This module teaches 4th grade science standards. Taught in conjunction with associated elementary science standards, this module introduces students to the concept of energy. Students will investigate and discuss specific energy types and energy sources. Two hands-on explorations will help students connect observed phenomenon with identifiable and measureable energy types.

After completing this module, student should be able to

* Define energy and identify the different types of energy
* Define potential and kinetic energy
* Understand the sources of different types of energy
* Understand the concept of renewable vs. non renewable energy
* Describe the role of engineering in finding and testing various energy sources

The learning objectives of this module are in alignment with Next Generation Science Standards (NGSS) for 4th Grade: **4-PS3-2:** *Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.*

The two explorations in which students identify and measure sound and kinetic energy connect to NGSS Engineering Practices related to standard **4-PS3-2**. *Students’ carry out investigations to answer questions associated with how light, sound, and kinetic energy are transferred from place to place.*

*Students will make observations and produce data that tests a design or provides an explanation of a phenomenon.* Specifically students will use an iPad application called Playground Physics to measure the kinetic energy of different forms of physical movement. Students will also create experiments where they can visually observe and classify sound waves.

Through this module, students will understand the NGSS Disciplinary Core Idea connected to standard **4-PS3-2.** Through completing the lessons and explorations, students will understand that *energy can be moved from place to place by moving objects or by sound, light, or electric currents.* Presentations in this module connect to third grade standard **PS3.B** *Energy is present whenever there are moving objects, sound, light, or heat. Light transfers energy. Energy can be transferred by electric currents.*  Both explorations in this module support the NGSS Cross Cutting Concept **4-PS3-2:** that energy can be transferred in various ways between objects. For example, in the kinetic energy exploration, students observe and measure the kinetic energy of thrown objects. In the visualizing sound exploration, students experiment with ways to use sound energy to create physical changes in objects around them.

To successfully complete this module, students will need the following prerequisite knowledge and skills met by teaching in the second and third NGSS standards:

* Understanding the effects of balanced and unbalanced forces on the motion of an object
* Understand that the patterns of motion in an object can predict future motion.
* Basic understanding of electric and magnetic interactions
* Be able to setup basic experiments with controlled variables

This module is designed to enrich existing 4th grade science standards. It will take approximately seven hours of instructional time consisting of seven, thirty-minute PowerPoint presentation and two, ninety-minute explorations. The two explorations will take approximately 30 minutes of setup/preparation time. There are no safety risks or hazardous materials associated with the two explorations.

Materials/supplies/equipment required for the two explorations:

* iPad with Playground Physics application (more than one preferable)
* Worksheets and printouts for students included in exploration lesson plans
* Chart paper and markers
* Shallow trays filled with water
* Tuning forks of different frequencies
* Sound energy summary poster

Resources used to create module include:

Sun, P., Gould, V. & JI, R. Center for Learning and Action. Energy Unit Available at: https://learning-in-action.williams.edu/opportunities/elementary-outreach/science-lessons/4th-grade-energy-unit/. (Accessed: 21st March 2018)

Freeclubweb.com. (2018). Optic Curriculum. [online] Available at: http://www.freeclubweb.com/privacypolicy.html [Accessed 22 Mar. 2018].

Holz, A. (2018). Playground Physics. [online] Noticing Tools - Teacher Hub. Available at: https://noticing.nysci.org/apps/playground-physics/ [Accessed 23 Mar. 2018].

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