Grade 7 curriculum roadmap
Earth Science

SEPUP Earth Science: Unit B (Rocks and Minerals), Unit C (Erosion and Deposition), and Unit D (Plate Tectonics)

Unit	Focus Question	Description	Objective(s)	# of classes	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
12	What makes a natural resource valuable? Does the fact that the resource is renewable or non-renewable play a role in determining it's value?	Students are introduced to the earth's natural resources. They observe samples of four resources and rank them from the most to least valuable. The class discusses what makes natural resources valuable, and the concept of renewable vs. non-renewable resources is introduced.	1. Students examine the natural resource samples and discuss their value. 2. The class discusses renewable and non-renewable resources.	1	Natural resources renewable, non-renewable	7.ESS.1 7.ESS.6 **7.ESS.7	- Identify and investigate the properties of minerals. Identify and classify a variety of rocks based on physical characteristics from their origin, and explain how they are related using the rock cycle. (i.e. Sedimentary, igneous, and metamorphic rocks). - Research common synthetic materials (i.e. plastics, composites, polyester, and alloys) to gain an understanding that synthetic materials do come from natural resources and have an impact on society. -Describe the positive and negative environmental impacts of obtaining and utilizing various renewable and nonrenewable energy resources in Indiana. Determine which energy resources are the most beneficial and efficient.**	Ranking	Examining samples, analyzing, discussing and defending opinion	**Leave plenty of time (10 mins) for class discussion about how students ranked the materials. Activity 12 aligns with 8th grade standard 8 ESS 3.** ** Standard 7.ESS.7 is not entirely addressed with Investigation 12. And no other investigation touches on environmental impact of obtaining natural resources.

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13	How can you identify natural resources?	In this activity, students gather data on a mineral sample that appears to be a diamond. Students begin to explore properties of minerals by making obersvations of color, hardness, and crystal shape.	1. Students observe a sample of unidentified material. 2. The class discusses similariteis and differnces in their results. 3. Students will understand that minerals are crystals that form naturally in the earth. They have characteristic properties such as color, hardness and a crystalline shape.	1	Crystal shape, luster, property, transparency, transparent	7.ESS.1	Identify and investigate the properties of minerals. Identify and classify a variety of rocks based on physical characteristics from their origin, and explain how they are related using the rock cycle. (i.e. Sedimentary, igneous, and metamorphic rocks)		Gathering and analyzing data, measuring with the metric system	
14	What is the identity of the earring material?	Students compare data on the mineral sample to the properties of four other materials. They discuss which properties are the most and least useful in telling the material apart.They use the data to eliminate materials and to identify the sample earring material as fluorite.	1. Students hypothesize what the earring material is. 2. Students compare experimental data to known inofrmation in order to identify the material. 3. The class discusses which properties are most useful for identifying the earring material.	1	Fluroite, property, hardness	7.ESS.1	Identify and investigate the properties of minerals. Identify and classify a variety of rocks based on physical characteristics from their origin, and explain how they are related using the rock cycle. (i.e. Sedimentary, igneous, and metamorphic rocks)	Compare and contrast	Observing, collecting and analyzing data, comparing data	

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15	What are mineral properties and how to they influence the value of a mineral?	A reading on minerals and mineral properties helps explain why certain minerals, like diamonds, are so highly valued. Characteristic properties of minerals, such as color and hardness, are further explained. Students are introduced to the idea that rocks are made of minerals.	1. Through the reading students will understand that a pure substance, like a mineral, can be identified by observations and tests performed to determine its physical properties. These properties are based on the unique structure of the substance. 2. Students will understand that rocks are made up of minerals.	1	crystalline structure, geologist, mineral, rock, property	7.ESS.1	Identify and investigate the properties of minerals. Identify and classify a variety of rocks based on physical characteristics from their origin, and explain how they are related using the rock cycle. (i.e. Sedimentary, igneous, and metamorphic rocks)	Reading comprehension	Reading, analyzing information from text	At about this point in the unit I have student begin a concept map to keep track of all of the vocabulary we are learning this unit. If you are a 1:1 school or have to technology, I recommend using Poppet at popplet.com.
16	What is the identity of the unknown mineral?	Students are provided with an unidentified mineral that is known to be either calcite or quartz. Students design an investigation to test and identify the mineral.	1. Students design and conduct an investigation to determine the identity of the mineral. 2. Students indentify the mineral by comparing their experimental data with the known data about the two known minerals, calcite and quartz.	2	Hardness, luster, transparency, property	7.ESS.1	Identify and investigate the properties of minerals. Identify and classify a variety of rocks based on physical characteristics from their origin, and explain how they are related using the rock cycle. (i.e. Sedimentary, igneous, and metamorphic rocks)	Experimental design	Design, collecting data, measuring volume, comparing and contrasting data, making a conclusion	Allow one day for experimental design and some beginning testing, allow another day to finish collecting data and then forming a conclusion.

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Unit	Focus Question	Description	Objective(s)	# of classes	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
17	How can you use mineral properties to identify a mineral found in a rock sample?	Students select a single property to determine whether the mineral found in a rock sample is calcite or quartz. After collecting data, they identify one of the minerals found in granite and one found in limestone.	1. Review how minerals are found in rocks and those minerals are quite small. Also review the properties of calcite and quartz. 2. Students select and test one property to identify the mineral found in a rock. 3. The class discusses which properties were chosen and why.	1	Hardness, luster, transparency, property, rock	7.ESS.1	Identify and investigate the properties of minerals. Identify and classify a variety of rocks based on physical characteristics from their origin, and explain how they are related using the rock cycle. (i.e. Sedimentary, igneous, and metamorphic rocks)	Compare and contrast	Collecting data, measuring volume, comparing and contrasting data, making a conclusion	
18	Could diamonds be found in Roughpoint National Forest? If so, would it be ok for people to dig for them and keep them?	Students discuss the content of a fictional newspaper story that describes the alleged discovery of diamonds in a national forest. Students learn that minerals are often found in association with certian rocks. A literacy strategy is used to guide discussion and help students process the ideas presented in the text.	1. Student further their understanding that minerals are found in rocks. They learn that specific minerals are formed in specific rocks.	1	Mineral, natural resource, rock	7.ESS.1	Identify and investigate the properties of minerals. Identify and classify a variety of rocks based on physical characteristics from their origin, and explain how they are related using the rock cycle. (i.e. Sedimentary, igneous, and metamorphic rocks)	Debating issues, government and national parks	Reading, analyzing information from text, forming opinions and defending them	

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Unit	Focus Question	Description	Objective(s)	# of classes	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
19	What are the three types of rocks and how are they formed?	Students use literacy strategies in this reading to organize and process how metamorphic, sedementary, and igneous rocks are formed.	1. Students will understand that rocks are categorized into three types: sedimentary, igneous, and metamorphic. 2. Students will be exposed to various rocks (coal, kimberlite, and marble) in order to better understand the three rock types and how they are formed.	1	igneous, magma, metamorphic, sedimentary	7.ESS.1	Identify and investigate the properties of minerals. Identify and classify a variety of rocks based on physical characteristics from their origin, and explain how they are related using the rock cycle. (i.e. Sedimentary, igneous, and metamorphic rocks)	Reading comprehension	Reading comprehension, organizing information, making connections	Feel free to modify the lab sheet a bit so that student are asked to also draw a diagram of how each rock type is formed.
20	Is the hiker's rock from Investigation 18 likely to contain diamonds? Why or why not?	Students observe rock samples and use a table of characteristics to determine each rock as either sedimentary, igneous, or metamorphic. Students then use this knowledge to identify the hiker's rock from Investigation 18.	1. Students use a table of identifying characteristics to analyze and categorize 8 various rock samples. 2. Using the data they collected and the better understanding they have of how to identify rocks, students will attempts to identify the hiker's rock.	1-2	igneous, rock, metamorphic, sedimentary	7.ESS.1	Identify and investigate the properties of minerals. Identify and classify a variety of rocks based on physical characteristics from their origin, and explain how they are related using the rock cycle. (i.e. Sedimentary, igneous, and metamorphic rocks)	Compare and contrast	Making observations, ollecting data, comparing and contrasting data, making a conclusion	Investigation 19 could take up some time at the beginning of this lab. It's important students know the 3 types of rocks and how they are formed before moving on. So spend some time reviewing. This will then cause Investigation 20 to take more than one day. I also use this time for students to create another concept map (or continuation of the mineral map) about the three rock types.

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Unit	Focus Question	Description	Objective(s)	# of classes	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
21	What do layers of rocks tell us about how and when they were formed?	Students model the formation of the rock layers of the earth's crust by dropping game chips into a cylinder. The class compares data and develops the idea that some layers are formed by the ongoing deposition of sediments and that lower layers are usually older than upper layers.	1. Students create a model to understand and communicate how layers of rock are formed, identifing that lower layers are formed before upper layers. 2. Data is collected by lab groups and then compiled as class. Discuss why larger pools of data in a model are necessary for the accuracy of said data.	1	layer, model, rock, sedimentary	7.ESS.1	Identify and investigate the properties of minerals. Identify and classify a variety of rocks based on physical characteristics from their origin, and explain how they are related using the rock cycle. (i.e. Sedimentary, igneous, and metamorphic rocks)	Modeling, range of data, averaging	Modeling, understanding the model and reality, collecting and sharing data, analyzing data	Taking students off-campus to a local IMI quarry is a great way to tie in what they're learning to their community.
22	How do rock types turn into other rock types in the rock cycle?	Students play a game that models the rock cycle. During the game students record what happens to their igneous, metamorphic, and sedimentary rocks. They share data to summarize the rock cycle.	1. Students will learn that rocks are formed and destroyed by various processes. The rock cycle describes both the formation and destruction of rocks from one type to another.	1	erosion, igneous, magma, metamorphic, rock cycle, sediment, sedimentary	7.ESS.1	Identify and investigate the properties of minerals. Identify and classify a variety of rocks based on physical characteristics from their origin, and explain how they are related using the rock cycle. (i.e. Sedimentary, igneous, and metamorphic rocks)	Motor skills	Game play, recording data, analyzing data, sharing data	Fun game! Good way to review all rock types and how they are formed. It is not in the kit but I make my students draw a diagram of the rock cycle in their notebooks as a reference to go along with the game lab sheet.

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Unit	Focus Question	Description	Objective(s)	# of classes	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
23	Are manufactured diamonds as valuable as natural diamonds?	Students evaluate data on mined vs. manufactured diamonds from the perspective of four different roles. They then discuss whether manufactured diamonds are as valuable as mined diamonds.	1. Students conclude the unit by circling back to the concept of natural resources. They will use the jig-saw method to discuss various perspectives on diamond manufacturing and mining. 2. Students will make difficult decisions and undestand that complex issues involve trade-offs.	1	Crystal shape, luster, property, transparency, transparent, trade-offs, natural resource, manufactured, mineral, renewable, non-renewable	7.ESS.1 7.ESS.6	- Identify and investigate the properties of minerals. Identify and classify a variety of rocks based on physical characteristics from their origin, and explain how they are related using the rock cycle. (i.e. Sedimentary, igneous, and metamorphic rocks). - Research common synthetic materials (i.e. plastics, composites, polyester, and alloys) to gain an understanding that synthetic materials do come from natural resources and have an impact on society.		Role play, analyzing varying persepctives, forming an opinion and being able to defend it, undestanding trade-offs	I don't think I've ever done this lesson to wrap up the unit. Instead I show a clip about blood diamonds and we discuss social issues that come from mining natural resources.
24	Where should the new housing be built in Boomtown?	Students are introduced to issues concerning the positive and negative impacts of construction on society and the land.	1. Students realize how human activities can induce hazards through urban growth and land-use decisions that may accelerate natural processes. 2. Students will make observations to make a decision on which site would be best for building Boomtown.	2	evidence, infernece, landform, marsh, observation, trade-off, wetlands	**7.ESS.7	Describe the positive and negative environmental impacts of obtaining and utilizing various renewable and nonrenewable energy resources in Indiana. Determine which energy resources are the most beneficial and efficient.**		Making observations, ollecting data, making a conclusion	** Standard 7.ESS.7 is not entirely addressed with Investigation 24.
25	How do you construct a topographical map of a land formation?	This is a hands-on activity in which students construct and interpret a topographical map of a land formation.	1. Students learn how to make a topographical map and understand how map keys/legends are crucial in reading maps.	1-2	contour interval, contour line, key, landform, scale, topography, topographical map	7.ESS.4	Construct an explanation, based on evidence found in and around Indiana, for how large scale physical processes, such as Karst topography and glaciation, have shaped the land.	Mapping	Interpreting data to make a map	These following investigations do not include Indiana-specific kartography or landforms.

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Earth Science
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26	How has Boomtown's topography changed over time?	Students compare the maps of Boomtown in the present with maps from 20-100 years ago. They identify changes that have taken place in the landforms at the building locations. They consider how evidence from the contour maps might suggest problems.	1. Students will explore, through examination of various topographical maps from different time periods, that maps can provide evidence about changes in the shape of the land.	1	contour interval, contour line, key, landform, scale, stability, topography, topographical map	7.ESS.4	Construct an explanation, based on evidence found in and around Indiana, for how large scale physical processes, such as Karst topography and glaciation, have shaped the land.	Reading a map	Analyze map, observe changes, discuss ideas	
27	How can weather effect the decision on site location for Boomtown's new housing development?	Students consider the potential impact of Boomtowns rainfall patterns on the three possible construction site. They find the mean, median, and mode of Boomtown's annual and monthly rainfall and then prepare bar graphs of the data. They then analyze and disucss the usefullness and limitations of using averages to characterize sets of data.	1. Students look at the impact weathering and erosion has on a construction site. They gather data averages and learn how averages can be helpful and also misleading.	1	mean, median, average, mode, sample size,	7.ESS.4	Construct an explanation, based on evidence found in and around Indiana, for how large scale physical processes, such as Karst topography and glaciation, have shaped the land.	Average, graphs	Reading and analyzing data and create bar graphs	
28	How is the interior of the earth arranged?	Students will read and evaluate the various layers of the earth. They complete a scaled drawing of the layers of the earth, documenting the material, depth, and temperature of each layer.	1. Read about the layers of the earth. 2. Create a scaled drawing of the layers of the earth, documenting key information.	2	core, crust, dormant, extinct, lava, lithosphere, magma, mantle, scale	7.ESS.5	Construct a model, diagram, or scale drawing of the interior layers of the Earth. Identify and compare the compositional (chemical) layers to the mechanical (physical) layers of the Earth's interior including magnetic properties.	Scaled drawing	Metric measurements, conversion and scaling, labeling	Great lesson but at their level of math it may be hard for kids to do on their own. I help them with figuring out how to make a scaled drawing. That's why it usually takes more than one for this lab.

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29	How is time organized on Earth?	Students are introduced to the age of the earth as they place important events in earth's history into one of four time periods. They compare their ordering with that of a modern geologist.	1. Students will understand that the Earth is over 4 billion years old, and different events on earth have occurred during different time periods. 2. Students will use clues like fossil evidence to further explore how life and environmental conditions have changed over time.	1	geological time, paleontologist, reptile	**7.ESS.2**	Construct a model or scale drawing (digitally or on paper), based on evidence from rock strata and fossil records, for how the geologic time scale is used to organize Earth’s 4.6 billion-year-old history.	Sequential ordering	Ordering events based on evidence	
30	What is contintental drift?	Students use puzzle pieces representing the earth's continents to begin exploring continental drift.	1. Students will create a model using puzzle pieces to show how various fossil evidence and landforms support the idea of continental drift.	1	continent, geological time, Pangea	7.ESS.3	Using simulations or demonstrations, explain continental drift theory and how lithospheric (tectonic) plates have been and still are in constant motion resulting in the creation of landforms on the Earth's surface over time.	Motor skills-puzzle	Using symbols to line up puzzle pieces, evaluating the evidence to put the "pieces" together.	You will find out how well your students know their continents in this investigation!
31	What is the evidence supporting the idea of continental drift?	Students evaluate evidence related to continental drift. They first determine which statements constitute evidence, and they then identify the statements that support this idea of continental movement.	1. Students will learn more about how the continents are a part of a large lithospheric plate the moves over time. 2. Students explore more evidence including modern scientific evidence that supports continental drift.	1	continental drift, evidence	7.ESS.3	Using simulations or demonstrations, explain continental drift theory and how lithospheric (tectonic) plates have been and still are in constant motion resulting in the creation of landforms on the Earth's surface over time.		Reading comprehension, data analysis, making a conclusion	

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32	How does continental drift differ from the theory of plate tectonics?	Students watch two video segments on the history of the development of plate tectonics, beginning with Wegener's idea of continental drift.	1. As students watch the videos they will follow along on a lab sheet. 2. Students will understand that continental drift is supported by the evidence found regarding plate tectonic movement in the earth.	1	continental drift, lithosphere, plates, plate tectonics, theory	7.ESS.3	Using simulations or demonstrations, explain continental drift theory and how lithospheric (tectonic) plates have been and still are in constant motion resulting in the creation of landforms on the Earth's surface over time.		Gathering information from a video, comparing and contrasting continental drift and the theory of plate tectonics.	
33	What is an earthquake? How do scientists measure earthquake activity?	Students model how a seismograph records earthquakes as they explore the relationship between earthquakes and plate tectonics.	1. By modeling earthquakes, students will learn how plate interaction can cause a shift in rock and generate energy to produce earthquakes.	1	earthquake, plate, Richter scale, seismograph, seismogram, fault	7.ESS.3	Using simulations or demonstrations, explain continental drift theory and how lithospheric (tectonic) plates have been and still are in constant motion resulting in the creation of landforms on the Earth's surface over time.	Modeling	Constructing and understanding a model, analyzing seismograms	Sometimes students need help with the model. They will try causing tons of motion so their seismogram is "off the charts". But the goal here is to see struggle and friction as students rub "plates" together and eventually break the toothpick.
34	Where are tectonic plates located on the earth? How can knowing the location of their boundaries give scientists data in earth processes?	Students compare sizes and shapes of continents with those of plates as they color in the continents and trace the boundaries. The relationship between plate boundaries, earthquakes, and volcanoes is reinforced as students use earthquake and volcano data to both plot and draw missing plate boundaries. Students then label the plates and use directional data to draw arrows showing the direction they're going.	1. Students will understand that plates touch at plate boundaries. Where plates interact is where volcanoes and earthquakes occur. Using that knowledge students will complete a map of plate boundaries.	1	continent, lithosphere, plates, risk	7.ESS.3	Using simulations or demonstrations, explain continental drift theory and how lithospheric (tectonic) plates have been and still are in constant motion resulting in the creation of landforms on the Earth's surface over time.	Mapping on an alpha-numerical grid	Drawing, mapping using a grid, labeling, compass rose directions	

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35	What are the three types of plate movement and the geological processes occuring at each boundary?	Students read about how the theory of plate tectonics helps explain earthquakes, volcanoes, and mountain ranges. They use a literacy strategy to organize the information presented in the reading.	1. Students will understand that land forms are a result of constructive and destructive forces. As they read about the various types of plates they will learn what geological processes occur at each boundary, if lithosphere is created or destroyed, and examples of those boundaries around the world.	1-2	convergent, divergent, transform, subduction, lithosphere, magma	7.ESS.3	Using simulations or demonstrations, explain continental drift theory and how lithospheric (tectonic) plates have been and still are in constant motion resulting in the creation of landforms on the Earth's surface over time.		Reading comprehension, applying textual information to a table	This is a very meaty lesson. They will learn all three boundary types and a lot about each boundary. I would have kids make a quizlet set or concept map to help organize these different words and concepts. You might also support this learning with them drawing a picture of what's happening at each boundary. Anything to help them learn and understand the process.
36	Why do plates move? What is happening under earth's crust to cause them to move?	Students explore the mechanism behind plate motion as they investigate convection currents.	1. Students will conduct a hands-on lab to observe a convection current. 2. Students will understand how density plays a role in convection, and that the movement of magma under the lithosphere acts as a conveyer belt to move the plates.	1	convection current, magma, mantle, density	7.ESS.3	Using simulations or demonstrations, explain continental drift theory and how lithospheric (tectonic) plates have been and still are in constant motion resulting in the creation of landforms on the Earth's surface over time.	Density	Making observations, connecting temperature and density	
37	How do plates spreading over time change earth's topography and physical characterstics?	Students utilize a computer simulation to investigate what happens when the earth's plates move apart. tudents investigate the rate of this change on earth as they set the rate of this simulation to run from different time periods from 10 years to 20 million.	1. Students will use a computer model to document changes to the earth's surfact as time goes by and the plates move.	0.5	divergent, geologic time, plates, lithosphere, mantle	7.ESS.3	Using simulations or demonstrations, explain continental drift theory and how lithospheric (tectonic) plates have been and still are in constant motion resulting in the creation of landforms on the Earth's surface over time.	Computer use, operating a simulation	Using a computer to run a simulation, document and analyze data	I combine this investigation with the next one. Both lessons use the computers and use the same program. And students can get both simulations done in 45 mins.

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38	How do plates sliding and colliding over time change earth's topography and physical characterstics?	Students utilize a computer simulation to investigate what happens when the earth's plates move apart. tudents investigate the rate of this change on earth as they set the rate of this simulation to run from different time periods from 10 years to 20 million.	1. Students will use a computer model to document changes to the earth's surfact as time goes by and the plates move.	0.5	convergent, transform, geologic time, plates, lithosphere, mantle	7.ESS.3	Using simulations or demonstrations, explain continental drift theory and how lithospheric (tectonic) plates have been and still are in constant motion resulting in the creation of landforms on the Earth's surface over time.	Computer use, operating a simulation	Using a computer to run a simulation, document and analyze data	See above.
39	Can you conclude whether the Yucca Mountain site, based on more geological evidence, is appropriate and safe for nuclear waste?	Students consider two additional nuclear waste site to Yucca Mountain. They first examine earthquake and volcano risk maps for the US and then read information about each site. They evaluate the relevant evidence and then draw on their knowledge gained from this unit to identify additional evidence that supports or does not support the sites. They discuss risks associated with each site and make a final site recommendation.	1. Using the knowledge gained from the unit, students will make a decision on where the nuclear waste site should be.	1	evidence, nuclear waste, evidence, trade-offs	N/A	N/A		Evaluating evidence, making a decision, weighing risk with reward	Again, I skip this lesson altogether. It ties in with the first lesson (#36) which I also skip so no gain, no loss.

Grade 7 curriculum roadmap
Physical Science

FOSS Chemical Interactions

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
2.1	What is the periodic table of elements?	Students learn that an element is a basic substance that cannot be reduced to simpler substances in a chemical reaction. They become familiar with the names and symbols of the 90 naturally occuring elements by studying the periodic table of elements.	Students will understand that an element is a basic substance that cannot be broken down and that elements combine to make all the substances on earth,	2	element, periodic table, Dimitri Mendeleyev, chemical symbol, mass number	7.PS.1	Draw, construct models, or use animations to differentiate between atoms, elements, molecules, and compounds.		Developing and using models, Obtaining, evaluating, and communicating information.	For a fun activity, I replaced the sticky note activity with students making element t-shirts.
2.2	What makes up all the substances on earth?	Students study the lists of ingredients in consumer products to discover what elements are present. They determine the total humber of elements, the most common elements, and the number of metallic elements in products.	Students will understand that elements combine to make all the substances on earth	3, with 1 session for quiz	element	7.PS.1	Draw, construct models, or use animations to differentiate between atoms, elements, molecules, and compounds.		Developing and using models, Obtaining, evaluating, and communicating information.	I brougth in food, cleaning, and beauty supply boxes, and set up stations for students to rotate through. This allowed them to see various products and keep them moving so it wasn't boring. The quizzes don't take an entire class period.
4.1	What happens to particles in a sample of air when the air is heated and cooled?	After reviewing the properties and composition of gas, students work with plastic bottles to find out what happens to air when it is heated and cooled.	Students will learn that particles gain kinetic energy as they warm and lose kinetic energy as they cool. Matter expands as kinetic energy increases; matter contracts as kinetic energy decreases.	2	contract, contraction, kinetic energy, thermometer, temperature	7.PS.2	Describe the properties of solids, liquids, and gases. Develop models that predict and describe changes in particle motion, density, temperature, and state of a pure substance when thermal energy is added or removed.	Cause and effect Systems and system models	Developing and using models, Planning and carrying out investigation, analyzing and interpretting data, constructing explanation	
4.2	What happens to particles in a sample of liquid when the liquid is heated and cooled?	Students construct a water thermometer using a glass bottome, plastic tube, and rubber stopper. They place the water-filled system in cold water, then hot water. They observe the contraction adn expansion of the liquid.	Students will learn that particles gain kinetic energy as they warm and lose kinetic energy as they cool. Matter expands as kinetic energy increases; matter contracts as kinetic energy decreases.	3	contract, contraction, kinetic energy, thermometer, temperature	7.PS.2	Describe the properties of solids, liquids, and gases. Develop models that predict and describe changes in particle motion, density, temperature, and state of a pure substance when thermal energy is added or removed.	Cause and effect Systems and system models	Developing and using models, Planning and carrying out investigation, Obtaining evaluating, and communicating information	

Grade 7 curriculum roadmap
Physical Science

FOSS Chemical Interactions

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
4.3	What happens to particles in a sample of a solid when the a solid is heated and cooled?	Students observe the brass sphere and ring demonstration. At room temperature, the sphere passes easily through the ring. When heated or cooled, the sphere will change how it interacts with the ring.	Students will learn that particles gain kinetic energy as they warm and lose kinetic energy as they cool. Matter expands as kinetic energy increases; matter contracts as kinetic energy decreases.	1	contract, contraction, kinetic energy, thermometer, temperature	7.PS.2	Describe the properties of solids, liquids, and gases. Develop models that predict and describe changes in particle motion, density, temperature, and state of a pure substance when thermal energy is added or removed.	Cause and effect Systems and system models	Developing and using models, Planning and carrying out investigation, Obtaining evaluating, and communicating information	Assessment given at end of this part.
5.1	If two equal volumes of hot and cold water are mixed, what will the final temperature be?	Students call on their knowledge of mixing hot and cold substances to predict the final temperature of a mixture of equal masses of hot and cold water.	Substances heat up or cool down as a result of energy transfer. Temperature is the measure of average kinetic energy.	2	Heating, energy transfer	7.PS.2 7.PS.9	-Describe the properties of solids, liquids, and gases. Develop models that predict and describe changes in particle motion, density, temperature, and state of a pure substance when thermal energy is added or removed. -Compare and contrast the three types of heat transfer: radiation, convection, and	Energy and matter, systems and systm models, stability and change	Planning and carrying out investigation, analyzing and interpretting data, Using mathematics and computational thinking	Careful that hot water isn't too hot. It can warp the plastic cups.
5.2	How does energy transfer from one substance to another?	Students explore the concept of energy transfer as a consequence of particle collisions. They engage in group discussions, minilectures, virtual animations, and participate in a structured classroom reading.	Energy transfers between particles as they collide. Energy always transfers from particles with more kinetic energy to particles with less. Substances heat up or cool down as a result of energy transfer. Temperature is the measure of average kinetic energy.	2	Heating, energy transfer, conduction, equilibrium	7.PS.2 7.PS.9	-Describe the properties of solids, liquids, and gases. Develop models that predict and describe changes in particle motion, density, temperature, and state of a pure substance when thermal energy is added or removed. -Compare and contrast the three types of heat transfer: radiation, convection, and	Patterns, systems and systm models, stability and change	Developing and using models, constructing an explanation, Obtaining, evaluation, and communication information	

Grade 7 curriculum roadmap
Physical Science

FOSS Chemical Interactions

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
5.3	How is heat measured?	Students are introduced to the calorie as a unit of heat energy. They conduct a water-mixing investigation and use the results to calculate the number of calories transferred during the interaction.	Energy is conserved. Energy is measured in calories (cal). Energy transfers between particles as they collide. Energy always transfers from particles with more kinetic energy to particles with less. Substances heat up or cool down as a result of energy transfer. Temperature is the measure of average kinetic energy.	3	Calorie, conservation of energy, heating, energy transfer	7.PS.2 7.PS.9	-Describe the properties of solids, liquids, and gases. Develop models that predict and describe changes in particle motion, density, temperature, and state of a pure substance when thermal energy is added or removed. -Compare and contrast the three types of heat transfer: radiation, convection, and	Energy and matter, systems and systm models, stability and change	Planning and carrying out investigation, analyzing and interpretting data, Using mathematics and computational thinking, Constructing an explanation	
8.1	What happens at the particle level when a substance melts?	Students heat three materials and observe the results. Students create a mental model of how particles in different states react to heat- using kinetic energy, energy transfer, and the relationship of particles	Matter exists on earth in three common states. Change of state is a result of change in energy. During state change, particles do not change. The temperature at which state change occurs is different for different substances.	1	Phase change, state of matter, melting point	7.PS.2	Describe the properties of solids, liquids, and gases. Develop models that predict and describe changes in particle motion, density, temperature, and state of a pure substance when thermal energy is added or removed.	Patterns, cause and effect, systems and system models, energy and matter, stability and change	Planning and carrying out investigation, analyzing and interpretting data, developing and using models, Constructing an explanation	
8.2	What is the relationship between melting and freezing?	Students use candles to increase the energy transferred to wax and sugar. Studnents observe the two substances as they heat and then cool, reaffirming their understanding that different substances have different melting and freezing points.	Matter exists on earth in three common states. Change of state is a result of change in energy. During state change, particles do not change. The temperature at which state change occurs is different for different substances.	2	Melting point, freezing point	7.PS.2	Describe the properties of solids, liquids, and gases. Develop models that predict and describe changes in particle motion, density, temperature, and state of a pure substance when thermal energy is added or removed.	Patterns, cause and effect, systems and system models, energy and matter, stability and change	Developing and using models, Planning and carrying out investigation, analyzing and interpretting data, constructing explanation	
8.3	How can you freeze water in the classroom?	Students think about freezing water. When they realize ice is not cold enough to freeze water, they add different substances to ice to see how they affect the freezing temperature.	Change of state is a result of change in energy. During state change, particles do not change.	3	freezing point,	7.PS.2	Describe the properties of solids, liquids, and gases. Develop models that predict and describe changes in particle motion, density, temperature, and state of a pure substance when thermal energy is added or removed.	Patterns, cause and effect, systems and system models, energy and matter, stability and change	Asking questions and defining problems, Developing and using models, Planning and carrying out investigation, analyzing and interpretting data, constructing explanation	

Grade 7 curriculum roadmap
Physical Science

FOSS Chemical Interactions

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
8.4	What are all the ways a substance can change state?	Students investigate all three phases of matter using a condensation apparatus. They then develop an explanation of the system using the particle model.	Matter exists on earth in three common states. Change of state is a result of change in energy. The process of phase change are: evaporation, condensation, freezing, melting, sublimation, and deposition.	1	Condensation, evaporation, freezing point, melting point, phase change, states of matter, sublimation, deposition	7.PS.2	Describe the properties of solids, liquids, and gases. Develop models that predict and describe changes in particle motion, density, temperature, and state of a pure substance when thermal energy is added or removed.	Patterns, cause and effect, systems and system models, energy and matter, stability and change	Developing models, analyzing data, and constructing explanations.	
9.1	How do atoms combine to make new substances?	Students review chemical formulas as symbolic representations of substances and learn that fundamental building blocks of substances are atoms. Chemical bonds are introduced.	All substances are made from 90 different types of atoms. A compound is a substance amde up of two or more different atoms. Atoms combine to make particles of substances.	2	Atom, bond, compound	7.PS.1 7.PS.3	-Draw, construct models, or use animations to differentiate between atoms, elements, molecules, and compounds. -Investigate the Law of Conservation of Mass by measuring and comparing the mass of a substance before and after a change of state.	Cause and effect, scale, proportion, and quantity, systems and system models, stability and change	Developing and using models, Using mathematics and computation thinking, Constructing explanations, Obtaining, evaluating, and communicating information	I usually did Investigation 9 immediately following Investigation 2. Inv. 9 does a lot with elements and particles.
9.2	What happens at the particle level when a chemical reaction occurs?	Students react limewater with their breath (CO2). They use atom tiles to represent the chemical reaction. They write a balanced equation for the reaction.	A chemical reaction is a process in which the atoms of substances (reactancts) rearrange to form new substances (products). Atoms are neither created or destroyed during a chemical reaction.	3	Reactant, product, conservation of matter, molecule, ionic compound	7.PS.1 7.PS.3	-Draw, construct models, or use animations to differentiate between atoms, elements, molecules, and compounds. -Investigate the Law of Conservation of Mass by measuring and comparing the mass of a substance before and after a change of state.	Cause and effect, scale, proportion, and quantity, systems and system models, stability and change	Developing and using models, Using mathematics and computation thinking, Analyzing and intepreting data, Obtaining, evaluating, and communicating information	

Grade 7 curriculum roadmap
Physical Science

FOSS Chemical Interactions

Lesson	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
9.3	What is the chemical reaction between sodium bicarbonate and hydrchloric acid?	Student observe a demo of the hydrochloric acic and sidoium bicarbonate reaction, then use atom tiles to try and figure out what they think the product is. They conduct the reaction and confirm the products through additional steps.	A chemical reaction is a process in which the atoms of substances (reactancts) rearrange to form new substances (products). Atoms are neither created or destroyed during a chemical reaction.	3	Precipiatate, chemical reaction, reactant, product, molecule, crystal	7.PS.1 7.PS.3	-Draw, construct models, or use animations to differentiate between atoms, elements, molecules, and compounds. -Investigate the Law of Conservation of Mass by measuring and comparing the mass of a substance before and after a change of state.	Cause and effect, scale, proportion, and quantity, systems and system models, stability and change	Developing and using models, Using mathematics and computation thinking, Analyzing and intepreting data, Obtaining, evaluating, and communicating information	

Grade 7 curriculum roadmap
Life Science

SEPUP Life Science: Unit B (Bodyworks), Unit C (Cell Biology and Disease)

Unit	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
12	What are the major organ systems and organs? What are their functions?	Students conduct various labs that explore the human body systems, organs, and their functions. They draw, use vocabulary cards, and build clay models to help introduce the human body.	Students will understand that the human body is split into organ systems that have similar functions. These systems are comprised of specific organs that work together in accomplishing that system's function.	4-6	cardiovascular system, cell, digestive system, excretory system, function, muscular system, nervous system, organ, reproductive system, respiratory system, skeletal system, structure, system, tissue	**7.LS.4**	Research and describe the functions and relationships between various cell types, tissues, and organs in the immune system, circulatory system and digestive system of the human body.	Modeling, Structure and function	Create models,	Part A: Get large, colorful bulletin board paper from the resource room. Groups roll them up after the first session and will revisit them in part D. I hang up one or two from each period. Part B: Can be tedious, allow 1.5-2 days. A lot of new vocabulary but definitely worth the time to talk about this. Some kids will never take anatomy in their life. DON'T skip reproductive parts. Essential to discuss and educate! I give a quiz at the end of this investigation to make sure students have the basics before moving forward.
14	How can you model the chemical and mechanical breakdown of food?	Students use antacid tablets and vinegar to model the process of chemical and mechanical digestion.	Students will explore the various ways chemicals can work to break down food even starting in the mouth. They will differentiate between chemical and mechanical digestion.	2	chemical breakdown, mechanical breakdown, surface area	**7.LS.4**	Research and describe the functions and relationships between various cell types, tissues, and organs in the immune system, circulatory system and digestive system of the human body.	Structure and function, Surface area	Design and conduct investigation, Explain using evidence, Create and analyze a graph	
15	How do the various digestive organs play a role in chemical and mechanical digestion as well as nutrient absorbtion?	Reading activity- students follow along a reading with lab sheets to label and learn the various digestive organs and what they do to contribute to digestion.	Students will know the various digestive organs and how they contribute to digestion. They will learn about nutrient absorbtion in the small intestines.	1	absorb, absorption, cross-section, nutrients	**7.LS.4**	Research and describe the functions and relationships between various cell types, tissues, and organs in the immune system, circulatory system and digestive system of the human body.	Structure and function	Reading comprehension	
18	How do the organs work together in supporting the circulatory system?	In this investigation, students model the circulatory system throughout the body by role playing various components: blood, lungs, heart, liver, small intestine, brain, nutrients, oxygen, CO_2, and waste.	Students will be able to model the role of the circulatory system as it transports nutrients, gases, and waste.	1	cardiovascular system	**7.LS.4**	Research and describe the functions and relationships between various cell types, tissues, and organs in the immune system, circulatory system and digestive system of the human body.	Modeling, Structure and function	Modeling	I rearrange my room as best as I can to make this activity work. Let students run the simulation a few times, switching roles so that people can participate in different ways. I also enjoyed creating a "blockage" so kids would see what happens when blood cannot be transported properly.

Grade 7 curriculum roadmap
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SEPUP Life Science: Unit B (Bodyworks), Unit C (Cell Biology and Disease)

Unit	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
19	How does breathing rate and heart rate effect blood flow?	Students collect data on their heart rate by calculating their pulse at rest and during activity. They compare the two, build graphs to exhibit data, and discuss why heart rate would go up during exercise.	Students will understand the connection between heart rate (rate at which the heart is pumping blood), pulse (how many times the heart beats per second) and breathing rate. They will notice that the more work the heart does (during activity) the more oxygen is needed for muscles and other tissues and thus a higher rate of breathing and blood flow.	1-2	pulse	**7.LS.4**	Research and describe the functions and relationships between various cell types, tissues, and organs in the immune system, circulatory system and digestive system of the human body.	Structure and function		I give 2 days: one day for collecting data (I gave choice between jogging and jump roping) and then the second day we made graphs and analyzed. You'll probably need something else to fill the extra time in day 2.
20	What is heart disease? How do you make people aware of things like heart disease?	Reading- students participate in a role-play where they must decide on how best to allocate limiated funds to fight heart disease and promote public health.	Students explore public health, dealing with funds dedicated to disease awareness and research, and discuss how best to combat heart disease.	1	trade-offs	**7.LS.4**	Research and describe the functions and relationships between various cell types, tissues, and organs in the immune system, circulatory system and digestive system of the human body.	Structure and function, Decision making, Science and society		I skip this one.
21	What structure is the heart most similar to? Explain.	In this activity, mechanical pumps serve as potential models for the human heart. Student analyze two different bulbs: the siphon bulb and the pressure bulb, which brings about discussion of valves in the heart.	Students understand that the heart is a huge muscle that works all the time to pump and transport blood throughout the body. In order to keep blood moving one-way they learne about the presence of heart valves.	1	valve	**7.LS.4**	Research and describe the functions and relationships between various cell types, tissues, and organs in the immune system, circulatory system and digestive system of the human body.	Create models, Structure and function, Formulate and test explanations	Create models, Structure and function, Formulate and test explanations	The siphon bulb can be a real pain and mess. So just be prepared for water on the lab tables. I purchased squeegies awhile back- best purchase ever!
22	Explore the heart as a muscle.	Students evaluate the strength of the heart by trying to pump water at the same rate as their resting heart rate. They compare the volume of water pumped to the volume of blood pumped in the same amount of time.	Students will begin to explore that the heart is doing work as a muscle.	1		**7.LS.4**	Research and describe the functions and relationships between various cell types, tissues, and organs in the immune system, circulatory system and digestive system of the human body.	Create models, Structure and function	Create models, Structure and function, Display data in graphs	
23	What are the structures of the circulatory system and how do they support it's function?	Reading/drawing-Students investigate the functions of the blood vessels and the major structures of the heart.	Students will know how the heart is organized as well as the various blood vessels used to transport blood (with nutrients and gases and waste).	1	arteries, atrium, blood vessels, capillaries, valves, veins, ventricle	**7.LS.4**	Research and describe the functions and relationships between various cell types, tissues, and organs in the immune system, circulatory system and digestive system of the human body.	Structure and function	Structure and function, drawing diagrmas	This is a pivotal lab for the circulatory system. I make sure we review all of the material, support this lab with additional video (I used Khan Academy video about the anatomy of the heart) and activities (maybe a Kahoot! or QuizletLive game) so that students fully understand the structure and function of the circulatory system.
24	How can you model the flow of blood into and out of the heart using pressure bulbs?	Students use their understanding of the circulatory system to model blood flow through the heart and lungs.	Students begin to see the connection between respiratory and circularoty anatomy. They will model one-way blood flow and understand why blood is flowing the way it does.	1	arteries, blood vessels	**7.LS.4**	Research and describe the functions and relationships between various cell types, tissues, and organs in the immune system, circulatory system and digestive system of the human body.	Structure and function, Models	Models, structure and function	You may think of using index cards or sticky notes to have students label the various "parts" of their model.

Grade 7 curriculum roadmap
Life Science

SEPUP Life Science: Unit B (Bodyworks), Unit C (Cell Biology and Disease)

Unit	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
28	What are various problems encountered in the cardiovascular system?	Reading- Students read about hypertension, heart attacks, and cardiac arrest. They use a lab sheet to draw and diagram what those ailments do to the heart.	Students will use their understanding of the cardiovascular system to identify what can go wrong and how.	1	coronary arteries, risk factor, hypertension, stint	**7.LS.4**	Research and describe the functions and relationships between various cell types, tissues, and organs in the immune system, circulatory system and digestive system of the human body.	Structure and function	Structure and function, drawing diagrmas	I follow this lab with the bioengineering activity Investigation 104: Designing Artificial Heart Valves.
37	What is the history of disease and understanding how people get sicK?	A history of the scientific discovery of the germ theory is explored as students read, discuss, and role play the contributions of different scientists.	Students will begin to understand that cells and bacteria had to be discovered. They will learn that different diseases are caused by different types of bacterium. They will also learn the cell theory: all living things are made of cells, cells come from other cells, and cells are the basic unit of function of life.	2-3	cell, cell theory, germ theory of disease, multicellular	**7.LS.1**	Investigate and observe cells in living organisms and collect evidence showing that living things are made of cells. Compare and provide examples of prokaryotic and eukaryotic	Science and society	Reading, discussing, developing roles, explaining using role-play	I modified this lab by spending a day reading through it as suggested, but then turning it into a skit project. Student groups chose a scientist and had to turn that excerpt into a skit. I gave them a day to prepare their skit and then they performed them.
38	How do cells differ depending on their source? Ex: animal cell vs plant cell	Students observe Amoeba proteus cells, cheek cells, green plant cells, and an onion cell under the microscope. Students make observations of structures that are similar and different in all cell types.	Students will understand that cells of different organisms have similar structures, such as a cell membrane. These structures function similarly in different organisms.	2	cell membrane, cytoplasm, nuclear membrane, nucleus, organelles	**7.LS.1, 7.LS.5**	-Investigate and observe cells in living organisms and collect evidence showing that living things are made of cells. Compare and provide examples of prokaryotic and eukaryotic organisms. Identify the characteristics of living things. -Compare and contrast the form and function of the organelles found in plant and animal cells.	Structure and function	Using a microscope, making observations, making connections based on observations	Complete Inv. 35 (not aligned) before doing anythign with the microscopes. I transformed Inv. 35 into microscope stations. Students learn the parts of a microscope, how to use one, and other various stations for viewing. I have them rotate every 10-15 mins per station. It's a 2-day activity.
39	Are cells alive? How do you know?	In this activity, students explore the idea that cells are alive and perform life functions (like respiration). Student are introduced to yeast as they investigate the ability of yeast cells to respire. Comparisons of human and yeast cells reinforce the cellular nature of life.	Student will see that cells are living and have similar functions, like respiration. Students will be able to support the fact that cells are alive with evidence they gather in the investigation.	1	Cell respiration	**7.LS.1**	Investigate and observe cells in living organisms and collect evidence showing that living things are made of cells. Compare and provide examples of prokaryotic and eukaryotic	Students develop explainations and models using evidence,	Experiment, gather evidence through observation	Sometimes we don't see much eviednce or change in this lab. Not sure if its the hard water we had at school but the BTB is support to show the presence of CO_2 by turning yellow (usually green though). This just doesn't happen very well. I was meticulous about the temperature of the yeast suspension and everything. So just be flexible if you don't see evidence right away or at all.

Grade 7 curriculum roadmap
Life Science

SEPUP Life Science: Unit B (Bodyworks), Unit C (Cell Biology and Disease)

Unit	Focus Question	Description	Objective(s)	# of Sessions	Vocabulary	IN #	Standard Text	Cross Cutting Concept(s)	Practices	Notes
41	Why is it necessary for larger organisms to have many cells (multicellular)?	Students model the relative size of cells to determine why cells are so small. This activity is used to reinforce the concept that multicellular organisms are made up of many cells.	Students will develop models in order to better understand the nature of cells.	1	multicellular, unicellular	**7.LS.2, 7.LS.5**	-Create a model to show how the cells in multicellular organisms repeatedly divide to make more cells for growth and repair as a result of mitosis. Explain how mitosis is related to cancer. - Compare and contrast the form and function of the organelles found in plant and animal cells.	Modeling, Structure and function	Creating a model, analyzing evidence through observation	
42	What are main components of the cell? What are their functions and how do they work together?	A reading elaborates upon the basic structures common to cells. The roles of the cell membrane, cytoplasm, and nucleus are emphasized. The relationship between cell biology and disease is presented.	Students will continue to explore the fact that cells are the basic unit of all living things, that there is a complementary nature of structure and function.	1-2, reading	mitochondria, nucleus, cytoplasm, cell membrane, organelles	**7.LS.3, 7.LS.4, 7.LS.5**	-Explain how cells develop through differentiation into specialized tissues and organs in multicellular organisms. -Research and describe the functions and relationships between various cell types, tissues, and organs in the immune system, circulatory system and digestive system of the human body. -Compare and contrast the form and function of the organelles found in plant and animal cells.	Reading comprehension	Reading, discussing	Although this is a one-day reading activity, I like to expand this investigation using technology so students are exploring more cell structures through simulations and online activities. You might start with the reading on day 1 and then day 2 support their introductory knowledge with further games and learning activities. You might even expnd this into a project where students construct cell models using various materials (middle schoolers love making cells out of candy!).
43	What are microbes?	Students begin to investigate how microbes are grouped. Students view prepared slides of protists and bacteria to investigate some of the characteristics of these two groups, including size and presence or absence of a nucleus.	Student will learn characteristics that distinguish microbes from eachother include size, shape, and structure. They also learn that protists and bacteria are unicellular organisms.	1	bacteria, protist	**7.LS.5**	Compare and contrast the form and function of the organelles found in plant and animal cells.	Structure and function	Microscopes, identifying key cellular structures	