

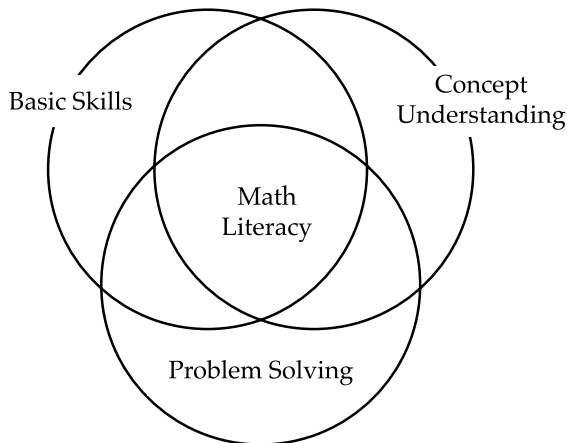
Why Teach Problem Solving, Part I: The World Needs Good Problem Solvers!

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There are three parts to learning mathematics: skills, concepts, and problem solving. It is fairly easy to understand why we teach the first two. Skills are essentially the tools of mathematics, such as learning how to add two numbers together to get a correct answer. Concepts are the ideas in mathematics (such as the concept of a triangle) which we need to understand before we can do mathematics.

But Problem Solving is harder to explain. If you think of skills and concepts as what we need to know in mathematics, then problem-solving is the ability to apply mathematics we know in different situations. Problem solving is important because it requires us to combine skills and concepts in order to deal with specific mathematical situations—we call these problems. If you know your mathematics skills and concepts well, but can not put them together in a particular situation, then you can not do mathematics well. Skills, concepts, and problem solving used together in real situations lead to mathematical literacy. It's a package!



In 2003 the Organization for Economic Cooperation and Development (OECD) stated:

“Mathematical literacy is defined as an individual’s capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgments, and to use and engage with mathematics in ways that meet the needs of that individual’s life as a constructive, concerned, and reflective citizen.”

From the definition of mathematical literacy, you can see how important it is for individuals, families, society, and even our environment, that we have good problem solvers. The one sure thing that we can all count on in the future is that we will be surrounded by problems that must be solved before we can move forward. And we are not just talking about “math” problems. Problems can be found in every area of our lives.

The OECD defined problem solving as:

“An individual’s capacity to use cognitive processes to confront and resolve real, cross-disciplinary situations where the solution is not immediately obvious, and where the literacy domains or curricular areas that might be applicable are not within a single domain of mathematics, science, or reading.”

Personally, I prefer a much simpler definition. One of my teachers, Lyle Fisher, stated:

“Problem solving is knowing what to do when you don’t immediately know what to do!”

For example, if you look at a math problem:

$$\begin{array}{r} 341 \\ + 279 \\ \hline \end{array}$$


...and immediately know what to do and how to do it, that is not a problem; it is an exercise. You have a *problem* when you look at a situation, and DON’T immediately know what to do to solve it.

A good problem presents you with a situation where you pause, ponder, and scratch your head before you can even put pencil to paper. And problems come in all sizes. Adding $341 + 279$ is a small problem if you haven’t learned the skill of addition. On the other hand, something like global warming is a huge problem, one that will take many people scratching their heads for a long time to solve. Obviously, problem solving is important.

Unfortunately, you do not magically become a good problem solver simply by reaching adulthood. You must begin learning how to solve problems as a child and practice problem solving every day from childhood to adulthood.

What makes mathematics especially well-suited to this task is that the ability to solve interesting problems using mathematics often carries over nicely to solving other sorts of problems, not only outside of math class, but outside of school. The strategies we use to solve unknown mathematical problems often work just as well with nonmathematical problems. So in addition to basic skills and concepts, we must also teach problem solving to K–12 students.

Unfortunately, it is easier to teach skills and concepts, and much harder to teach problem solving. Many students leave school with a full mathematical tool kit of skills and concepts, but do not know how to put them together, and, because of that, are often fearful and avoid new and unfamiliar mathematics situations.

In the next article, *Why Teach Problem Solving, Part 2*, I will take a look at how teachers and parents help students become good (and fearless) problem solvers. 

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