

Physics Modeling Workshops

Session I: July 25-29, 2011

Session II: August 1-5, 2011

The workshop on physics teaching thoroughly address all aspects of middle & high school teaching, including the integration of teaching methods with course content for physics classrooms. Special emphasis will be placed on modeling conceptual development and integrating technology appropriate for the middle and high school.

Participants will be introduced to the *Modeling Method* as a systematic approach to the design of curriculum and instruction. Participants will be instructed on computer hardware and software selection, techniques for laboratory data collection and analysis, and internet use to help them become experts on the best uses of technology in education.

Participants will be given techniques to deliver in-service training and help in strengthening local teacher alliances, like the Southern Maine Physics Alliance.

Content from first and second semester high school physics or introductory middle school physical science is organized around five basic models to simplify structural coherence:

1. Free particle model: Objects in linear, uniform motion subject to no net force.
2. Constant force particle model: Objects in linear or parabolic, uniformly accelerated motion subject to a constant net force.
3. Restoring force model: springs - a method to introduce energy and work.
4. Impulsive force model: Collisions
5. Central force model: Circular motion.

New modelers are supplied with course materials and will work through activities alternately in the roles of student or teacher.

Goals

1. To train teachers in the use of a model-centered, constructivist method of teaching while simultaneously improving their content knowledge in physics.
2. To provide continued professional development for experienced instructors as well as mentoring of new instructors.
3. To integrate computer courseware effectively into the physics curriculum.
4. To establish electronic support and a learning community among participants.
5. To help participants to make better use of national resources for physics education.
6. To strengthen local institutional support for participants as school leaders in disseminating standards-based reform in science education.

The Modeling Cycle

Participant activities are organized into modeling cycles that engage participants systematically in all aspects of modeling. Each cycle has two phases.

(1) Model development

A cycle begins with a demonstration and a discussion to establish a common contextual understanding of terminology and goals. The leader is sensitive to participant's initial knowledge state and builds on it, instead of treating their minds as empty vessels.

In groups of three, participants design and perform their own experiments and prepare whiteboards for presentation of results and conclusion. Participant's reports articulate and evaluate a model for making sense of experimental results, and submit to questions and critique from all other participants.

(2) Model deployment

Participants are given a variety of problems and situation to analyze using the model. They prepare to present and defend their arguments and conclusions. Leader guides participants unobtrusively through each modeling cycle, with an eye to improving the quality of student discourse by insisting on accurate use of scientific terms, on clarity and cogency of expressed ideas and arguments.

Proviso

Experience shows that a 3-week minimum is needed by most high school science teachers to transform their teaching to modeling instruction. Participants with prior modeling training find the workshop reinvigorates their teaching. Those without modeling training will recognize this is a first step in long-term professional development.

Workshop Features

Modeling approach to physics instruction will be used:

- Session I covers kinematics and dynamics.
- Session II covers energy, collisions and circular motion.
- All sessions are M-F 8-5 p.m.
- Workshops are limited to 12 participants.
- Intensive 40-hour/week course.
- Workshop fees include lunch.
- Graduate credit available from U Maine.

Workshop leaders

Mike Waters has six years of modeling instruction in three subjects at high school. Jamie Vesenka is a professor of physics at UNE and has directed 11 summers of modeling workshops training over 500 teachers from 5th grade to college.

Workshop Logistics

Housing is available as needed at local motels (these are not endorsements).

super8sanford@yahoo.com

(Least expensive, 10 miles from FPUU)

<http://www.kennebunkcottages.com>

(On Route 1, 1 mile from FPUU)

<http://www.thekennebunkinn.com>

(Downtown Kennebunk, 1/4 mile from FPUU)

Limited housing is available with FPUU church members. Lunch is provided as part of the workshop. Non-refundable checks of \$650 for per session (CAN BE TAKEN INDEPENDENTLY OF EACH OTHER), \$1200 for both, should be mailed to address below. Please send in application electronically if possible:

FPUU Kennebunk

P.O. Box 235

Kennebunk, Maine 04043

Electronic application submission: kbkuu@gwi.net

Please write "Physics Modeling Workshop" on the memo line. Two graduate credits can be purchased from the University of Maine for workshop participation (in-state \$900, out of state \$2200). Course SMT598 Special Topics - Physics Modeling Instruction. The school of each participant is strongly encouraged to set aside adequate No Child Left Behind funds to support attendance, or laboratory equipment, instructional materials, and/or technology to be purchased at the discretion of the participant to implement the modeling instruction. For further information contact:

James Vesenka: jvesenka@gmail.com (cell: 207-281-3316)

How to find us and what to bring?

Directions to the workshop are at: www.uukennebunk.org/howtofindus.html. I will have computers and dynamics tracks. If you have your own laptop you are strongly encouraged to bring it to the workshop to familiarize yourself with the use of the technology, including motion sensors and blue tooth force sensors. White boards play an important role in helping students to communicate ideas and are used extensively.

There are several good local restaurants within walking distance from the workshop. August is warm and humid on coastal southern Maine. It rains periodically too, so have a raincoat or umbrella handy. Though we put in 8 hour days, evenings are long so there is still beach time, and less crowded too. Kennebunk beach is four miles away and an easy bike ride. Bikes can be rented locally at www.capeablebikes.com.