

Writing in Math Class?

Absolutely!

How to enhance students' mathematical understanding while reinforcing their writing skills

By Marilyn Burns

For my first 20 years as an educator, I separated math and writing into opposing camps, convinced that they went together like oil and water. Now I can't imagine teaching math without making writing an integral part of it.

I've found that writing in math class has two major benefits. It supports students' learning because, in order to get their ideas on paper, children must organize, clarify, and reflect on their thinking. Writing also benefits teachers because stu-



A window on students' learning: Marilyn offers Lindsey feedback on her paper.

dents' papers are invaluable assessment resources. Their writing is a window into what they understand, how they approach ideas, what misconceptions they harbor, and how they feel about what they're discovering. Over the decade that I've been asking students to write about math, I've learned a great deal. In this article, I present nine important strategies, the answers to commonly asked questions, four different types of writing assignments for math, and math activities that lead to writing.



As Elissa (left) uses manipulatives to investigate a problem, Ali and Darius write about their discoveries.

9 Math and Writing Strategies

1 **Talk with students about the purpose of their writing.** Make sure students understand the two basic reasons for writing in math class—to enhance and support their learning and to help you assess their progress.

2 **Establish yourself as the audience.** Explain to students how their writing helps you. Tell them, “What you write shows me what you’re learning and what you understand. It helps me think about how to better teach you.” During class it’s hard to listen to all students describe their thinking, so point out that their

writing should include as much detail as possible.

3 **Use students’ writing in classroom instruction.** Children’s papers are effective springboards for class discussions and activities. Using them in this way reinforces to the students that you value their writing. Hearing others’ ideas shows children different ways to approach problems. Ask children to read their papers aloud. For example, when I asked fifth graders to trace one of their feet on centimeter-squared graph paper, figure out its area, and then describe the process they used, Nelson wrote that he had

counted whole squares, added up partial squares that equaled whole ones, and used these numbers to calculate the area. Amy wrote that

she had drawn a rectangle around the outline she’d traced and found its area. By listening to what others wrote, students learned about different methods they could have used. This inspired a few to revise their work.

4 **Have students discuss their ideas before writing them.** For most children, talking is easier than writing, and class discussions allow students to express their ideas and hear others. After a discussion, remind children that they may write about any idea they heard, as long as it makes sense to them and they can explain it.



When this group of students got stuck, Marilyn talked with them to prompt their thinking.

For example, when a third-grade class read a book written in 1979, I asked, “How long ago was that?” (It was 1992 at the time.) Before having students write their responses, I had them share their thinking. Lisa said she counted from 1980 to 1992 and came up with 13 years. Leif started counting at 1979, and got 14. James said he knew it was 13 because his sister was born in 1979 and she was 13. Lauren argued that it depended on when in 1979 the book was written and when in 1992 we were reading it. After a 15-minute discussion, children wrote about the problem.

5 Provide prompts. To help students get started writing, put a prompt on the board, such as, “I think the answer is _____. I think this because _____.” (Don’t demand that students use the prompts. What’s important is that their writing, no matter how they express it, relates to the problem and makes sense.)

Sometimes prompts may be more specific to the assignment. For example, I had fourth graders each take a handful of cubes, record the number of cubes they grabbed on a class graph, and use the graph to figure out how many cubes there

were in all of the handfuls. I wrote: “We have _____ altogether. We figured this out by _____.”

After I write a prompt, I remind students to describe their thinking with words, numbers, and, if they like, pictures.

6 Give individual help to students who don’t know what to write.

First, talk to students to make sure they understand the assignment. Then try additional prompts, such as: “What do you think?”, “What idea do you have?”, or “What do you remember about what others said?” Once children offer ideas, suggest that they repeat them in their heads before writing them down. I add: “Let the words go from your brain past your mouth, through your shoulder, down your arm, and out through your pencil onto your paper.” It’s graphic and it works!

7 Post math word lists.

Post a list of the different areas of math you’re studying—numbers, geometry, measurement, probability, and so on. Then start a word list that directly relates to each. Encourage students to consult the charts for vocabulary and spelling.

8 Ask students to revise and edit.

If possible, when children hand in their papers, have them read their work aloud to you. Whenever their papers do not give complete or detailed information—which I find happens more often than not—ask students to revise. You might say, “That’s a good beginning,” and then give guidance by adding: “Write some more about why you’re sure that’s correct” or “Give some details or examples to help me better understand your idea.”

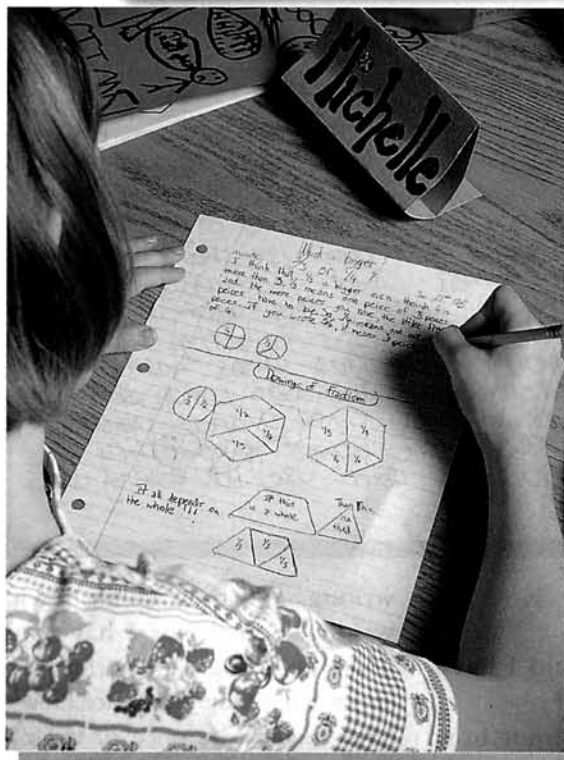
Depending on the child and the assignment, you might ask a student to make spelling and grammatical corrections. My policy is that students should underline words they don’t think they’ve spelled correctly. Because the purpose of their writing is to give me insights into their understanding—not to be published—sometimes I ask children to correct it and other times I don’t. Making a decision in each case is part of the craft of teaching.

9 Read students’ work to evaluate your teaching and to assess progress.

Reading class sets of assignments gives you an overview of how the class responded to particular lessons and helps you evaluate the effectiveness of your instructional choices. It also gives you information on each child’s understanding.

File students’ papers in their individual folders. Keep the papers in order so you’ll have a chronological set of work. Reading individual student work done over time gives you a sense of the child’s progress.

4 Ways to Have Students Write in Math Class



Michelle uses words, numbers, and pictures to explain why $\frac{2}{3}$ is larger than $\frac{1}{4}$.

students that they're not expected to know everything yet.)

Writing about learning. It's helpful occasionally to give a writing assignment

Writing the solutions to math problems.

When writing solution to problems, students should not only present answers, but should also explain their thought processes.

Writing math essays. From time to time, ask students to write

that doesn't focus on a math concept or problem, but instead on some aspect of students' learning processes. For example, you might ask children to write about which was their most and least favorite activity in a unit and why. Or have them write about what makes a good partner or how well they worked with their partner or group. Sometimes you might have students write the directions for an activity or game they can teach to someone at home. →

about a

Writing in journals or logs.

Journals or logs help students keep ongoing records of what they do in math class. When students begin to write in their logs, give them general reminders, such as, "Write about what you did, what you learned, and what questions you have"; "Include something you learned, you're not sure about, or you're wondering about"; or "Write about what was easy and what was difficult for you in solving this problem."

At times you may give guidelines that are specific to the lesson, such as: "Explain why Elissa's answer made sense," or "Write about why Lindsey and Daniel disagreed." It's helpful to some students if you write these suggestions on the board for them to refer to.

mathematical concept. Their responses are excellent re-sources for assessing what they understand.

During a probability unit, for example, I asked third graders to write about *equally likely*. "Explain what it means," I said, "and give an example." At the end of a unit on division, I asked fourth graders to write about how multiplication and division were alike and different. In the middle of a unit on fractions I asked fifth graders to write "What I Know About Fractions So Far." (This title conveys to

Math-Writing

What writing does for me is it unlocks my brain and it lets me think. But if I didn't write, I would be getting nowhere. I wouldn't learn anything. I mean I wouldn't think so hard if I didn't write. I would just play the game even if I didn't know how because I wouldn't have to write. But when you write it just makes you think.

Students agree with Marilyn—writing helps them better understand math.

What can I do about students who have difficulty writing? I don't want to turn them off to math.

Helping children learn to write is one of the basic responsibilities of school. In order for their writing abilities to improve, students need many different types of experiences, and incorporating writing into math class provides a ready source. What's important is that students understand that part of learning math is learning to communicate ideas.

What about my primary-grade students?

To help support emerging readers and writers, I tell students that what they put on their paper should help them remember their thoughts about a problem. I instruct children to use words, numbers, and pictures to record their ideas, and I make time to have them explain to me what they've written. At times, I'll take dictation for a child.

Is it appropriate for children to write in pairs or in small groups?

Yes. I often have students work and write cooperatively. Sometimes

students talk together and then write their own papers. At other times, I have pairs or a small group of children collaborate on one assignment. In that case I make photocopies of the paper to put in the file folder of each child who contributed.

How often should I have students write?

My decision about how often students should write depends on the math they're studying, the purpose of their

Math-Writing

When you write about your work, your ideas lead to other ideas, which lead to other ideas etc. and you can use that knowledge for games which lead you to new theories about the game, which solve problems nobody's ever thought of. Plus who's going to stop you? You can write so much, you can change your perspective about probability so you can use it every day.

writing, and their comfort with writing. Sometimes I have students keep logs and write daily about what they do. Other times I have them write once or twice a week about problems they're solving or to respond to a question I've raised.



Above, Dan explains why writing is beneficial. At right, students talk about their ideas. Later they'll write about them.

Math Activities to Write About



How Many Does it Take?

Grades: 1-4; for older students, vary the quantity of cubes to compare.

The Purpose: To help students build number sense and develop computational strategies by comparing quantities.

The Problem: Show children two identical jars, one filled to the top with blue cubes (or like objects, such as marbles) and the other half filled with white ones. Have students count the cubes in each jar, then ask them to figure out how many more white cubes

The blue and white cube problem. We have to put in 17 more white cubes in the white jar because you got 19 white cubes in the white jar but how many more to go up to 36? You got 19 white cubes plus 11 makes 30 plus six makes 36. So you need 17 more white cubes to fill the jar.

they'd need to fill the half-full jar.

The Writing Link: As with all writing assignments, ask children to explain—with words, numbers, and, if they like, pictures—how they arrived at the number of cubes needed.

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② Which is larger $\frac{3}{4}$, $\frac{2}{3}$ or $\frac{3}{4}$? Explain why.

$\frac{2}{3}$ out of a circle leave $\frac{1}{3}$. $\frac{3}{4}$ out of a circle leave $\frac{1}{4}$. $\frac{1}{3}$ is bigger than $\frac{1}{4}$. If $\frac{1}{3}$ takes up more room than $\frac{1}{4}$ than $\frac{3}{4}$ is obviously bigger.

Too Easy

Just right

Too hard



Comparing Fractions

Grades: 4-6

The Purpose: It's important that students' work with fractions involves explaining their understanding, not merely manipulating fractional symbols.

The Problem: Ask students to compare $\frac{2}{3}$ and $\frac{3}{4}$, or any other fractions.

The Writing Link:

Have kids explain their reasoning and evaluate whether the problem is *too easy*, *just right*, or *too hard* for them.

in four different contexts:

- divide 21 balloons among 4 people;
- divide 21 cookies among 4 people;
- divide \$21.00 among 4 people; and
- divide 21 by 4 on a calculator.

The Writing Link: Ask students to explain why the answer they get for each situation makes sense.



How Much Is 21 Divided by 4?

Grades: 3-6; use larger numbers if appropriate.

The Purpose: To illustrate that the answer to a division problem is often dependent on the situation, especially when remainders are involved.

The Problem: Give students the problem

21 ÷ 4

1. Cookies. This is how I would divide.

5 or 5 R1

2. This is how I would divide balloons.

5 R1

3. This is how I would divide \$21.00.

\$5.25

4. Using calculator.

21 ÷ 4 = 5.25

1. This answer made sense to me because you can split a cookie up.

2. This answer made sense to me because you can split up a balloon.

3. This answer made sense to me because first I gave them equal amounts in dollars. There was one dollar left.