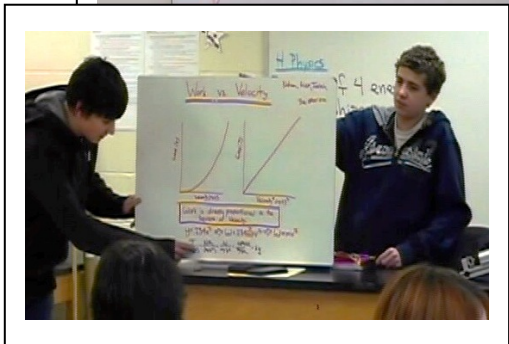


# PHYSICS INSTRUCTION SUMMER WORKSHOP FOR HIGH SCHOOL TEACHERS

July 12-30, 2010  
Spring Lake Park High School, Minnesota

A three-week, 15-day summer workshop to learn mechanics using the successful Modeling method of delivery. Held at Spring Lake Park High School, a Twin Cities suburban school district.

Monday –Thursday, 8:00 a.m. - 3:30 p.m.; Friday, 8:00 a.m.-12 noon



## Modeling PHYSICS INSTRUCTION

Participants receive 30 hours per week of instruction. Participants are exposed to Modeling as a systematic approach to the design of curriculum and instruction. The workshop incorporates up-to-date results of science education research, best practices in high school science teaching, use of technology, and experience in collaborative learning.



Since “teachers teach as they have been taught,” the workshop includes extensive practice in implementing the curriculum as intended for high school classes. Participants rotate through roles of student and instructor as they practice techniques of guided inquiry and cooperative learning. Plans and techniques for raising the level of

discourse in class classroom discussions and student presentations are emphasized. The workshops immerse teachers in the physics content of the entire semester of mechanics. In addition, each teacher receives all the paper materials necessary for teaching mechanics. All units are designed to promote understanding and improve student retention as demonstrated by research on the Modeling methodology.

We had hoped to be funded by a grant where each participant would earn a stipend of \$1200. This did not happen therefore we are requesting \$300 per participant to cover expenses. Thanks to Dr. Leon Hsu, arrangements have been made with the U of M so teachers may earn graduate credit for the workshop. The course number is PSTL (Post Secondary Teaching and Learning) 5001.

### Workshop Leaders

Contact Michael or Eric for more information

#### Michael Crofton

physics teacher, Spring Lake Park High School, Spring Lake Park, MN  
[mcroft@district16.org](mailto:mcroft@district16.org)  
*Trained in Modeling Instruction in 1997 and 1998; leader of 13 modeling workshops since 2000*

#### Eric Larson

physics teacher, Fridley High School, Fridley, MN  
[eric.larson@fridley.k12.mn.us](mailto:eric.larson@fridley.k12.mn.us)  
*Trained in Modeling Instruction in 2000*

# Modeling PHYSICS INSTRUCTION

The Summer 2010 Modeling Workshop at Spring Lake Park High School: 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 to 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 physics 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 this workshop 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, 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. Until now, Minnesota has not been one of those states.*

*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 physics 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 physics.*

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