Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
2008 Volume V: Forces of Nature: Using Earth and Planetary Science for Teaching Physical Science

Seeing Mathematics in the Forces of Nature

Guide for Curriculum Unit 08.05.07
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Mathematics is used to explain and to generate the models that are used to understand many physical phenomena. This unit discusses some of the mathematical concepts that are used to explain selected topics from the “Forces of Nature” seminar. The major topics of the seminar included forces, movement, gravity, energy and power and fluid flow. From these topics the unit was developed. The concepts covered in the unit are: waves and sound waves, earthquakes, the Doppler Effect, and sonic boom.

The unit was written to accomplish the following objectives:

a. To provide a series of lessons that can be used to enhance mathematics application using topics from the physical sciences.
b. To provide research ideas for students enrolled in A.P. calculus.
c. To provide connections of mathematics and the physical sciences.

The unit is written in three sections. Section I explains the concepts of waves and the mathematics of waves. Section II covers sound waves, earthquakes, the Doppler Effect and sonic boom. Section III provides samples of lesson plans. The unit will be taught over a period of two to three weeks. The purpose is to provide background information to situations that occur when teaching problem solving. In cases where students are faced with a problem situation, for example in logarithms, the section of the Richter scale will be discussed. The unit can be taught in its entirety or in parts as the need arises. It is recommended that the problems be supplemented by similar problems that can be found in mathematics textbooks.

(Developed for Mathematics, grades 11-12; recommended for Mathematics, grades 11-12)