



NSTA Symposium: Energy: Stop Faking It! **Saturday, March 21, 2009**

1:30 PM – 1:55 PM

Welcome, Introductions, Goals for the Symposium

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- About NSTA Symposia
- Agenda/Goals
- Forms/Logistics/Introductions

Bill Robertson, Author, Energy: Stop Faking It!

1:55 PM – 2:15 PM

Constructivism and the Learning Cycle

2:15 PM – 2:30 PM

Recognizing and labeling different kinds of energy

2:30 PM – 3:15 PM

Kinetic and potential energy

3:15 PM – 3:35 PM

Transformation of energy

3:35 PM – 3:50 PM

Work and the work-energy theorem

3:50 PM – 4:05 PM

Mid-Afternoon Break

4:05 PM – 4:30 PM

Conservation of Energy

4:30 PM – 4:50 PM

A few energy calculations

4:50 PM – 5:20 PM

Simple machines—Levers, Pulleys, and Perpetual Motion

5:20 PM – 5:40 PM

Final Words

- Post-assessment/Evaluation forms/Credit info
- Drawing of door prizes

5:40 PM – 6:00 PM

Distribution of books and Q&A

Learning Outcomes

- Participants will be able to define constructivism in everyday terms and will be able to explain the main stages of the Learning Cycle and how one can use it to develop classroom procedures that incorporate constructivism.
- Participants will be able to classify different forms of energy with descriptive terms and will be able to label each kind of energy as either potential energy or kinetic energy.
- Participants will be able to justify the presence of each of the variables in the formulas for gravitational potential energy and for kinetic energy.
- Participants will be able to identify various energy transformations and be able to track the different kinds of energy involved in an energy transformation.
- Participants will be able to explain the principle of conservation of energy.
- Participants will be able to apply the principle of conservation of energy in solving a simple textbook problem.
- Participants will be able to define the scientific concept of work, and use this concept and the transformation of energy to explain the operation of a couple of simple machines.
- Participants will be able to explain why perpetual motion machines are a practical impossibility.

**National Science Education Standards Addressed:
Content Standards, 5-8**

Content Standard B: Physical Science

As a result of their activities in grades 5-8, all students should develop an understanding of

- Motions and Forces
 - If more than one force acts on an object along a straight line, then the forces will reinforce or cancel one another, depending on their direction and magnitude. Unbalanced forces will cause changes in the speed or direction of an object's motion.
- Transfer of Energy
 - Energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical. Energy is transferred in many ways.

Teaching Standards

Teaching Standard B:

Teachers of science guide and facilitate learning. In doing this, teachers

- Focus and support inquiries while interacting with students.
- Encourage and model the skills of scientific inquiry, as well as the curiosity, openness to new ideas and data, and skepticism that characterize science.

Professional Development Standards

Professional Development Standard B:

Professional development for teachers of science requires integrating knowledge of science, learning, pedagogy, and students; it also requires applying that knowledge to science teaching.

Learning experiences for teachers must

- Connect and integrate all pertinent aspects of science and science education.
- Occur in a variety of places where effective science teaching can be illustrated and modeled, permitting teachers to struggle with real situations and expand their knowledge and skills in appropriate contexts.
- Address teachers' needs as learners and build on their current knowledge of science content, teaching, and learning.
- Use inquiry, reflection, interpretation of research, modeling, and guided practice to build understanding and skill in science teaching.