

Problem-Solving

When students are working at math problems and they run into difficulty, some students persevere and untangle the knot of confusion which is blocking them. Many others quickly give up and start waiting in line at the teacher's desk.

Sadly, real problem-solving begins when we are stuck. Students must learn the questions to ask which will help untangle the knot. Provide students with a list of "heuristics" (problem-solving strategies) which they should try out before asking for help:

- Reading the problem aloud
"What is the problem here?"
- Drawing, charting, graphing, creating a model
"What would this look like in a picture, drawing, in another form, in the form I like best?"
- Identifying the problem
"What am I stuck on? What do I need to know?"
- Breaking the problem into manageable parts
"What are the smallest pieces I can break this down into and still have it make sense?"
- Trial and error (guess and test)
"What might work? What can I try?"
- Listing of alternatives
"What are all the things I could do?"
- Considering similar problems from the past
"What do I know about that is like this?"

Basic to many of these strategies are questions such as "What do I know? What don't I know? What do I need to know? How can I find out? What is the real problem? What are the parts of this problem? Are some of the parts easier to solve than others? What are the characteristics of this problem? Have I seen others like it? What strategy worked then? Which strategy do I need now?"

These are powerful questions which the most powerful thinkers use on the toughest of problems. Students can use such questions to move from trial-and-error to systematic, thoughtful problem-solving. They can empower your students if you encourage them and teach them to use questions as thinking tools.