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## Using Learning Logs in Mathematics: Writing to Learn

The practice of writing across the curriculum has become widely accepted in the nation's elementary schools, middle schools, and high schools. In almost every school, students use their writing skills in language arts, science, and social studies classes. However, although the NCTM has encouraged communication in mathematics since before *Curriculum and Evaluation Standards for School Mathematics* was published in 1989, an observer is less likely to see students writing in mathematics class (Quinn and Wilson 1997).

*Principles and Standards for School Mathematics* (NCTM 2000, p. 60) prescribes the following:

Instructional programs from prekindergarten through grade 12 should enable all students to—

- organize and consolidate their mathematical thinking through communication;
- communicate their mathematical thinking coherently and clearly to peers, teachers, and others;
- analyze and evaluate the mathematical thinking and strategies of others;
- use the language of mathematics to express mathematical ideas precisely.

This standard is the basis for the concept of using learning logs, as described in this article. The purpose of writing in learning logs is to have students reflect on what they are learning and learn while they are reflecting on what they are learning. Our learning logs give students various types of writing tasks to complete as they do so.

The term *learning log* fits our philosophy of how writing across the curriculum is used in the mathematics classroom (McIntosh and Draper 1997). The first word, *learning*, states the purpose of the writing. The second word connotes a particular format, that is, a *log*, or a running commentary. A learning log is not meant to be a polished piece of writing that is rewritten through many drafts. To us, the term *learning log* fits well with our belief that writing in mathematics gives learners an opportunity to communicate their ideas and to clarify, refine, and consolidate their thinking (McIntosh and Draper 1997). Responding to specific prompts in learning logs encourages students to address the teacher's

concerns. When mathematics teachers use learning logs, they can be confident that they are not taking time away from content instruction, because students are using the time to write about mathematical concepts, algorithms, and problem solving.

A recent study of mathematics teachers' beliefs about, and practices involving, writing in the classroom found that although most teachers surveyed agree that writing is an important component of teaching mathematics, not all teachers used writing activities consistently. "Two aspects of time were cited by teachers as a reason for not using writing activities: teacher time and class time" (Quinn and Wilson 1997, p. 19). The writing ideas presented in this article address both these concerns; learning logs take neither a great deal of teacher time nor much class time, but they have tremendous value for teachers and students.

### EFFECTIVELY USING LEARNING LOGS

We have used learning logs in our classrooms for years. We offer the following tips to help make learning logs an integral part of instruction.

- Students should use learning logs frequently. Using them every day is not necessary, but they should be used several times a week. Using learning logs frequently keeps students in the habit of thinking about mathematics and communicating mathematically.
- As with anything new, the teacher should anticipate mild resistance at first. Unless students have had experience with classes in which writing was an integral part of the mathematics cur-

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riculum, they are likely to inform the teacher, “This class is math—not language arts.” Our experience indicates that as soon as students see that the writing is about mathematics and that we respond to the writing as mathematics teachers, they are willing to comply with our requests that they complete their learning logs.

- The teacher should write with the students. When students are reflecting on their learning or on how to do something, the teacher should reflect with them. For example, if the learning-log prompt says, “I see myself using mathematics in the future,” teachers and students can both respond to the prompt. If the prompt asks the writer to explain how he or she solved one of the problems in the homework, then we can write about our processes when the students are writing. Doing so sends a powerful message that we value the process enough to take part in it, too.
- The teacher should not accept partial, ill-conceived, no-effort answers. Just as the teacher does not accept poor work in other areas of mathematics, he or she should not accept poor work in the learning logs. We do not believe in grading learning logs per se, but we do believe that a teacher who gives participation points, daily grade points, and so on, for other classwork and homework should award such points for learning logs. A teacher who does not award points for daily activities does not need to do so with learning logs but should inform students that their participation is expected, just as it is expected with other learning experiences offered to them.
- Learning logs do not have to take much class time or much grading time. We often collect the learning logs when students are leaving our classroom, and we can read them quickly to get an idea about how the day’s lesson went. In the time that students need to file out the door, we can read the learning-log responses to get a sense of the learning and thinking that occurred in class. Other times, we collect them and read them at the end of the day. Usually, a set of learning logs takes about five to ten minutes to read—or ten to fifteen minutes to read and make responses, depending on the class size and on the depth of students’ responses. Another alternative is to have students simply place their learning logs in the writing section of their notebooks. When notebooks are collected, the teacher can look over the learning logs while reviewing other components of the notebooks. The time needed to read and respond to the learning logs then becomes part of the time that the teacher sets aside for grading notebooks.

- Students need to know that their learning logs are being read. Responding to what they have written either orally or in writing lets students know that the teacher cares about what they think. Teachers should make sure that they respond positively, making such comments as, “Good thinking,” “I like how you explained this point here,” and “I appreciate the thoroughness with which you explained your thought process.” Students are more likely to accept positive rather than negative feedback, and they obtain one more positive connection with mathematics. We have found that students are willing to write more when we respond to what they have written.

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### EXAMPLES OF LEARNING LOGS

To give a few examples of the range and types of responses that can be expected from a learning-log prompt, we have included a few of them. **Figure 1** is an example of a learning log in which students were asked to connect new knowledge with previous knowledge. Teachers can use information from students’ learning logs to reinforce the connectedness of mathematics and the need for students to remember and use information from one unit to the next and from one year to the next.

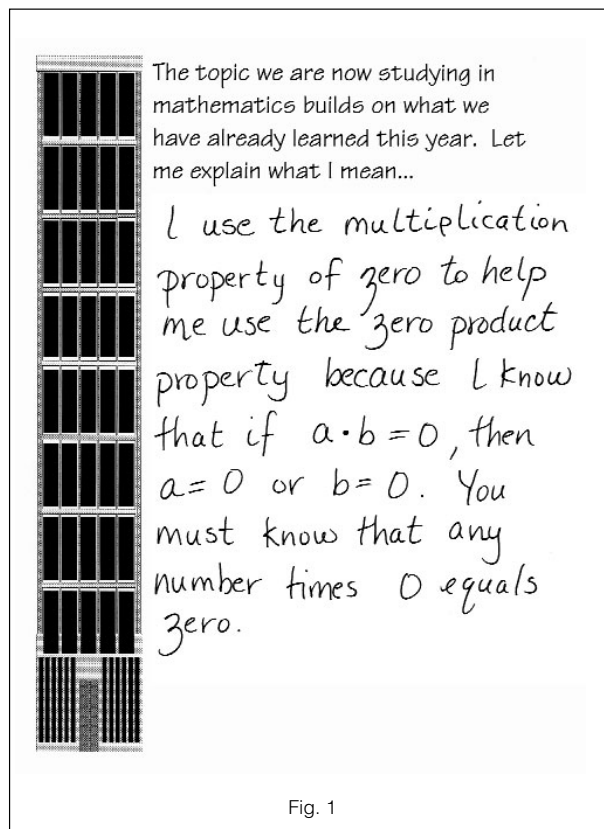


Fig. 1