Grade 4 curriculum roadmaps
Physical Science

FOSS Energy - NG

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
1 part 1	**What is needed to light a bulb?**	Students make a complete circuit using a D-cell, wires, and a lightbulb. They are introduced to electricity and energy.	1. Electricity transfers energy that can produce heat, light, sound and motion. Electricity can be produced from a variety of sources. 2. An electric circuit is a system that includes a comlete pathway through which electric current flows from an energy source to its components.	1 active 1 reading	energy light D-cell battery energy source system electricity electric current circuit terminal comonents transfers contact points filament bulb base bulb casing	**4.PS.4 4.PS.5**	**PS.4 Describe and investigate the different ways in which energy can be generated and/or converted from one form of energy to another form of energy. PS.5 Make observations that energy can be transferred from place to place by sound, light, heat, and electric currents.**	Cause and effect Systems and system models Energy and matter	Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations Engaging in argument from evidence, Obtaining, evaluating and communicating information	
1 part 2	**What is needed to make a complete pathway for current to flow in a circuit?**	Students add a switch and a motor to the circuit so they can turn it on and off. They explore materials that act as conductors and as insulators for the flow of electricity	1. Electricity transfers energy that can produce heat, light, sound and motion. Electricity can be produced from a variety of sources. 2. Conductors are materials through which electric current can flow; al metals are conductors.	1 active 1 reading	motor shaft motion switch closed circuit open circuit conductor insulator	**4.PS.4 4.PS.5**	**PS.4 Describe and investigate the different ways in which energy can be generated and/or converted from one form of energy to another form of energy. PS.5 Make observations that energy can be transferred from place to place by sound, light, heat, and electric currents.**	Cause and effect Systems and system models Energy and matter	Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations Obtaining, evaluating and communicating information	
1 part 3	**How can you light two bulbs brightly with one D-Cell**	Students find ways to operate more than one lightbulb in a circuit. They explore the differene between a series and a parallel circuit.	1. In a series circuit there is a single pathway from the energy source to the components. 2. In a parallel circuit, each component has its own direct pathway to the energy source. 3. Two bulbs can be lit brightly using parallel circuitry because each bulb has direct access to the energy source.	1-2 active 1 reading	series circuit parallel circuit	**4.PS.4 4.PS.5**	**PS.4 Describe and investigate the different ways in which energy can be generated and/or converted from one form of energy to another form of energy. PS.5 Make observations that energy can be transferred from place to place by sound, light, heat, and electric currents.**	Cause and effect	Asking questions, Develping and using models, Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations and designing solutions	

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Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
1 part 4 Engineer-ing	**Which design is better for manufacturing long strings of lights-series or parallel?**	Students investigate which type of circuit would be the best design for a string of lights. They analyze the designs and make a recommendation based on their knowledge of circuitry.	1. In a series circuit all lights share a single pathway; if one light burns out, current stops flowing, causing all bulbs to go out. 2.In a parallel circuit, each light has its own pathway to the energy source; if one lightbulb burns out, current continues flowing and the remaining bulbs shine.	1 active 1 reading 2 assess	Engineers criteria constraints prototype solution	**3-5.E.1** **3-5.E.2** **3-5.E.3**	E.1 Identify a simple problem with the design of an object that reflects a need or a want. Include criteria for success and constraints on materials, time, or cost. E.2 Construct and compare multiple plausible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. E.3 Construct and perform fair investigations in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.	Cause and effect, Systems and system models	Asking questions and defining problems, Planning and carrying out investigations, Constructing explanations and designing solutions, Engaging in argument from evidence	This lesson applies PS.4 and PS.5 to an engineering/design challenge. Great way for students to apply science understanding to Engineering. Be intentional about identifying criteria and constraints of the challenge.
4 part 1	**What do we observe that provides evidence that energy is present?**	Students work in centers to explore evidence of energy when sound, heat, and light are produced and when objects are in motion.	Energy is evident whenever there is motion, electric current, sound, light or heat. Energy can be transferred from place to place.	1-2 active 1 reading	fuel heat	**4.ESS.2** **4.PS.4** **4.PS.5**	ESS.2 Obtain and combine information to describe that **energy and fuels are derived from natural resources** and their uses affect the environment. PS.4 Describe and investigate the **different ways in which energy can be generated and/or converted from one form of energy to another form of energy.** PS.5 Make observations that energy can be transferred from place to place by **sound, light, heat, and electric currents.**	Energy and matter	Planning and carrying out investigations, Analyzing and interpreting data, Engaging in argument from evidence, Obtaining, evaluating and communicating information	This is an important lesson that explores other forms of energy than electriccal.

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Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
4 part 2	**How does the starting position affect the speed of a ball rolling down a ramp?**	Students roll steel balls of different sizes down ramps and explore the variables. They investigate how the variables of ball size (mass) and starting position on the ramp affect the speed of the rolling ball.	Kinetic energy is the energy of motion; potential energy is the energy of position or condition. The faster an object is moving, the more kinetic energy it has. Objects at higher positions have more potential energy.	2 active 1 reading	potential energy, kinetic energy speed gravity	**4.PS.2** **4.PS.4** **4.PS.1**	**PS.2** Investigate the **relationship of the speed of an object to the energy of that object. PS.4** Describe and investigate the different ways in which energy can be generated and/or converted from one form of energy to another form of energy PS.1 Investigate transportation systems and devices that operate on or in land, water, air and space and **recognize the forces** (lift, drag, friction, thrust and **gravity) that affect their motion**.	Cause and effect Patterns	Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations Engaging in argument from evidence, Obtaining, evaluating and communicating information	
4 part 3	**What happens when objects collide?**	Students investigate variables that determine how far a cork will move along a runway after colliding with a steel ball rolling down a ramp. Students explore the variables of mass and starting position and the affects on energy transfer.	When objects collide, energy can transfer from between objects changing their motion. The faster an object is moving, the more kinetic energy it has. Objects at higher positions have more potential energy. When two objects interact, each one exerts a force on the other, and these forces can transfer energy.	2 active 1-2 reading 2 assess	collide collision stationary **friction**	**4.PS.2** **4.PS.4** **4.PS.1**	**PS.2** Investigate the **relationship of the speed of an object to the energy of that object. PS.4** Describe and investigate the different ways in which energy can be generated and/or converted from one form of energy to another form of energy PS.1 Investigate transportation systems and devices that operate on or in land, water, air and space and **recognize the forces** (lift, drag, **friction**, thrust and **gravity) that affect their motion**.	Patterns Energy and matter	Asking questions, Planning and carrying out investigations, Analyzing and interpreting data, Using mathematics and computational thinking Constructing explanations Engaging in argument from evidence, Obtaining, evaluating and communicating information	

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Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
5 part 1	**How are waves involved in energy transfer?**	Students work with models of waves using ropes, water, spring toys and a sound generator.	Waves are a repeating pattern of motion that transfer energy from place to place. There are sound, light, radio, micro and ocean waves.	2 active 1 reading	waves compression waves, wavelength cycle frequency peak trough amplitude	**4.PS.4** **4.PS.5**	PS.4 Describe and investigate the different ways in which energy can be generated and/or converted from one form of energy to another form of energy. PS.5 Make observations that energy can be transferred from place to place by **sound,** light, heat, and electric currents.	Patterns Energy and matter Cause and effect Systems and system models	Developing and using models, Using mathematics and computational thinking Constructing explanations, Obtaining, evaluating and communicating information	This investigation provides a deeper understanding of **3.PS.4** Investigate and recognize properties of sound that include pitch, loudness (amplitude), and vibration as determined by the physical properties of the object making the sound. It also provides background for Grade 6 PS exploration of wave energy.
5 part 2	**How does light travel?**	Students build a conceptual model about how light energy travels using sunlight, flashlights, mirrorss and cups of water.	Light is a form of energy that travels in a straight line and can bounce off surfaces. Light can refract (change direction) when it passes fron one trnasparent material to another.	1-2 active 1 reading	rays reflect reflection refract refraction	**4.PS.4**	PS.5 Make observations that energy can be transferred from place to place by sound, **light**, heat, and electric currents.	Cause and effect Systems and system models Energy and matter	Developing and using models, Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations Obtaining, evaluating and communicating information	

Grade 4 curriculum roadmaps
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FOSS Energy - NG

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
5 part 3 Engineer-ing	**How can you make a motor run faster using solar cells?**	Students design series and parallel solar cell circuits and obser e the effect on the speed of a motor. They read about alternative energy sources.	The energy of two energy sources (D-Cells or solar cells) adds when they are wired in series, delivering more power than a single source. Two cells in parallel have the same power as a single cell.	1-2 active 2 reading 2 assess	solar cell	**4.PS.4** **4.PS.5** **4.ESS.2** **4.ESS.4**	**ESS.2** Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. **ESS.4 Develop solutions tht could be implemented to reduce the impact of humans on the natural environment and the natural envrionment on humans.** **PS.4** Describe and investigate the different ways in which energy can be generated and/or converted from one form of energy to another form of energy. **PS.5** Make observations that energy can be transferred from place to place by sound, light, heat, and electric currents.	Cause and effect Systems and system models Energy and matter	Asking questions and defining problems Constructing explanations and designing solutions, Obtaining, evaluating and communicating information	T**his investigation requires a sunny day.** See guidelines in *Teacher Resources* for Taking Science Outdoors. Excellent opportunity to apply science learning to an engineering problem. You can **implement Engineering standards 3-5.E. 1, 3-5.E.2 and 3-5.E.3** by being intentional about criteria and constraints, recording plausible solutions and noting variables that improve the design.
2 part 1 Optional	**What materials stick to magnets?**			1-2 active 1 reading						

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Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
2 part 2 **Optional**	**What happens when two or more magnets interact? What happens when a piece of iron comes close to or touches a permanent magnet?**			1-2 active		3.PS.1	**3.PS.1** Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.			
2 part 3 **Optional**	**What happens to the force of attraction between two magnets as the distance between them changes?**			2 active 1-2 reading 2 assess		3.PS.1	**3.PS.1** Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.			
3 part 1 **Optional**	**How can you turn a steel rivet into a magnet that turns on and off?**			2 active 1 reading		4.PS.4 4.PS.5	PS.4 Describe and investigate the different ways in which energy can be generated and/or converted from one form of energy to another form of energy. PS.5 Make observations that energy can be transferred from place to place by sound, light, heat, and electric currents.			

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Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
3 part 2 Optional	**How does the number of winds of wire around a core affect the strength of the magnetism?**			1 active 1 reading		4.PS.4 4.PS.5	PS.4 Describe and investigate the different ways in which energy can be generated and/or converted from one form of energy to another form of energy. PS.5 Make observations that energy can be transferred from place to place by sound, light, heat, and electric currents.			
3 part 3 Optional Engineer-ing	**How can you reinvent the telegraph using your knowledge of energy and electromagne-tism?**			1-2 active 1 reading 2 assess		3-5.E.1 3-5.E.2 3-5.E.3	E.1 Identify a simple problem with the design of an object that reflects a need or a want. Include criteria for success and constraints on materials, time, or cost. E.2 Construct and compare multiple plausible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. E.3 Construct and perform fair investigations in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.			

Grade 4 curriculum roadmaps
Earth Science

Module Title: Soils Rocks and Landforms

Investigation #	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
Investigation 1: Soils and Weathering **Part 1**: Soil Composition	**What is soil?**	Students investigate properties of soil by comparing four different soils. They add water to soils samples in vials to do a settling test. They learn that soils are composed of essentially the same types of materials (inorganic earth materials and humus), but the amounts of the materials vary.	• Soils can be described by their properties. • Soils are composed of different kinds and amounts of earth material and humus.	2 active 1 reading	abrasion acid rain basalt calcite chemical reaction chemical weathering clay conglomerate earth material expand freeze granite gravel humus limestone marble pebble physical weathering rock sand sandstone silt soil weathering			Patterns Structure & function Stability & change	Posing questions. Constructing and performing investigations. Obtaining, evaluating, and communicating information.	At the end of this lesson students are told the soil samples represent the kinds of soil that might be found in four different locations -- desert, mountain, river delta, and forest. They guess which location each sample comes from, and will return to re-evaluate their guesses after they learn more about how soils form and other processes that shape Earth's surface in the next few weeks.
Investigation 1: Soils and Weathering **Part 2:** Physical Weathering	**How do big rocks break down into smaller rocks?**	Students explore how rocks break into smaller pieces by tumbling them and freezing them in water.	• Weathering is the breakdown of rocks and minerals at or near Earth's surface. • The physical-weathering processes of abrasion and freezing break rocks into smaller pieces.	2 active		4.ESS.3	Describe how geological forces change the shape of the land ~~suddenly and~~ over time.	Cause & effect Systems & system models Structure & function Stability & change	Developing and using models. Constructing and performing investigations. Constructing explanations. Engaging in argument from evidence.	The idea that rocks start out a big as mountains and get broken down into pieces small enough to be part of the soil helps students to begin to create a simple model that explains why the materials in soils are different from one location to the next.

Grade 4 curriculum roadmaps
Earth Science

Module Title: Soils Rocks and Landforms

Investigation #	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
Investigation 1: Soils and Weathering **Part 3:** Chemical Weathering	**How are rocks affected by acid rain?**	Students explore how 4 different kinds of rocks interact with "acid rain."	• Weathering is the breakdown of rocks and minerals at or near Earth's surface. • Chemical weathering occurs when exposure to water and air changes rocks and minerals into something new.	3 active 1 reading		4.ESS.3	Describe how geological forces change the shape of the land ~~suddenly and~~ over time.	Cause & effect Systems & system models Structure & function Stability & change	Constructing and performing investigations. Constructing explanations. Engaging in argument from evidence.	This investigation lends itself to a review of the 3rd grade standard 3.ESS.3 Observe the detailed characteristics of rocks and minerals. Identify and classify rocks as being composed of different combinations of minerals. Calcite is a mineral in some rocks that reacts with acid, causing some of the rock material to be changed into a new material.
Investigation 1: Soils and Weathering **Part 4:** Schoolyard Soils	**What's in our schoolyard soils?**	Students collect and analyze soil samples to determine how much humus and rock material are in local soils.	• Soils can be described by their properties. • Soils are composed of different kinds and amounts of earth materials and humus. • Weathering is the breakdown of rocks and minerals at or near Earth's surface.	2 active				Patterns Scale, proportion, & quantity	Posing questions. Constructing and performing investigations. Constructing explanations. Obtaining, evaluating, and communicating information.	Students compare school yard soil samples to the four samples from part 1. This lesson could be optional, but if it is skipped, be sure to view the video clip on soil. The discussion guide provides a good oportunity to review all the concepts developed in investigation 1.

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Earth Science

Module Title: Soils Rocks and Landforms

Investigation #	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
Investigation 2: Landforms **Part 1:** Erosion and Deposition	**How do weathered rock pieces move from one place to another?**	Students use stream-table models to observe that water moves earth materials from one location to another. They shake a vial of earth material mixed with water to observe settling.	• Weathered rock material can be reshaped into new landforms by the slow processes of erosion and deposition. • Erosion is the transport of weathered rock material (sediments) by moving water or wind. • Deposition is the settling of sediments when the speed of moving water or wind declines.	1 active reading 1	alluvial fan canyon crust delta deposition earthquake erosion flood floodplain landform landslide lava magma mantle meander model mountain river channel river mouth sediment slope valley volcano	4.ESS.3	Describe how geological forces change the shape of the land ~~suddenly and~~ over time.	Cause & effect Systems & system models Stability & change	Posing questions. Developing and using models and tools. Constructing and performing investigations.	Students repeat a settling test as they did in the first lesson of the module in order to understand why some materials move farther down the stream table than others.

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Module Title: Soils Rocks and Landforms

Investigation #	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
Investigation 2: Landforms **Part 2:** Stream-Table Investigations	**How does slope affect erosion and deposition? How do floods affect erosion and deposition?**	Students investigate the variables of slope and water quantity, (flood), and plan and conduct their own stream-table investigations.	• The rate and volume of erosion relate directly to the amount of energy in moving water or wind. • The energy in moving water depends on the mass of water in motion and its velocity. The greater the mass and velocity, the greater the energy.	2-4 active		4.ESS.3	Describe how geological forces change the shape of the land suddenly and over time.	Cause & effect Systems & system models Stability & change	Posing questions. Developing and using models and tools. Constructing and performing investigations.	After testing slope and flood variables, this lesson encourages students to plan and conduct their own investigations, giving the teacher a great opportunity to assess students underatnding of a control group, (the "standard run"), and one variable to change, (the "experimental run.) Be sure to check out the video clips as they provide a great oportunity to discuss how weathering, erosion, and deposition interact -- the core content ideas for 4th grade earth science.
Investigation 2: Landforms **Part 3:** Schoolyard Erosion and Deposition	**Where are erosion and deposition happening in our schoolyard?**	Students look for evidence of erosion and deposition outdoors. They learn about the different processes that can result in fossils and how fossils provide evidence of life and landscapes from the ancient past.	• Erosion is the transport of weathered rock material (sediments) by moving water or wind. • Deposition is the settling of sediments when the speed of moving water or wind declines.	1 active		4.ESS.3	Describe how geological forces change the shape of the land suddenly and over time.	Energy & matter Structure & function Stability & change	Constructing explanations. Engaging in argument from evidence. Obtaining, evaluating, and communicating information.	

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Module Title: Soils Rocks and Landforms

Investigation #	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
Investigation 2: Landforms **Part 4:** Rapid Changes	**What events can change Earth's surface quickly?**	Students learn about processes that cause rapid changes to Earth's surface -- landslides, earthquakes, floods, and volcanoes.	• Catastrophic events have the potential to change Earth's surface quickly	1 active 1 reading		4.ESS.3	Describe how geological forces change the shape of the land suddenly ~~and over time.~~	Cause & effect Stability & change	Constructing explanations. Obtaining, evaluating, and communicating information.	The math extensions at the end of this lesson are great. They provide opportunity to incorporate two science practice standards: • Analyzing and interpreting data. • Using mathematics and computational thinking.
Investigation 3: Rocks and Minerals **Part 1:** Schoolyard Rocks	**How can we best describe rocks for later identification?**	Students investigate rock properties and record observations. Students trade sets of rocks and descriptions and try to match a new rock with another student's description.	• Rocks and minerals can be described by their properties. • Igneous, sedimentary, and metamorphic rocks are formed by different processes.	1-2 active 1 reading	break cleavage feldspar fluorite fossil fracture galena gypsum hardness hematite hornblende igneous rock luster magnetism magnetite metallic metamorphic rock mica mineral Mohs' scale nonmetallic pyrite quartz scratch test sedimentary rock streak	3.ESS.3	Observe the detailed characteristics of rocks and minerals. Identify and classify rocks as being composed of different combinations of minerals.	Patterns Structure & function Stability & change	Obtaining, evaluating, and communicating information. Engaging in argument from evidence.	All of investigation 3 does a great job of teaching the 3rd grade content standard for rocks and minerals -- perhaps better than the other ISI modules for 3rd grade. If possible, don't skip these lessons.

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Module Title: Soils Rocks and Landforms

Investigation #	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
Investigation 3: Rocks and Minerals **Part 2:** Mineral Hardness	**How does the property of hardness help us identify minerals?**	Students investigate color and hardness, (scratch test), to help identify four minerals.	• Rocks are made of ingredients called minerals; minerals are made of only one ingredient. • Hardness, a mineral property, is the resistance of a mineral to being scratched. • Minerals can be identified and seriated by hardness. • When comparing the hardness of any two objects, the harder one will scratch the softer one.	1-2 active 1 reading		3.ESS.3	Observe the detailed characteristics of rocks and minerals. Identify and classify rocks as being composed of different combinations of minerals.	Cause & effect Structure & function Stability & change	Constructing and performing investigations. Analyzing and interpreting data. Engaging in argument from evidence. Obtaining, evaluating, and communicating information.	
Investigation 3: Rocks and Minerals **Part 3;** Other Mineral Properties	**What other properties can help us identify minerals?**	Students learn about streak, luster, and how to use a mineral properties table to identify minerals.	• Rocks and minerals can be described by their properties (including hardness, streak, and luster).	1-2 active 1 reading		3.ESS.3	Observe the detailed characteristics of rocks and minerals. Identify and classify rocks as being composed of different combinations of minerals.	Patterns Structure & function	Obtaining, evaluating, and communicating information.	The reading in this lesson can be compared to their own mineral identification tables--a great activity to make connections between the information found in the text and the data gathered through investigation.

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Module Title: Soils Rocks and Landforms

Investigation #	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
Investigation 3: Rocks and Minerals **Part 4:** Minerals in Granite	**What minerals make up the rock granite?**	Students sort rocks and minerals, and identify the minerals that make up granite.	• Rocks are made of ingredients called minerals; minerals are made of only one ingredient. • Granite is an igneous rock containing rock-forming minerals quartz, feldspar, mica, and hornblende.	1 active reading 1		3.ESS.3	Observe the detailed characteristics of rocks and minerals. Identify and classify rocks as being composed of different combinations of minerals.	Cause & effect Structure & function	Constructing explanations. **Engaging in argument from evidence.** Obtaining, evaluating, and communicating information.	This lesson provides a great oportunity to engage in argument from evidence as students present evidence and debate the minerals in granite. Getting the exact minerals exactly correct is not the most important task. Gathering and presenting evidence shold be the focus.

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Module Title: Soils Rocks and Landforms

Investigation #	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
Investigation 4: Natural Resources **Part 1:**Introduction to Natural Resources	**What are natural resources and what is important to know about them?**	Students review what they have learned in Investigations 1–3. They write a story or draw a concept map to bring the ideas together. Then they focus on earth materials as renewable and nonrenewable natural resources by viewing and discussing a video.	• Natural resources are natural materials taken from the environment and used by humans. • Some natural resources are renewable (sunlight, air and wind, water, soil, plants, and animals) and some are nonrenewable (minerals and fossil fuels). • Geoscientists study earth materials in part to help humans use those resources wisely. • Alternative sources of energy include solar, wind, and geothermal.	2 active reading 1	aggregate cement concrete fossil fuel geothermal power natural resource nonrenewable resource renewable resource solar energy wind power	4.ESS.2	Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.	Structure & function Stability & change	Engaging in argument from evidence. Obtaining, evaluating, and communicating information.	This lesson asks students to build relationships among the concepts in this module by writing a story or creating a concept map about how soils form or how landforms change over time. The video clips about natural resources zero in on the 4th grade content standard.
Investigation 4: Natural Resources **Part 2:** Making Concrete	**How are natural resources used to make concrete?**	The class makes a stepping stone out of concrete.	• Concrete is an important building material made from earth materials.	1 active reading 1				Scale, proportion, & quantity Structure & function	Using mathematics and computational thinking.	This lesson is optional. However, using correct proportions for mixing concrete provides a great oportunity to apply this science practice standard.

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Module Title: Soils Rocks and Landforms

Investigation #	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
Investigation 4: Natural Resources **Part 3:** Earth Materials in Use	**How do people use natural resources to make or build things?**	Students go on a schoolyard walk to find objects and structures and consider what natural resources were used to construct them.	• Rocks and minerals are natural resources important for shelter and transportation. • Earth materials are resources for artists.	1 active reading 1		4.ESS.4	~~Develop~~ solutions that could be implemented to reduce the impact of ~~humans on the natural environment and~~ the natural environment on humans.	Structure & function Stability & change	Constructing explanations. Obtaining, evaluating, and communicating information.	The connection to the content standard is that Earth materials are stonger and more durable for building than other materials such as wood.

Grade 4 curriculum roadmaps
Life Science

Module Title: Environments										
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN #**	**Standard Text**	**Cross Cutting Concept(s)**	**Practices**	**Notes**
1 part 1 order meal worms in advance	**How do mealworm structures and behaviors help them grow and survive?**	Students observe mealworms and describe their structures and behaviors. They set up a room temperature mealworm environment for further observation and comparison to one at a colder temperature.	1. An environmentconsisits of living and nonliving components that influence an organism. 2. Environmental factors influence the growth and survival of organisms. 3. Organisms have sturctures and behaviors to support survival, growth and reproduction.	1 active 1 reading	organism, mealworm structures behaviors function environment environmental factor, life cycle, larva molting, pupa, pupated, adult, darkling beetle, antennae	4.LS.1 4.LS.2 4.LS.3	**LS.1** Observe, analyze, and interpret how offspring are **very much, but** not exactly like their parents or one another**. Describe how these differences in physical characteristics among individuals in a population may be advantageous for survival and reproduction. LS.2** Use evidence to support the explanation that a change in the environment **may result in a plant or animal will survive and reproduce, move to a new location, or die. LS.3** Construct and argument that **plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction in different ecosystms.**	Structure and function, Cause and effect, Systems and system models	Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanaitons, Obtaining, evaluaitng and communicating information	150 mealworms and 150 isopods can be obtained using the organism card/letter in your tote. **It may take up to 4 weeks for delivery. Mealworms can be purchased at a local pet store. Adults may emerge within a few weeks. Place mealworms in a closed plastic container with bran, raw oatmeal or cornmeal. Every 3-4 days place an apple, carrot or potato slice in the container to provide water.**

Grade 4 curriculum roadmaps
Life Science

Module Title: Environments										
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN #**	**Standard Text**	**Cross Cutting Concept(s)**	**Practices**	**Notes**
1.2 order isopods in advance or find in local areas	**What moisture conditions do isopods prefer? What light conditions to isopods prefer**	Students compare environmental factors to determine optimal isopod environments. Based on the findings they design an isopod envrionment in a terrrarium.	1. Designing an investgation involves controlling the factors so the effect of one factor can be observed. 2. Every oganism has a set of preferred environmental conditions.	4 active	sow bug isopod conditions terrarium preferred environment inference	4.LS.2	**LS.2 Use evidence to support that a change in the environment may result in a plant or animal will survive and reproduce, move to a new location or die.**	Cause and effect	Asking questions, Devleoping and using models, Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations Engaging in argument from evidence, Obtaining, evaluaitng and communicating information	150 isopods are needed. They can be purchased using organism card or Isopods can be collected by you and your students in local areas-under rocks, logs, leaf litter.
1 part 3	**What are characteristics of animals living in the leaf-litter environment?**	Students go to schoolyard to collect, observe and sort organisms found in leaf litter in their schoolyard.	1. An environment consisits of living and nonliving components that influence an organism. 2. Environmental factors influence the growth and survival of organisms. 3. Every organism has a set of preferred environmental conditions.	1 active 1-2 reading 2 assess		4.LS.3	**LS.3 Construct an argument that plants and animals have internal and external structures that funciton to support survival, growth, behavior and reproduction in different environments.**	Structure and function	Asking questions, Planning and carrying out investigations, Analyzing and interpreting data, Obtaining, evaluaitng and communicating information	

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2 part 1 Optional	**What are the environmental factors in an aquatic system?**	Students compare environmental factors in terrestrial environment to aquatic environments in 2 class aquariums.	1. Aquatic environments incude living and nonliving factors. 2. The interaction of organisms with one another and with the nonliving environment is the ecosystem.	2 active 1 reading	freshwater environment, interaction	4.LS.2	LS.2 Use evidence to support that a change in the environment may result in a plant or animal will survive and reproduce, move to a new location or die.	Systems and system models	Planning and carrying out investigations, Constructing explanations Obtaining, evaluaitng and communicating information	Requires purchase of 2 goldfish and 6 guppies 10-12 aquatic snails, elodea from local pet store. Gamarus (scuds) can be purchased through Delta Education. This investigation is well designed because it does provide understanding of environmental factors and 4.LS.2 in a different context (fresh water). It can be optional if time for science is limited.
2 part 2	**What are the roles of orgnisms in a food chain?**	Students use organism cards to create food chains and webs to trace the flow of energy.	Organisms intereact in feeding relatinships in ecosystems. Producers make their own food which is used by consumers. Organisms may compete for resources in an ecosystem. Decomposers eat dead plant and animal materials and recycle nutriets in the system.	1 active 2 reading	predator food chain producers energy consumers herbivores omnivores carnivores decomposer	4.LS.3	LS.3 Construct an argument that plants and animals have internal and external structures that funciton to support survival, growth, behavior and reproduction in different environments.	Energy and matter	Analyzing and interpreting data, Engaging in argument from evidence, Obtaining, evaluaitng and communicating information	The concept of transfer of energy within an ecosystem is addressed more deeply in Grade 5. The focus of this lesson for Grade 4 should be the role the organisms have in the ecosystem and the internal/external structures of organisms that enable them to perform within the ecosystem.

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2 part 3	**How does food affect a population in its home range?**	In the schoolyard or large open indoor space , students simulate a population of deer foraging for food and explore the balance between # of organisms and the area supprting the population.	1. Organisms interact in feeding relationships in ecosystems. 2. When the environment changes, some plants and animals survive and reproduce; others move to new locations, and some die.	1 active 1 reading	population home range carrying capacity	4.LS.2 4.ESS.4	LS.2 Use evidence to support that a change in the environment may result in a plant or animal will survive and reproduce, move to a new location or die. ESS.4 Develop **solutions that could be implemented to reduce the impact of humans on the natural environment** and the natural environment on humans.	Stability and change, Systems and system models Energy and matter	Devleoping and using models, Analyzing and interpreting data, Constructing explanations Obtaining, evaluaitng and communicating information	If it is not possible to go outdoors, secure an open space inside such as the gym or cafeteria. Include online activities Virtual Aquarium, Virtual Terrarium Note the Reading "Human Activities and Aquatic Environments" helps address 4.ESS.4
2 part 4	**How do animals use their sense of hearing?**	Students go to the schoolyard or large indoor opent space to simulate the use of animal sounds to locate each other without being found by a predator.	1. Animals communicate to warn others of danger, scare predators away, or locate others of their kind. 2. Organisms have sensory systems to gather information about their environment and act on it.	1 active 1 reading 2 assess	prey	4.LS.3	LS.3 Construct an argument that plants and animals have internal and external structures that funciton to support survival, growth, behavior and reproduction in different environments.	Structure and function	Planning and carrying out investigations, Constructing explanations Obtaining, evaluaitng and communicating information	Reading "Human Activities and Aquatic Environments" helps address 4.ESS.4

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3 part 1	**How can we find out if salinity affects brine shrimp hatching?**	Students investigate the environmental factor of salinity in hatching brine shrimp eggs with a controlled experiment using four different salt concentrations in water.	1. An environmental factor can be a living or nonliving part of an environment. 2. Organisms have a range of tolerance for environmental factors that affect its ability to survive and reproduce.	1 active 1 reading	concentration salinity migrating brine shrimp, controlled experiment, brine brine shrimp	4.LS.2	LS.2 Use evidence to support that a change in the environment may result in a plant or animal will survive and reproduce, move to a new location or die.	Systems and system models, Scale, proportion and quantity	Devleoping and using models, Planning and carrying out investigations,Using mathematics and computational thinking, Obtaining, evaluaitng and communicating information	Brine shrimp eggs will be in the tote. **Test for egg viablility at least 1 week prior to the lesson. Brine shrimp larvae should appear 24-48 hours after placement in water with correct salinity.**
3 part 2	**How does salinity affect the hatching of brine shrimp eggs?**	Students monitor saltwater environments and determine which are conducive to hatching brine shrimp eggs. They analyze results of multi-trial class experiement.	1. Within a range of tolerance, there are optimum conditions that produce maximum reproduction and growth. When environments change, some plants and animals survive and reproduce; others move to new locations; and some die.	1 active 2 reading	range of tolerance	4.LS.2 4.ESS.4	LS.2 Use evidence to support that a change in the environment may result in a plant or animal will survive and reproduce, move to a new location or die. ESS.4 Develop solutions that could be implemented to reduce the impact of humans on the natural environment and the natural environment on humans.	Systems and system models, Cause and effect	Devleoping and using models, Planning and carrying out investigations, Analyzing and interpreting data, Using mathematics and computational thinking, Constructing explanations Obtaining, evaluaitng and communicating information	ESS.4 Addressed in reading What happens when" Ecosystems Change?"

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3 part 3	**Does changing the environment allow the brine shrimp eggs to hatch?**	Students are challenged to manipulate the environment to get dormant eggs to hatch. They design an investigation to test their prediction.	When environments change, some plants and animals survive and reproduce; others move to new locations; and some die.	2 active 1 reading	viable	4.LS.2 4.ESS.4	LS.2 Use evidence to support that a change in the environment may result in a plant or animal will survive and reproduce, move to a new location or die. ESS.4 Develop solutions that could be implemented to reduce the impact of humans on the natural environment and the natural environment on humans.		Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations Engaging in argument from evidence, Obtaining, evaluaitng and communicating information	This should occur on Day 5 of brine shrimp hatching. DEFINTELY read " the Shrimp Club"-real world account of a class restoring an environment to help and endangered organism.
3 part 4	**What are some benefits of having variation within a population?**	A predator-prey simulation occurs in the schoolyard using imaginary animals.	Individuals of the same kind differ in their characteristics, and sometimes the differences give individuals an advantage in surviving and reproducing.	1 active 1 reading 2 assess	variation inherited trait reproduce survive thrive	4.LS.1	LS.1 Observe, analyze, and interpret how offspring are very much, but not exactly like their parents or one another. Describe how these differences in physical characteristics among individuals in a population may be advantageous for survival and reproduction.	Systems and system models Structure and function	Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations, Obtaining, evaluaitng and communicating information	
4 part 1 optional	**How much water is needed for early growth of different kinds of plants? What is the salt tolerance of several common farm crops?**	Half of the class tests range of water tolerance for early growth of plants. Half the class tests the effet o fsalinity on the same 4 plants.	1. Every organisms has a range of tolerance for each factor in its environment. 2. Organisms have specific requirements for successfule growth, development and reproduction. 3. Optimum conditions are those most favorable to an organism.	4-5 active 2 reading	irrigate drought salt sensitive salt tolerant	4.LS.2	LS.2 **Use evidence to support that a change in the environment may result in a plant** or animal will **survive** and reproduce, move to a new location or die.	Cause and effect	Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations Engaging in argument from evidence, Obtaining, evaluaitng and communicating information	Plan to observe plant growth on days 5,8,13 If your schedule allows, this is a good investigation because it explores environmental changes **on plants**-previous investigations explored evironmental factors and the impact on animals. If necessary, it can be an optional lesson.

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4 part 2	**How does mapping the plants in the schoolyard help us to investigate environmental factors?**	Students map and document plant distribution patterns in the schoolyard. They discuss senvironmental factors that might be responsible for these patterns.	1.A relationship exists between environmental factors and how well organisms grow. 2.Optimum conditions are those most favorable to an organism.	2 active 1 reading	dominant extinct	4.LS.2 3.ESS.4	**LS.2 Use evidence to support that a change in the environment may result in a plant or animal will survive and reproduce, move to a new location or die.** **3.ESS.4** Determine how fossils are formed, discovered, layered over time, **and used to provide evidence of the organisms and the environments in which they lived long ago.**	Patterns	Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations Obtaining, evaluaitng and communicating information	Boundary flags are provided to stake out areas in schoolyard to study. Reading "Animals from the Past" addresses Grade 3 ESS.4
4 part 3	**What are some examples of plant adaptations ?**	By viewing a video, students are introduced to plant adaptations that alllow them to thrive in dry and in wet environments.	1.A relationship exists between environmental factors and how well organisms grow. 2. Adaptations are structures and behaviors of an organism that help it survive and reproduce.	1 active 1 reading 2 assess	natural selection, adaptation	4.LS.1	LS.1 Observe, analyze, and interpret how offspring are very much, but not exactly like their parents or one another. Describe how these differences in physical characteristics among individuals in a population may be advantageous for survival and reproduction.	Structure and function	Obtaining, evaluaitng and communicating information	

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STC Motion and Design 4th grade curriculum roadmap

Lesson #	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
1	**What do we know about the motion and design of vehicles?**	Students brainstorm what they know about motion and about design of vehicles.	Build a vehicle(cart) that will move at least 100 cm.	1	vehicle motion design requirement	4.PS.1 4.PS.2	Investigate transportation systems and devices that operate on or in land, water, air and space and recognize the forces (lift, drag, friction, thrust and gravity) that affect their		Developing and using models; obtaining, evaluating and communicating information	
2	**How can you use a drawing to help build a vehicle?**	Students make a record of the vehicles they built in Lesson 1. They build a vehicle by following a two-view technical drawing. Students identify details that are important in technical drawings and compare their own drawings with a technical drawing.	To draw the vehicle they designed in lesson 1 and learn about technical drawing.	1.5-2	three-view drawing technical drawing blueprint	4.PS.1 4.PS.2	Investigate transportation systems and devices that operate on or in land, water, air and space and recognize the forces (lift, drag, friction, thrust and gravity) that affect their motion. Investigate the relationship of the speed of an object to the energy of that object.	Systems and systems models	Developing and using models;	
3	**How do vehicles move?**	Students set up a system to pull their vehicles. They compare how the the motion of their vehicle changes when more or less weight is on the string to pull it. Students complete a data table to record observations.	To study the principle that force applied to an object changes its motion.	1.5	force unbalanced force weight falling weight system	4.PS.1 4.PS.2	Investigate transportation systems and devices that operate on or in land, water, air and space and recognize the forces (lift, drag, friction, thrust and gravity) that affect their motion. Investigate the relationship of		Posing questions; performing investigations; collecting and analyzing data	
4	**How does the weight of a load affect a vehicle's motion?**	Students add blocks to their vehicles to investigate the effects of a load on motion. Students use timers to measure the time it takes for a loaded vehicle to move a given distance. Students graph their results and observations.	To test how adding weight to a vehicle affects its motion	2	mean median mode load line plot	4.PS.1 4.PS.2	Investigate transportation systems and devices that operate on or in land, water, air and space and recognize the forces (lift, drag, friction, thrust and gravity) that affect their motion. Investigate the relationship of the speed of an object to the energy of that object.		Designing solutions; Analyze and interpret data	

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Lesson #	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
5	**What changes must be made to your standard vehicle for it to successfully complete the challenge?**	Students design vehicles and systems to pull the vehicles to meet time requirements. Students use and apply previously collected data to design their systems.	Build vehicles to meet design specifications	1.5	load	4.PS.1 4.PS.2 3-5.E.1 3-5.E.2	Investigate transportation systems and devices that operate on or in land, water, air and space and recognize the forces (lift, drag, friction, thrust and gravity) that affect their motion. Investigate the relationship of the speed of an object to the energy of that object. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. 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.		Defining problems; designing solutions	
6	**How do you increase the amount of energy stored in a rubber band?**	Students explore how rubber bands can be used to move their vehicle. They evaluate the design of their standard vehicle for using rubber band energy.	Examine different energy sources to drive the vehicle	1	energy motion energy stored energy kinetic energy potential energy			Cause and Effect;	Posing questions; collecting data	
7	**What are the effects of an increase in stored energy on the motion of the vehicle?**	Students predict and investigate how variations in rubber band energy affect the distance their vehicles travel. Students record their results in a data table and identify patterns. They discuss the relationship between the number of turns of the rubber band around the axle and the distance their axle-driven vehicle travels.	Investigate how variable amounts of energy affect the motion of the vehicle	1	stored energy potential energy	4.PS.1 3-5.E.2	Investigate transportation systems and devices that operate on or in land, water, air and space and recognize the forces (lift, drag, friction, thrust and gravity) that affect their motion. 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.		Constructing and performing investigations	

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8	**How does friction affect a vehicle's performance?**	Students evaluate specific design features that reduce or increase friction on vehicles propelled by a rubber band.	Examine how design variables reduce or increase the force of friction on the vehicle.	1	friction hub axle	4.PS.1 3-5.E.2	Investigate transportation systems and devices that operate on or in land, water, air and space and recognize the forces (lift, drag, friction, thrust and gravity) that affect their motion.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.	Cause and Effect;	Posing questions; Developing and using models;	
9	**How does a sail affect the motion of a vehicle? How can you minimize the sail's effect?**	Students adapt their vehicles to hold a sail. They discuss how it might affect the vehicle's motion.	Adapt their vehicle to hold a sail and discuss how it might affect motion of the vehicle.	1	load energy sail hypothesis air resistance	4.PS.1 4.PS.2 3-5.E.1 3-5.E.2	Investigate transportation systems and devices that operate on or in land, water, air and space and recognize the forces (lift, drag, friction, thrust and gravity) that affect their motion. Investigate the relationship of the speed of an object to the energy of that object. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. 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.	Structure and Function	Developing and using models; constructing explanations	
10	**How does air resistance affect a vehicle's performance?**	Students test how air resistance influence a vehicle's motion. Students relate their observations to real-world objects designed to minimize air resistance.	Explore air resistance and how it affect a vehicle's motion.	1	air resistance drag aerodynamics	4.PS.1 3-5.E.2	Investigate transportation systems and devices that operate on or in land, water, air and space and recognize the forces (lift, drag, friction, thrust and gravity) that affect their motion.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.	Structure and Function	Performing investigations; constructing explanations	

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Lesson #	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
11	**What steps must be met in order to meet a design challenge?**	Students brainstorm ideas for building a propeller-driven vehicle. They build propeller-driven vehicles from a technical drawing. Students complete a data table recording distance traveled.	Design and build a propellar driven vehicle and compare them with the axle driven vehicle.	1	propellar potential energy	4.PS.1 3-5.E.2	Investigate transportation systems and devices that operate on or in land, water, air and space and recognize the forces (lift, drag, friction, thrust and gravity) that affect their motion. 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.		Defining problems;designing solutions	
12		Students analyze the features of propeller-driven vehicles. Students discuss the motion and design of their propeller-driven vehicles and compare these features with those of vehicles previously built.	Evaluate the design of a propellar-driven vehicle.	2	friction surface clockwise counterclockwise action reaction angle	3-5.E.2	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.		Designing solutions	
13		Students look at "cost" of their vehicles and modify the design to reduce cost.	Evaluate the cost of their design.	2	cost effective trade-offs performance standards	3-5.E.1 3-5.E.2	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. 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.		Obtaining, evaluating and communicating information	
14		Each team is given a different design challenge. Students individually and then collectively brainstorm ideas to meet the challenge. As a team they plan a solution. The solution is presented to the class for feedback. NOTE: Teacher will need to provide a small electric fan for one challenge and a piece of Masonite or foamboard for another challenge.	Brainstorm how to solve a design challenge.	1-2 class periods	engineer aerospace engineer chemical engineer computer scientist chemical engineer	3-5.E.1 3-5.E.2	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. 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.		Obtaining, evaluating and communicating information; designing solutions	

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15		Students implement their plans from lesson 14 by building, testing and evaluating and refining their vehicles and the systems for moving them . Students determine the "cost" of their design.	Teams build and test their vehicles and refine their design plans.		falling weight system budget aerodynamic cost effective recursive testing engineer	3-5.E.1 3-5.E.2	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. 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.		Analyzing and interpreting data	