Preparing Elementary Teachers to Meet the NGSS Challenge

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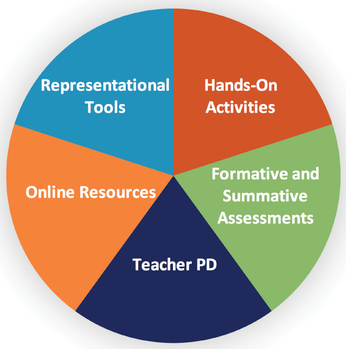
Focus on Energy developed a coherent set of resources for introducing scientific ideas about energy to students and teachers in Grades 4 or 5.



The Energy Tracking Lens

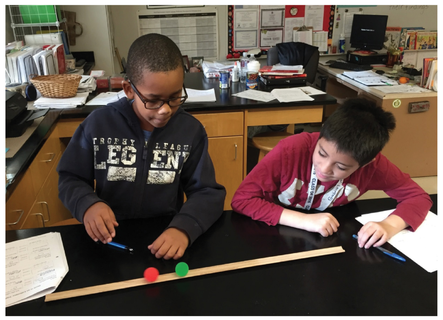
A consistent conceptual framework for using energy ideas to think about any scenario:

Part 1: Describe what you observe.
Part 2: Tell the energy story.

Telling the Energy Story

- System components?
- Form(s) of energy?
- Energy gains and losses?
- Energy transfers?
- Energy transformations?
- Where does the energy come from and where does the energy go?

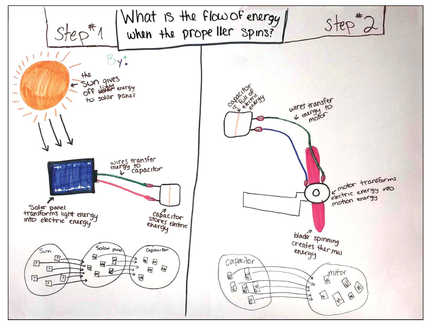
Use observations to support your energy story.

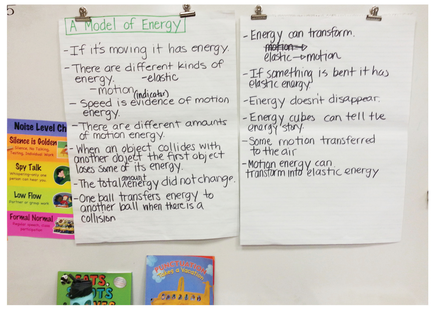


What Should 5th Graders Know About Energy?

Energy as a MODEL for understanding the world (not disconnected facts or terminology)
Key Ideas:

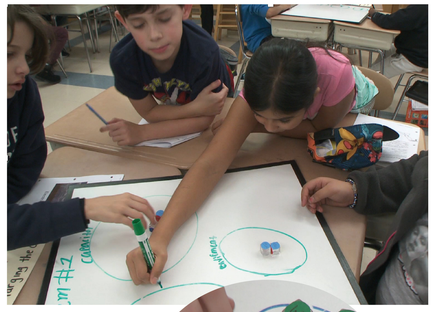
- Forms and their indicators (e.g., motion/speed)
- Transfer and transformation
- Dissipation
- Tracking energy gains & loss (precursor to conservation)
- Learning about energy means learning to use energy ideas to describe, explain and predict behavior

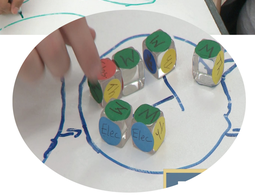




What Can Wait?

- Full understanding of conservation
- Indicators vs factors (e.g., thermal energy vs temp)
- Technical terms (kinetic, potential, fields)
- Degradation/entropy
- Microscopic (atomic/molecular) understanding
- Quantitative calculations (e.g., ½ mv2)
- Gravity



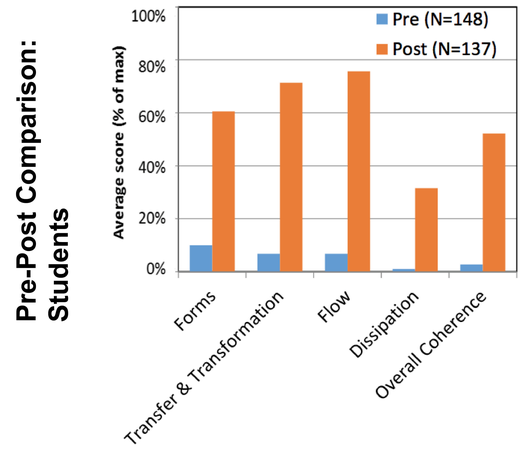


What Are Key Curriculum Features?

- 13-15 classes in three units: Motion/ Elastic, Thermal, Electrical Energy
- Each lesson includes:
  - -Investigation question
  - -Guided hands-on investigation
  - -Sense-making (individual, small-group, all-class)
- Class collectively builds and refines model of energy
- Age-appropriate, general, semi-quantitative representational tools (energy bars, energy cubes) for thinking and communicating the "energy story"

It works for elementary students:

- Preliminary data from 8 Grade 4 and 5 classrooms.
- No significant difference between low and high SES schools.
- 40% spontaneously (no prompt) included dissipation.

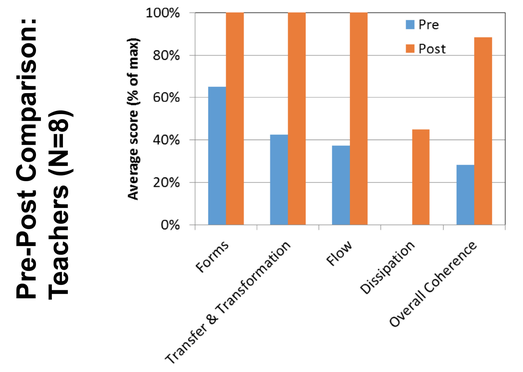


Other observations:

- Students exhibit authentic model-based science reasoning.
- Accessible to ESL and SPED students.

It also works for teachers:

- Teachers had intensive 1-week summer workshop.
- Experienced the same curriculum – activities, model-building, representations, sense-making discussions.
- Adults and children have many of the same conceptual challenges in understanding energy.
- Teachers also found curriculum engaging and showed large learning gains.



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