Who Are We?

It's the end of another school year, and it's time to reflect on our role as mathematics educators. It's time to consider what we are doing, why we are doing it and who we are.

We manifest who we are every time a student approaches us to ask a question or to seek help. "I don't understand." "Where do I start?" "I'm confused." "Can I do the problem this way?"

Our responses to these requests, implicitly and explicitly, tell our students what we believe is important about learning. Do we make statements like "Go read the problem again, or Let me show you how to do that"? If so, we may be giving the message that either we do not know how to help that student or that we believe "helping" is doing the problem for the student.

Telling students to reread a problem is often frustrating for students who do not know how to start a problem. Often they have reread it many times and wonder why rereading it again would necessarily help them. By "showing" students how to do a problem, we are not being helpful because now the students are not doing the problem, we are.

When it comes time for them to do problems on their own, students often say, "I understood the problem when I watched you do it, but I can't do it without your help." To solve problems, students need our help in different ways. We need to respond to students by giving hints, those ideas that truly lead students in helpful directions, but at the same time, not to solve problems for them. We need to model how we do problems, not in an artificial manner after we have solved a problem, but during the problem solving process so that students see the kinds of strategies we use, and also so they see that the process is not as neat and orderly as textbooks would have them believe.

If we react to their questions in this manner, we convey a different sense of what learning mathematics is all about. We convey a sense of support and at the same time the belief that students are responsible for their own learning. We convey a sense of authenticity. We let students know that mathematics is not simply a mechanical procedure; it is a way of knowing when and where to use procedures. We tell students that mathematics is not always procedural; it is a method of knowing what information is relevant and what is not, and this helps them decide what kinds of mathematical questions to ask.

Our responses indicate what we believe to be educationally important as does our curricula. Students in my university classes often wonder how they can use textbooks or mandated curricula creatively. They assume that because they are being told what to teach or what materials to use, they are also being told *how* to teach. I tell them that the same curricula will "look" different in classroom practice because of the variety of methods and approaches that can be used.

If a drill and practice approach is being emphasized, students are given the message that this is what constitutes mathematics. A recent episode of television's "60 Minutes" devoted a portion of the program to the work of John Saxon, a self-proclaimed expert in mathematics education from the United States. Mr. Saxon has written a series of self-published mathematics textbooks based on his theories of learning, which can best be summarized as "practice, practice, practice, practice." Not only is practice the bedrock of Saxon's program, but the procedures being practised are purely rote and mechanical. What was disturbing was Saxon's

claim that his students are doing well on standardized exams used for college admission. Whether or not this is "true" is not the issue. What is important is the way we test students and how these tests are used.

If exams are comprised of items that can be successfully completed by students who have memorized rules and procedures, then a message is being given to them. That message is, you don't need to understand mathematics. The issue that Saxon did not address was whether his students were successful once they entered university. After having spoken to mathematics professors, I have learned that too many students manifest little understanding once they enter university courses even if they obtained high marks in high school mathematics. Many students drop out and/or fail the university calculus courses required for many professions. These failure rates should make us question not only how we are evaluating students but also how we are using the mathematics curricula.

If we say that problem solving and critical thinking are our goals as educators, do we project that message to our students? Are we problem solvers and critical thinkers ourselves, and do we model this behavior in our classrooms? Do we use traditional teaching styles only, demonstrate how-to procedures, have students practise those same procedures, and then wonder why students are unable to think for themselves? Or do we use a variety of teaching styles to get students active in their own learning? Do we demonstrate that we have thought critically about the kinds of mathematical problems we give students or do we merely assign one textbook page after another? In short, do we give the message Do as I say, not as I do by paying lip service to problem solving and critical thinking? Answers to these questions require much more space than is available, but I pose them to help us become aware of the images we are projecting to our students.

Finally, we need to think of ourselves not only as part of the classrooms in which we teach, but also as members of the wider society in which we live. Our values and beliefs about mathematics affect not only the students we teach but they touch the lives of our friends and families. It is important to remember this fact when we recoil from the prevalent image of mathematics as mechanical computational procedures, as being able to balance one's chequebook. We need to remember because we, as members of this culture have helped contribute, often unknowingly, to this attitude.

As teachers, it is difficult to make changes in our classrooms because changes cannot be made in isolation. We are part of a school system. We need the support of our colleagues and the administration. The parents of our students must also understand why it is important to break away from traditional rote drill and practice methods in mathematics.

We need not only to think about ourselves and who we are as mathematics teachers but we also need to speak to other teachers, parents and administrators. We need to reflect and pose questions as I have here. Changing mathematics education begins with changing ourselves, and change begins with the awareness of who we are.

The articles in this issue of *delta-K* can be placed in this context. Ted Aoki's presentation, although not written for the mathematics educator in particular, explores the theme of questioning who we are and how that affects our curriculum. Darlene Hubber's essay about math anxiety makes us question ourselves as teachers in a different way by calling forth an awareness of our influence on our students' self-esteem. Werner Liedtke's article asks us to question our teaching methods, the kinds of questions we ask students and the amount of discussion we promote.

Marlow Ediger poses some issues for us to think about. Although many of the issues he poses may not be "new" for some readers, they are issues worth reflecting on again. James Vance provides us with excerpts from interviews of students' work with rational numbers. These allow us to reflect not only on student concepts of fractions but also on our role as teachers in the creation of these concepts. The article by Yvonne Pothier, Gail Brooks and Daiyo Sawada provides a different twist on this issue's theme. By providing an

example of innovative teaching, using mathematics in a dramatic setting, they help expand our repertoire of teaching styles.

Finally, a new feature of *delta-K* is the IDEAS department. In this issue, it contains two articles. I encourage readers to send more manuscripts to this department, which is designed to highlight interesting problems and situations for use in the classroom.

Linda I. Brandau

Wanted

Material for a monograph on problem solving in the high school is now being compiled. Send a brief manuscript, two to five typed pages, outlining a problem and/or situation, and describe how you use it in your classroom, how it relates to the curriculum and the "results" in terms of student learning.

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