Problem-Solving Skills

Problem solving is a process where people apply routine or basic skills in a specific and organized way to move from one state to a more desired state. Problem solving is a higher-order thought process because it requires basic skills to analyze, interpret, and evaluate a situation.

As a teacher, I want my students to learn how to solve problems on their own. My most important task in teaching problem solving is to convey to my students that they can become good problem solvers. To build my students' confidence, I will teach them that most of the information they will use to solve a problem will be information they already know. The problem solving process requires them to recall and apply basic information in a particular way. I will also teach problem solving as a process of five general steps. Although there are many different kinds of problems, the steps involved in each one fall into one of the five general steps as follows:

1. Identify the problem and to extract the known information.
2. Determine what information is needed and to define goals for obtaining that information.
3. Explore possible strategies for obtaining and applying the new information.
4. Anticipate the possible outcomes and to take action, overcome obstacles, and solve the problem.
5. Look back and learn so that this process can be applied to another problem.

There are three methods students can use to help them break down problems into this general process. I will teach students to use the algorithm, subgoaling, and analogical approaches.

Algorithms are well-defined steps or instructions that lead students to a solution. The key factor in using algorithms is that success is guaranteed when the steps are completed accurately and in the specified order. There are numerous opportunities to use algorithms in math. Any time students plug known information into a formula and perform operations in a specified order to calculate a new value, they are using an algorithm.

Subgoaling involves breaking down a larger process into manageable steps and completing those steps one at a time. Math offers many opportunities for students to use this method. Problems often involve more than just plugging numbers into a formula. For example, there are five steps to solving an optimization problem involving quadratic functions. Students must read and understand the problem, express the problem as a function of one variable, rewrite the problem in a standard form, evaluate the answer to determine if it is a maximum or minimum value, and answer the question posed by the problem.

The analogical approach involves referring to an already known example that is similar to the new one. As with algorithms and subgoaling, the analogical approach has many applications in math. For example, students usually learn the standard equation of a circle before they learn the standard equation of an ellipse even though a circle is a special kind of ellipse. Students can understand the standard equation for an ellipse more easily when they can compare it to that of a circle. Likewise, students understand the standard equation of a hyperbola more easily when they can compare it to that of an ellipse.

My students will learn how to solve problems on their own because I will lead them through the process of using each of the methods. I will make them aware not only of what they are using, but that they are using it. I will model my thought processes as I work through sample problems, so they know why a particular approach works. I will give them guidelines for when to use each method and stress the connection between using the method and finding a solution. Finally, I will reward students for using these methods on their own.