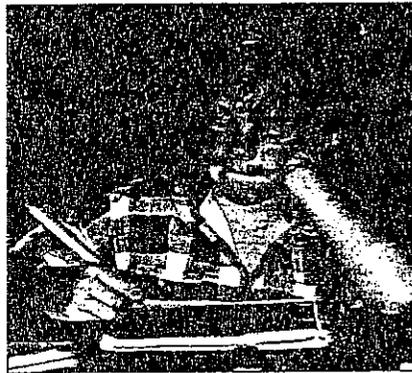


Sonia M. Helton

# I THINK THE CITANRE WILL HODER LASE: **JOURNAL KEEPING** IN MATHEMATICS CLASS

**A**

fter telling a story about Bruno Bear using jelly beans, the teacher held up a pint jar and a small plastic butter container and asked a group of first-grade students to estimate which object would hold the least amount. One first grader wrote in her journal, "I think the citanre will hoder lase." [I think the container will hold less.] Using invented spelling, the student's entry indicates that an estimation decision had been made and documented by writing the spoken language expressed in a typical first-grade response. In another journal entry (fig. 1), after hearing a teacher-told story and acting out the story situation using manipulatives, a child recorded a conclusion



Journal writing communicates mathematical ideas.

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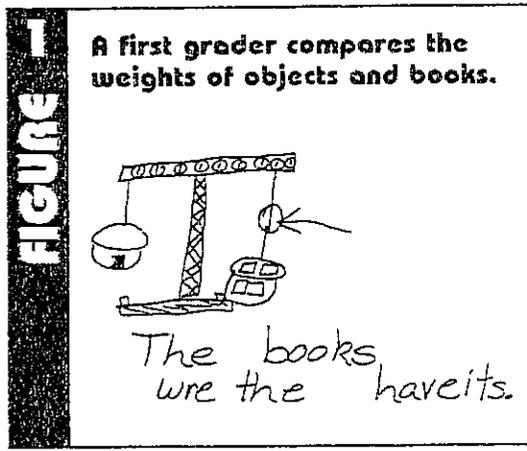
by making a drawing of a scale weighing books and a box of objects. She then wrote, "The books wre the haveits." [The books were the heaviest.] In her own words reflecting her own understanding, this six-year-old drew a picture and communicated mathematical ideas using the spoken language and the language of mathematics.

The manner in which children express themselves in writing is very important to a teacher's understanding of how they communicate ideas, especially mathematical ideas. Keeping a journal in mathematics is one way that children can express and document their mathematical thoughts. Journal keeping in mathematics is a relatively new practice in classrooms. Getting started is easy. A teacher who understands the constructivist principle that "all knowledge is constructed by the learner and therefore, learning is an intensely personal affair" (Post 1992, 17) will easily adapt to the use of mathematics journals (Kamii 1985, 1989). A journal gives a child an opportunity to explore the understanding of a mathematical concept and to communicate that understanding through the writing tools and symbols best understood by the child.

## Getting Started

Teachers need to understand the different approaches to journals that can be used in the classroom. Teachers can have students use their journal entries to—

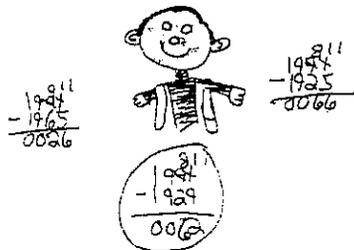
- show a heuristic and practice skills;
- create routine and nonroutine problems using real-life situations; and
- document and analyze mathematical thinking.



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**A journal entry showing skill practice**

Renée Jan. 15, 1991  
 Martin Luther King was born on January 15, 1929. If he were alive today, how old would he be?



Martin Luther King is 62 years old

**Sample lesson plan**

Read a story such as *Over in the Meadow* by Paul Galdone (1989) to the students. Have them use real objects and a work mat to act out problems in the story as it is read. For example, students could count the animals on each page, using marshmallows as counters.

Reread the story as students write numbers for the spoken mathematical language. Discuss how the spoken word may be used to generate an addition sentence such as  $1 + 1 = 2$  or  $2 + 1 = 3$ .

Next, have students record these problems in their journals by drawing a picture of the set and writing the numbers both as words and as symbols. An example of a kindergartner's work is seen in **figure 3**.

**Nine animals from *Over in the Meadow***



An alternative approach is to have students make up their own word problems, follow the problem-solving heuristic, and write in their journals. For example, **figures 4** and **5** show journal problems that a third grader created about a witch preparing for guests at her Halloween party.

**Creating routine and nonroutine problems**

A second approach to journal entries is to use a problem-solving situation related to a real-life experience. An example would be the investigation of insects. A teacher might ask students to identify the parts of an insect. This activity could be introduced by reading a book such as *Fire Flies* by Julie Brinkelos (1985) or by bringing an insect to class.

Once the question is asked, the teacher might encourage students to find interesting insects, catch them, and put them in jars for short observation periods. Observation activities may include sketching the insect; studying every little hair, eyelash, leg, and scale; and giving vital statistics of the insect

**Showing a heuristic and practicing skills**

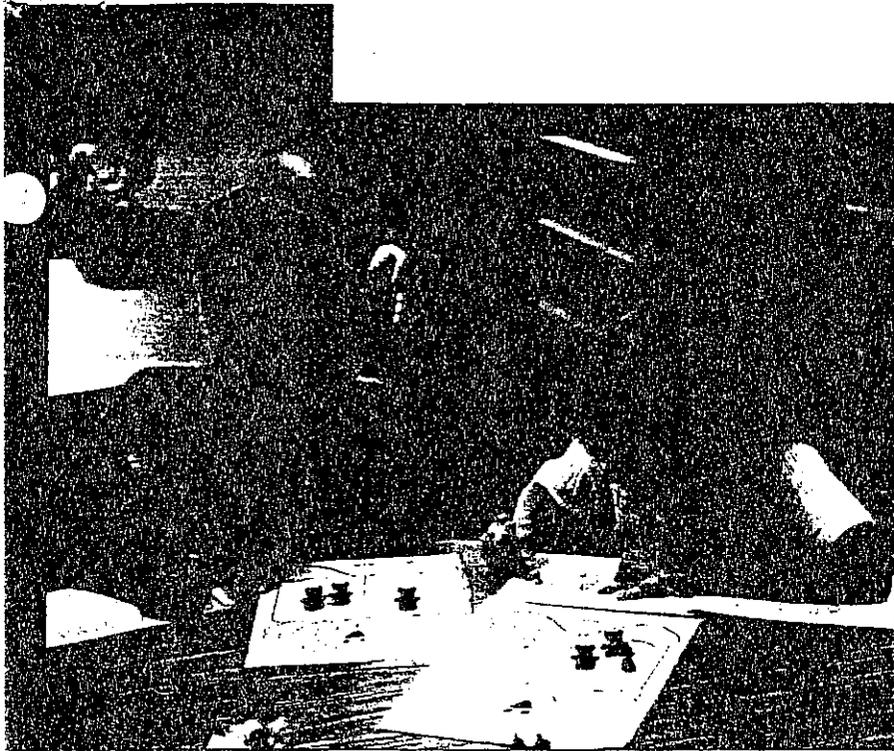
An effective problem-solving heuristic includes having children do the following:

- Listen to a story problem.
- Write the problem in their own words.
- Identify any facts.
- Draw a picture of the problem.
- Write a mathematical sentence to solve the problem.
- Label any answers using the spoken language.

A student's entry illustrating this heuristic is seen in **figure 2**.

A teacher may use this heuristic for content implementation during a lesson, beginning with kindergartners. By developing the heuristic with students and keeping in mind the use of manipulatives to reinforce teaching methods, the teacher can put students in a journal-keeping situation.

An extension allows students to create their own word problems and to apply the heuristic by themselves. This objective may be reached by encouraging the students to ask questions about real-life situations, to seek answers to those questions, and to record their mathematical thinking. The teacher may ask students to base their questions or problems on books they are reading. The heuristic offers students a logical strategy for organizing information and finding solutions to the questions they may ask.



Students writing helps teachers to assess understanding.

to describe its size, length, color, shape, habitat, name, and so on. Suggesting what the insect was doing five minutes before it was found; thinking about every aspect of the insect in terms of its measurements, personality, habitat, correct scientific name, eating habits, reproductive habits, and relatives; and then documenting the activities in a journal are excellent choices for grades 3 through 6. An example is seen in **Figure 6**.

Other nonroutine problems for students to investigate and write about might include the following:

- What do you suppose the inside of a dog house looks like? Draw a floor plan with room measurements. What is the area of the floor? The perimeter? Write a story about what happens inside a dog house or give directions for building a dog house.
- Make a bar graph of the contents in your bedroom or dresser. Determine the probability of choosing a pair of white socks from your collection of socks.
- What is the best buy at the grocery store on green beans—fresh, frozen, or canned? Estimate how much your family will save in a month if they purchase the best buy on green beans.
- Make a time line of your life. If you can, draw an analogy between your life and something in nature, such as the growth of a tree or the metamorphosis of a butterfly.
- Find pictures in magazines that are symmetric about a line, that is, when the picture is folded along the line, the halves match. Cut the pictures in half. Paste half of one picture in your journal and draw its mirror image. Or find as many examples of line symmetry in nature as you can. Paste the findings in the journal. Describe each example as accurately as possible, including each object's measurements, color, texture, correct name, and place and time that it was found. Label any parts.
- Create a mathematics problem situation involving geography. **Figure 7** shows a fourth-grade example.

Students act out the story

**FIGURE 4**

**A third grader's Halloween problem**

Renee Feb. 8, 1991  
 The Vamper family arrive, so that there are 59 guests now. Rita wants to have seven pickled warts for each person. How many does she need?

$$\begin{array}{r} 59 \\ \times 7 \\ \hline 406 \end{array}$$

She needs 426 pickled warts

**FIGURE 5**

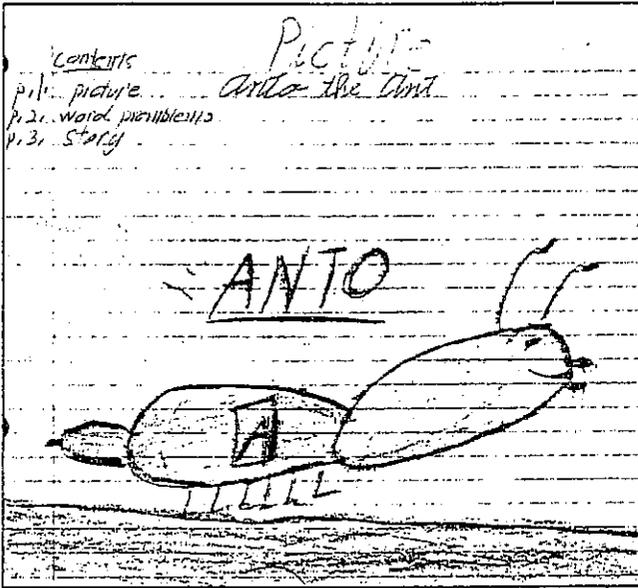
**A Halloween-problem extension**

Renee Feb. 11, 1991  
 More guests arrive, so that there are now 76. Rita serves four fat flies to each guest. How many fat flies does she have in all?

$$\begin{array}{r} 76 \\ \times 4 \\ \hline 304 \end{array}$$

Rita needs 304 fat flies

"Anto the Ant" drawn by a fourth grader



P.2

WORD PROBLEMS

1. Anto's body is 16 cm long. If Anto's body legs are 43 cm long, how big would Anto's whole body be?

$$\begin{array}{r} 16 \\ +43 \\ \hline 59 \text{ cm} \end{array}$$

2. Anto's antennae is 3 cm long. If you multiplied that times 21, how long would his antennae be?

$$\begin{array}{r} 3 \\ \times 21 \\ \hline 63 \text{ cm} \end{array}$$

3. Anto's tummy is 6 cm long. If you added 21 to that, and then subtracted 6, how many cm would his whole tummy be?

$$\begin{array}{r} 21 \\ +6 \\ \hline 27 \\ -6 \\ \hline 21 \end{array}$$

• Cut out the largest numbers that you can find in the newspaper, paste the numbers in the journal, then write the number word for each number. Order the numbers from smallest to largest. (Kindergarten students sometimes interpret *large* as referring to the size of the print rather than to the numerical value of the numbers; the teacher needs to assess students' readiness to develop the latter meaning of the concept.) Use the numbers to make up addition, subtraction, multiplication, or division problems.

as student prompts for journal writing:

- What did I learn in mathematics today?
- What did I like about what I learned today?
- What did I not like about what I learned today?

**Following Up**

Holding conferences with students about journal entries is one important step associated with the journal-keeping process. The guidelines presented subsequently were developed by two teachers in the Pinellas County, Florida, School System.

Develop a set of questions about a journal entry to address the student's logic and thinking used in the mathematical process:

- Tell me how you arrived at the answer.
- What did you learn as you solved the problem?
- What would you like to do in an entry about a similar problem?
- What question would you like to ask me?

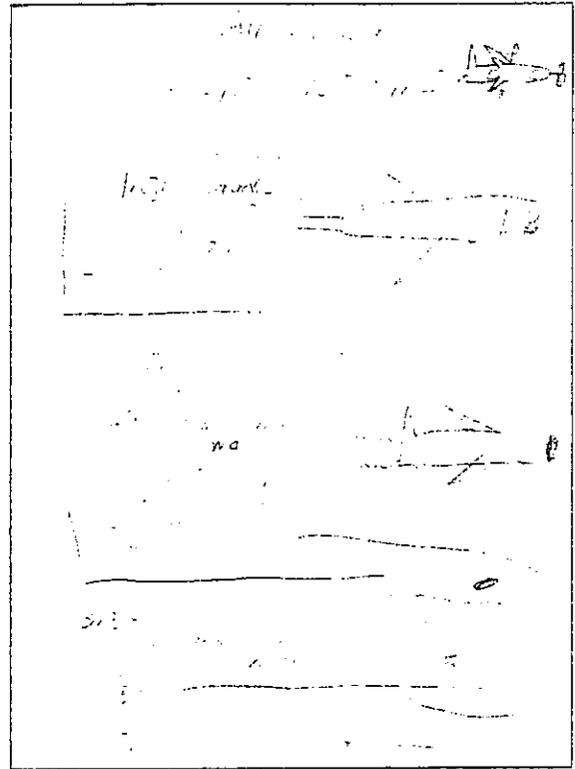
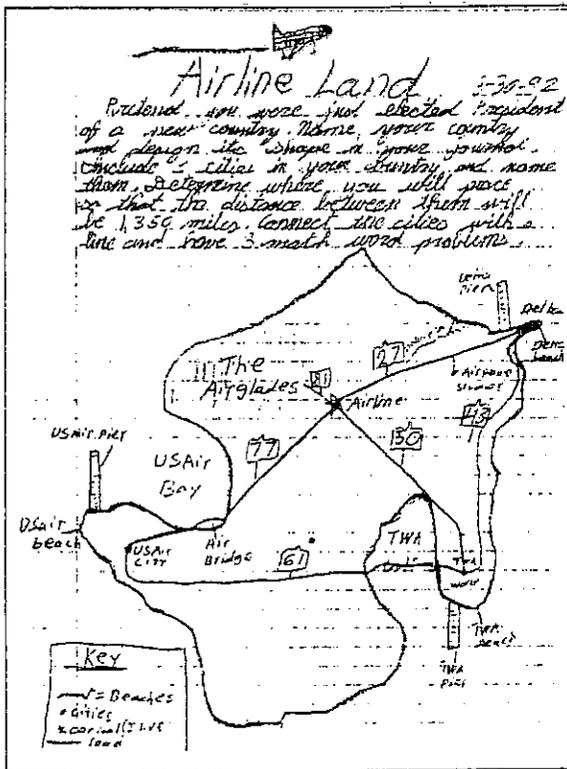
In the conference, the teacher should listen to the student. The purpose of the conference is to give the

What did I learn in math today?

**Documenting and analyzing mathematical thinking**

A third approach to journal writing is based on reflective thinking. With this approach, students are encouraged to write about their thinking processes for solving particular problems or to evaluate their feelings and opinions about learning mathematics. Asking opinion questions may afford the teacher insights about a student's mathematical thinking on a specific topic or about the student's attitude toward the mathematics class. Using such entries may allow a teacher to intervene if special help is required. Such questions as the following may serve

A fourth grader's geography problem



What did you learn as you wrote?

student an opportunity to express ideas about how he or she applies the mathematical process to solve problems and to give the teacher insight into the student's strengths, weaknesses, and progress in daily work. Overall, the conferences should be short and frequent to be effective. If talking with each child becomes too time-consuming, limit the discussion to only one issue at each conference.

**Further Suggestions**

The following hints may help the teacher get started with journal keeping in the classroom:

- A teacher should be a journal keeper along with the students.
- A teacher should set the tone for journal keeping by modeling how an entry might appear in a journal; helping children find ways to record and communicate mathematical ideas and processes; encouraging students to create problem situations and to document questions about the real world; helping students develop problem-solving heuristics as journal-writing prompts; and establishing a sharing atmosphere where students allow others to read their work.

A word to the wise: remember that the purpose of journal keeping in the mathematics class is to write, think, and record mathematical ideas and processes, not to make the experience a writing process only (Bickmore-Brand 1990).

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