Journals

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We at TIMS embrace the idea of writing across the curriculum. We see helping students to write better as part of every teacher's job.

By writing in mathematics and science class, students improve their communication skills and develop their subject-matter understanding. Writing about mathematics and science helps students consolidate ideas, see connections between school and life, and think more abstractly.

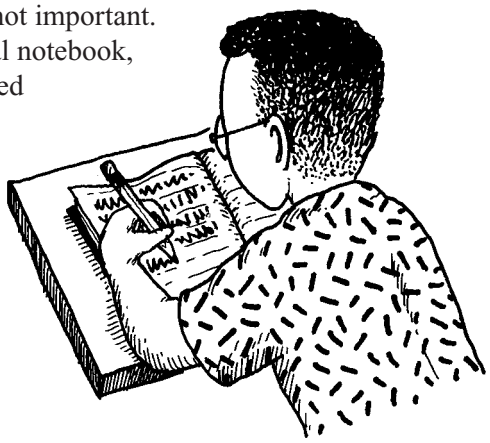
Another reason to have students write about mathematics and science lessons is so that you can gain insight into how those lessons are being received and what the students are learning. Collecting and saving students' writing is also an excellent way to document long-term student progress.

We have tried several ways to incorporate writing into *Math Trailblazers.* We often ask for students to write a short or extended answer to a question and we may also ask students to explain how they obtained their solutions. Students may be asked to write about problems they have solved in cooperative groups.

Journals can be another effective way to use writing in mathematics and science. Typically, a journal is a small, bound book in which students write regularly. The writing can be in response to various prompts, or it can be rather undirected. Because each student can respond at his or her own level and rate, journal writing is accessible to all students.

The teacher reads students' journals regularly, possibly responding in writing to what the students have written. Usually journal writing is not corrected for grammar, spelling, and punctuation—the focus is on the content of the writing rather than on the form.

The physical form of the journal is not important. A cloth-covered bound book, a spiral notebook, or even several sheets of paper stapled together will work just fine.



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Journal Prompts

We urge you to have your students write regularly, every day or at least every week. Start with short periods and gradually extend the amount of time. When a student fills up one journal, give him or her another. Students will also enjoy reading their writing aloud and discussing it.

The writing your students do in their journals should take a variety of forms. Here are some suggestions for assignments ranging from highly structured to rather open-ended.

Sentence Completion

Give part of a sentence and ask students to complete it (Azzolino, 1990). For example, you might ask students to complete sentences like these:

"A shape is symmetric when . . ."
"Today we learned . . ."
"Before you use an equal-arm balance it's important to . . ."

A variation of this activity is to give one or more complete sentences and then to ask students to continue.

Explanations of Procedures

Ask your students to explain how to measure the area of a leaf, how to use an equal-arm balance, how to add two three-digit numbers, or how to make a graph of some data. An explanation of an entire procedure or only of certain steps may be required.

Answers to Specific Questions

Sometimes you may pose a specific question about a lesson. For example, ask students to describe the shape of the graph for a certain experiment and to explain why the graph has that shape. Many *Math Trailblazers* lessons include questions that require some writing; these questions can be answered in the journals.

A question to ask sometimes is, "How did working in your group turn out?" You may get valuable information that can help you improve the dynamics of your small groups.

Descriptions of Solutions

There are usually many ways to solve a mathematics problem; it is often worth exploring multiple solutions. To correct the common misconception that there is usually only one way to solve a problem, students need to learn that the process of problem solving is often as important as the answer. In *Math Trailblazers,* they see connections by comparing different solutions. They learn that mathematics makes sense because their own ideas are validated. They are exposed to advanced ideas through other students' solutions, but without undue stress if they fail to understand those advanced ideas.

One way to encourage multiple solutions is to ask students to write about how they solved a problem. Ask them to describe all the ways they were able to solve a problem or to describe a single way in depth. Ask them to write about failed solutions or what they did when they got stuck. Such assignments will encourage students to see such efforts not as failures but as periodic by-products of the problem-solving process.

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Definitions

Ask students to define a key concept like area or volume. You may be surprised at some of the answers you get.

Advice to Adventure Book Characters

Often the characters in the *Adventure Books* and other activities encounter problems that yield to the techniques the students have been learning in the labs and activities. You might stop part way through an *Adventure Book* story and ask your students to write some advice, perhaps in the form of a letter, to the hero. When you finish the book, compare what the hero actually did with students' advice.

Reactions

Ask your students what they liked or didn't like about a certain lab, activity, or adventure book. Or, ask what they learned or what confused them.

Word Banks

Supply a list of words or phrases and ask students to use those words in a piece of writing (Azzolino, 1990). For example, you might supply the following words, "ten, hundred, thousand, less than, seven, more than, nine."

Problems

Students enjoy writing their own problems. Ask them to write another problem like a given problem; to write an addition, subtraction, or sharing problem; to write a number riddle; or to make up any problem that students in the class would find interesting to solve.

Free Writing

Other times, simply tell students to write whatever they want about a certain lesson.

Some Tips for Getting Started

- Start with brief periods of writing and gradually extend the amount of time.
- Encourage pictures, data tables, graphs, number sentences, and other mathematical and scientific forms of communication.
- Vary the prompt. Sometimes be very specific; other times make the assignment more open-ended.
- Do not worry about grammar, spelling, and punctuation. Focus on content.

Conclusion

The name of our project—TIMS (Teaching Integrated Mathematics and Science)—expresses our conviction that the teaching of mathematics and science should be integrated. But we also feel strongly that integration should not stop there; language arts and social studies can and should be integrated with mathematics and science. Journals are one way to use writing in mathematics and science. Reading and writing are too important to be confined to language arts lessons.

References

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