

Problem Solving



Introduction

- Primary goal of physics course is to teach problem solving
 - Use the concepts of physics to answer a question when you don't already know the solution
- Students do not reason with physics, they hunt for the equation with the right variables
- How do we teach our students to reason with physics?



Outline and Learning Goals

- Solve two problems to investigate
 - How experts solve problems
 - How that differs from the way we generally teach problem solving
- Learn the benefit of using an explicit problem solving method with our students



I – Simple Problem

- Solve the simple problem.
- One pen! Work together on the problem.

II – Problem Solving Method

- Do the second problem
- Record all of the steps and decisions you make in your groups to get to the solution
 - Step: We checked the units
 - Decision: We decided to solve this problem using conservation of energy
- One solution recorder
- One method recorder



Steps and Decisions

- Volunteer?

Problem Solving Method

- Interpret the problem
 - What's going on? What am I trying to solve for?
- Model the problem
 - What is the relevant physics? Can I make any assumptions?
- Plan the solution
 - Do I have enough information? How will I combine the relevant equations?
- Solve
- Check your answer
 - Does this make sense?



III – Discussion

- What are some of the differences between the two problems you solved?
- Did you use the steps of the problem solving method in the first problem? Which steps are clear in your solution?
- How can we reinforce proper problem solving in your students?

Summary

- We often skip over steps in the problem solving methodology when we are teaching our students
- To teach students quantitative problem solving, it is essential to
 - Use good problems!
 - Reinforce their conceptual understanding
 - Communicate all of the steps we take in solving the problem
 - Explicitly refer to the steps of the general problem-solving method when we coach them



References

This module was developed with materials from:

- 2006 TA Training Materials, Physics Department, University of Minnesota
- "The Competent Problem Solver, A Strategy for Solving Problems in Physics", University of Minnesota, School of Physics & Astronomy, 1994