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Curriculum Units by Fellows of the National Initiative
2015 Volume V: Problem Solving and the Common Core

Solving Big Problems: Using Estimation to Develop Scientific Number Sense

Guide for Curriculum Unit 15.05.11, published September 2015
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This unit seeks to improve students' number sense, problem deconstruction and communication skills through the use of estimation questions known as Fermi Problems. Problem solving strategies, order of magnitude sense, estimation skills, an understanding of precision and experience justifying mathematical computations with writing will be developed. Students always ask, "when will I need this" and this unit attempts to give them something they can use. The true value of a physics education comes in the ability to ask questions, make observations and solve problems. Not just textbook or classroom problems, but real life problems. Number sense, especially when orders of magnitude are concerned, is a tough skill to develop and internalize. Being able to decompose complex questions into approachable parts puts understanding within reach.

This unit is designed for an 11th grade Physics class concurrently enrolled in Algebra 2 or Precalculus. It doesn't depend on any particular physics content knowledge, so it is immediately applicable in a chemistry class. It would also fit well into an Algebra 1, Algebra 2 or Precalculus class offered at the high school level. The complexity of questions and techniques can be scaled depending on the age of the students.

(Developed for AP Physics I and Advanced Physics, grade 11; recommended for Physics, Chemistry, Environmental Science, and Mathematics, grades 9-12)