

CS 2104

Introduction to Problem Solving

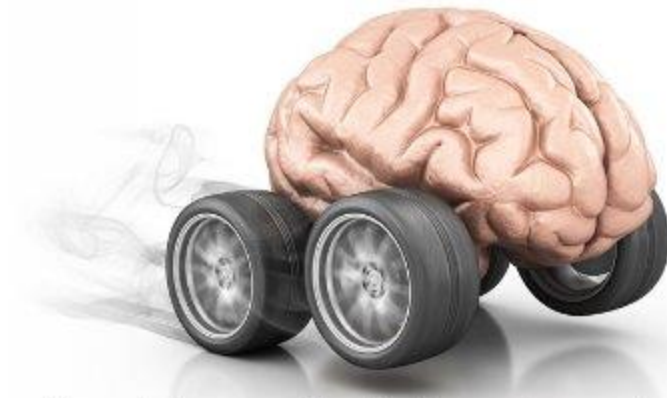
Methods



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Slides based on the “Problem Solving and Comprehension” book
some slides created by Layne T. Watson

To solve the problems we have created as a species, we'll need to speed up our thinking.



Creative Problem Solving is a learnable skill!

newandimproved.com

Learning is a skill

Research has shown that

- Accuracy and thoroughness are ***mental habits***
- Which can be cultivated through ***training and exercise.***
- Learning skills happens gradually
- Then will become natural to you
 - Idea: to identify/list the least accurate areas and work on
 - Practice and practice

Learning a Skill

- In general, to learn a skill (golf, driving car):
 1. Skill is demonstrated to student
 2. Student is directed and guided while practicing
- What about analytical reasoning skills?
 - It goes on inside the head – hard to demonstrate
 - Hard to direct and guide student

Thinking Aloud

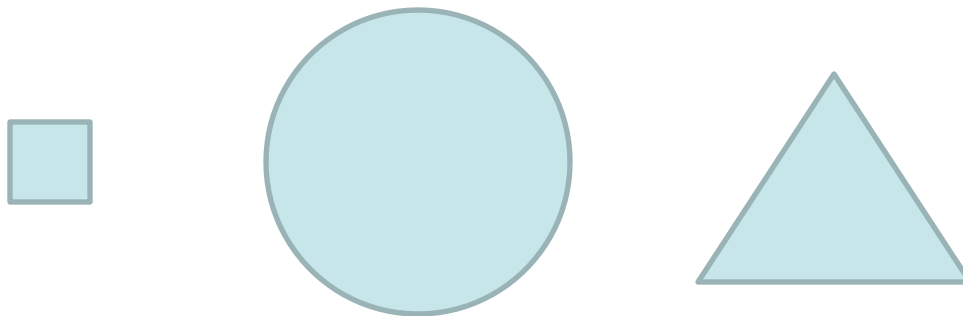
- The most effective way to expose the process is to verbalize our thinking process
 - This is hard work! Not our normal mode
 - Need to be careful to explain every step
- Demonstrate analytical reasoning by watching problem solvers solve problems while thinking aloud
- Practice problem solving by thinking aloud to a partner

Pairs Problem Solving

- We will use the technique of Whimbey & Lochhead
- The partners have distinct roles:
 1. One partner should read and think aloud.
 - On our homeworks, will be scribe as well
 2. The other partner is the listener
 - Continually check accuracy
 - Demand constant vocalization
- Thinking is a skill... but it is largely invisible
 - So we need to do everything possible to make it visible during this process

Problem 1

- If the circle below is taller than the square and the triangle is shorter than the square, put a K in the circle. However, if this is not
- the case, put a T in the second tallest figure.



Characteristics of Good Problem Solvers

- Positive attitude
 - Belief that academic reasoning problems can be solved through persistence, as opposed to believing “either you know it or you don’t”
 - Engage a confusing problem
- Concern for accuracy
 - Actively work to check your understanding
- Break the problem into parts
- Avoid guessing
 - And don’t jump to conclusions
- Active in problem solving
 - Do more things as part of the process

Problem 2

- If the word *sentence* contains less than 9 letters and more than 3 vowels, circle the first vowel. Otherwise circle the consonant that is farthest to the right in the word.

Role of the Listener

Crucial role, hard work. Not a passive role!

1. Continually check accuracy

- Catch errors
- Must work along/understand every step
- Don't let solver get ahead of him/herself
- Point out errors, do not correct

2. Demand constant vocalization

- Solver must spell out EVERY step
- On homeworks, solver must make notes on EVERY step

3. Use Socratic questioning (Fogler/LeBlanc, p. 89—92)

Problem 3

Bill, Judy, and Sally have the occupations of teacher, plumber, and teamster but not necessarily in that order. Bill is shorter than Judy but taller than Sally. The plumber is the tallest and teamster is the shortest. What is Judy's occupation?

Problem 4

If the second letter in the word *west* comes after the fourth letter in the alphabet, circle the letter A below. If it does not, circle the B.

A

B

Problem 5

Give a rough estimate of the number of telephones on the Virginia Tech campus.

Problem 6

You drive a car at a constant speed of 40 mph from A to B, and on arrival at B, you return immediately to A but at a higher constant speed of 60 mph. What was your average speed for the whole trip?

The Role of the Problem Solver

- Read the problem aloud.
- Speak all of your thoughts as they occur.
 - Keep talking to your listener.
 - Write legibly down the page.
- Use 'X' next to the written work instead of erasing or crossing out.
 - Keep talking to your listener.

The Role of the Listener

- Sit so that you may look at the problem solver and at their written work.
- Keep the problem solver talking their thoughts aloud and listen carefully.
- Ask questions to clarify anything you don't understand or don't agree with.
 - Follow the written work.
- Keep the problem solver talking until you reach consensus on the problem.

Role of the Listener

- Do not solve the problem yourself.
- Do not have a pen or pencil in your hand.
- Do not correct the problem solver, but instead ask questions for clarification.
- Do not solve the problem yourself.

