From the Editor's Desk

Sandie Gilliam, Editor

In *Principles to Actions* (PtA), NCTM suggests that there is too much focus on learning procedures without any connection to meaning, understanding, or the applications that require these procedures. Why is this happening?

Thoughts:

- Many students have an adverse reaction to word problems. In response, many teachers either reduce or completely skip textbook work related to applications.
- Teacher presents a word problem. Students moan sayings they don't know where to start. Teacher starts doing it (explaining as he/she goes along). Actually, the teacher then does most of the problems because students have figured out how to act helpless.
- Word problems take too much time out of the class period (time to read and understand, time for students to start and then complain, and time for teacher to do ONE or go over one.) Let's just skip word problems, altogether, so we can get through the content.
- Math is about numbers. English is about making sense of words and sentences.
- Step-by-step procedures are easy to follow; you just plug and chug and get the answer. Could you get an answer without knowing what you did?

This edition of the CMT presents another of the eight mathematics teaching practices found in *Principles to Actions*: ***Implement tasks that promote reasoning and problem solving***. *Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.*

How might a task look? A word problem found in one of my high school trig units, *High Dive*, is about a diver being dropped from a Ferris wheel that is moving counterclockwise at a constant rate. At the same starting time, a cart located 240 feet to the left of the base of the Ferris wheel starts moving at a constant speed of 15 feet per second along a track that is parallel to and below the moving Ferris wheel. The water level in the cart is 8 feet above the ground. **When should the diver leave the Ferris wheel so as to land in the cart?**

My vision of an ideal program for students uses an engaging, comprehensive, problem-centered mathematics curriculum that connects to real world and other school subject areas, such as science. In this curriculum, students are given an over-riding problem, like the one above, that is provocative enough for them to find a solution. This problem functions as a means and a reason to learn the necessary mathematics, discover a viable approach, and then apply the mathematics concepts to their approach towards the solution.

Secondly, my vision of an ideal program is one that invites curiosity and rewards the curious with even more questions to answer. I believe that it's important to create an environment that encourages students to ask questions. Students' natural curiosity fosters good questions. It puts the students in a state of temporary confusion that can only be resolved through asking thoughtful questions. When asked aloud, students' questions invite others to share in the quest of the solution or in the answer to the problem. My ideal classroom creates a space and the discussion opportunity for this to play out. As a teacher, I respond to students' questions, but my response is not always an answer. Many times, I find that my answer to my student's questions is another question—a question to make them continue their journey. There is an art to responding to a question. Without being

evasive, I try to lead them. They know that I ask a question so that they'll feel the pride and satisfaction that comes when they discover the answer for themselves. It is never the same feeling one gets when the teacher solves the problem. That feeling of self-accomplishment that comes through discovery is powerful learning, and it encourages the students to ask more, listen more, reflect, and continue learning. I work hard to provide an environment that allows and encourages students to be comfortable asking questions of me and their classmates. They question each other, in a positive way when solutions don't seem right. As a result, my students have grown in their communication and presentation skills, and have learned how to work as a team to solve problems.

Thirdly, my vision of an ideal program is one that contains skills that business desires in future workers. This interest is grounded in the Secretary's Commission on Achieving Necessary Skills (SCANS) report, which suggests that business wants workers who can work cooperatively, and communicate both verbally and in written form. Working on these skills in school eliminates the need for business to provide after-hours classes on these skills in the work-place.

To this end, my students are constantly in front of the classroom presenting their work and explaining their thinking. Business also wants workers who can explore new solutions through lateral "out of the box" thinking. I don't teach algorithms with practice exercises followed by related word problems. Students think about the problems from multiple viewpoints.

Because they discuss the mathematics and the strategies that might be useful, they tackle the problem with determination. "No, not word problems. I hate doing word problems," is what I used to hear. One day, in contrast, I heard, "Can't you give us more real-life word problems in this section? I understand better when I can put the mathematics into context."

This *High Dive* assignment which has the students write up a complete and detailed solution to the question, **"When should the diver leave the Ferris wheel so as to land in the cart?",** is designed to emphasize opportunities for students to engage in the mathematical processes of:

- modeling mathematical relations in problem situations by using symbolic expressions—representing important relationships, operating on symbolic expressions to gain understanding of the situation, and applying results of mathematical analysis to solve the problem and make decisions

and

- communicating mathematical information in verbal, numerical, graphical, and symbolic forms and through physical models of mathematical principals.

I find these processes very important and necessary in order for students to improve upon their reasoning skills.

Do you teach in an ideal program? Do you regularly have students asking you for real life problems that give them a contextual way to understand the math? Does your textbook have *engaging* word problems that connect to the real world or another school subject, or are the word problems more *procedural* in nature? Do YOU end up doing most of the work for the problem because the students don't know where or how to start and where to go with the problem? Email me your story at sandie.gilliam@comcast.net. Stay tuned! More on problems and problem solving in the next issue of the CMT.