

Problem Solving Strategies

Fogler and LeBlanc, Strategies for Creative Problem Solving, 3rd ed, 2013

D.R. Woods, An Evidence Based Strategy for Problem Solving,

Journal of Engineering Education, Vol 89, pp 443-460.

1. **Engage**
 - focus on solving the problem
2. **Problem Definition**
 - clarify all available information
 - restate the problem: what is known? what is unknown?
 - draw diagrams
 - take notes
3. **Explore Possible Solutions**
 - talk with others: brainstorm
 - collect missing information
 - thought experiments
 - ball park estimates
 - check for errors in logic
4. **Plan a Course of Action**
 - select best approach
 - lay out plan of attack
 - stuck? Take a break!
 - critical path analysis
 - obtain resources
5. **Do it.**
6. **Evaluate the Results**
 - right order of magnitude?
 - viable solution?
 - are all constraints and requirements met?

Characteristics of Expert Problem Solvers

(adapted from ASEE Prism, Oct/96)

Expert problem solvers spend most of their time in the "define" and "explore" stages of the problem. They always evaluate the results. Underlying these actions, they have developed a lot of "mental toughness," (or panic avoidance). Expert problem solvers place a high value on the following approaches:

1. Accuracy in Reading

- focus on the meaning of the problem statement
- understand every word
- collect all facts
- reread the statement several times (at least 3)
- complete the problem definition before doing any work

2. Accuracy in Thinking

- value accuracy
- work carefully
- use words, notation, and procedures consistently
- check information if unsure
- work calmly
- draw conclusions only if warranted

3. Active Exploration of Possible Solutions

- draw sketches
- think out loud/group think
- break problem down into parts
- build from easy solutions to more difficult ones
- draw on prior knowledge and experience
- ask questions

4. Play to Win/Persevere/Believe in Yourself

- self confidence
- self critical - question methods and approaches
- ground all conclusions thoroughly
- use a "time out" to regroup for a fresh attack