

How Are We Doing – Now That We Know What It's All About?

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No other topic in mathematics education, involving curriculum development, implementation, or instructional inservice, has received more attention than that of problem solving. It has been defined, redefined, exemplified, and "workshopped" into submission, it would seem. Publishers of resources, from monographs to computer software, have left us with no excuses. Every mathematics teacher and administrator must know what it is and why it is, and so the big question remains: *What have we been doing with problem solving, now that we know what it is all about?*

The assumption in this article is that we have passed the "understanding the problem" and the "developing and carrying through the plan" stages, and we are now looking back. This point is can be argued. However, the question remains: "Are children actually experiencing anything different in mathematics than they did before the topic emerged into prominence?" My "guess and check" is no. For the believer, this is tough medicine, but if we were to look at an overall time-on-task analysis of Alberta elementary children's mathematics engagements, it would be as follows: operations and properties - 60 percent; numeration - 25 percent; measurement - 10 percent; geometry - four percent; graphing - one percent; and problem solving - zero percent.

This is another story of curriculum and implementation similar to that of the "new mathematics." Problem solving will also fail for the same reasons. The topic and content has not had an impact on the belief system of teachers and administrators. The word fell on unprepared soil, and the intensity of the normal classroom snuffed it out. We gave teachers seed packages, but neglected the planting and the nurturing. Our workshops and monographs gave episodes of problem solving, but did not confront the issues of where, when, and how in the context of the total mathematics program. Anyone can set up an appropriate problem and get people all excited and involved in finding solutions. To help in this regard, we even provided a good list of skills. (See *Let Problem Solving Be the Focus for the 1980s*, an Alberta Education monograph published in 1983.)

We also failed in not recognizing that change comes only when that which is new is perceived as being more appropriate than that which is present, and when the new can be accommodated within the teacher's conceptual and operational plan.

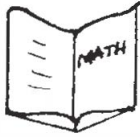
We are almost to the point of waiting for something new to come along. While we seem to need that, let's not give up on problem solving yet. One of the big reasons for not including problem solving in the mathematics program has been time. "How can I fit more into my current program?" has been the question.

Here are a few ways of recapturing this precious commodity. Note the savings:

$$\begin{array}{r} 19 \\ 35 \\ \hline 414 \end{array} \quad \begin{array}{r} 207 \\ 536 \\ \hline 703 \end{array}$$

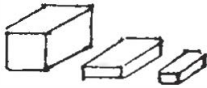
If students are having difficulty, diagnose and treat the specific errors. If they are succeeding, restrict practice and review to reasonable limits.

Save 15%



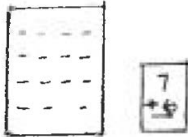
If you teach the content of an authorized textbook, you are keeping children overly busy, including nonprogram objectives and missing others. Design and utilize a meaningful plan.

Save 15%



If you can teach the concept of skill manipulatively, don't do it abstractly. We know this, but fail so often to apply this most important principle.

Save 10%



No more worksheets for basic fact recall - use student-made flash cards, and personal and home contracts for mastery. Time saved includes helping students overcome dependency habits.

Save 5%

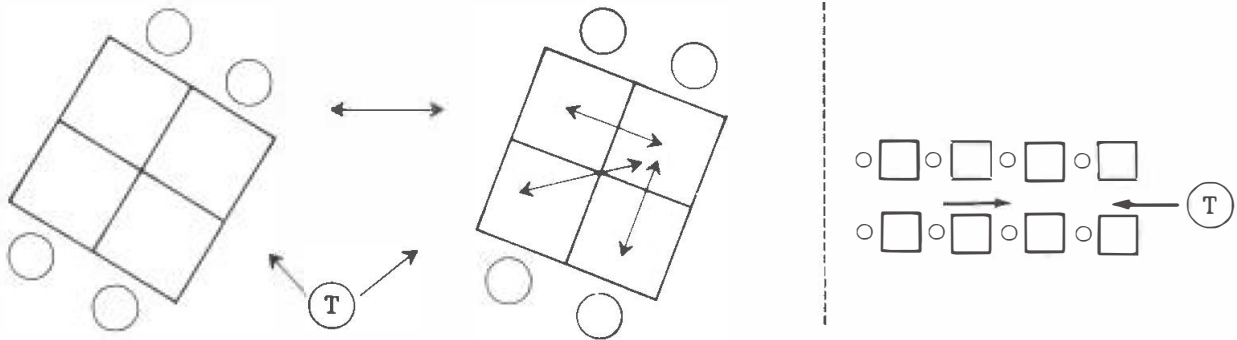
We can be more comprehensive in dealing with the components of effective lessons and increase the positive attitude toward mathematics by 50 percent. To illustrate, teachers could take any mathematics objective at any grade level - as an example, "compare two or more objects as shorter, longer, thinner, thicker, heavier, lighter than" (Grade 1) - and balance one week of instruction as follows:

Instructional Program Emphasis in Minutes

	Day 1	Day 2	Day 3	Day 4	Day 5	Total
Goal-Objective Orientation	10				5	15
Introduction Activity	10	5	5	5	5	30
Lesson Development	15	15	10			40
Practice Application		10	10		10	30
Problem Solving			10	35		45
Assessment Evaluation		10			10	20
Closure Activity	5		5	5	10	25

In this model, problem solving requires but one period per 205-minute week, still allowing time for mastery of the core program objectives. Implementing the plan will involve describing the specific activities under each of the instructional components for the week. Each week is best tied to an overall yearly outline.

Reorganize your physical classroom space while you are at it. The interactive and integrative nature of good mathematics problems requires that communications flow multidirectionally. Clustered desk arrangements allow for the needed get-togethers to include you, the teacher. Let's face it, a good percentage of a student's learning is from other students. One step back, and you have your individual child work space.



It is critical that problem solving become a part of instruction in the mathematics program in the elementary school. Alberta Education will soon release a monograph on the topic as it applies to the junior high level.

So the question remains: "What are we going to do with problem solving now that we know what it is all about?"

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