ENHANCING MATHEMATICS COMMUNICATION VIA CRISS

By Jim Devine

"One way to instill active comprehension and dynamic discussion is through graphic and pictorial organizers." These words of introduction from the CRISS manual remind us that these strategies assist students in transforming information and, as with all CRISS strategies, provide the structure for the students to do the work and make the meaning.

In the fall of 1997, after teaching high school mathematics for 22 years, I took a new position as our district staff development trainer for mathematics. The job initially was to train our K-12 mathematics staff in standards-based teaching. Our new state test, the FCAT, was in the beginning stages and, at grades 5, 8, and 10, performance items were part of this assessment. For the first time, students were being asked not only to solve a problem, but also to explain their process. This explanation part of the assessment was a major change from our former assessments and, especially for our grade 5 teachers, presented a unique challenge.

Fortunately, as a CRISS teacher and trainer, I had learned that no matter what I was going to teach, the best method involved strategies that were easily adaptable to the particular teaching situation. In my trainings, I frequently remind participants that all the strategies can be tweaked and modified to fit special situations. I thought about the various strategies I might use to help students with the performance items, and finally settled on the "Hamburger Paragraph" as a starting point. *[Note: the Hamburger Paragraph is similar to the Spool Paper; but, instead of the introduction, body, and conclusion being paragraphs, in the H-Paragraph they are sentences, i.e., the bun part of the hamburger represents the introduction (top half) and conclusion (bottom half). Between the pieces of bread, you have lettuce, tomatoes, onions, meat, cheese, etc.; the sentences which elaborate on the main idea presented in the introduction.]* As I worked with the paragraph, it eventually evolved into a simple graphic organizer (*Figures A-1 and A-2*). I reached this first stage by cutting and pasting together other organizers I had used.

My first test of the organizer was with 5th grade students. I used it to involve the students in active classroom discussions for open-ended problem solving situations. I selected problems with multiple steps, so students arrived at their solutions using different strategies. The organizer helped me emphasize to the students that there were many ways to solve each problem and, more importantly, it provided a space for them to do so.

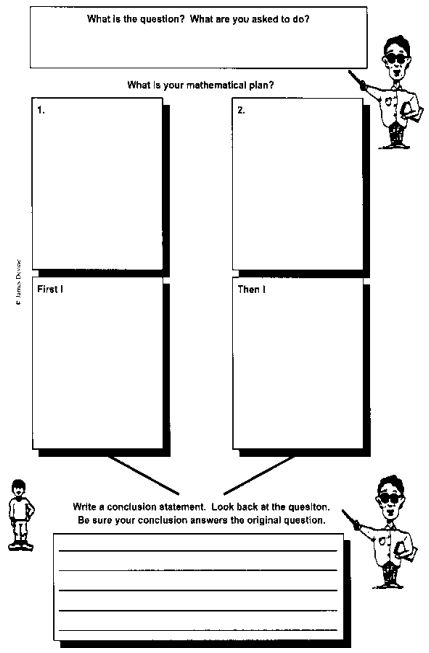

Figure A-1

For the first step, I had the students paraphrase the question and write out what they were being asked to do. This information went in the box at the top of the page. Their problem solving plan followed in the middle set of boxes. In the boxes, numbered "1" and "2", they wrote out their *mathematical* plans using numbers and symbols. Because of the types of problems I used, the students often had three or more different ways of calculating the answer. The boxes below the mathematical plan were for

pre-writing. Below each step in their mathematic plan, they explained, in words, what they did. After this step, students synthesized their information into a concluding statement which they placed in the bottom box. The pre-writing step, in particular, was a big aid to the students, because it helped them explain their process, which, for most of them, was a new experience. When all the students had completed the organizer, I had them share their different processes both in small groups and as a whole class. They were amazed at the different ways their classmates solved the same problem.

The problem:

Anna's allowance is $5 a week. She can earn more by doing extra chores. She can earn $1 per day for walking the dog and $1 per day for doing the dishes. How much can Anna make in four weeks if she does every chore? Show how you figured it out and write a brief explanation of your process. (*Figure A-2*.)

In the student sample (*Figure A-2*), you will notice the student got the correct answer in the problem solving plan (box #2), showed the process, and did a pre-write. In the last box, the student does a good job describing the problem solving process, but he forgets to include the answer to the original question. With the use of the graphic organizer, this is easily correctable. This student can be coached to use the words of the question as a prompt in answering it, so this omission won't happen again.

This problem solving organizer also helped us as teachers, because we could begin to understand how the children were approaching their problem solving and we could see their thought processes. We could identify the weaknesses in both areas and were able to observe growth over time as their problem solving work improved. As mentioned above, the organizer prompted students to paraphrase the question and then refer to the question again as a writing prompt for their concluding statement. Research from Japanese classrooms emphasizes the importance of identifying the question as a key ingredient to

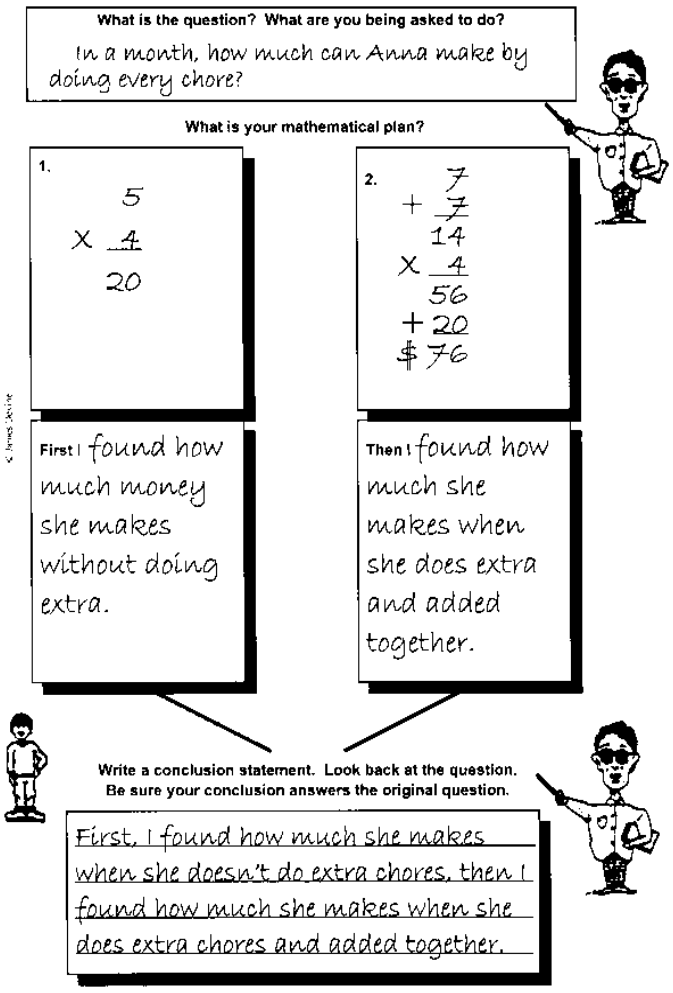

Figure A-2

the problem solving process. Best practices from Japanese classrooms also emphasize that children be allowed to discuss multiple representations for problem solving. It is their belief that more time should be spent in the process of problem solving. Students need to examine and discuss the various methods of solving one problem before attempting to solve another problem. Frequently in the United States, we attempt to do multiple problems without allowing time for this important process of communication. The National Council of Teachers of Mathematics (NCTM), in its recently released *Principles and Standards for School Mathematics (2000)*, also emphasizes this need for communication and the use of multiple representations as part of the Process Standards for teaching mathematics in the new millennium.

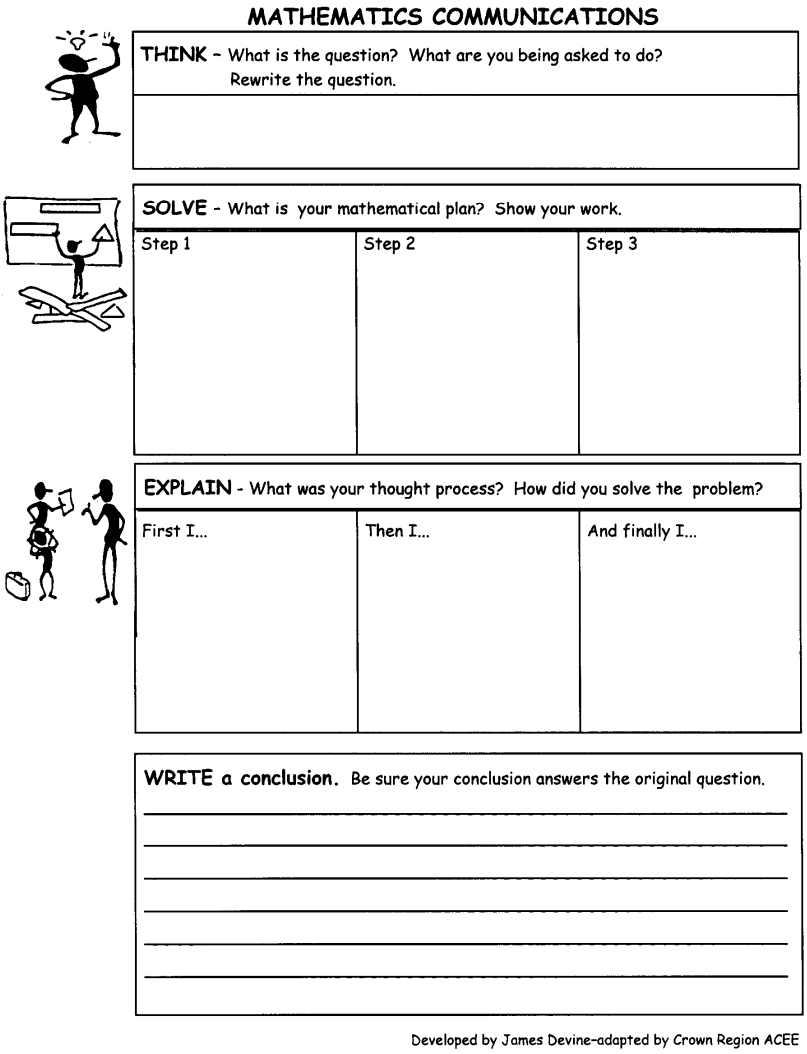

Figure A-3

In the last few years, I have presented this organizer at several state and national teacher conferences. In 1999, the Florida Association of Math Supervisors (FAMS) asked me to present a CRISS awareness to their group, and I shared this organizer at their annual conference. Interestingly, two members of that group, Jill Nielsen and Ronda Bourn, each took the organizer and began using it in their regions. The best part, though, was that they "tweaked" the organizer and improved its appearance. (*Figure A-3*) In keeping with the CRISS philosophy, they made it their own to use with their students. Their students, in turn, have used and modified it for problem solving and to make meaning for themselves.

This organizer has proven successful over time with a great many math students who have used it to increase their problem-solving skills. If you do choose to use this organizer, or if you just want to discuss it, feel free to send an e-mail to me at <devinej@flagler.k12.fl.us>. CRISS provides us many opportunities as teachers and learners. It is this dialog with other teachers and the ideas you share that make being a CRISS teacher a great conduit for lifelong learning.

Jim Devine is in his 5th year as a Staff Development Specialist in Mathematics for the Flagler County Schools (Florida). Prior to this, Jim spent 22 years teaching Middle School and High School Mathematics, primarily Algebra I and Geometry at Flagler Palm Coast High School. In addition, Jim is a National level trainer for Project CRISS.