

Facilitation Guide



Forms of Energy: Embodied Cognition Memory Technique & Instrument Extension

SABES Lesson 4

EXPERIENCE OVERVIEW

Students use embodied cognition as a memory technique for recalling and categorizing the different forms of energy. Additionally, students explore sound energy through the use of various sound-producing objects.

Standards

SCIENCE

- Science & Engineering Practices- SEP3: Planning and Carrying Out Investigations- ES3: Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.
- Disciplinary Core Ideas- PS3.A: Definitions of Energy- ES2: Energy can be moved from place to place by moving objects or through sound, light, or electric currents.
- Crosscutting Concepts- CCC5: Energy & Matter- ES1: Energy can be transferred in various ways between objects.

MARYLAND STATE ARTS STANDARDS

- Anchor Standard 10: Synthesize and relate knowledge and personal experiences to make art.

Getting Ready

SABES LEARNING OBJECTIVES:

- Lesson 4—Forms of Energy: Students will plan and carry out an investigation to determine how we use different forms of energy within the school building, home, and community. Forms of energy include mechanical, electrical, light, thermal, and sound.

MATERIALS

- Science notebooks, Sticky Notes, Chart paper or whiteboard, Various objects that produce sound (e.g., musical instruments, bells, whistles, and other found classroom objects)

TEACHER BACKGROUND

- Teachers should have an understanding of the various energy types and examples in their school building.
- It is important to consider any auditory processing challenges amongst students prior to the sound exploration or centerpiece game described below.

ACCESSIBILITY NOTES:

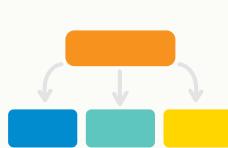
- Having students spread out if at all possible for the activities supports students in proprioceptive sensory input (body spatial awareness) and auditory processing.

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ARTS INTEGRATION MATERIALS



 CONCEPT
MAP



SLIDES



VIDEO
PLAYLIST

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Engage

Movements for Memory

Begin by activating prior knowledge. Ask students:

- 1. What is energy?** *Energy is the ability to do work.*
- 2. What is kinetic versus potential energy?** *Kinetic energy is the energy an object has in motion. Potential energy is stored energy an object has because of its position (not in motion).*

Remind students that energy can take on many forms. Display the "Different Energy Types" slides here for review.

After reviewing mechanical, electrical, light, thermal, and sound energy on the slide or via discussion, invite students to collaborate with you as a class to develop a gestural movement that represents each type of energy. Below are some movement ideas for getting started.

- **Mechanical Energy:** Students can pretend to turn a crank or wheel, representing mechanical energy used in machines.
- **Electrical Energy:** Students can make a circular motion with their hands to represent electrons moving in a circuit. They can also mimic flipping a switch on and off to demonstrate the flow of electricity.
- **Light Energy:** They can also make a sweeping motion with their hands to represent light rays spreading out.
- **Thermal Energy:** Students can rub their hands together briskly to demonstrate friction and the resulting heat. They can also pretend to warm their hands over a "campfire" by holding them out in front of them.
- **Sound Energy:** Students can cup their hands around their mouths and pretend to "shout" (silently), to represent how sound waves are produced. They can also tap their fingers on a desk to simulate the vibrations that create sound.

Use these hand motions throughout the unit for repeated rehearsal of material through embodied cognition (these practices support long-term retention of knowledge in students' memories).



Apply: Types of Energy Examples Extension

Display three anchor charts around the classroom labeled "thermal/heat", "sound," and "light." Give students three sticky notes.

- On note one, invite students to write down one object they can think of here in the school that uses thermal/heat energy.
- For note 2, do the same for "sound" energy, and for note 3, for "light" energy.
- Give students a few minutes to create their three sticky notes, then have students add their sticky notes to the anchor charts.
- After all the sticky notes have been put up, have students do a "Station Rotation" and look at what other students put on the charts.

Exploring Sound Energy with Instruments (Serves as strong prior knowledge building for the second 4th-grade SABES unit Arts Integration Overlay, "Music To My Ears")

- Explain to students that sound energy comes from vibrations, or waves, moving through a solid, liquid, or gas.
- Show this video [Sound and vibration: do you hear what I hear?](#) for a strong visual example.
 - Note: We recognize the video is intended for lower elementary student use, but we still recommend it as an appropriate introduction to this concept.
- Gather various objects that produce sound, such as musical instruments (if accessible), bells, whistles, or classroom materials like rulers that can be clapped together or rubber bands stretched across an empty tissue box.
- Arrange the objects in different stations around the classroom.
- Divide the class into small groups and assign each group to start at a different station.
- Explain to students that they will have a few minutes at each station to explore the sound-producing object and discuss among their group what they notice about the sound it makes.
- Encourage students to pay attention to the pitch (high or low), volume (loud or soft), and other characteristics of the sound.
- Rotate the groups through each station, giving them enough time to explore and discuss the sound at each one.

Try this game to allow students to explore sound waves through hands-on experiences and help them understand how sound travels and how we perceive it:

1. Arrange students in a circle with one student standing in the center.
2. The student in the center must identify what sound they hear and where it is coming from (e.g., to their right, behind them).
3. Encourage them to explain how they can tell the direction of the sound and what characteristics help them determine the sound's properties, such as the pitch (is the sound high or low?)
4. Allow each student a turn to be in the center.

Assess

Note: For students with an auditory processing disorder, being the centerpiece in the game above could be highly challenging and distressing due to being unable to tell which direction a sound is coming from. To support these students, consider providing additional cues or support during the activity. This could include visual aids or gestures to indicate the direction of the sound.

To assess students' learning following these experiences, we suggest:

Artful Reflections: Ask students to "show what they know" about the thermal, sound, and light energy by:

- A. Writing a poem
- B. Writing a song
- C. Or drawing an informational poster

Explain that in whatever option they choose, students should:

1. Name/show what EACH energy type looks like/sounds like when it is in **kinetic** form
2. Name/show what EACH energy type looks like/sounds like when it is in **potential** form
3. Name/show an **example** of EACH in your school building

Concept Mapping:

- Before the lesson begins, have students create a circle in the center of three consecutive pages in their science notebook. In the center of circle 1, have them write "heat/thermal," in circle 2, "sound," and in circle 3, "light."
- Throughout the lesson's learning experiences and explorations, have students come back to their maps and add information that they learned.
- At the end of the class period, have students share with a peer or with the group 1 or 2 specific learnings from the day, and 1 or 2 concepts they are now wondering about.