



LESSON PLAN

ENERGY TRANSFER GRADES 3-5

SUMMARY

To explore the transfer of energy from place to place and form to form. They observe examples of energy transfer between light, heat, electrical, motion and sound. Students have the opportunity to apply their understanding of energy transfer by building a solar oven.



4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

| Science & Engineering Practices | Connections to Classroom Activity |
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| Planning and Carrying Out Investigations (4-PS3-2) Constructing Explanations and Designing Solutions (4-PS3-4) | <ul style="list-style-type: none">• Observe a variety of different types of energy being transferred from place to place by sound, light, heat and electric currents.• Brainstorm scenarios where one form of energy is converted to another.• Test a device that converts energy from one form to another.• Use what they have learned about energy transfer to imagine ways to convert one type of energy to another.• Explain how energy is transformed multiple times to solve a problem (power the singing fish). |



PS3.A: Definitions of Energy

Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2)

PS3.B: Conservation of Energy and Energy Transfer

Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2)

Light also transfers energy from place to place. (4-PS3-2)

Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-2)

PS3.B: Conservation of Energy and Energy Transfer

Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-4)

PS3.D: Energy in Chemical Processes and Everyday Life

The expression “produce energy” typically refers to the conversion of stored energy into a desired form for practical use. (4-PS3-4)

ETS1.A: Defining Engineering Problems

Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (secondary) (4-PS3-4)

- Observe evidence of energy being moved from place to place.
- Observe and experiment with light transferring energy.
- Observe energy that was produced through motion (human pedaling bike) being transferred from place to place through electric currents.
- Explore where energy in power plants and batteries comes from.



Energy and Matter (4-PS3-2, 4-PS3-4)

- Recognize that energy transfer is occurring all the time in different places in their world.

DURATION

One 50 - minute class period

PRE-ASSESSMENT QUESTIONS

Please see Discussion Questions. These can be discussed as a group or answered individually in student science notebooks.

MATERIALS

- Hand crank flashlight (or video of a hand crank flashlight)
- Plastic cup or another container
- Paper
- Scissors
- Pen
- Computer/printer (optional)
- Science notebooks
- Pencils



ENGAGE

Show students a hand crank flashlight. Let them take turns making it shine.



EXPLORE

Print or write the words “motion energy, sound energy, light energy, heat energy” on slips of paper. You will need to make enough for one per student. Place the slips in a cup or other container. Have each student draw one slip. Students will get different types of energy. Facilitate a discussion about examples of motion energy, sound energy, light energy, and heat energy. Once students are able to give examples of the form of energy they have drawn from the cup, instruct them to find, or assign them, a partner in one of the other groups. Together, each pair must try to think of an example where the type of energy one represents is transformed to the other. They can share their idea with the class or write it in their science notebook. For example, if a pair consists of heat energy and light energy, the pair may think about reading and staying warm by firelight. Or, if a pair had motion and light energy, they may discuss a solar powered car.



EXPLAIN



AS A GROUP, WATCH THE GENERATION GENIUS ENERGY TRANSFER VIDEO.

Then, facilitate a discussion using the Discussion Questions.



ELABORATE

Students can revisit their ideas from the Explore portion of the lesson. Now they have the background to consider more complex energy transformations. They can combine into larger groups and brainstorm ways to transform energy from one form to another. Students can also complete the DIY Activity and create a S'mores maker for their classroom. Adding the additional challenge described in "further exploration" provides a rich engineering component to the lesson.



EVALUATE

In their science notebooks each student should draw Dr. Jeff's "singing fish" example (can be a simplified model). They should then label their drawing to explain how energy is transferred from the batteries to the fish to make it sing and move. (Chemical energy stored in the batteries flows through the wires to the lamp where it is transformed into light energy. Then, the light energy is converted by the solar cell into electrical energy where the fish moves (motion energy) and talks and sings (sound).

Singing Fish

Solar Cell

Lamp

Batteries

