Modeling Science Program

Deptford Township High School
Modeling in a Nutshell

- Traditional Science turned upside down!
  - Experiment first!
  - Results and conclusions
  - Discussion – teacher reviews

- Let the students do the talking

- Ask, “How do you know that?”

- Require diagrams and representations whenever possible
Modeling Class Progression

- **Modeling Physics – 9th grade**
  - Physics is the science that deals with matter, energy, motion, and force.

- **Modeling Chemistry – 10th grade**
  - Chemistry is the science that deals with the composition and properties of substances and various elementary forms of matter.

- **Modeling Biology – 11th grade**
  - Biology is the science of life or living matter in all its forms, especially with reference to origin, growth, reproduction, structure, and behavior.
Modeling class in action
What? You can’t Answer My Question?! 

- Teacher answers questions with questions!
- Promotes:
  - Problem solving
  - Higher order thinking
  - Student discussion
  - Prerequisite and background knowledge
  - Taking risks
  - No more “rescuing” students with an answer
Why modeling science works

• Interactive engagement
• Student discourse & articulation
• Cognitive scaffolding/building
• Multiple methods for learning
• Students retain the information and apply it!
The Modeling Cycle

How the class works...
I - Model Development

- **Students in cooperative groups**
  - design and perform experiments.
  - formulate functional relationship between variables.
  - evaluate “fit” to data.

- **Post-lab analysis**
  - whiteboard presentation of student findings
  - multiple representations
  - justification of conclusions
II - Model Deployment

- In post-lab discussion, the instructor
  - brings closure to the experiment.
  - fleshes out details of the model, relating common features of various representations.
  - helps students to abstract the model from the context in which it was developed.
II - Model Deployment

In deployment activities, students

• Learn to apply model to variety of related situations.
  » identify system composition
  » accurately represent its structure
• Articulate their understanding in oral presentations.
• Are guided by instructor’s questions:
  » Why did you do that?
  » How do you know that?
How to Teach it?

• cooperative inquiry vs. lecture/demonstration
• student-centered vs. teacher-centered
• active engagement vs. passive reception
• student activity vs. teacher demonstration
• student articulation vs. teacher presentation
• lab-based vs. textbook-based
• hands-on vs. hands-off (watching)

• The teacher is your “guide-on-the-side”