

Wright City Science Curriculum

(4th Grade)

Grade	4th Grade
Unit of Study	Waves, Forms of Energy, and Energy Transformation
Length of Unit	30 days (30 mins/ day)
Sample Essential Questions	Sample Corresponding Big Ideas
- How do waves help us see, hear, and communicate - What patterns do all waves share, and how do those patterns affect the way energy travels? - How can observing patterns in an object's past motion help us predict its future motion?	Wave Properties - Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. <i>(Note: This grade band endpoint was moved from K-2.)</i> (4-PS4-1) - Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (4-PS4-1)
- How does energy move from one place or object to another? - How do we use energy transfer in our everyday lives?	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) <u>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.</u> (4-PS3-2),(4-PS3-4)
- How do the available materials limit our ability to solve a problem? - What specific criteria must our model have to prove that energy is actually being transformed? - Why is it important to research how other machines convert energy before we start building our model? - How can sharing our initial sketches with classmates help us spot problems we didn't see?	ETS1.A: Defining and Delimiting 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. (A.1) ETS1.B: Developing Possible Solutions - Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (B.1) - At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (B.1) - Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (C.1) ETS1.C: Optimizing the Design Solution - Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (C.1)

- When we test our model, what failure points indicate that energy is being lost or not converted efficiently? - If we build two different versions of the model, how will we decide which one does a better job of demonstrating energy transformation?	
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Missouri Learning Standards	
Priority Standards	Supporting Standards
4.PS4.A1 -Develop a model of waves to describe patterns in terms of amplitude or wavelength and that waves can cause objects to move	
4.PS3.B2 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another	4.ETS1.A.1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost 4.ETS1.B.1 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem
4.PS3.B. 1 Provide evidence to construct an explanation of an energy transformation(e.g. temperature change, light, sound, motion, and magnetic effects)	4.ETS1.C.1 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Unit 1 Sequence			
MLS	Topic(s)	Learning Targets	Academic Vocabulary
4.PS4.A1	waves	I can develop a model of waves that describes patterns found in amplitude and wavelength that cause objects to move. I can identify properties of waves.	abstract representation amplitude analogy constraints

		- I can develop a model using an analogy, example, or abstract representation to describe a scientific principle. - I can demonstrate how waves can be made in water by disturbing the surface.	crest disturbance input net motion output particle pattern properties receiver scientific principle transmitter trough vibration wavelength waves
4.PS3.B.1	energy transformation	I can explain how one form of energy transforms into another.	convert energy prototype transfer
4.PS3.B.2	energy transformation	I can design, test, and refine a device that has various forms of energy transfer	variable

MLS	Learning Activities	
4.PS4.A1	Introduction to waves and their properties	Must Do ▾
	Water disturbance water model	Can Do ▾
	Rope Wave models	Option L... ▾
	Slinky wave models	Option L... ▾
	Focus on Sound Energy and Vibrations	Must Do ▾
	“Dancing Rice” demonstration for sound/ vibration model (optional to allow students to do vs observe)	Must Do ▾
	Net Motion lesson and model	Must Do ▾
	Light waves and sight lesson	Must Do ▾
	Flash Light and mirror lab	Option L... ▾
	Sound Communication/ cup phones	Option L... ▾
	Thermal energy lesson/ model	Must Do ▾
4.PS3.B.1	Introduction into energy conversion	Must Do ▾

	energy conversation classroom scavenger hunt	Option L... ▾
		Option L... ▾

Assessments		
MLS	Description or Location	Rubric/Location
	Waves quick check	QuickCheck
4.PS3.B.2	Energy conversion model (example robot or object that can send a signal)	4th grade Science Pacing Guide

Additional Resources	
●	Waves and Energy Transfer Teacher slides
●	Guided Notes
●	Materials listed by activity
●	Scope and Sequence