

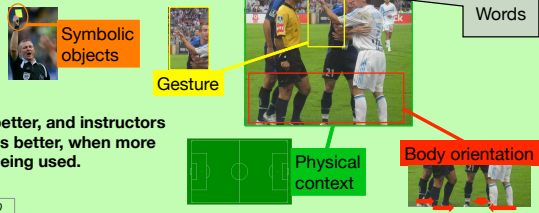
# Energy In Action: The Construction Of Physics Ideas In Multiple Modes

Eleanor W. Close, Hunter G. Close, Sarah B. McKagan, and Rachel E. Scherr – Department of Physics, Seattle Pacific University

## Theory

People say what they mean in many ways at the same time (multiple semiotic fields).

An example context:

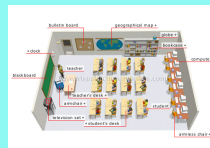


Students will learn better, and instructors will be able to assess better, when more semiotic fields are being used.

Goodwin "Embodiment," 2000

## Traditional classrooms

- Restricted communication among learners
  - Few words; limited gestures; fixed body orientation
- Restricted formative assessment



<http://visual.meritiam-vebster.com/>

## Tutorial classrooms

- Communication less restricted
  - More words by students; room for gestures; flexible body orientation; some use of objects
- Words still dominant
- Use of bodies not encouraged

## Energy Theater

Encourages use of multiple semiotic fields

Energy Theater rules:

- You are a chunk of energy.
- Objects in the 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.

## Example Scenario

Scenario: **Box shoved** suddenly across floor.



- Energy flows from hand to box.
- Energy is transformed from chemical to kinetic.

Participants:

Elementary teachers in a summer professional development course at SPU

## Showing what's going on with the energy

Yellow\*: And then as we push, we turn...  
 Stripe: We push...  
 Black: We should all push  
 Yellow: **As we push, we turn to gree-eeen..**

Prosody: rhythm and tone of speech

- Stress draws attention
- Contour emphasizes "green" – suggests energy form is the focus
- Length of word: Gives time to respond? Encourages others to follow her lead?

## Body orientation



Participants stand in box formation → being the box?

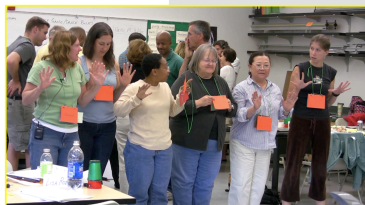
## Symbolic objects

- Participants communicate by:
  - holding their cards up
  - turning from one card to another
  - looking at each others' cards
- Consensus (or lack) is visible
  - to participants
  - to instructors



## Words and what they mean

- Words indicate what speaker thinks should happen
  - Change from **chemical** to **kinetic**
  - Flip cards to show transformation
- "We" has different meaning in the two parts of the sentence



Gesture



## Body orientation

Yellow\* changes her body orientation to hold eye contact with Black → intellectual leadership?

\*Participant pseudonyms = shirt colors

## Honing assessment skills

- In Energy Theater, participants are encouraged to say what they mean in many ways at the same time
- All these ways are relevant for assessing the learning taking place – for participants as well as teachers and researchers
- With practice, we can learn to observe and evaluate these ways effectively, in real time