Grade 3 curriculum roadmap
Physical Science

	Module Title:	Physics of Sound (FOSS, 2nd Ed.)									
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
1 part 1 OPTIONAL	**What are the properties of sounds that make them identifiable?**	Students explore their ability to discriminate sounds. They listen to sounds made by objects dropped into a drop chamber and attempt to identify each object from its sound.	1. Sounds have identifiable characteristics. 2. Objects can be identified by the sound they make when dropped.	**1-2 active** 1 reading	sound discrimination			Cause & Effect	Asking questions, Obtaining, evaluating, and communicating information	This lesson, while engaging, actually is all about properties of matter, and is not necessary to the development of the remaining investigations or understanding of the standard.	**1 part 1 OPTIONAL**
1 part 2 OPTIONAL	**How can sound discrimination be used to make a code for sending messages?**	Students develop a code by assigning letters of the alphabet to a selection of objects. Using this sound code, they send messages to one another, utilizing the drop chamber.	1. The identifiable properties of sounds can be used to make a code. 2. Sounds can convey information.	**2 active** 1 reading	code			Cause & Effect	Planning and carrying out an investigation		**1 part 2 OPTIONAL**
1 part 3	**How are sounds made?**	Students explore the production of sound with a door fiddle, an electronic tone generator, and two other sound instruments. Through these explorations, students look for vibrations at the sound source, identify the sound receivers, and compare sound volume to vibration intensity.	1. Sound originates from a source that is vibrating (sound source) and is detected at a sound receiver, such as the human ear. 2. The intensity of the vibration determines the volume of the sound.	**2-3 active** 1 reading 1 **assessment**	vibrate, vibration sound source sound receiver volume loud soft	3.PS.3	Generate sound energy using a variety of materials and techniques, and recognize that it passes through solids, liquids, and gases (i.e. air).	Cause & Effect	Planning and carrying out an investigation, Analyzing & interpreting data, Constructing explanations	* Start collecting **glass bottles** of the same shape and size, to use in Investigation 2.2. * When setting up the **door fiddle**, it is helpful to have another adult assisting, to pull the string taut. As the students continue using the door fiddle in successive investigations, the door fiddle will need retightening from time to time.	**1 part 3**
2 part 1	**How are high and low sounds made?**	Using their voices and tongue depressors, students look for evidence that different vibrations produce different pitches of sound. They revisit the door fiddle and tone generator to look more closely at the vibrations that make high and low pitches.	1. Sound originates from vibrating sources. 2. Pitch is how high or low a sound is. 3. Differences in pitch are caused by differences in the rate at which objects vibrate.	2 **active** 1 reading	pitch frequency rate	3.PS.3	Generate sound energy using a variety of materials and techniques, and recognize that it passes through solids, liquids, and gases (i.e. air).			Of the two sound sources used, the door fiddle is the one tool in this entire unit that most dramatically demonstrates vibrations and the resulting sounds. Students can actually see the string vibrating. It's definitely worth the effort to make sure this is available to students. I leave mine assembled for a couple of weeks, so students can go back to it again and again, to make the connections to this concept!	**2 part 1**
2 part 2	**How does length affect the rate of vibration, and therefore the pitch?**	Students use a waterphone, xylophone, kalimba, and string beam to look at how length affects pitch. They observe what happens when the length of the vibrating sound source changes.	1. Long objects vibrate slowly and have a low pitch. 2. Short objects vibrate quickly and have a high pitch.	2 **active,** 1 reading	length	3.PS.3	Generate sound energy using a variety of materials and techniques, and recognize that it passes through solids, liquids, and gases (i.e. air).		Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations	The teacher must supply the glass bottles to make the waterphone, as well as assemble the string beam.	**2 part 2**

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2 part 3	**How does tension affect the rate of vibration, and therefore the pitch?**	Students use a minigutbucket and a FOSS-ulele to look at how tension affects the pitch of a sound. They study what happens when the tension applied to a sound changes.		2 **active** (1 on-line activity) 1**assessment**	tension	3.PS.3	Generate sound energy using a variety of materials and techniques, and recognize that it passes through solids, liquids, and gases (i.e. air).		Planning and carrying out investigatins, Analyzing and interpreting data, Constructing expalnations, Obtaining, evaluating , and communicating information	There is a FOSS video, "All About Sound", in the Next Generation Sound and Light module resources, if teachers are able to use an access code.	**2 part 3**
3 part 1	**How is sound different when heard through air? Water?**	Students use listening tubes and tuning forks to compare how sound travels through air in two ways - by simply playing the tuning fork in air, and then using a tube to direct the sound. They use stethoscopes placed in water to determine whether sound can travel through liquid. They compare the shape of a megaphone to that of their outer ears for directing sound through air.	1. Sound vibrations need a medium through which to travel. 2. Sound travels through air. 3. Sound travels through water. 4. Sound that is directed travels better through air. 4. The shape of the human ear is designed to receive, direct, and amplify sound.	1-2 **active** 1 reading	air liquid stethoscope megaphone outer ear	3.PS.3	Generate sound energy using a variety of materials and techniques, and recognize that it passes through solids, liquids, and gases (i.e. air).	Structure and function, Systems and system models	Asking questions, Analyzing and interpreting data, Constructing explanations, Obtaining, evaluating and communicating information	Extension opportunities for investigating echolocation used by bats, and whale/dolphin communication.	**3 part 1**
3 part 2	**How is sound different when heard through solids?**	Students listen through string telephones and wood dowels to determine how well sound travels through solids. They compare the results to the sounds they observed when sound traveled through air and water.	1. Sound travels through solids.	5 **active** 1 reading 1 on-line activity		3.PS.3	Generate sound energy using a variety of materials and techniques, and recognize that it passes through solids, liquids, and gases (i.e. air).	Systems and system models	Developing and using models, Analyzing and interpreting data, Using mathematical and computational thinking, Obtaining, evaluating, and communicating information, Construcitng explanations		**3 part 2**

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4 part 1	**How can pitch, volume, and the distance a sound travels be modified (changed) or enhanced?**	Each group of students gets a specific problem in the area of sound generation, transmission, or modification to solve, using familiar materials and their knowledge of vibrations, pitch, and how sound travels. Students present their solutions to the rest of the class.	1. Several variables affect pitch, including size or length and tension of the sound source material. 2. Sound can be directed through air, water, and solid material to the sund receiver.	2-3 **active**	No new vocabulary			Scale, proportion, & quantity Systems and system models Structure & function	Planning and carrying out investigations, Using mathematics and computation, Analyzing and interpreting data, Obtaining, evaluating and communicating information		**4 part 1**
4 part 2 OPTIONAL	**No FQ**	Students use what they have learned about sound as a starting point for further inquiry into sound. They may choose to conduct investigations or demonstrations using materials, or they may choose to research a topic of particular interest around sound. They present projects to the rest of the class.	*Apply content introduced in previous lessons.	2 or more **active**	No new vocabulary				Planning and carrying out investigations, Obtaining, evaluating and communicating information		**4 part 2**

Grade 3 curriculum roadmap
Earth Science

Water & Climate (FOSS - NGSS)											
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN Standard #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
1 part 1 **OPTIONAL**	**What happens when water falls on different surfaces?**	Students conduct investigations to observe the properties of water. They compare how water drops interact with four materials: paper towel, waxed paper, aluminum foil, and writing paper. Students discover that water soaks into absorbent materials and forms dome-shaped beads on waterproof materials.	1. Water forms beads on waterproof materials and soaks into absorbent materials.	**1 active** 1 reading	earth material absorbent waterproof bead dome evidence opinion observation relationship repel surface			Patterns Cause & effect	Developing & using models Planning and carrying out investigations, Obtaining, evaluating, and communicating information		**1 part 1** **OPTIONAL**

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Water & Climate (FOSS - NGSS)											
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN Standard #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
1 part 2 **OPTIONAL**	**How does water move on a slope?**	Students use droppers to make water domes and observe the domes' behaviors on a sloped surface. During the investigations, students observe that water domes always move downhill, and that the size and angle of slope affect the speed at which the domes move.	1. Water moves downhill. 2. A large water dome moves faster down a slope than a smaller water dome. 3. The steeper the slope of a surface, the faster a water dome moves.	**1 active** 1 reading 2 videos 1 online activity	direction slope gravity bead dome move repel surface			Patterns Cause & effect	Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations, Obtaining, evaluating, & communicating information	While this does not directly address the 3rd grade ESS standards, this investigation helps students to begin understanding the concepts around slope and its effect on water movement, which will be developed in 4th grade FOSS Soils, Rocks, & Landforms module.	**1 part 2** **OPTIONAL**

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Water & Climate (FOSS - NGSS)											
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN Standard #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
1 part 3 **OPTIONAL**	**How much water can a dry sponge soak up?**	Students are challenged to measure how much water a dry sponge can soak up. This can be determined by measuring mass, volume, or both. Students use measurement tools (FOSS balance and syringe) and develop their own procedure to answer this question.	1. Water forms beads on waterproof materials and soaks into absorbent materials.	**1 active** 1 reading 6 online activities	data evidence sponge			Patterns Cause & effect	Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations, Engaging in argument from evidence	While this does not directly address the ESS standards, there is a direct connection between the science and math standards. (IN Mathematics 3.M.2) This investigation helps student to make the connection between volume of water and its mass. (Formerly contained in FOSS Measurement/	**1 part 3** **OPTIONAL**

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Water & Climate (FOSS - NGSS)											
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN Standard #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
1 part 4 OPTIONAL	**What happens ourdoors when rain falls on natural materials?**	Students go out to the schoolyard to collect small samples of natural materials, including living and dead plant material and eaarth materials. They drop water on the materials to simulate rain, and observe what happens.	1. Water forms beads on waterproof materials and soaks into absorbent materials.	**1 active** 1 reading 2 **assessment**	natural materials earth materials			Patterns Cause & effect	Developing & using models, Constructing explanations		**1 part 4 OPTIONAL**

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Water & Climate (FOSS - NGSS)											
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN Standard #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
2 part 1	**How can you measure temperature accurately?**	Students compare the temperatures of three cups of water, using their finger as a gauge. They realize that a standard is needed, as well as a more accurate device to measure temperature. Students are introduced to the thermometer.	1. Temperature is a measure of how hot matter is. 2. The metric unit for temperature is degrees Celcius (oC). 3. Water freezes at 0 oC and boils at 100 oC. 4. Thermometers are the tool which measures temperature.	1 **active** 1 reading 2 online activities	degrees Celcius temperature thermometer Fahrenheit standard matter solid liquid gas	3.ESS.1	Obtain and combine information to determine seasonal weather patterns across the different regions of the United States.	Cause & effect Scale, proportion, and quantity	Planning and carrying out investigations, Analyzing and interpreting data, Engaging in argument from evidence	While this group of lessons in Investigation 2 do not **directly** address the Indiana ESS standard, they collectively build understanding around the concepts of temperature and its effects on water, which of course translate to the water cycle and all the weather variables inherently associated with that	**2 part 1**

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Water & Climate (FOSS - NGSS)											
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN Standard #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
2 part 2	**What happens to water when it gets hot? Cold?**	Students build a thermometer and conduct investigations to find out what happens when the thermometer is placed first in hot water, then in cold. They learn that heated water expands and cooled water contracts.	1. Water expands when heated and contracts when cooled.	1 **active** 1 online activity	contract expand mass bulb stem			Cause & effect Scale, proportion, and quantity	Planning and carrying out investigations, Developing & using models, Constructing explanations		**2 part 2**
2 part 3	**What happens when hot or cold water is put into room-temperature water?**	After observing that some objects float in water and some sink, students are given an operational definition:objects float if they are less dense than water; objects sink if they are more dense than water. Students lower a vial of hot water and then a vial of cold water into a cup of room-temperture water. They observe that the less-dense warm water rises (floats), and the more-dense water sinks.	1. A material that floats in water is less dense than the water; a material that sinks is more dense. 2. Cold water is more dense than warm water.	1 **active** 1 reading 2 online activities	dense, density float sink volume			Cause & effect Scale, proportion, and quantity	Planning and carrying out investigations, Developing & using models, Constructing explanations		**2 part 3**

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Water & Climate (FOSS - NGSS)											
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN Standard #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
2 part 4	**How does water change when it gets really cold?**	Students freeze water in vials and in syringes to observe and measure that water expands when it freezes. They observe that a volume of liquid water has a greater mass than an equal volume of ice. They predict the behavior of ice in water, and explain the observation that ice floats in liquid water because ice is less dense than water.	1. Water expands when it freezes. 2. Ice is less dense than liquid water.	3 **active** 1 reading 1 online activity	freeze expand			Cause & effect Scale, proportion, and quantity	Asking questions, Analyzing and interpreting data, Constructing explanations, Obtaining, evaluating and communicating information		**2 part 4**

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Water & Climate (FOSS - NGSS)											
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN Standard #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
2 part 5	**Where should an animal go to stay warm or to stay cool?**	Students take ice outdoors, place one ice cube in the sunshine, place a second cube in the shade, and bury a third cube. They monitor the ice cubes and, by extension, determine the best place for an animal to go to stay warm or to stay cool. Students compare above-ground melting to underground melting. In cole-weather locations (temperatures consistently below freezing) students do an alternative activity with water to determine how an animal can keep from freezing.	1. Ice melts when heated; water freezes when cooled.	1 **active** 2 **assessment**	maintain			Cause & effect Scale, proportion, and quantity	Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations	This investigation addresses 3.LS.3 and provides a strong foundation for 4.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 ecosystems.	**2 part 5**

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Water & Climate (FOSS - NGSS)											
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3 part 1	**What does the weather forecast tell us?**	Students compare the weather data that they observe and collect to meteorologists' forecasts and historical data. They watch a short video about how meteorologists make their forecasts. Then they review local weather, forecasts, and records set in previous years. Students take turns collecting local weather data to compare to the forecasts and records.	1. Weather is measured using observation and tools such as thermometers, wind vanes, and rain gauges.	2 **active with 7 days monitoring** 1 reading 1 video 2 on-line activities	weather thermometer wind vane compass rain gauge forecast meteorologist historical data precipitation	3.ESS.1	Obtain and combine information to determine seasonal weather patterns across the different regions of the United States.	Patterns Cause & effect	Planning and carrying out investigations, Analyzing and interpreting data, Obtaining, evaluating, and communicating information		**3 part 1**

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Water & Climate (FOSS - NGSS)											
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN Standard #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
3 part 2	**What happens to wet paper towels overnight?**	Students observe a demonstration in which two paper towels are soaked with equal amounts of water and then put into cups on a balance. One cup is open to air and the other cup is closed. A day later, the towel in the open cup is dry. Students learn that things dry because of evaporation.	1. Evaporation is the process by which liquid (water) changes into gas (water vapor).	2 **active, plus 4 days of monitoring** 1 reading	evaporation water vapor gas			Cause & effect Scale, proportion, and quantity	Developing and using models		**3 part 2**

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Water & Climate (FOSS - NGSS)											
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN Standard #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
3 part 3	**How does surface area affect evaporation?**	Students measure equal amounts of water into four containers with different surface areas. After 4 days, students measure the amount of water remaining in each container to discover that the greater the surface area exposed to air, the greater the amount of evaporation.	1. The larger the surface area of a volume of water that is exposed to air, the greater the rate of evaporation. 2. Moving air (wind) increases the rate of evaporation.	2 **active** with 3-4 days between the two sessions 1 reading	surface area			Cause & effect	Planning and carrying out investigations, Analyzing and interpreting data, Using mathematics and computational thinking, Constructing explanaitons, Engaging in argument from evidence, Obtaining, evaluating and communicating informaiton	This investigation offers the opportunity to practice **Mathematics Process Standard 4: Model with Mathematics** to figure out the approximate surface areas of the four containers, using the centimeter grid mat supplied in the resources. This is an opportunity to develop the science language "...I	**3 part 3**

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Water & Climate (FOSS - NGSS)											
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3 part 4	**What else affects how fast water evaporates?**	Students measure equal amounts of water into four cups, place the cups in four different locations, and monitor temperature for 4 days. They measure the amount of water remaining in the cups to discover that warmer environments promote more evaporation.	1. As temperature increases, the rate of evaporation increases.	2 **active, with daily monitoring over 5 days*** 1 on-line activity	(no new vocabulary)			Patterns Cause & effect	Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations, Engaging in argument from evidence	*Make sure to start this investigation on a **Monday** <u>of a full week of school</u>. Morning and afternoon 5-10 minute monitoring sessions are suggested.	**3 part 4**
3 part 5	**What causes water to form on the side of a cup?**	Students set up cups of ice water and room-temperature water, and observe condensation on the ice-water cup. They learn that water vaopr in the air condenses into a liquid on cold surfaces. The water cycle is introduced.		2-3 **active** 1 reading I video 1 on-line activity 2 **assessment**	water cycle condensation chamber surface			Patterns Cause & effect Scale, proportion, and quantity	Asking questions, Developing and using models, Planning and carrying out investigations, Constructing explanations, Engaging in argument from evidence		**3 part 5**

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Water & Climate (FOSS - NGSS)											
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4 part 1	**What are typical weather conditions in our region?**	The class analyzees local daily weather data for four months of the **previous year** (January, April, July, October). Each group works with a two-week period in one of those four months to come up with a description of the weather during that period. The data categories for each day include condition, high/low temperatures, and precipitation. Students grapple with what data to use and how to organize the data to extract meaning from them.	1. Typical weather in a region often varies with seasons. High and low temperatures and amounts of precipitation are the main ways so describe seasonal weather changes.	1-2 **active,** 2-3 reading 1 video	condition local region season typical average actual	3.ESS.1	Obtain and combine information to determine seasonal weather patterns across the different regions of the United States.	Patterns	Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations & designing solutions, Engaging in argument from evidence, Obtaining, evaluating and communicating informaiton		**4 part 1**

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Water & Climate (FOSS - NGSS)											
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN Standard #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
4 part 2	**How do we describe different climates?**	Students are introduced to climate and suggest schemes for dexcribing world climate regions, based on their understanding of the weather. They view a video to gather information on climate and compare their climate-region scheme to those of climatologists.	1. The sun's energy drives the weather. 2. Climate is the average or typical weather that can be expected to occur in a region of the Earth's surface, based on long-term observation and data analysis.	1-2 active 1 reading 1 video 1 on-line activity	climate climatologist zone tropical desert temperate subarctic polar	3.ESS.1	Obtain and combine information to determine seasonal weather patterns across the different regions of the United States.	Patterns Scale, proportion, & quantity	Developing & using models, Planning and carrying out investigations, Constructing explanations & designing solutions Obtaining, evaluating and communicating informaiton	This could easily take more than 2 active investigation periods, as time for students to explore other climates/regions is suggested. FOSS provides links to other helpful websites for students to use in this investigation,	**4 part 2**

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Water & Climate (FOSS - NGSS)											
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4 part 3	**How do people deal with natural hazards such as floods?**	Through vidoe and readings, studnents are introduced to ways that people manage the natural hazards associated with floods. Students discuss engineering methods to deal with floods and droughts.	1. Weather-rrelated natural hazards include tornadoes, hailstorms, blizzards, lightning, floods, and drought. 2. People often modify their homes and their way of life to deal with floods. 3. Wetland protection and restoration is one way to prevent floods.	1-2 **active *see notes** 1-2 reading 2 video 2 **assessment**	natural hazard embankment flood floodplain sluice gate flow rate wetland tornado hailstorm ice storm blizzard lightning hurricane monsoon drought	3.ESS.2	Develop solutions that could be implemented to reduce the impact of weather related hazards.	Cause & effect Scale, proportion, and quantity	Developing & using models, Planning and carrying out investigations, Constructing explanations & designing solutions Obtaining, evaluating and communicating informaiton	This investigation addresses solutions and management for two hazardous weather conditions; however, it does not include other hazardous weather conditions that typically occur in Indiana (severe thunderstorms, tornadoes, ice storms, hailstorms, lightning) or other hazardous weather	**4 part 3**

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Water & Climate (FOSS - NGSS)											
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5 part 1 OPTIONAL	**What happens when water is mixed with other Earth Materials?**	Students pour equal amounts of water through equal masses of two Earth materials, soil and gravel. They measure the amount of water that drains through the Earth Materials and compare the resulting masses of soil and gravel, using a balance.	1. Soil is rock particles mixed with organic matter called humus. Soil retains more water than rock particles alone. 2. Water drains more easily through some Earth materials than others.	1-2 **active** 1 reading	gravel humus retain soil water retention			Cause & effect	Analyzing and interpreting data, Planning and carrying out investigations, Constructing expalnations, Obtaining, evaluating and communicating informaiton	These final 3 investigations are an interesting and logical extension of the previous work around the concepts of water movement	**5 part 1**
5 part 2 OPTIONAL	**Do soils in the schoolyard drain water at the same rate?**	Students test the soil in a number of locations in the schoolyard to find out how long it takes each soil to absorb equal amounts of water. Student dig small holes in the ground and fit them with perforated filter cups. They time how long it takes 100 ml of water to drain into the soil. Students use this data to consider which soils are best suited for plant growth.	1. Water drains more easily through some Earth materials than others.	1-2 **active** 1 reading	drain, drainage			Systems and system models	Analyzing and interpreting data, Engaging in argument from evidence, Obtaining, evaluating and communicating informaiton		**5 part 2**

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Water & Climate (FOSS - NGSS)											
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN Standard #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
5 part 3 OPTIONAL	**What is needed to make a waterwheel system function well?**	Students are presented with an engineering challenge to design and construct a simple water wheel. They use water to poser their waterwheels to lift or pull objects. Students consider which features are necessary to make the waterwheel work, and what the function of each part of the system servess. They refine their designs with each trial and determine how many syringes of water it takes to move an object a specific distance.	1. The energy flow of water can be used to do work. 2. Waterwheels are machines powered by flowing water.	2-3 **active** 1 reading 2 **assessment**	load constraints system trials			Systems and system models	Defining problems, Planning and carrying out investigations, Analyzing and interpreting data, Constructing expalnations, Obtaining, evaluating and communicating informaiton	Interesting engineering challenge! This investigation also helps to develop basic understandings for 4.ESS.4	**5 part 3**

Grade 3 curriculum roadmap
Life Science

Module Title: Structures of Life (FOSS - NGSS)											
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
1 part 1	**How are seeds alike and different?**	Students use a variety of fresh fruits to go on a seed hunt. They open a fruit, locate the seeds, describe seed properties, and count or estimate the number of seeds in the fruit.	1. Seeds develop in the plant part called the **fruit**. 2. Different kinds of fruits have different kinds and numbers of seeds; seeds have a variety of properties.	**1-2 active** 1 reading	fruit seed	3.LS.1	Analyze evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.	Patterns Structure & function	Analyzing & interpreting data Obtaining, evaluating, and communicating information	This lesson does not directly address IN LS standards, but is necssary to build understanding for 3.LS.1 and 3.LS.2 This lesson helps students to understand that the edible structures we often call vegetables are considered the **fruit** of the plant in the scientific community. The teacher must supply a variety of fruits and vegetables for this lesson - **the more diversity, the better!**	**1 part 1**
1 part 2	**What effect does water have on seeds?**	Using two different sprouting systems, students find out the effect of water on seeds. They water seeds daily for a week and record their observations about the changes.	1. Seeds undergo developmental changes **in the presence of water**. 2. A seed is a living organism, containing an embryonic plant.	**2 active**, plus 6 days of monitoring and data collection 1 reading	seed coat embryo cotyledon root stem leaves	3.LS.1	Analyze evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.	Cause & Effect Structure & function	Planning and carrying out an investigation		**1 part 2**
1 part 3 OPTIONAL	**How much water does a seed soak up?**	Students use measurement tools(FOSS balance and meter tape) to determine how much water dry lima beans can soak up.	1. Compare the size and mass of dry seeds with those soaked in water overnight.	**2 active** 1 reading	mass soaked swell				Planning and carrying out an investigation, Analyzing & interpreting data, Using mathematics and computational thinking, Constructing explanations, Engaging in argument from evidence, Obtaining, evaluating , and communicating information	While this does not directly address the LS standards, there is a direct connection between the science and math standards in this investigation. It would be an efficient use of "wait time" ongoing during the previous investigation.	**1 part 3 OPTIONAL**

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	Module Title: Structures of Life (FOSS - NGSS)										
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
1 part 4	**How do seeds disperse away from the parent plant?**	Students view a video from the Missouri Botanical Gardens about a variety of seed dispersal mechanisms plants use to ensure survival of the species. Students then go out to the schoolyard to design and apply modifications to seeds and fruits for dispersal. Students also consider adaptations of seeds found in the school area.	1. Seeds move away from the parent plant, via a number of seed dispersal mechanisms. 2. Plants use natural means (wind, water flow, animals) to help disperse seeds.	**1 active** 1 reading 1 video 1 assessment	disperse, dispersal mechanisms adaptation parent reproduction inherit	3.LS.1	Analyze evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.	Structure & function	Asking questions and defining problems, Developing and using models, Constructing explanations		**1 part 4**
2 part 1	**What structures does a seedling have to help it grow and survive?**	Students observe germinated seeds to identify the structures which become apparent at germination.	Germination is the onset of a seed's growth, the beginning of the life cycle.	2 **active** 1 reading	germinate, germination swell growth adult seedling nutrients roots stems leaves	3.LS.1, 3.LS.3	Analyze evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	Systems and system models Scale, proportion, and quantity	Planning and carrying out investigations, Analyzing and interpreting data, Using mathematics and computational thinking, Constructing explanations,		**2 part 1**

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Module Title: Structures of Life (FOSS - NGSS)											
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
2 part 2	**What is the sequence of the bean plant's life cycle?**	Students grow seedlings, previously sprouted, in a hydroponic system, using a nutrient solution. They observe and monitor plant growth over a 6-week period, watching for evidence of the sequence of the life cycle - flowers, fruits, new seeds.	1. The life cycle is a sequence of stages during which a seed grows into an adult (mature) plant, produces seeds, which in turn produce new plants. 2. Plants need water, light, air, and nutrients to grow and reproduce. 3. The fruit of the plant develops after flowering. 4. Each kind of organism has inherited characteristics.	2 **active,** plus 6 weeks of monitoring 1 reading 2 videos	life cycle seedling adult nutrients roots stems leaves pollination hydroponics inherit	3.LS.1,3.LS.2	Analyze evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. Plan and conduct an investigation to determine the basic needs of plants to grow, develop, and reproduce.		Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations	This lesson helps students to understand and dispel two common misconceptions often held: Plants need soil to grow. Plants take in **food** from the environment. This lesson is accompanied by two FOSS videos. Note: The importance of pollinators in the plant life cycle is not thoroughly explored, as in the previous material used by ISI.	**2 part 2**

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Module Title: Structures of Life (FOSS - NGSS)											
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
2 part 3	**How do the roots of schoolyard plants compare to the roots of bean plants?**	Students go out to the schoolyard to investigate the roots and shoots of various plants. They use tools to dig up plants and compare the structures above & below ground. They also compare the root structures of various plants and discuss their inheritance of characteristics from the parent plant.	1. Roots are the plant structures below ground. They serve several functions: take up water and nutrients, snchor the plant into the ground, store water and nutrients during harsh or drought conditions. 2. Shoots are the above-ground structure of a plant. 3. Different kinds of plants have different root systems.	2 **active** 2 assessment	shoot tap root fibrous root anchor root system	3.LS.1	Analyze evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.		Planning and carrying out investigatins, Analyzing and interpreting data, Constructing expalnations, Obtaining, evaluating , and communicating information		**2 part 3**
3 part 1 ORDER THE CRAYFISH 3 WEEKS PRIOR TO STARTING THIS INVESTIGATION	**What are the structures of a crayfish?**	Students observe and record crayfish structures through direct interaction with live crayfish. They set up two crayfish habitats and learn to care for the the crayfish in the classroom.	1. Crayfish have observable structures that serve various functions in growth, curvival, and reproduction. 2. Crayfish have particular requirements for life, including clean, cool water with oxygen, food, and space.	1-2 **active** 1 reading	crayfish crustaceans pincers antennae elodea environment gills elodea male female swimmerets walking legs carapace molting	3.LS.1 3.LS.3	Analyze evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	Structure and function, Systems and system models	Asking questions, Analyzing and interpreting data, Constructing explanations, Obtaining, evaluating and communicating information	This investigation addresses 3.LS.3 and provides a strong foundation for 4.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 ecosystems. Environment: While not required, crayfish thrive quite well if fresh well water, rather than conditioned city water, is used in their habitats. In addition to the pieces of cat food (provided by teacher), and elodea (which can be ordered when ordering the crayfish), crayfish will also nibble quite happily on bits of kale leaves or individual brussel sprout leaves.	**3 part 1 ORDER THE CRAYFISH 3 WEEKS PRIOR TO STARTING THIS INVESTIGATION**

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	Module Title: Structures of Life (FOSS - NGSS)										
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
3 part 2	**How do crayfish structures and behaviors help them survive?**	Students study crayfish behavior and learn that is has survival value. They are introduced to adaptation and consider particular adaptations that allow organisns to survive. Students use a computer simulation to study variation of traits in species and how variation might affect survival of individuals.	1. Adaptations are structures and behaviors of an organism that help it survive in its environment and reproduce. 2. Differences in characteristics between individuals of the same species may provide an advantage in survival.	5 **active** 1 reading 1 video 1 on-line activity	adapt, adadptation behavior environment protective coloration	3.LS.3	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	Systems and system models	Developing and using models, Analyzing and interpreting data, Using mathematical and computational thinking, Obtaining, evaluating, and communicating information, Construcitng explanations	This investigation addresses 3.LS.3 and provides a strong foundation for 4.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 ecosystems.	**3 part 2**
3 part 3	**What kind of behavior do crayfish display in their habitat?**	Students set up a long-term habitat and recording system for investigating territorial behavior in crayfish. They record and analyze the location preferrences of individual animals. They consider territorial behavior as a possible adaptation that serves to improve the individual's chances for survival.	1. Behavior of organisms is influenced by internal and external cues. 2. Some animals claim a territory that they defend against others of their kind. Some organisms live in social groups. 3. Diversity of organisms is related to diversity of environments.	2 **active, plus 4 days of monitoring** 1 reading	adaptation structure behavior territory survival diversity	3.LS.3	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	Patterns Scale, proportion, and quantity Systems and system models	Planning and carrying out investigations, Developing and using models, Analyzing and interpreting data, Constructing explanations, Obtaining, evaluating, and communicating information		**3 part 3**

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	Module Title: Structures of Life (FOSS - NGSS)										
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
3 part 4	**How are the structures of crayfish and other animals alike and different?**	Students seek out local schoolyard organisms for observation. Snails are recommended, but other available animals may be used. Students set up a Venn diagram to compare crayfish structures and functions to one other animal's structures and functions.		1-2 **active** 1-2 reading		3.LS.3	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	Patterns Systems and system models	Developing and using models, Analyzing and interpreting data, Constructing explanations		**3 part 4**
3 part 5	**What is needed to sustain a food chain?**	Students go outdoors to investigate food chains, by assuming the roles of various animals in a food chain. By changing the number in each population (grass, grasshoppers, frogs, hawks), students try to achieve a sustainable food chain.	1. Organisms are related in feeding relationships called food chains. 2. Some animals eat plants while other animals eat those animals.	1 **active** 1 reading 2 assessment	food chain population sustain, sustainable herbivore carnivore omnivore predator prey species stable system	3.LS.3	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	Cause & Effect Stability & Change	Developing and using models, Using mathematical and computational thinking, Analyzing and interpreting data, Constructing explanations	This investigation addresses 3.LS.3 and provides a strong foundation for 4.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 ecosystems.*	**3 part 5**

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	Module Title: Structures of Life (FOSS - NGSS)										
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
4 part 1	**What are the functions of the skeletal system?**	Students observe each other jumping rope. They count the number of bones in the human skeleton, first without, then with visual aids. Students assemble a model of a skeleton from memory. They compare & discuss their models, then compare a picture of an accurate model to their own work.	1. A skeleton is a system of interacting bones. 2. The bones have several functions: support, protection, and movement. 3. There are about 206 bones in the human skeleton. 4. Each bone in the human body has an identifiable shape, position, orientation, & function.	2-3 **active** 1 reading 1 on-line activity	bones skeleton skull support protection movement articulated torso pelvis	3.LS.1	Analyze evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.	Scale, proportion, & quantity Systems and system models Structure & function	Planning and carrying out investigations, Using mathematics and computation, Analyzing and interpreting data, Obtaining, evaluating and communicating information		**4 part 1**

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Module Title: Structures of Life (FOSS - NGSS)											
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
4 part 2	**In what ways are the skeletons of a rodent and a human similar?**	Students examine and dissect owl pellets, remove the rodent bones from them, and compare the structures of rodent bones to that of human bones. They rethen reconstruct the rodent skeleton. They read about researchers finding 10,000-year-old preserved owl pellets. Through readings and media, students learn about fossils, how they are formed, and what evidence they provide about the	1. The skeletons of humans and other mammals have many similarities. 2. Bones have different shapes, depending on where they are and what their purpose is. 3. The number and kinds of bones in an organism are characteristics inherited from the parents of the organism. 4. Fossils are important evidence about extinct organisms and	2 **active, *plus additional time for reconstruction** 2-3 reading 1 video	skeletal system tissue fossils paleontologist extinct	3.LS.3, 3.ESS.4	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. **Also, 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.	Scale, proportion, & quantity Systems and system models Structure & function	Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations & designing solutions, Engaging in argument from evidence, Obtaining, evaluating and communicating information	*This investigation can take more than 2 active investigations in order to dissect and accurately reassemble a rodent skeleton from the owl pellet. This investigation is critical, as it is the only place where the **3.ESS.4** standard about fossils and fossil formation is addressed in 3rd grade.	**4 part 2**
4 part 3	**What makes our skeletal system flexible?**	Students investigate joints & discover the advantages of an articulated skeleton. They modify their own hands to simulate having no thumbs. Students then look for and feel muscles at work. They work in pairs to build leg and foot models that emulate the actions of jumping and running.	1. The place where two bones meet is called a joint. 2. The human skeleton has different types of joints. 3. Muscles contract when they work. 4. Muscles attach across joints to move bones.	1 active 1 reading	joint ball-and-socket joint gliding joint hinge joint opposable thumb muscle cartilage tendon contract	3.LS.1,3.LS.3	Analyze evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	Scale, proportion, & quantity Systems and system models Structure & function	Developing & using models, Planning and carrying out investigations, Constructing explanations & designing solutions	This investigation addresses 5.LS.3 and provides strong review of 4.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 ecosystems.*	**4 part 3**

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Module Title: Structures of Life (FOSS - NGSS)											
Lesson	**Focus Question**	**Description**	**Objective(s)**	**# of Sessions**	**Vocabulary**	**IN #**	**Text of Standard**	**Cross Cutting Concept(s)**	**Practices**	**Notes**	**Lesson**
4 part 4	**How are fingerprints alike and different?**	Students use pencils and tape to make carbon prints of their skin texture and fingerprints. They learn how to classify their prints into three basic patterns: arch, loop, and whorl.	1. Fingerprints can be sorted into three groups based on basic patterns. 2. No two people have the same fingerprints.	1-2 active 1 reading 2 assessment	arch characteristic fingerprint loop whorl	3.LS.1, 3.LS.3	Analyze evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	Scale, proportion, & quantity Systems and system models Structure & function	Analyzing and interpreting data, Constructing explanations	This first-hand experience with their own fingerprints establishes important thinking about diversity, which will be refined again in the 4th grade Environments module.	**4 part 4**

Grade 3 curriculum roadmap
Engineering

Motion and Matter (FOSS - NGSS)

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN Standard #	Text of Standard	Cross Cutting Concept(s)	Practices	Notes	Lesson
1 part 1	What happens when magnets interact with other magnets and with paper clips?	Students explore the forces of magnetism and gravity. They bring two magnets close to each other and find that sometimes the magnets pull each other together and sometimes they push each other away. Students recognize that both magnetism and gravity can pull, and magnetism can sometimes push as well. Both forces can make things move, even when not in direct contact with another object.	1. Magnetic interactiions between a pair of objects does not require that the objects be in contact. 2. The strength of the magnetic force depends on the properties of the objects and their distance apart. 3. How magnets interact depends on their orientation (attract or repel). 4. Gravity is the force that pulls masses toward the center of the Earth.	1 active 1 reading 1 online activity	force magnet, magnetism magnetic force magnetic field gravity pull push attract repel model motion balanced unbalanced evidence change of motion	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.	Patterns Cause & effect	Asking questions, Planning and carrying out investigations, Developing & using models, Constructing explanations, Obtaining, evaluating, & communicating information		1 part 1

Grade 3 curriculum roadmap
Engineering

Motion and Matter (FOSS - NGSS)

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN Standard #	Text of Standard	Cross Cutting Concept(s)	Practices	Notes	Lesson
1 part 2	How is the magnetic field affected when more magnets are added?	Students build on the observations they made in part 1 and look for patterns in data to predict how far the magnetic field extends around two magnets. Students use and discuss science practices in the context of investigating magnetic fields.	1. Magnetic interactiions between a pair of objects does not require that the objects be in contact. 2. The strength of the magnetic force depends on the properties of the objects and their distance apart.	1 active 1 reading	data pattern			Patterns Cause & effect	Asking questions, Planning and carrying out investigations, Analyzing and interpreting data, Using mathematics and computational thinking, Obtaining, evaluating and communicating informaiton	Although not directly addressing the standard, this investigation builds on understanding s previously introduced, which will be brought up again in the design challenges of Investigation 3.	1 part 2
1 part 3	What causes change of motion?	Students explore other pushes and pulls. They expand their understanding of force to include a force's strength and direction, and more about the effects of balanced and unbalanced forces.	1. A force is a push or a pull. 2. Each force acting on an object has both strength and direction. 3. When an object is at rest,the sum of the forces acting on the object is zero; the forces are balanced. 4. Unbalanced forces (pushes or pulls) cause change of motion.	1 active 1 reading 2 videos 2 assessme nt	direction strength	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.	Patterns Cause & effect	Constructing explanations, Obtaining, evaluating and communicating informaiton		1 part 3

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Engineering

Motion and Matter (FOSS - NGSS)

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN Standard #	Text of Standard	Cross Cutting Concept(s)	Practices	Notes	Lesson
2 part 1	How can we change the motion of wheels rolling down ramps?	Students set up cardboard ramps down which they roll plastic disks. They put the disks on shafts to make a wheel-and-axle system. They try all kinds of configurations of sheel size, axle length, and axle position to meet a variety of challenges.	1. The pattern of an object's motion in various situations can be observed and measured. 2. A wheel-and-azle system with two sizes of wheels decribes a curved path when rolled down a slope. The system curves toward the smaller wheel.	1 active	axle friction pattern of motion ramp shaft slope system disk wheel	3.PS.2	Identify types of simple machines and their uses. Investigate and build simple machines to understand how they are used.	Patterns Cause & effect Systems & system models	Asking questions and defining problems, Planning and carrying out investigations,		2 part 1
2 part 2	What rules help predict where a rolling cup will end up?	Students roll paper cups down ramps and grapple with the different behaviors of rolling systems with two different-sized wheels. They observe the way cups roll and use the predictable curved rolling path to meet challenges. They put cups together to make them roll straight and weight them in various ways to see how weight affects rolling.	1. A wheel-and-azle system with two sizes of wheels decribes a curved path when rolled down a slope. The system curves toward the smaller wheel. 2. When past motion exhibits a regular pattern, future motion can be predicted from it.	1-2 active 1 reading 1 online activity	wheel-and-axle system weight	3.PS.2	Identify types of simple machines and their uses. Investigate and build simple machines to understand how they are used.	Cause & effect Patterns	Planning and carrying out investigations, Constructing explanations & designing solutions, Obtaining, evaluating and communicating information	The teacher needs to supply about 50 pennies for this investigation.	2 part 2

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Engineering

Motion and Matter (FOSS - NGSS)

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN Standard #	Text of Standard	Cross Cutting Concept(s)	Practices	Notes	Lesson
2 part 3	(Student-created) such as: What happens to the motion of a twirly bird when the design changes?	Students make twirly birds (flying spinners) that create motion from interaction of forces of gravity and air friction (resistance). First they create a standard twirly bird; then the class focuses on scientific practices as they investigate variables. Students take their twirly birds outdoors to find out if they fly the same.	1. A twirly bird is a simple winged system that spins when it interacts with air. 2. Twirler performance is affected by variables, including wing size, shape, and angle.	1-2 active	standard variable twirly bird outcome	3.PS.2	Identify types of simple machines and their uses. Investigate and build simple machines to understand how they are used.	Cause & effect Patterns	Asking questions and defining problems, Planning and carrying out investigations, Analyzing and interpreting data, Obtaining, evaluating and communicating information		2 part 3
2 part 4	What is the best design for a top?	Students make tops from plastic disks and shafts, and spin them by applying a torque force to the shaft. After finding an arrangement of parts that produces the best top, they use the tops to look at different designs as they spin. Finally they look at the path that a drawing top reveals as it spins.	1. Tops exhibit rotational motion (spinning) when torque is applied to the axial shaft. 2. Top performance is affected by variables including speed, disk mas, and diameter.	1 active 1 reading 2 assessment	axis rotate top kick-out friction	3.PS.2	Identify types of simple machines and their uses. Investigate and build simple machines to understand how they are used.	Cause & effect	Planning and carrying out investigations, Constructing explanations & designing solutions, Obtaining, evaluating and communicating information		2 part 4

Grade 3 curriculum roadmap
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Motion and Matter (FOSS - NGSS)

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN Standard #	Text of Standard	Cross Cutting Concept(s)	Practices	Notes	Lesson
3 part 1	What are some important features of a cart that will roll from here to there?	Students tackle an engineering challenge. The only criterion given is that whatever is created must be able to roll from one place to another with a small push or a pull. The two constraints are a restricted set of materials and a time limit. This challenge provides the foundation for science learning and engineering activities throughout the rest of the investigation.	1. Possible solutions to a problem are limited by available materials and resources (constraints). 2. The success of a designed solution is determined by considering the desired features of a solution (criteria). 3. 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.	1 active 1 reading 1 video 2 on-line activities	criterion, criteria constraint bearing engineer solution	3.PS.2	Identify types of simple machines and their uses. Investigate and build simple machines to understand how they are used.	Patterns Cause & effect	Planning and carrying out investigations, Constructing explanations & designing solutions, Obtaining, evaluating and communicating informaiton		3 part 1

Grade 3 curriculum roadmap
Engineering

Motion and Matter (FOSS - NGSS)

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN Standard #	Text of Standard	Cross Cutting Concept(s)	Practices	Notes	Lesson
3 part 2	How can you improve the design of your cart?	Students get a second chance to build carts and improve their design. Once they have a new working cart, students are challenged to make it roll farther or stop shorter than the initial trial distances that they recorded.The meter (m) and centimeter (cm) are reviewed as the units used by scientists to measure distance.	1. Research on a problem should be carried out before beginning to design a solution. Testing a solution involves evaluating how well it performs under a range of likely conditions. 2. Communicating with peers about proposed design solutions can lead to improved designs.	1-2 active 1 reading 2 online activities	standard unit meter centimeter metric system	3.PS.2	Identify types of simple machines and their uses. Investigate and build simple machines to understand how they are used.	Cause & effect Scale, proportion, and quantity	Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations & designing solutions		3 part 2
3 part 3	(Student created) such as: How does start position affect the distance a cart rolls?	Students investigate start position. They assemble new carts and investigate how start position affects the distance a cart will travel. Students plan and conduct this investigation on their own, and discuss their investigation proceedures and how they can improve them.	1. The pattern of an object's or a system's motion in various situations can be observed and measured. 2. When past motion exhibits a regular pattern, future motion can be predicted from it.	1 active 1 reading	start position	3.PS.2	Identify types of simple machines and their uses. Investigate and build simple machines to understand how they are used.	Cause & effect	Asking questions and defining problems, Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanaitons & designing solutions		3 part 3

Grade 3 curriculum roadmap
Engineering

Motion and Matter (FOSS - NGSS)

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN Standard #	Text of Standard	Cross Cutting Concept(s)	Practices	Notes	Lesson
3 part 4	How can you use magnets to do cart tricks?	Students modify their systems (carts) to meet new challenges. They use their knowledge of magnets to resolve new engineering challenges.	1. Possible solutions to a problem are limited by available materials and resources (constraints). 2. The success of a designed solution is determined by considering the desired features of a solution (criteria).	1-2 active 2 assessment	(no new vocabulary)	3.PS.2	Identify types of simple machines and their uses. Investigate and build simple machines to understand how they are used.	Patterns Cause & effect	Asking questions and defining problems, Planning and carrying out investigations, Constructing explanations & designing solutions, Obtaining, evaluating and communicating informaiton	The engineering conference held in this investigation is not to be missed, even if it has to be postponed until the following day. If time permits, encourage students to devise other tricks besides the three given in this investigation.	3 part 4

Grade 3 curriculum roadmap
Engineering

Motion and Matter (FOSS - NGSS)

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN Standard #	Text of Standard	Cross Cutting Concept(s)	Practices	Notes	Lesson
4 part 1	What happens when you mix two materials?	Students make four different mixtures, one that includes two solids and three that use 50 mL of water and one of three solids (sand, chalk, or salt). In one mixture, the solid salt dissolves, resulting in a solution. Students determine the mass of the salt and water and compare the sum to the mass of the solution to observe that the salt is still presentk even though it is not visible.	1. A mixture is two or more materials distributed evenly throughout one another. 2. A special class of mixture, a solution, results when a solid material dissolves in a liquid. 3. Mass is neither created nor destroyed during physical and chemical reactions. Matter is conserved.	1 active, 1 reading 4 online activities	mixture solution cloudy suspended dissolve transparent calcium carbonate chalk conservation of mass			Cause & effect	Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations & designing solutions, Engaging in argument from evidence		4 part 1

Grade 3 curriculum roadmap
Engineering

Motion and Matter (FOSS - NGSS)

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN Standard #	Text of Standard	Cross Cutting Concept(s)	Practices	Notes	Lesson
4 part 2	What happens when you mix two materials?	The students determine the mass of a volume of vinegar and baking soda before mixing them. They observe bubbling and fizzing, evidence that a new material - carbon dioxide gas - formed. The new material is evidence that a chemical reaction occurred. Students determine that the mass of the mixture after the bubbling stops is less than the mass of the original materials. This change in mass pushes students to infer that carbon dioxide has mass, which went into the air.	1. Starting materials change into new materials during chemical reactions. 2. Mass is neither created nor destroyed during physical and chemical reactions. Matter is conserved.	1 active, 1 reading 1 online activity	baking soda vinegar chemical reaction carbon dioxide			Energy & matter Cause & effect	Planning and carrying out investigations, Analyzing and interpreting data, Engaging in argument from evidence		4 part 2

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Engineering

Motion and Matter (FOSS - NGSS)

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN Standard #	Text of Standard	Cross Cutting Concept(s)	Practices	Notes	Lesson
4 part 3	What is the importance of accurate measurements for a metric field day?	Students plan and participate in an outdoor field day featuring metric measurement. The events can call for estimation, speed, accuracy, or problem solving, and they all deal with the skill of metric measurement. It is a day of fun, enriched with light-hearted competition.	(Application of measurement concepts learned throughout module.)	3 active 1 reading 3 online activities 2 assessment	(No new vocabulary)			Scale, proportion, and quantity	Planning and carrying out investigations, Analyzing and interpreting data, Constructing explanations & designing solutions Obtaining, evaluating and communicating informaiton		4 part 3