

## Modeling Instruction in High School Physics

**Publisher and Developer:** Arizona State University

**Grade levels:** 9–12

**Scientific domains:** Physics

**Web site:** <http://modeling.asu.edu>

**Year profiled:** 2002

*Modeling Instruction in High School Physics* has been under development at Arizona State University for more than a decade under the leadership of David Hestenes, Professor of Physics. The program cultivates physics teachers as users of technology in science teaching, and infusion of technology into the classroom is a key component of this program. It also focuses on pedagogical reform by aligning with the national standards and by offering the Modeling Method as an alternative to the traditional lecture-demonstration method. The Modeling Method pursues course coherence by organizing the course around a small number of scientific models. All curriculum materials are available free from the project Web site, and hands-on materials are available through various providers. In 2001, the U.S. Department of Education recognized *Modeling* as one of two exemplary programs in K–12 education.

### SCOPE/CONTENT

The curriculum materials provided by the *Modeling Instruction in High School Physics* program consist of units in physics (with developmental materials in physical science and chemistry) to be used at the teacher's discretion. The program sees the first part of the course (slightly longer than one semester) consisting of nine units focusing on issues around mechanics, with the rest of the course drawn from such units as "Models of Light," "Waves and Sound," and "Electricity and Magnetism."

Currently, the units for Mechanics are:

- Scientific Thinking in Experimental Settings
- Particle Moving with Constant Velocity
- Uniformly Accelerating Particle Model
- Free Particle Model: Inertia and Interactions
- Constant Force Particle Model
- Particle Models in Two Dimensions
- Energy
- Central Force Particle Model
- Impulsive Force Particle Model

### FORMAT

The Web site offers free to workshop participants fully downloadable units and lessons that represent the approach of the program. The teaching materials include timelines, criteria for student presentations, lab report forms, and score sheets. For each unit, the program includes the instructional goals and overview, lab notes, instructional comments, description of student materials, deployment exercises in which the students apply their models to new situations, and tests and quizzes. Students experience a physical phenomenon, develop an explanation for it, then present and defend their conclusions. The schools must provide the requisite computer-based technology.

### **ASSESSMENT INSTRUMENTS**

These are available on the Web site.

### **PROFESSIONAL DEVELOPMENT SUPPORT**

The *Modeling Instruction in High School Physics* program is primarily dependent on the summer workshops conducted by Arizona State University and other universities. Workshop dates and locations are listed on the Web site. Workshops have a variety of formats—from a one-week introductory workshop to a four-week intensive workshop—but all are based on making models and modeling the central theme of the course.

### **STAND-ALONE VS. SUPPLEMENTAL**

The curriculum materials provided are designed to be used in place of existing high school physics curricula, but can be modified by teachers as they see fit.