

# Problem Solving

Class notes #1

Introduction

September 3, 2003

Every day we are called upon to deal with solving some sort of problem, from mundane decisions as what to wear to the more difficult problems that are found in school or on the job. Most real-world problems have many possible solutions. The more complex the problem, the more alternative solutions there are. The goal is to pick the best solution for the given problem. We can achieve this goal by exercising our problem-solving skills frequently to make them sharper. This goal of this course is to develop your problem-solving technique and to make you a much more efficient problem solver. The structured process of defining and solving real problems is called a heuristic. A problem-solving heuristic is a systematic approach that helps guide us through the solution process and generate alternative solution pathways. The systematic problem-solving technique (i.e. heuristic) cannot prevent people from making mistakes, but it can provide a uniform systematic approach to dealing with any problem.

## Defining the real problem

A student and his professor are backpacking in Alberta when a grizzly bear starts to chase them from a distance. They both start running, but it's clear that eventually the bear will catch up with them. The student takes off his backpack, puts on his running shoes. His professor says, "You can't outrun the bear, even in running shoes!" The student replies, "I don't need to outrun the bear; I only need to outrun you!"

As you can see, defining the real problem is important. The student realized that the bear would be satisfied when he caught one person; consequently the student defined the real problem as outrunning the professor rather than the bear.

Problem definition is a common but difficult task. The real problem is often disguised in a variety of ways. It requires skill to analyze a situation and extract the real problem from a wide variety of information.

Sometimes we can be fooled into treating the symptoms instead of solving the root problem. For example, putting a bucket under a leaking roof (i.e. treating symptoms) can give the satisfaction of a quick fix, but finding the cause of the leak (i.e. solving the real problem) is important to minimize time lost, money, and effort.

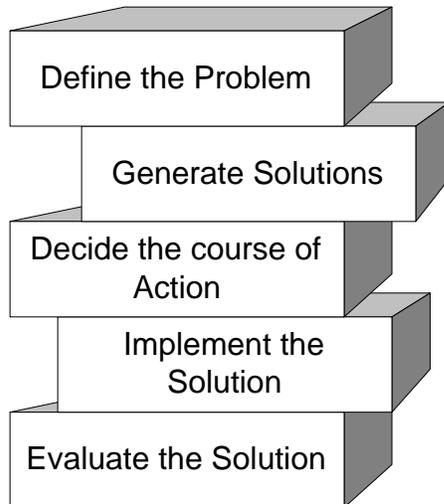
Implementing real solutions to real problems requires discipline to avoid being pressured into accepting a less desirable quick fix solution because of time constraints.

## Wrong solutions to the right problem

Even though a real problem is identified correctly; the solution to the problem is equally important. Solutions to problems that are inadequate, incorrect, or unnecessary can sometimes be more damaging than the original problem.

## McMaster Five-Point Strategy

The problem-solving approach which we will be studying is called the McMaster five-point strategy and is given below:



**Figure 1: The five building blocks of the problem-solving Heuristic**

**Define:** In practice, this phase can resurface at any point of the problem solving process as one finds dead ends or changing criteria or conditions. Once you have defined the real problem, it is then important to ask the following questions: Has this problem been solved before? Is it worth solving? What resources (time, money, personnel) are available to obtain a solution? Have you collected all the necessary information by reviewing the data, reading the literature, and talking to colleagues and those involved in the problem?

**Generate:** After gathering significant information about the problem, you can proceed to the next step, which is generate alternative solutions. One of the most popular techniques used in industry to generate ideas is brainstorming. In addition to brainstorming, other methods to facilitate idea generation include analogies and blockbusting.

**Decide:** After you generate a number of solution alternatives, the next step in the solution process is to decide which alternative to choose. Logic and analysis of each alternative are major factors in reaching a decision. Once the decision is made, you need to plan to ensure its success by identifying things that could go wrong, the causes of each potential problem, the preventive actions that could be taken, and the steps of last resort.

**Implement:** Having made the decision and planned for its success, you may now implement the solution. The first step is to plan the activities you need to do to solve the problem. A number of techniques to allocate time and resources are presented to carry the solution through to successful completion.

Evaluate: You need to look back and make sure all of the criteria in the problem statement were fulfilled and that none of the constraints were violated. Has the problem really been solved, and is the solution the best solution? Is the solution innovative, new and novel, or is it merely an application of principles? Is the solution ethical, safe, and environmentally responsible? Although evaluation is listed at the end of the heuristic, you should also evaluate the problem solution at various points along the way, especially when major decisions are made or branch points occur.