

Houghton Mifflin

# Math Expressions

## Student Leaders and Quick Practice in *Math Expressions*



**Dr. Karen Fuson**

Program Author of *Math Expressions* and Professor Emerita, Learning Sciences, School of Education and Social Policy, Northwestern University

**T**his is the third article describing the classroom structures found in the **Math Expressions** program. These structures are Building Concepts, Math Talk, Student Leaders, Quick Practice, and Helping Community. Though we discuss the five structures in four separate author papers, they interact synergistically in the classroom. The Children's Math Worlds Research Project (CMW) that developed the curriculum now called **Math Expressions** found that using these structures in the classroom enables children from all backgrounds to learn ambitious levels of mathematics with understanding, fluency, and confidence.

### FOSTERING INTERDEPENDENCE AND INDEPENDENCE

In developing the CMW Kindergarten through Grade 5 program, I drew on my research and teaching background in mathematics education, child development, and cognitive psychology. The cross-cultural child development research literature describes how families in some cultures (e.g., higher

socio-economic Anglo families in the United States) primarily socialize their children to be independent and others (e.g., Japanese families in Japan and Latino families in many areas) primarily socialize their children to be interdependent. However, business leaders in the United States emphasize that both kinds of skills are needed by the 21st century worker. Therefore, it is important to help foster both kinds of social-cognitive skills in students and especially to help balance those who might have a lot of experience and skill in one area and little in the other. This is particularly important because we have found both kinds of students in our classrooms.

In the Helping Community aspect of **Math Expressions**, students have many opportunities to use their interdependent skills and to develop them more fully. During problem solving, two or three students may walk around to help those who need help. Explicit helping partners may be used at any time, sometimes over several days until an important topic can be done independently. Math Talk and explaining by the helper and the helpee are important during all such helping.



HOUGHTON MIFFLIN

Teachers, of course, need to help students become better helpers. Teachers can lead discussions of what good helping is and is not. They can also, at certain points, summarize good helping in classroom charts. Many helpers, while still learning their role, may initially solve a problem for the helpee; solve a problem using their own method rather than trying to help the helpee with the method that the helpee is trying to use; or dictate steps without explaining the process (*I tell him and tell him and tell him, but he doesn't stay told!* wailed one beginning first-grade helper). This is where Math Talk plays an important role. Talking about feelings



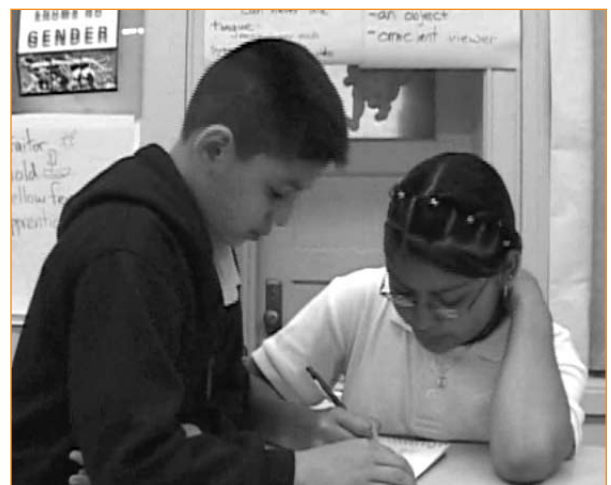
of frustration by the helper and the helpee and ways to communicate feelings can support more effective helping. However, we have also found that in every classroom, even Kindergarten classrooms, there are excellent natural helpers who need little support to give sensitive and adapted help. And in every classroom, all students can learn to be better helpers. Helpees can facilitate this process by identifying what they do not understand and thus become helpers themselves. This is very good for their confidence in the classroom.

In the Class Learning Path Model that describes how **Math Expressions** enables teachers to individualize

instruction within whole-class activities (see Fuson & Murata, in press), we identify seven Responsive Means of Assistance that were used in classrooms in the CMW Research Project and that facilitated learning and teaching by all. These were engaging and involving, managing, and five kinds of coaching: modeling, cognitive structuring and clarifying, instructing/ explaining, questioning, or giving feedback. Students and teachers do all seven kinds of assistance. Practicing these structures helps them to become better at them.

### STUDENT LEADERS AND QUICK PRACTICE

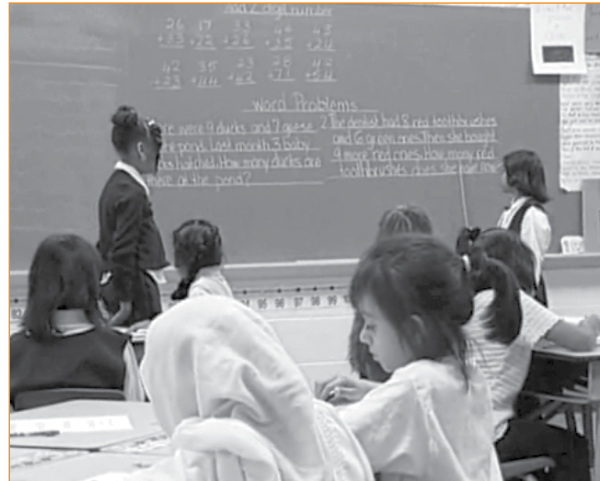
Early in the project several of our teachers had students lead parts of lessons, even in first-grade classrooms. This experience of independently leading the classroom potentially seemed to be very powerful. However, these teaching situations demanded considerable knowledge by the student and might prove difficult for some. So I looked for a structure in which all students would be able to lead the class. Simultaneously we had been developing short practice routines with which teachers could begin class. These routines focused on vitally important skills/concepts that could be practiced in a whole-class activity with immediate feedback. In the early grades these were sometimes engaging rhymes that could be led by a student. For example, a Student Leader writes several decade numbers on the board.



# Math Expressions

The Student Leader says, *40 tigers in a line*, and the class responds, *With one less, there's 39*. We developed what we came to call Quick Practice activities that could be led by Student Leaders at every grade level including Kindergarten. For some, students needed to make up the problems (which was a good test of understanding), and for others students used special Quick Practice sheets (e.g., leading division practice in Grade 4). Some Quick Practice activities required that the Student Leader use a hand signal for responding in order to keep faster students from saying the answer before other students had found it.

Quick Practice activities sometimes were individual or partner practice using the CMW special practice sheets with answers and the conceptual flashcards. These flashcards have visual supports to help in checking or understanding an answer. Occasionally the Quick Practice time was used for a sprint. A sprint is a quick check of what is being practiced, such as multiplications and divisions of fours or one multi-digit addition problem with and one without regrouping. Teachers reported that the Quick Practice time provides an engaging start for math class and helps to build a Helping Community as well as eventually enables all students to act as Student Leaders. When students were doing Quick Practices they already knew, some



teachers used this time to walk around and see the homework students had put out on their desks. This made it obvious when a student had not done homework. Also, a couple of key problems could be checked to assess where the class was before the lesson started. The Quick Practice topics sometimes built prerequisites needed in future lessons (e.g., meaningful counting to 100 by 10s and by ones) and sometimes brought to mastery topics that had already been discussed in class (e.g., practicing subtraction with totals in the teens by counting on to find the addend or by making a 10).

We found that teachers were sometimes reluctant to have Student Leaders lead the Quick Practice activities. It was much easier and faster to lead these themselves. But when teachers did assign Student Leaders, they became very excited at what students could do and asked, *Why didn't I try this earlier? It is so powerful!* I still receive e-mails from teachers using **Math Expressions** who are so excited at what their students can accomplish. One teacher reported how wonderful it was when a student with speech difficulties led the Quick Practice with his speech therapy teacher watching, in amazement and pride, from the back of the room. Another e-mail, from a first-year teacher in an extremely difficult inner-city school, reported that



the chance to be a Student Leader was the only reward powerful enough to enable some of her students to control their behavior.

Most teachers start student leading with volunteers, sometimes having two students lead a Quick Practice together. Gradually, as students become more familiar with the structure, more students volunteer, and finally the shyest student will ask to be a Student Leader. This process may take four to six weeks before all students are able to lead Quick Practice. For new Quick Practices, the teacher may model or co-lead while the class learns the new Quick Practice. Occasional short discussions about how to improve Quick Practices can be helpful in improving student leading.

### **EXTENDING INTERDEPENDENCE AND INDEPENDENCE**

Teachers report that students spontaneously extend the independence of student leading and the interdependent helping behaviors into other subject areas. Many teachers also modify their management of materials and of student movements to allow significantly more involvement and responsibility by students (e.g., a Student Leader may call tables or groups for lining up while another leads those in line in a Quick Practice). Students respond to such initiatives and often have good ideas about improving these aspects of classroom life. Both Student Leader roles and the Math Talk described in the second author paper help students improve their independent and interdependent competencies. The result is a **Math Expressions** classroom in which open communication and strong support allow each student to play a vital role in classroom activities, improving confidence and validating their struggles and achievements.

### **REFERENCES**

- Fuson, K. C., De La Cruz, Y., Smith, S., Lo Cicero, A., Hudson, K., Ron, P., & Steeby, R. Blending the Best of the 20th Century to Achieve a Mathematics Equity Pedagogy in the 21st Century. In M. J. Burke & F. R. Curcio (Eds.), *Learning Mathematics for a New Century*. Reston, VA: National Council of Teachers of Mathematics, 2000, pp. 197–212.
- Fuson, K. C., & Murata, A. (in press). Integrating NRC principles and the NCTM Process Standards to form a Class Learning Path Model that individualizes within whole-class activities. *NCSM Journal of Mathematics Education Leadership*.
- Greenfield, P. M. (1994). Independence and interdependence as developmental scripts: Implications for theory, research, and practice. In P. M. Greenfield & R. R. Cocking (Eds.), *Cross-cultural Roots of Minority Child Development* (pp. 1–37). Hillsdale, NJ: Lawrence Erlbaum.
- Rogoff, B., Mistry, J., Goncu, A., & Mosier, C. (1993). Guided participation in cultural activity by toddlers and caregivers. *Monographs Society for Research in Child Development*, 58 (7): Ser. No. 236.
- Rothbaum, F., Pott, M., Azuma, H., Miyake, K., & Weisz, J. (2000). The development of close relationships in Japan and the United States: Paths of symbiotic harmony and generative tension. *Child Development*, 71 (5), 1121–1142.

