NGSS and NEED: Fourth Grade Energy

Some educators have asked for insight on how to use NEED materials exclusively to meet large portions of the Next Generation Science Standards. We have put this document together to show how you can use what we have to meet those rich, complex learning expectations. The following plan has been assembled for fourth grade – specifically, the page in NGSS entitled, "4-PS3 Energy". The accompanying spreadsheet was developed by downloading our entire NGSS correlations spreadsheet, clicking to the fourth grade tab, and hiding the unnecessary columns from view. The columns remaining in view were those only found on that page of NGSS. For any other grade or NGSS page, you would follow the same procedure.

When we correlate our materials to any set of educational standards, we use a two-dot system. Solid dots indicate a strong correlation such that we think the listed activity or book can be used to teach that standard. Anywhere we have placed a hollow dot we are indicating that activity or curriculum guide can be used in support of other materials to meet that standard. When choosing materials from our curriculum library to teach a set of standards without incorporating any other resource, you will want to choose materials with solid dots.

As you look over the spreadsheet at the end of this document, you will notice two units in particular are most strongly correlated to the "4-PS3-Energy" page of NGSS – *EnergyWorks* and *Elementary Science of Energy*. We have developed a suggested plan that will allow you to cover most of the Science and Engineering Practices, Disciplinary Core Ideas, and Cross-Cutting Concepts used to help students be able to meet the Performance Expectations on that NGSS page. The suggested guide below assumes that you will spend 45-60 minutes every day working with fourth graders on science. If your school days are structured differently, you will have to make some adjustments.

DAY	SUGGESTED LESSON(S)	CURRICULUM GUIDE(S) NEEDED
1	Heat module – introduction and demonstration	
2		
3	Heat module – student explorations	
4		
5	Light module – introduction and demonstration	
6		
7	Light module – student explorations	
8		
9	Motion module – introduction and demonstration	EnergyWorks Teacher
10		EnergyWorks Student
11	Motion module – student explorations	
12		
13	Sound module – introduction and demonstration	
14		
15	Sound module – student explorations	
16 17		
	Growth module – introduction and demonstration	
18	Growth module – set up student explorations (take data daily for 7-10 days)	
19	Science of Energy – Teacher demonstration	
20	Science of Energy – Station investigations	
21	Science of Energy – Presentation Planning	
22		Elementary Science of Energy
23	Science of Energy – Station Rotations	
24		
25	Science of Energy – Energy Flows	

Following the above plan will enable your students to establish a good understanding of the nature of energy and energy transfers.

With respect to 4-PS3-4, Apply scientific ideas to design, test, and refine a device that converts energy from one form to another, we recommend taking your students through activities from one or more of our energy source curriculum units. For example, *Wonders of Water, Wonders of Wind*, and *Wonders of the Sun* are all good choices that introduce and explore the very interesting, (as far as fourth graders are concerned), topics of renewable energy. Our intermediate-level wind curriculum, *Energy from the Wind*, has a set of activities about wind turbine blades that can very easily be adapted into an engineering and design challenge. The individual books for each energy source unit can be found by navigating to http://www.need.org/curriculum and then choosing the topic you're interested in from the left side menu bar or icons in the center of the page.

Keep in mind that *EnergyWorks, Elementary Science of Energy*, and many of our energy source curriculum guides also have associated kits containing much of what is needed to conduct all of the activities. Some things, such as a lamp, an apple, water, etc. will need to be provided by you but they are all things that are very easy to obtain. You can find purchasing information for our kits at http://shop.need.org/.

 = This activity meets the grade leve benchmark. 	o = This activity reinforces or sup- ports the grade level benchmark.	PERFORMANCE EXPECTA- TIONS Energy	4-PS3-1. Use evidence to con- struct an explanation relating the speed of an object to the energy of that object.	4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and	4-PS3-3. Ask questions and pre- dict outcomes about the chang- es in energy that occur when objects collide.	4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.	PRACTICES Asking Questions and Defin- ing Problems	Ask questions that can be inves- tigated and predict reasonable outcomes based on patterns such as cause and effect rela- tionships.	Constructing Explanations and Designing Solutions	Use evidence to construct an explanation.	Apply scientific ideas to solve design problems.	Planning and Carrying Out Investigations	Make observations and/or mea- surements to produce data to serve as the basis for evidence for an explanation of a phenome- non or test a design solution.	DISCIPLINARY CORE IDEAS	PS3.A: Definitions of Energy The faster a given object is moving, the more energy it	possesses. Energy can be moved from place to place by moving objects or through sound, light, or electric currents.	PS3.B: Conservation of Ener- gy and Energy Transfer	Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be trans- ferred 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.	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 enerov.	Relationship	When objects collide, the contact forces transfer energy so as to change the objects' motions.	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.	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.	CROSS-CUTTING CONCEPTS Energy and Matter	Energy can be transferred in var- ious ways and between objects.
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