

# TRANSFER OF ENERGY VIDEO CONFERENCE



Connecting Learning and Standards  
Monroe #1 BOCES

Monroe #1 BOCES Technology Services  
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# Transfer of Energy Video Conference

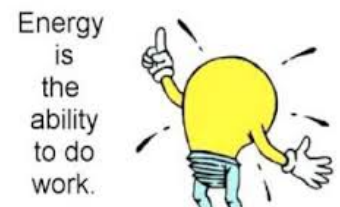
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The Challenger Learning Center has an exciting way to build learning through state-of-the-art technology in your classroom and bring it into the hands of your students. Through the Transfer of Energy Video Conference, students interact with our science expert as they learn about the forms of energy and types of energy transfers. In groups, students explore a range of devices to interpret, compare, collect, and form conclusions from 8 energy transfer experiments. They report their results, allowing teachers to include formative and summative assessments in the process.

## CONSERVATION OF ENERGY AND ENERGY TRANSFER IN THE CURRICULUM

*What is meant by conservation of energy?*

*How is energy transferred between objects or systems?*



The total change of energy in any system is always equal to the total energy transferred into or out of the system. This is called conservation of energy. Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems.

- When objects collide or otherwise come in contact, the motion energy of one object can be transferred to change the motion or stored of the other objects.
- Energy can also be transferred from place to place by electric currents. Heating is another process for transferring energy.
- Heat transfer occurs when two objects or systems are at different temperatures. Energy moves out of higher temperature objects and into lower temperature ones, cooling the former and heating the latter.



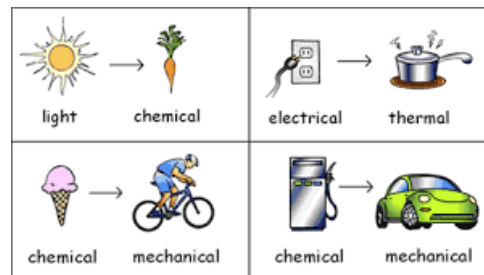
- Radiation can be emitted or absorbed by matter. When matter absorbs light or infrared radiation, the energy of that radiation is transformed to thermal motion of particles in the matter.

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.



Light also transfers energy from place to place. For example, energy radiated from the sun is transferred to Earth by light. When this light is absorbed, it warms Earth's land, air, and water and facilitates plant growth.

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 (e.g., moving water driving a spinning turbine which generates electric currents).<sup>1</sup>



To schedule a kit and video conference, please call 585-249-7063 for more information. NYS Core Curriculum Elementary Grades K-5.

**Suggested Grade Placement: 3-5. Scheduling: 90 minutes Kit - 1 week**



<sup>1</sup> "5 Dimension 3: Disciplinary Core Ideas - Physical Sciences." *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: The National Academies Press, 2012. Accessed August, 2015.



## Common Core State Standards Connections

ELA/Literacy		VIDEO CONFERENCE Transfer of Energy
<b>RI.4.1</b>	Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-PS3-1)	Predicting Results Introduction and Demonstration
<b>RI.4.3</b>	Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. (4-PS3-1)	Interpretation of Results Describing Energy Transfer
<b>RI.4.9</b>	Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS3-1)	Comparative Research Forms of Energy Transfer
<b>W.4.2</b>	Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (4-PS3-1)	Gathering Data Student Report Explaining Results
<b>W.4.7</b>	Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-PS3-2),(4-PS3-3),(4-PS3-4),(4-ESS3-1)	Student Activity Forms of Energy
<b>W.4.8</b>	Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-PS3-1),(4-PS3-2),(4-PS3-3),(4-PS3-4),(4-ESS3-1)	Post-Activity Assessment The Energy Quiz
<b>W.4.9</b>	Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-PS3-1),(4-ESS3-1)	Analyzing Outcomes Reporting Results



# New York State Standards Connections

## Elementary Science Core Curriculum

Key Idea 4: Energy exists in many forms, and when these forms change energy is conserved.

Students should understand that energy exists in a variety of forms. Students should observe the results of simple energy transformations from one form to another in their physical environment.

NYS Science Standard		VIDEO CONFERENCE Transfer of Energy
<p><u>Performance Indicator 4.1</u> Describe a variety of forms of energy (e.g., heat chemical light), and the changes that occur in objects when they interact with those forms of energy.</p>	<p>4.1a Energy exists in various forms: heat electric, sound, chemical, mechanical, light 4.1b Energy can be transferred from one place to another 4.1c Some materials transfer energy better than others 4.1g Interactions with energy can be either helpful or harmful</p>	<p>Introduction and Demonstration Forms of Energy Forms of Energy Transfer</p>
<p><u>Performance Indicator 4.2</u> Observe the way one form of energy can be transferred into another form of energy present in common situations (e.g., mechanical to heat energy, mechanical to electrical energy, chemical to heat energy)</p>	<p>4.2a Everyday events involve one form of energy being changed to another</p> <ul style="list-style-type: none"> <li>• Animals convert food to heat and motion</li> <li>• The Sun’s energy warms the air and water</li> </ul> <p>4.2b Humans utilize interactions between matter and energy</p> <ul style="list-style-type: none"> <li>• Chemical to electrical, light, and heat: battery and bulb</li> <li>• Electrical to sound (e.g., doorbell buzzer)</li> <li>• Mechanical to sound (e.g., musical instruments, clapping)</li> <li>• Light to electrical (e.g., solar powered calculator)</li> </ul>	<p>Student Hands-on Activities Making Observation Gathering Data Reporting Results Describing Observations Explaining Energy Transfer</p>



ENERGY

PS3.A: Definitions of Energy

PS3.B: Conservation of Energy and Energy Transfer

Next Generation Science Standards		Transfer of Energy Video Conference
4-PS3-2.	<p><b>Students who demonstrate understanding can:</b>  <b>Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.</b>  <i>[Assessment Boundary: Assessment does not include quantitative measurements of energy.]</i></p>	<p>Introduction and Demonstration            Forms of Energy            Forms of Energy Transfer</p>
4-PS3-3.	<p><b>Ask questions and predict outcomes about the changes in energy that occur when objects collide.</b>  <i>[Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.]</i>  <i>[Assessment Boundary: Assessment does not include quantitative measurements of energy.]</i></p>	<p>Student Hands-on Activities            Gathering Data            Reporting Results</p>
4-PS3-4.	<p><b>Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.</b>  <i>[Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.]</i> <i>[Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.]</i></p>	<p>Describing Results            Explaining Energy Transfer</p>



## Science and Engineering Practices

### Asking Questions and Defining Problems

Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.

- Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. (4-PS3-3)

### Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (4-PS3-2)

### Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.

- Use evidence (e.g., measurements, observations, patterns) to construct an explanation. (4-PS3-1)
- Apply scientific ideas to solve design problems. (4-PS3-4)

### Obtaining, Evaluating, and Communicating Information

Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluate the merit and accuracy of ideas and methods.

- Obtain and combine information from books and other reliable media to explain phenomena. (4-ESS3-1)

## Disciplinary Core Ideas

### PS3.A: Definitions of Energy

- The faster a given object is moving, the more energy it possesses. (4-PS3-1)
- Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2),(4-PS3-3)

### 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), (4-PS3-3)
- 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),(4-PS3-4)

## Crosscutting Concepts

### Energy and Matter

- Energy can be transferred in various ways and between objects. (4-PS3-1),(4-PS3-2),(4-PS3-3),(4-PS3-4)

### Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change. (4-ESS3-1)

### Connections to Engineering, Technology, and Applications of Science

#### Interdependence of Science, Engineering, and Technology

- Knowledge of relevant scientific concepts and research findings is important in engineering. (4-ESS3-1)

#### Influence of Engineering, Technology, and Science on Society and the Natural World

- Over time, people’s needs and wants change, as do their demands for new and improved technologies. (4-ESS3-1)
- Engineers improve existing technologies or develop new ones. (4-PS3-4)

### Connections to Nature of Science

#### Science is a Human Endeavor

- Most scientists and engineers work in teams. (4-PS3-4)
- Science affects everyday life. (4-PS3-4)

Articulation of DCIs across grade-levels:

**K.PS2.B** (4-PS3-3); **K.ETS1.A** (4-PS3-4); **2.ETS1.B** (4-PS3-4); **3.PS2.A** (4-PS3-3); **5.PS3.D** (4-PS3-4); **5.LS1.C** (4-PS3-4); **5.ESS3.C** (4-ESS3-1); **MS.PS2.A** (4-PS3-3); **MS.PS3.A** (4-PS3-1),(4-PS3-2),(4-PS3-3),(4-PS3-4); **MS.PS3.B** (4-PS3-2),(4-PS3-3),(4-PS3-4); **MS.PS3.C** (4-PS3-3); **MS.PS3.D** (4-ESS3-1); **MS.PS4.B** (4-PS3-2); **MS.ESS2.A** (4-ESS3-1); **MS.ESS3.A** (4-ESS3-1); **MS.ESS3.C** (4-ESS3-1); **MS.ESS3.D** (4-ESS3-1); **MS.ETS1.B** (4-PS3-4); **MS.ETS1.C** (4-PS3-4)

The performance expectations were developed using the elements from the NRC document *A Framework for K-12 Science Education*.



## Scheduling and Contact Information

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The Challenger Learning Center brings state-of-the-art technology into your classroom, and into the hands of your students. By using video conferencing technology, your students will participate in a hands-on, engaging distance learning experience with our Mission Commanders.

Your classroom comes alive via distance learning technology! Our Instructional Specialists are ready to challenge your students with demonstrations, Hands-On activities, and a high tech game show style quiz to assess their understanding...all from the comfort of your own classroom!

Give us a call to set up the conference. We can also ship a kit of hand-on experiments to you for use during the conference. Contact us for cost information. Our premiere conference is based on Energy Transformations, aligned with Common Core State Standards, national, and state learning standards. Join the fun now!

To Schedule:

If you are from a school district in New York State, contact Debra Croce at [debra\\_croce@boces.monroe.edu](mailto:debra_croce@boces.monroe.edu) or 585-249-7063 for pricing and scheduling information.

All others, information is available through the Center for Interactive Learning and Collaboration website at <http://www.cilc.org/> under "Content Provider Programs".

Contact Steve Orcutt at [steve\\_orcutt@boces.monroe.edu](mailto:steve_orcutt@boces.monroe.edu) or (585) 249-7890 for more information about programs and curriculum.

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