



**Modeling  
Instruction  
Institute (MI<sup>2</sup>)**

**July 11-28, 2011**

*Summer Workshop for  
High School Teachers*

**Fort Hays State University**

• *Physics*

**Emporia State University**

• *Chemistry*

**Apply online at:**

<http://www.fhsu.edu/smei>



# Modeling Instruction Workshops

**F**ort Hays State University and Emporia State University will offer a three-week summer workshop (Monday - Thursday), July 11 - 28, 2011 for high-school physics, chemistry and physical science teachers. Participants are exposed to Modeling as a systematic approach to the design of curriculum and instruction. The workshop includes the latest results of science education research, best practices in high school science teaching, use of technology, and experience in collaborative learning.

**T**he workshop, *Modeling Instruction Institute (MI<sup>2</sup>)*, is supported by an Improving Teacher Quality Partnership grant administered by the Kansas Board of Regents. Concurrent sessions will convene at ESU and FHSU sites.

**W**hy Modeling Instruction? Extensive research supports the effectiveness of the Modeling approach in enhancing student learning. Based on a comparison of traditional high school instruction, Modeling high school students score an average of about 1.5 standard deviations higher on assessments of conceptual understanding of physics.

**S**upport for participants:

- Technology package for your classroom
- Scholarship towards three (3) hours graduate credit
- Daily stipend
- FREE Housing/FREE Parking
- Funds provided to attend KATS 2012
- Academic year support

**Workshop Goals:**

- **Improve instructional pedagogy** by implementing research-based instructional strategies, inquiry methods, critical and creative thinking, cooperative learning, use of standardized evaluation instruments, and effective use of classroom technology in instruction.
- **Deepen content understanding** in physics (FHSU) and chemistry (ESU) by using multiple representational tools for constructing scientific models in these disciplines.
- **Learn effective pedagogical strategies** from veteran educators who model these strategies throughout the workshop.
- **Participate in an on-going collaboration** among the partners through a state-wide professional learning community of modeling teachers.
- **Enhance/improve science curriculum** in your school district.

For additional information contact:

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*Forward thinking. World ready.*



**EMPORIA STATE  
UNIVERSITY**

# Modeling INSTRUCTION INSTITUTE

## SUMMER WORKSHOP FOR HIGH SCHOOL CHEMISTRY AND PHYSICS TEACHERS JULY 2011

The Summer 2011 Modeling Workshop at Fort Hays State University (physics) and Emporia State University (chemistry): Four core needs of an effective system of science education.

### 1) Enhancing teacher

#### **understanding of content material:**

There is currently a movement in the nation for the science sequence to begin with physics instead of ending with it. That has led to some teachers leading a class with insufficient preparation in this area. The success of previous Modeling workshops, demonstrates that this intensive training increases teachers' depth of understanding in physics.

### 2) Effective methods of science

**instruction for all students:** While understanding the content is a necessary condition, it is not sufficient. Teachers also need a high level of skill and expertise in teaching students the material.

Modeling workshops intensively train teachers in extremely powerful and adaptable pedagogical techniques which use the scientific process as a vehicle for learning and engagement. This method works for a very diverse group of students. Modeling instruction naturally lends itself to differentiated instruction and has been successful nationwide at schools ranging from economically challenged inner-city, rural schools, and private boarding schools.

### 3) Research-based pedagogy that is effective and long-lasting:

Through the efforts of high-quality education research, much is now known about how students learn science: typical preconceptions they bring into the classroom with them; successful pedagogy for correcting misunderstandings, building upon correct notions, and instilling an appreciation for the process of science; and valid methods for assessing student outcomes in these areas.

However, many teachers remain disconnected from this body of knowledge. Modeling instruction provides a framework for incorporating these results in high school science instruction. Modeling workshops have been offered for nearly 20 years for

3000 science teachers nationwide, and have demonstrably improved the learning of hundreds of thousands of students.

### 4) Enhancing teacher skills in using technology:

This is the era of STEM (science, technology, engineering and mathematics) education in our state and nation. There is no better course than physical science courses to incorporate all of these elements. It is important to increase student proficiency in the technological tools that scientists use to gather and manipulate data. In these workshops teachers will become proficient and be able to guide their students in using the computer as a scientific tool. Data is gathered using probes such as photogates, motion detectors, pressure sensors and force probes that interface with the computer. The data gathered is analyzed with the help of spreadsheets and graphed on the computer. Graphs are then linearized and the type of relationship of the variables is stated based on the steps needed to linearize.

*Modeling was initiated by Arizona State University and funded by the National Science Foundation nearly 20 years ago. It was one of only two K-12 science education efforts to be designated "exemplary" by the Department of Education in 2001.*

*As of October 2008, approximately 2700 high school teachers have taken at least one in-depth Modeling workshop of median length 15 days.*

*Twenty-seven states have hosted workshops. Modeling Instruction is an evolving, research-based program for high school science education reform.*

*The emphasis is on the student constructing their conceptual models of physical phenomena as a central aspect of learning and doing science. It develops in students the ability to analyze data, reach a conclusion and*

*defend it; and it emphasizes experimental design. Other 21st century workplace skills developed include scientific use of computers and probeware, teamwork, and verbal and written communication skills.*

*Students become self-directed, independent learners. Instead of relying on lectures and textbooks, the Modeling Instruction program emphasizes active student construction of conceptual and mathematical models in an interactive learning community.*

*Students are engaged with simple scenarios to learn to model the physical world. Modeling cultivates teachers as school experts on the use of technology in science teaching, and encourages teacher-to-teacher training in science teaching methods, thereby providing schools and school districts with a valuable resource for broader reform.*

*Modeling Instruction is an innovative, effective pedagogy. Data on some 20,000 students shows that those who have been through the Modeling program typically achieve twice the gains on a standard test of conceptual understanding as students who are taught conventionally.*

*Further, the Modeling method is successful with students who have not traditionally done well in science.*

Additional information on modeling:  
<http://modeling.asu.edu>