

Diana: Brian, can you explain to Charlie what you're thinking?

Brian: You would add up that side first.

■ *AMY PARKS is an assistant professor of early childhood education in the Department of Elementary and Social Studies Education, University of Georgia, Athens, Georgia.*

Diana: Don't say side; use the place value name.

Brian: You would add up the ones first.

Diana: Do you want to show how you would do it?

Brian nodded and came to the front of the room. He rewrote the problem in the conventional way, writing a "1" at the top of the tens place and writing "52" as the answer.

Diana: Why did you do that?

Brian: Seven and five is 12. The "1" is the ten of the 12 (pointing to the "1" and "2" in the problem). You have to put it in the tens place.

Diana: Charlie, you said it didn't matter where the one is. What about what Brian is saying?

Charlie: The one is still a ten — even if it's in the middle. It's the same. It doesn't matter.

Many children shook their heads.

Diana: It looks like some of you disagree. What do you think about Brian and Charlie's ideas?

In this genre, which is influenced by the values of reform teaching, Diana called on a student who looked confused, asked children to respond to each other's thinking and to make their own reasoning apparent, and directed students' attention toward a piece of mathematics designed to promote opportunities for justification, rather than mastery of an efficient procedure. Diana didn't expect that students would face a problem similar to this one on the state's standardized test, nor did she want her students to adopt this new algorithm to replace the more traditional one. Her goal in this lesson was to encourage students to act like mathematicians by evaluating a novel problem and making public sense of it within a community of scholars. Repeatedly, she directed students to pay attention to and respond to each others' ideas and to make arguments that required mathematical reasoning.

In another lesson that occurred within two weeks of the one described above, Diana enacted another genre in her classroom, which made quite different demands on students and portrayed a very different image of mathematics. In the *Game Show* genre, students were expected to answer quickly and correctly. Students rarely spoke to each other, and the purpose of the discussion was often to allow students to demonstrate what they already knew, rather than to explore new ideas together. These features can be seen in the following episode, which occurred during a lesson on rounding.

Diana: What is 362 rounded?

Many children raised their hands.

Diana: Everybody?

Children: 400!

Diana: Who can tell us why it's 400 and not 300?

Eight children raised their hands, some leaning forward in their seats. Others, including Caitlin and Jerome, looked down at the ground.

Diana: Marcus?

Marcus: It's past 350, and 350 is in the middle of 300 and 400.

Diana: Very good. Everybody, what does 978 round off to? (About five seconds go by.) This is hard. Nine. Hundred. Seventy. Eight. (said slowly).

Two children raised their hands. Diana called on LaTonya.

LaTonya: 10,000 — wait (she looked at the ceiling).

Diana: I know you have the right answer. You just got confused.

LaTonya: 1,000.

Diana: Good. You got it!

In this conversation, as well as in other Game Show episodes, Diana enacted many of the values promoted by back-to-basics educators by highlighting students' abilities to get right answers through the use of a standard procedure. She didn't ask Marcus to talk about why his answer made sense but praised him when he reported the procedure he used to obtain the correct answer. Similarly, she didn't ask LaTonya if her answer of 10,000 made sense. Instead, she affirmed LaTonya's ability to produce a right answer and celebrated when she did this. In contrast to the Discussion genre, Diana took on the role of praising students who answered correctly and didn't invite children to comment on each others' thinking.

In the Game Show genre, children used mathematics as students. They quickly solved problems set for them, used procedures they had learned, and attempted to produce correct answers as determined by an expert. This concept of mathematics has been criticized by reform-oriented educators; however, the ability to use mathematics in this way may allow students to succeed at key moments in their academic careers, such as when they are required to take high-stakes, standardized tests. In addition, people like mathematician Hung-Hsi Wu (1999) have argued that repeated practice such as this allows students to uncover important mathematical relationships for themselves.

Group Work, a third genre Diana frequently used in her classroom, differed from both of the previous two in the demands it made on students and in the view of mathematics it portrayed. When students worked in groups in Diana's classroom, they typically tackled

a small number of challenging problems, and Diana expected her students to resolve both the mathematical challenges as well as the interpersonal ones within the group. In these episodes, students frequently worked with manipulatives, produced written products together, and negotiated the relationships of the group. While Diana was a strong presence in most of the classroom genres, during Group Work her voice was rarely heard. In the episode below, Diana asked Caitlin and Evan to work together on a problem that asked students to use tiles to find figures that had different perimeters, but areas of 16. Students were expected to work together to make the figures and record their drawings separately.

Before sitting down, Caitlin complained quietly about having to work with Evan primarily because he was a boy and her best friend was getting to work with a girl. She threw her books down on the table before sitting down and sweeping the tiles on the middle of the table toward her. She and Evan both took sheets of graph paper. Caitlin arranged the tiles into a three-by-five array with one extra tile in the last column. She turned toward Evan.

Caitlin: Can it be like that?

Evan: It can be like that, can't it? (leaning over the table to look at the tiles).

They both started drawing the shape on their paper. When she finished, Caitlin started to rearrange the blocks even though Evan wasn't done. Evan looked over at Caitlin's drawing, but she had drawn hers vertically and Evan had drawn his horizontally. He continued to draw on his own as Caitlin worked on rearranging the tiles. Caitlin then colored her shape in, while Evan wrote the date on his paper. Then she looked at his drawing.

Caitlin: Don't do that! We're supposed to do it the same way!

Evan ignored her and continued to draw.

Caitlin: You did it wrong! (She pointed to his picture, where he had drawn two rows of five instead of three rows of five.) You missed some.

Evan: I don't get it. My head hurts (putting his head in his hands).

Caitlin: Fine. We were supposed to work together, but I guess that's not going to happen. Fine!

Caitlin rearranged the blocks into a four-by-four square. She started to draw the shape and then looked

Photo: JIunlimited.com/Stockxpert Images

back at Evan's paper.

Caitlin: You did that wrong! I hope you know that. There's supposed to be another one down there. (She pointed, but Evan ignored her.) Okay, you just do what you do.

Caitlin began drawing on her own paper. Evan looked at her work for a moment and then wrote, "A=16" by his first drawing, even though the drawing showed an area of 11. He looked at his drawing for a moment and then counted the tiles. When he got 11, he added another row to his drawing and then counted the perimeter. He wrote "P=18." Caitlin looked at his paper and then counted the perimeter and area on her first drawing. She wrote, "A=16" and "P=18." She started to count the second one, writing "A=16" and "P=17" for the four-by-four square. She looked at Evan's paper.

Caitlin: What did you get for the second one?

Evan: I got 16. The perimeter is 16.

Caitlin: Okay. I'll count again. (She did.) You do get 16 (surprised).

Evan: So I was right.

Caitlin: Yeah (smiling). Let's see if we can do three and then the ones for extra credit.

In Group Work, students used mathematics more like office workers than either students or mathematicians. Students seemed focused on completing the task at hand more than on the exploration of mathematical ideas. Early on, Caitlin snapped at Evan because he wasn't doing his work correctly and because he declined to respond to her attempts at correction. As a result, she treated him like a delinquent colleague who wasn't pulling his weight. In a genre that valued individual work, it would have been very unusual for Caitlin to show any concern about the quality of Evan's work, but because this was a group activity, she accepted some responsibility for his performance. When Evan re-engaged in the task and helped Caitlin correct her mistake, she smiled at him and encouraged him to join her in doing "extra credit," that is, getting more work done.

The mathematics in Group Work episodes was often entangled with the negotiation of personal relationships. When Caitlin pointed out Evan's mistake, she not only referred to the spatial relationships — his drawing did not match the tiles — but also used an angry tone intended to spur him into action. Mathematics in this genre was often used as a tool that aided students in completing the task at hand. Conversations about interesting ideas raised while working on the problem generally did not happen until Diana called the class to a whole-group discussion, whereupon the genre changed.

POSSIBLE GENRES

One way of looking at the teaching in Diana's classroom would be to hold up the genre of Discussions as an ideal where students engage in mathematics like mathematicians. From this perspective, other genres could be examined to find the reasons they fell short of embodying these values or suggestions could be offered to get them closer to the ideal. However, from my perspective, this diversity of genres — including many more than those described here — is a great strength of Diana's teaching. (See Figure 1 for a list of genres I found in Diana's classroom).

A classroom that has many genres is more likely to provide all students with the opportunity to feel successful in mathematics at some point during the week.

Each of these genres allowed different students to feel confident and successful in the mathematics classroom. Marcus, who capably answered Diana's question about rounding, tended to misinterpret her questions during Discussions and often spoke with uncertainty during this genre. Brian, who enjoyed Discussions and was often a dominant voice during these conversations, was less likely to participate in Game Shows because it took him slightly longer than many of his classmates to compute the solution to problems. Meanwhile, Caitlin rarely spoke in any kind of whole-class setting and often tried to deflect attention from herself during Game Shows (as she did in the episode above) by looking at the ground. However, Caitlin was not a passive mathematics student, as demonstrated in the Group Work episode. The opportunity to have conversations in small groups allowed her to experience what it felt like to be a leader when working in mathematics. This doesn't mean students should not experience and get better at genres that aren't their strengths; but, a classroom that has many genres is more likely to provide all students with the opportunity to feel successful in mathematics at some point during the week.

Also, a diversity of genres presents a broader and more realistic picture of how mathematics is used in the

FIG. 1

Genres of Teaching In Diana's Classroom

1. Mathematical discussions
2. Game shows
3. Group work
4. Individual student math book work
5. Cross-examination
6. Presenting work publicly
7. Individual student-teacher conversation
8. Games
9. Journal writing
10. Tests/quizzes

world. Mathematicians aren't the only ones who use math. Carpenters, biologists, accountants, teachers, grocery clerks, and students sitting for the SAT all use mathematics, but not the same mathematics. Most accountants are not particularly concerned with explaining why equations work, but with accomplishing the tasks that allow them to tell their clients the taxes they will owe. Similarly, shoppers may use a lot of mental mathematics, but they may not carry their calculations out to a stage that mathematicians would consider complete (Lave 1988). Students who have the opportunity to recognize that mathematics can encompass all of these ways of thinking and acting may be less likely to make blanket statements about "not being good at math." The language of genres could allow teachers to ask, "What kind of math do you mean?"

Finally, the concept of genre could support conversations between mathematics educators and teachers about genres we would like to see introduced into the classroom. For instance, few public school classrooms draw on genres that present mathematics as an aesthetic pursuit (Sinclair 2006). However, a genre that encourages students to interpret or critique the elegance of a solution might welcome more students into the discipline. Similarly, genres that take seriously the idea of mathematics as a real-world activity might have a positive effect on some students. These genres would have to be different from the typical word problem set in everyday contexts. Few people figure out how many oranges are in their fruit basket by counting up all of the pieces of fruit and then subtracting the apples and bananas. Instead, these genres would have to allow students to engage in activities that naturally require mathematical thinking — such as sewing and carpentry — without attempting to turn these activities into school mathematics.

Adopting a language of genre to talk about teaching practice might also make possible more productive conversations between mathematics educators and other teachers because practices that are already part of instruction would be more respected. Rather than arguing that all timed tests and practice pages must go, math educators could acknowledge the role these activities play in producing successful students. They could ask teachers to diversify their practices to provide a more complete picture of math's role in the world and to offer more students opportunities for success. This move toward genre acknowledges that there is no one best practice. Given the many ways math is used, and the many different people who use it, no unitary vision of classroom practice — whether traditional or reform-oriented — can hold it all. ◼

REFERENCES

Bakhtin, Mikhail. "The Problem of Speech Genres." In *Speech Genres and Other Late Essays*, ed. Caryl Emerson and Michael Holquist, 60-102. Austin: University of Texas Press, 1986.

Boaler, Jo. "Open and Closed Mathematics: Student Experiences and Understandings." *Journal for Research in Mathematics Education* 29, no. 1 (1998): 41-62.

Lave, Jean. *Cognition in Practice*. Cambridge, U.K.: Cambridge University Press, 1988.

O'Brien, Thomas C. "The Old and the New." *Phi Delta Kappan* 88 (May 2007): 664-668.

Sinclair, Nathalie, and William Higginson. *Mathematics and Beauty*. New York: Teachers College Press, 2006.

Spillane, James P. "External Reform Initiatives and Teachers' Efforts to Reconstruct Their Practice: The Mediating Role of Teachers' Zones of Enactment." *Journal of Curriculum Studies* 31, no. 2 (1999): 143-175.

Wu, Hung-Hsi. "Basic Skills Versus Conceptual Understanding: A Bogus Dichotomy." *American Educator* 23, no. 3 (1999): 1-7.