

PROBLEM SOLVING

Instructor's Guide

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OBJECTIVES

After completing this module, students should be able to:

Describe the problem-solving process

Discuss approaches used in problem solving

Solve routine problems (exercise-solving)

Solve novel, out-of-context, problems where the approach is not obvious

Critique problem-solving process

JUSTIFICATION

Good problem-solving skills are important because:

The essential engineering skill

ABET requirement

PREREQUISITE KNOWLEDGE OR SKILLS:

TEAMING

CLASSROOM REQUIREMENTS:

computerized projection system

INSTRUCTION OUTLINE

SESSION 1

1. Introduction (10 minutes – 8 slides)
2. TEAM EXERCISE (15 minutes – 1 slide)
3. REVIEW TEAM EXERCISE (10 minutes – 2 slides)
4. ENGINEERING PROBLEM SOLVING (10 minutes – 3 slides)
5. Assignment 1 (5 minutes – 2 slides)

SESSION 2

1. assignment 1 solution (5 minutes – 1 slide)
2. Quiz 1 (5 minutes – 1 slide)
3. CREATIVE PROBLEM SOLVING (1 minute – 1 slide)
 - A. 1. Define (1 minute – 1 slide)
 - B. HUNGRY BEAR (3 minutes – 2 slides)
 - C. gas from coal (5 minutes – 4 slides)
 - D. 2. Explore (5 minutes – 2 slides)
 - E. Putrid Pond (5 minutes – 3 slides)
 - F. A/CL/TEAMING EXERCISE (5 minutes – 1 slide)
 - G. NUMBERS (10 minutes – 3 slides)
4. Assignment 2 (1 minute – 1 slide)
 - A. 1. Rubric for problem-solving (2 minutes – 1 slide)

SESSION 3

1. Quiz 2 (5 minutes – 2 slides)
1. Work complex problems in teams (12 minutes – 3 slides)
2. Critique problem-solving process (5 minutes – 3 slides)
3. Work complex problems in teams (18 minutes – 3 slides)
4. Critique problem-solving process (5 minutes – 3 slides)
1. Quiz 3 (5 minutes – 2 slides)

ASSIGNMENTS:

1. "Percentage problem" (individually or in teams).
2. Devise rubric (individually or in teams).

PERFORMANCE ASSESSMENT USED TO EVALUATE (GRADE) INDIVIDUAL STUDENTS

1. Rubric for evaluating problem-solving process.
3. Quiz 1 on session 1.
4. Quiz 2 on session 2.

OUTCOMES ASSESSMENT – USED TO EVALUATE EFFECTIVENESS OF THE MODULE

1. Before the module, have half of class solve a problem.
2. Score these using the rubric.
3. After the module, have other half of class solve same problem.
4. Score these using the rubric.
5. Compare the before and after problem solving skill.

SOURCE MATERIAL

Bodner, G.M., "A View From Chemistry" in: Smith, M.U. (ed.), Toward a Uniform Theory of Problem Solving, Views from the Contents Domain, Lawrence Erlbaum, Associates, Inc., Hillsdale, NJ, 1991.

Fogler, H. S. and S. E. LeBlanc, Strategies for Creative Problem Solving, Prentice Hall, Englewood Cliffs, NJ, 1995.

Lumsdaine, E. and M. Lumsdaine, Creative Problem Solving, Thinking Skills for a Changing World, McGraw-Hill, Inc., New York, NY, 1995.