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## Procedural Writing in Math

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I'm getting ready to make gluten-free oatmeal cookies, and I'm thinking about what a fifth grader said to me, "We spent all this time working on word choice and voice and now you don't want us to use it?"

"You could say it that way, but word choice and voice just look very different in procedural writing."

I have a few minutes to whip this recipe up and chill it so we can have thick rounds of oatmeal wonderfulness after dinner tonight. I'm really glad that the Gluten-Free Girl, Shauna Ahern, (my go-to source for recipes at <http://glutenfreegirl.blogspot.com/>) has gone easy on the adjectives.

Imagine if I had to sort through an ingredient list like this:

"Get a dusty ½ cup scoop of the flour that comes from a drought-resistant annual grass first grown in Africa but later cultivated in Egypt. Yes, it's sorghum."

Now I'm a patient person, but you'd likely hear, "Are you kidding me? I just want to make cookies!"

Truly, I love a good story and interesting anecdotes, but only when I'm reading for that purpose. Right now what I'm interested in is accurate measurements, clear ingredients, and a step-by-step easy-to-follow guide. The word choice should be the precise language of the discipline (in this case, culinary) and the voice should be clear and factual. Still, while procedural writing is "just the facts ma'am" simple, it's not as cinchy to teach.

### Choosing Mentor Texts

When I look for mentor texts for teaching procedural writing, I know they must have these traits:

- A clear purpose
- A list of materials and resources
- Safety precautions (possibly)
- All the procedural steps stated in sequential order with transitions like *first*, *next*, *then*
- Helpful tips so that the reader can follow the procedure without making assumptions

Some of my favorites include:

The Dangerous Book for Boys by Conn Iggulden and Hal Iggulden and The Daring Book for Girls by Andrea J. Buchanan and Miriam Peskowitz

Kids' Sudoku For Dummies by Andrew Heron

Kitchen for Kids: 100 Amazing Recipes Your Children Can Really Make by Jennifer Low

While the style and content of these books vary greatly, they all contain those core traits I find essential for teaching procedural math writing.

### Applying the Math

Three years ago I was trained by Jan Christinson, who authored Five Easy Steps to a Balanced Math Program for Upper Elementary Grades with Larry Ainsworth (<http://www.leadandlearn.com/>). Step 2 of the Five Easy Steps focuses on problem

solving tasks and independent procedural writing of the process. The student excerpt below is based on the "Problem-Solving Task Write-Up Guide" for upper grades from Five Easy Steps. My colleague Lisa Sutton and I worked together to teach procedural writing skills to her fifth graders. We created this shared writing model as her students were introduced to procedural writing in math.

## Student Write-Up for the Window Problem

### Paragraph One: Problem Statement

This problem is called the Window Problem. It is about finding how much new paper and border is needed for the window in our classroom. I'm supposed to find the area and perimeter of the window.

### Paragraph Two: Work Write-Up

First I drew a picture of the rectangular window. I labeled the base 22 inches and the height 12 inches. I used graph paper so that I could check my answer later. Then I found the border by getting the perimeter. The perimeter was 68 inches because perimeter is the distance around the outside which is  $22 + 22$  for the base sides and  $12 + 12$  on the height sides for a sum of 68 inches. Next I found the area. I multiplied the base times the height because that gives you all the square inches inside of it. My answer for the area was 264 square inches.

### Paragraph Three: Answer

My answer is 68 inches for the perimeter and 264 square inches for the area. I think my answer makes sense because 68 inches is about 6 feet around the outside and that looks right. 264 is right because I checked it by my graph paper since area is the amount of square inches inside the rectangle (window).

I told the students another way to think about these three math paragraphs is:

- #1 is the *what* paragraph,
- #2 is the *how* paragraph and
- #3 is the *why* paragraph.

## Elaborating in Procedural Writing

In my experience, paragraphs one and three are fairly straightforward, but paragraph two is hard for writers. Lisa Sutton, reflected on her writers' obstacles with paragraph two and wrote, "Students couldn't always see that there were multiple steps involved. In their minds, you do what you do and that's it."

"You do what you do and that's it" sounds like students are making assumptions about what the reader knows and can do. The antidote for assumptions is elaboration. Two explicit tools for elaboration in procedural writing are *Buddy Sentences* and *Because*. A *Buddy Sentence* is a technique that I learned from my colleague, Janeal Maxfield, who discovered it in our *Write Source* kindergarten curriculum. We both use it in all grades to help clarify what elaboration is and how to do it in a kid-friendly way. The idea is simple: just like buddies, sentences focused on the same idea often come in pairs or triads. The *Because* technique is a simple prompt which forces students to expand their explanations.

Problem-solving sentence **without a buddy**:

*I drew a picture of the rectangular window.*

Problem-solving sentence **with buddies** to tell more about the graphic representation:

*I drew a picture of the rectangular window. I labeled the base 22 inches and the height 12 inches. I used graph paper so that I could check my answer later.*

Problem-solving sentence **without because**:

*I found the perimeter was 68 inches.*

Problem-solving sentence **with because**:

*I found the perimeter was 68 inches because perimeter is the distance around the outside which is  $22 + 22$  for the base sides and  $12 + 12$  on the height sides for a sum of 68 inches.*

## Choosing Words Carefully

My fifth-grade friend who asked if we were dropping the traits of word choice and voice soon realized that the voice in procedural writing was more like that of a reporter. While word choice wasn't about sensory words, it was about the language of the discipline. Before students start the problem-solving write-up, we brainstorm a list of math terms that may be used. Notice in my examples that there is rich math vocabulary throughout: *rectangular, base, height, perimeter, sum, multiplied and square inches*. In order to explain their understanding, students need to know much more than the textbook definitions of math terms, and I don't leave that to chance. I want the word bank to guide them in their choice of precise verbs, adjectives and nouns.

With this approach, there are seven steps to teaching procedural writing in math:

1. Share intriguing mentor texts - how do "real writers" use procedural writing?
2. Record the traits of procedural text.
3. Engage students in a rich problem-solving task and track work on a data sheet.
4. Brainstorm math terms that may be used in write-up.
5. Model and share three procedural paragraphs in the write-up: the *what*, the *how* and the *why*.
6. Use elaboration strategies when writing the *how* of the procedure.

Finally, Step 7. Celebrate your success in merging two subjects that were meant to be taught together.

Marilyn Burns in her book *Writing in Math Class* reminds us of this bond: "The process of writing requires gathering, organizing and clarifying thoughts. It demands finding out what you know and don't know. It calls for thinking clearly. Similarly, doing mathematics depends on gathering, organizing and clarifying thoughts, finding out what you know and don't know, and thinking clearly. Although the final representation of a mathematical pursuit looks very different from the final product of a writing effort, the mental journey is, at its base, the same - making sense of an idea and presenting it effectively."

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