

# Making the abstract concrete with a kinesthetic activity for energy

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# Outline (tentative)

- Background
- Energy Activity
  - Demonstration
  - Small groups
- Discussion
- Diagraming
- Writing
- More discussion

# Energy Project (NSF DRL 0822342)



*Professional development program*  
for K-12 teachers  
on the learning of **energy** and  
practices of **formative assessment**

*Research program on:*

- teaching and learning of energy
- embodied cognition
- proximal formative assessment
- Rogerian relational discourse

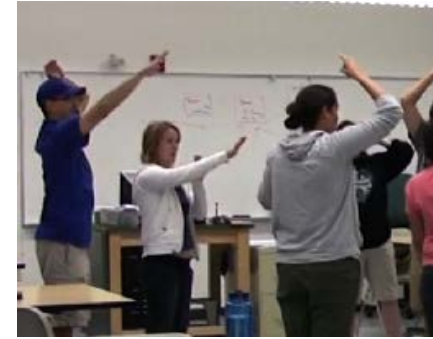
# Different kinds of “Kinesthetic Activities”

## 1. “Embodied Learning Activity”

Bodies represent physics entities

Conceptual understanding ↔ movement

Structure supports learning specific concepts



## 2. “Feeling the Physics”

Using a physical sensation to help internalize intuition about a science concept



## 3. “Wiggling”

Getting blood flowing to brain by moving body

Movement not directly related to target concept



# “Energy Theater”

1. You are a chunk of energy.
2. Objects in the scenario correspond to areas on the floor.
3. You indicate your form in some way.
4. You move to different locations on the floor to show when energy is transferred among objects.

# “Energy Theater” features

1. You are a chunk of energy → *energy is conserved (neither created nor destroyed).*
2. Objects in the scenario correspond to areas on the floor → *energy is found in objects.\**
3. You indicate your form in some way → *energy always has a form; the form can change (energy can transform).*
4. You move to different locations on the floor to show when energy is transferred among objects → *energy can transfer from one object to another.*

# Scenario 1

**A box is pushed across the floor at constant speed.**

***Challenge:* Show what's going on with the energy.**



***Rules (restated from previous slide):***

- Each person is a unit of energy
- Regions on the floor correspond to objects in the scenario
- Each person has one form at a time (indicate somehow)
- Show what happens in scenario by moving around and changing your form

# Discussion questions

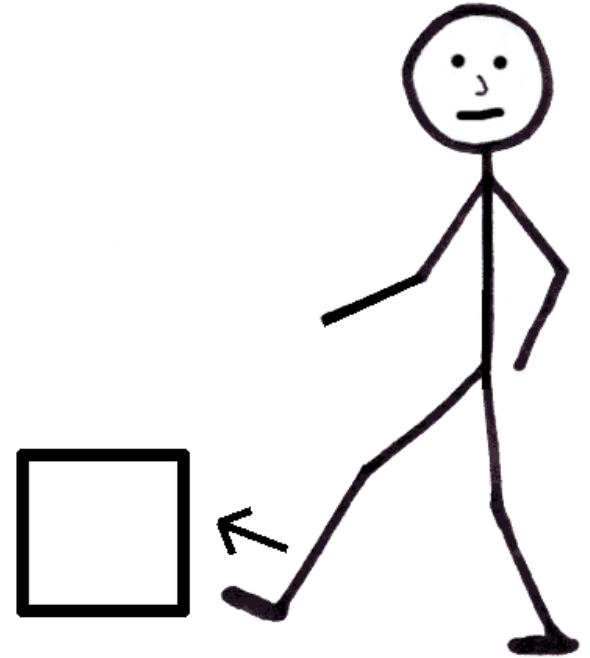
- What forms of energy are relevant to this scenario?
- How are we showing that the speed of the box is constant?
- How would we show that the box is slowing down?



# Scenario 2

**A box is kicked across floor,  
slows down and stops.**

**Challenge: Show what's  
going on with the energy.**



*Rules (restated from previous slide):*

- Each person is a unit of energy
- Regions on the floor correspond to objects in the scenario
- Each person has one form at a time (indicate somehow)
- Show what happens in scenario by moving around and changing your form

# Scenario 3

**A cold-pack is put into a bowl of room-temperature water.**

***Challenge:* Show what's going on with the energy.**

***Rules (restated from previous slide):***

- Each person is a unit of energy
- Regions on the floor correspond to objects in the scenario
- Each person has one form at a time (indicate somehow)
- Show what happens in scenario by moving around and changing your form



# Advantages of Energy Theater

In Energy Theater, you can:

1. Show what you know
2. Learn new things
3. Ask new questions
4. Connect abstract concepts to physical experience



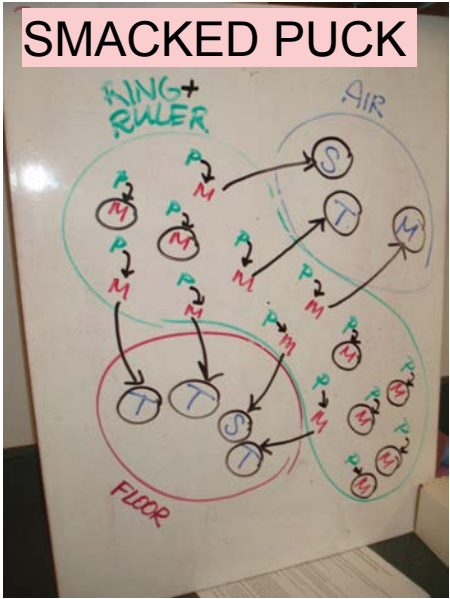


# Assessment of energy learning

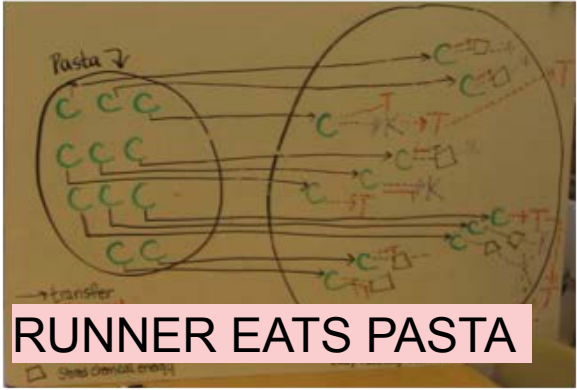
After acting out the Energy Theater, draw and label one or more diagrams that show what your group did.

# Learner-invented representations

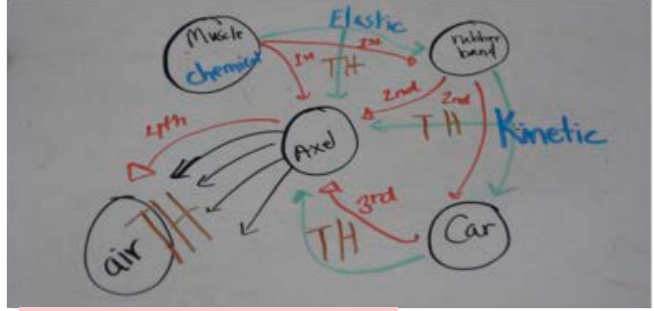
SMACKED PUCK



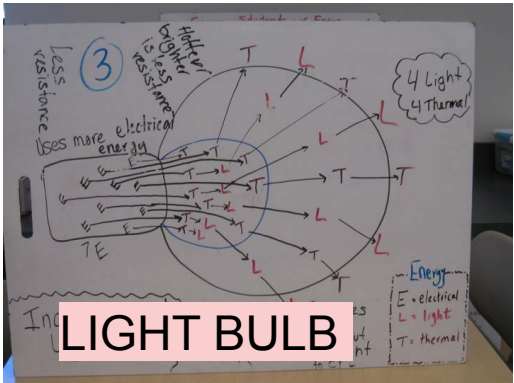
RUNNER EATS PASTA



PULLBACK CAR



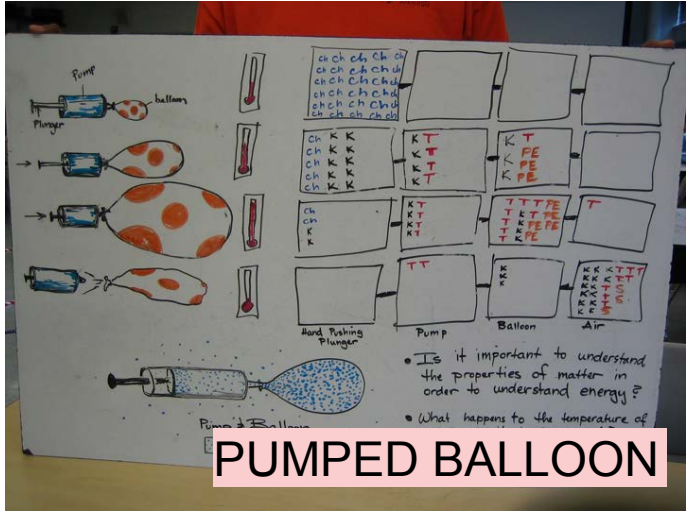
LIGHT BULB



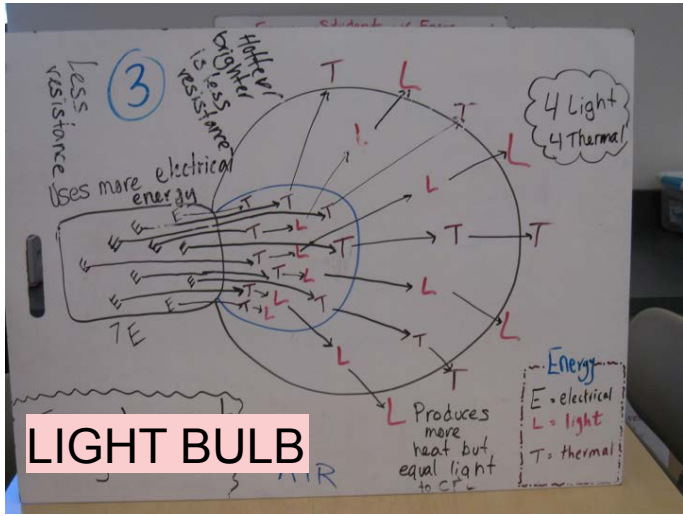
LIGHT BULBS



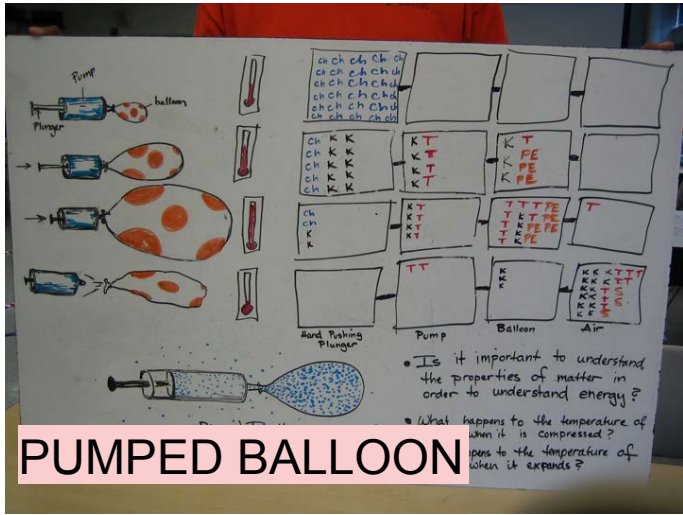
PUMPED BALLOON



# Learner-invented representations



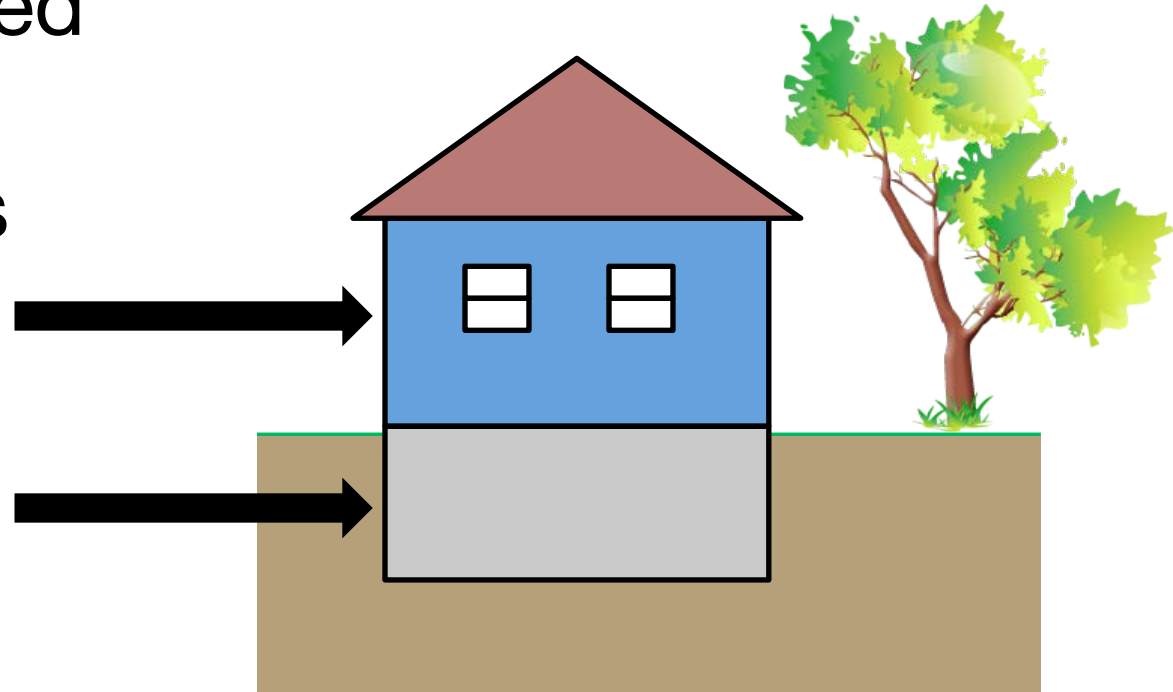
Each energy unit is a letter that traces a path through the system; when form changes, letter changes



Energy units are colored letters; objects are schematic areas; time sequence is diagram sequence; coordinated with observable state of system (volume, temperature)

Learner-generated  
diagrams and  
verbal narratives  
about energy

Energy Theater  
enactment





THE END

# “Energy Theater”

- You are a chunk of energy.



# “Energy Theater”

- You are a chunk of energy.
- **Objects in scenario correspond to areas on floor.**



# “Energy Theater”

- You are a chunk of energy.
- Objects in scenario correspond to areas on the floor.
- **You indicate your form in some way.**





# “Energy Theater”

- You are a chunk of energy.
- Objects in scenario correspond to areas on the floor.
- You indicate your form in some way.
- **As energy is transferred among objects, you move to different locations on the floor.**

