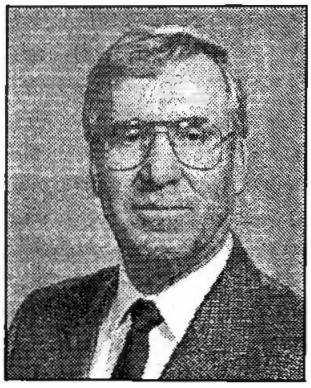
EDITORIAL



As you read this issue of *delta-K*, you are well into the year 2000 and near the end of another school year. For many of you, this will have been your second year teaching the Applied and Pure Mathematics streams that were developed as part of the Western Canadian Protocol. I am sure that some of you are still struggling, while others are beginning to reach an appropriate comfort level within these new streams. Any call for significant curricular change poses new challenges for teachers. The new curriculum is no exception. It not only identifies the strands and general and specific outcomes for students to learn but also lists seven mathematical processes, which are seen as critical components that students must encounter in their mathematics learning.

These seven mathematical processes—communication, connection, estimation and mental mathematics, problem solving, reasoning, technology and visualization—permeate the teaching and learning of mathematics from Kindergarten to Grade 12. While incorporating all these mathematical processes in the lessons requires thoughtful planning by teachers, problem solving continues to challenge teachers in a significant way. This is partly due to the fact that as teachers employ problem solving throughout the strands, they are required to develop new techniques for evaluating what students have learned and the effectiveness of instruction. Problem solving also draws in other mathematical procedures, such as opportunities for students to be active in constructing mathematical meaning, communicating mathematical ideas, reasoning and the use of technology. In addition, problem-solving activities should provide the students with the opportunity to work cooperatively.

Teachers are generally very supportive of the importance of problem solving as the focus of mathematics at all grade levels, but they question current evaluation/assessment methods. While this is a critical issue, it does not mean that problem solving can be ignored. Some suggestions that you might find useful in implementing problem-solving processes in your classroom follow.

What am I trying to evaluate? Problem solving involves many subskills, knowledge and attitudes, and your assessment can focus on them individually. It is important to recognize that successful problem solving not only involves the mastery of these subskills but also their coordination.

What are some evaluation techniques that I can use in my classroom? Your selection of an evaluation method is probably guided by a number of factors, such as the type of problem, class size, the time available for evaluation, your experience and availability of resources. Depending on the outcomes to be evaluated—student performance or student attitudes/beliefs---several techniques can be employed, including observation, checklists and questioning of students, using assessment data from students, holistic scoring methods or multiple-choice and completion tests.

How do I organize and manage my evaluation program? This important question requires you to reflect on your own beliefs about evaluation and, in this case, problem solving. Is your evaluation plan part of your instructional plan, its content and activities? As you develop your plan, be mindful of the following guidelines:

- Evaluate your students' work on a regular and systematic basis.
- Evaluate their thinking processes as well as their answers.
- Match your evaluation plan to your instructional goal.
- Assess attitudes and beliefs about problem solving as well as performance.
- Interview students individually whenever possible.
- Observe students' small-group efforts and their written work as an important part of your evaluation plan.
- Do not feel compelled to evaluate all students at the same time or to record their performance on every problem-solving experience.
- Advise students of your evaluation plan and how it works.

How do I use the evaluation results? Clearly, the major reason for developing and using an evaluation plan for problem solving should be to gain information that enables you to make instructional decisions based on students' identified strengths and weaknesses. More specifically, one might ask, Are the problems appropriate with respect to the level of difficulty? Is problem solving part of my instructional program or is it an extra?

Are the experiences properly sequenced to develop students' skills? Do I incorporate appropriate content and teaching methods? or Do I use my results for evaluating student progress in problem solving or for grading?

The assessment/evaluation of the mathematical process of problem solving is indeed complex and challenging, but with the appropriate attention to its purpose, techniques, organization/management and the use of the results, problem solving can be a very positive experience for students and teacher.

As George Polya (1949), the great teacher of problem solving, said:

> No one can give away what he has not got. No teacher can impart to his students the experience of discovery if he has not got it himself.

References

Charles, R., F. Lester and P. O'Daffer. *How to Evaluate Progress in Problem Solving*. Reston, Va.: National Council of Teachers of Mathematics, 1987.

Polya, G. *California Mathematics Council Bulletin* 7, no. 2 (1949).

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