***Standards listed in bold font are Utah Core Science Standards. Those that are not in bold are supplemental.**
****Words that are in bold font in the lesson are vocabulary words that your child should know by the end of the lesson.**
*****Standards that can be found in all science lessons include: ELA.SL.1, ELA.SL.1.a, ELA.SL.1.b, ELA.SL.1.c, ELA.RIT.3, ELA.RIT.4, ELA.RIT.5, ELA.RIT.10**

Title of Lesson 1: What's the Matter?

Standards Taught: 5.S.2.1, 5.S.1.1, 5.S.1.1.a, 5.S.1.1.c

Materials:	**Preparation:**	**Implementing the Lesson:**
Balloon Salt Water Mixing Spoon Scale Small bowl		Tell your child that everything is made up of something called **matter.** Matter takes up space and has mass (weight). Matter is made up of tiny particles, so small that we cannot see them with our eyes. Like tiny building blocks, these particles make up everything around us, even the air. Give your child the balloon. Ask them to describe it to you. Discuss its color, shape, and size. Explain that we are going to see if air has matter. Have your child blow up the balloon. What happened? Explain that the balloon got bigger because the air that your child blew into is made of matter, it takes up space. Next, give your child the water and salt. Ask your child to do the following steps: 1. Place about ½ a cup of water in the bowl 2. Weight the water in the bowl and record the weight in the data chart below 3. Weigh the salt directly on the scale and record the weight below 4. Pour the salt into the water and mix to **dissolve** the **solid** salt into the **liquid** water 5. Observe the properties of the water once the salt is dissolved completely. Can you still see it? 6. Weigh the mixture, keeping it in the same bowl, and record the weight on the data chart Place the bowl outside in a protected and sunny spot. Allow the water to evaporate naturally. This will take some time but keep checking back on it every day or so. When the water is evaporated, ask your child to bring the bowl and observe what is left. Explain that the salt does not evaporate so it stayed behind. Ask your child to weigh the salt directly on the scale as before, taking it out of the bowl. Record your observations on the data sheet. Point out that the salt amount did not significantly change, though it was dissolved in the water. This shows us that matter cannot be destroyed. Explain that the water changed into a gas when it was evaporated. That gas then rose into the air, but the matter was not destroyed and it will fall as rain somewhere else.

Weight of Water Before	**Weight of Salt Before**	**Weight of Mixture Before**	**Weight of Salt After**

Title of Lesson 2: Layers of Liquids

Standards Taught: 5.S.5.2.1, 5.S.5.2.2, 5.S.5.2.3, 5.S.5.2.4, 5.S.1.2, 5.S.1.2.a, 5.S.1.2.b, 5.2.1.2.c, 5.S.5.1, 5.S.5.1, 5.S.5.1.a

Materials:	**Preparation:**	**Implementing the Lesson:**
Clear Jar Turkey baster, Pipette, or Medicine Dropper Mixing Spoon Food coloring, various colors ½ c. of each of the following: Corn syrup Dish Soap Water Oil (olive or vegetable) Rubbing Alcohol Observation Sheet Lesson 2 Scale	Use the food coloring to color the soap, water, and alcohol different colors Lay out the liquids in separate bowls across the table, label each one	Tell your child that today we are going to learn about how matter can change. Explain that there are two different types of changes: physical and chemical. Today we are going to learn about physical changes. Explain that a **physical change** is a change that alters a substance without changing its composition (what it is made of). Physical changes do not create something new. Give some examples of physical changes (ice melting, water boiling, cooking an egg, dissolving sugar in water). Give your child the observation sheet. Ask them to fill in questions 1-2. Weigh each substance and the jar separately and ask your child to add them together to find the total mass. Ask your child to observe the matter in the jar. What is in the jar? What does it look like? Describe the color. Is it wet or dry? Heavy or light? Explain that the air and the materials are separate right now. They each have a composition of 100% of each substance and aren't mixed with anything else in their respective containers. Carefully pour each substance into the jar using the turkey baster, pipette, or medicine dropper. Once all the substances are in, quickly do questions 3-4 on the observation sheet and weigh the mixture, recording the weight in the data chart on the observation sheet. Explain that placing the liquids in the same container resulted in a physical change to the matter in the jar. There is no longer just one substance in the container, but many. The composition is not 100% air anymore. It is a mixture of all the ingredients. Ask your child to continue to observe. Discuss the different properties of the liquids and briefly discuss why some fall to the bottom and why some float on the top. They are different densities. Density is another property of matter. It describes how many particles are in a specific space. Explain that the color, amount, and state of matter of all the substances stayed the same and the mixture did not create something new, just a sum of the parts. Discuss that the state of matter sometimes does change in a physical change. For example, when ice melts it goes from a solid to a liquid. It is still water either way, however, and does not change its mass (weight) or composition (it's still 100% water in both states). Ask your child to answer question 5 on the observation sheet.

Observation Sheet: Lesson 2

Data Chart	
Weight Before	**Weight After**

1. What **substances** do you see? List them below.

2. Describe or draw each substance. Focus on its color, amount, smell, and state of matter (liquid, solid, or gas)

3. How did the substance in the jar change? Describe the change to the composition of the materials in the jar.

4. Did it create something new? Draw a picture of your observations.

5. What is density?

Title of Lesson 3: Physical Changes

Standards Taught: 5.S.5.2.2, 5.S.5.2.3, 5.S.25.2.4, 5.S.1.2, 5.S.1.2.a, 5.S.1.2.b, 5.S.1, 5.S.1.1, 5.S.1.1.a, 5.S.1.1.b

Materials:	**Preparation:**	**Implementing the Lesson:**
Ice Cube Bar of Chocolate Observation Sheet Lesson 3 Several small objects that are two different colors (marbles, counting blocks, fruit snacks, etc) Large Bowl Scale	Separate the small objects by color into two groups	First, give your child the observation sheet. Ask them to review what a physical change is and explain that today we are going to investigate a few more physical changes today. Give your child the ice cube and ask them to draw a picture and describe it on the observation sheet in the section labeled: "Ice Before". Ask them to point out its properties (size, shape, state of matter, color, hardness, etc.) Weight the ice cube on a scale in a small cup and record the weight in the same section. Place the ice cube on a tray or plate in a warm area and set it aside, allowing it to melt. Alternatively, you can add it to a small pot on the stove to melt it more quickly. Next, ask your child to draw a picture and describe on the observation sheet ("Small Objects Before" section) the two different colors of small objects. Ask your child to point out the properties of both groups separately. Have your child pour both colors of the small objects into the large bowl and mix them up with their hands. Ask your child to draw and write their observations in the "Small Objects After" section of the observation sheet and fill out and discuss question 1. Next, give your child the bar of chocolate. Ask them to fill in the "Chocolate Bar Before" section as they did with the other items. Then allow your child to break the chocolate bar into pieces and fill in the "Chocolate Bar After" section. Discuss and fill in an answer for question 2 on the observation sheet. Return to the ice when it has melted at least partially. Weigh the water on the scale using the same cup and recording it in the "Ice After" section of the observation sheet. Ask your child to draw and describe the water answer questions 3 and 4. Point out that all of these changes were physical changes. Not one of the substances was changed into something new, they simply had their properties changed. The ice changed from a solid to a liquid state, changed shape, and likely changed color. The marbles changed color composition. The chocolate changed shape and size.

Observation Sheet: Lesson 3

Ice Before	Ice After
Weight:	Weight:

Chocolate Before	Chocolate After

Small Objects Before	Small Objects After

Question 1: What is different about the small objects before and after mixing? Did the substances change?

Question 2: What is different about the chocolate before and after breaking? Did the substances change?

Question 3: What is different about the ice before and after melting? Did the substances change? Did the weight change?

Question 4: What type of change were all of these experiments? Why?

Title of Lesson 4: Chemical Changes

Standards Taught: 5.S.5.2, 5.S.5.2.1, 5.S.5.2.3, 5.S.5.2.4, 5.S.1, 5.S.1.1, 5.S.1.1.d, 5.S.1.3.a-e

Materials:	**Preparation:**	**Implementing the Lesson:**
Ingredients and supplies to bake a cake Scale Observation Sheet Lesson 4 Cream and Vinegar Two bowls or cups that are the same weight		Ask your child to review the definition of physical changes. Explain that the second type of change is a **chemical change.** A chemical change changes the substance into something new through a chemical reaction but does not change the amount of matter. Explain that there are several common signs that a chemical reaction has occurred. Some of those signs include: bubble, color change, heat produced, light produced, sound, and/or odor. Discuss how not all chemical changes show all of these signs but usually at least one is present during a chemical change. Ask your child to create a visual representing these signs (poster, coloring page, video, etc). Show your child the cream and vinegar. Explain that these are our two ingredients, or **reactants**, for our first experiment. Ask your child to weigh each reactant separately, using the bowls/cups that have the same weight and record their data on the observation sheet chart. Next, slowly pour the cream into the vinegar and observe what happens. Ask your child to describe the changes they see. Point out that the reactants created a new substance or **product**. Have your child weight the product on the scale again and record it on the data chart. Ask your child to add the reactant weights together and compare that to the solution weight. Did the amount of matter change? Show your child the reactants for our next experiment (baking a cake). Briefly discuss the properties of each ingredient. Ask them to prepare the cake batter according to the recipe. When the batter is in the pan, ask your child to weigh it on the scale and record their data in the chart on the observation sheet. Ask your child to describe and draw the cake batter on their observation sheet. Place the cake in the oven and allow it to bake, explaining that the **heat** from the oven is what will begin the chemical reaction in the cake. When the cake is finished baking, ask your child to observe the temperature of the cake by carefully placing their hand above it. When the cake is cooled, allow your child to finish their data chart by observing the finished cake. Answer the questions on the observation sheet. Discuss the answers with your child. Explain that the weight of the cake after was less than the weight before not because matter was destroyed, but because the liquids in the reactants were turned to steam as heat was added. The steam evaporated, or changed states of matter, but was not destroyed. Point out that this is like the ice melting into water.

Observation Sheet: Lesson 4

Cream and Vinegar

Weight of Reactants	Weight of Solution
1. 2. Sum:	

Cake

Before Baking	After Baking
Describe: What is the temperature like: Draw: Weigh:	Describe: What is the temperature like: Draw: Weigh:

1. Explain the differences between the cake before and after baking.

2. Why do you think the weight was different?

3. What do you think would happen to the cake if you changed an ingredient? How would that affect the chemical reaction?

4. Name three examples of chemical reactions that happen in your life

5. What is the difference between a chemical and a physical reaction?

Title of Lesson 5: Static Electricity

Standards Taught: 5.S.4, 5.S.4.1, 5.S.4.1.a, 5.S.4.1.b

Materials:	**Preparation:**	**Implementing the Lesson:**
Tin Foil Plastic Fork Balloon, blown up and tied shut Rubber Glove Plastic or Wooden Cutting Board Book Wooden pencil Key with insulator	This experiment is best on a cool, low-humidity day in a room that can get very dark	Ask your child to tell you what electricity is. Explain that electricity is a form of energy that results from the existence of charged particles. Remind your child that everything is made up of matter and that matter is made up of tiny particles. These particles sometimes are charged and have electricity. There are different types of electricity. Today we are talking about static electricity. Discuss some everyday examples of static electricity (e.g. hair sticking up while jumping on a trampoline, sliding on your socks and touching someone else, lightning). Explain that static electricity charges the particles through friction, or rubbing certain materials together. On the trampoline and when you slide in your socks, you create friction where your feet touch the surface, lightning is friction created in the particles of clouds. Have your child do the following: 1. Wrap a small piece of tin foil around the prong end of the fork (it will look like a spatula), and flatten any sharp edges or bumps. 2. Put on the rubber glove. With your gloved hand, rub the balloon in your hair to create friction. 3. Carefully place the balloon on the cutting board without touching anything else 4. Carefully pick up the fork, touching only the plastic handle and not letting the fork get too close to the balloon. 5. Ask someone to turn off the light and/or close the blinds 6. Gently touch the tin foil on the fork to the balloon Discuss what happened. Explain that the spark that you saw was static electricity. The electricity started by rubbing the balloon on your hair and creating friction. It then went from the balloon to the metal on the fork. Explain that it did not flow into the fork handle, the rubber glove, or the cutting board because those items are **insulators**. They do not **conduct** electricity. Metal, however, is a **conductor,** meaning electricity will flow through it. Ask your child to touch the fork to the balloon again. Discuss what happened. Why was the reaction different? Explain that the **charge**, or electricity created, all flowed from the balloon to the metal the first time and there was none left. Allow your child to recharge the balloon by rubbing on their head and try the experiment again. Repeat this experiment to find other conductors. Touch the charged balloon with a book, a wooden pencil, a key (holding on to the insulator), your finger, and finally with the fork after removing the tin from it. Discuss with your child the reactions of each experiment and whether each item is a conductor or insulator. Keep the tin foil covered fork for a later lesson

Title of Lesson 6: Static Electricity: Attract or Repel

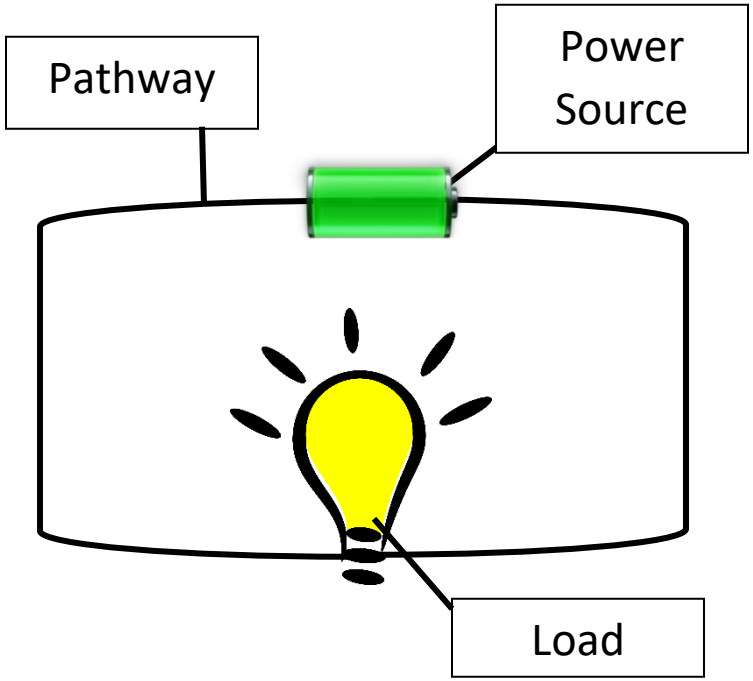
Standards Taught: 5.S.4, 5.S.4.1, 5.S.4.1.a, 5.S.4.1.c, 5.S.4.1.d, 5.S.4.1.e

Materials:	**Preparation:**	**Implementing the Lesson:**
2 Balloons, blown up and tied shut. Tie a foot-long piece of string to the end of each balloon. Plastic bag Hairbrush Small, fuzzy blanket String Ground Pepper Phone, tablet, or camera with video recording capabilities or a large mirror	Set up the camera/mirror where your child can stand in front of it and see themselves	Ask your child to review what static electricity is. Discuss and remind your child that static electricity occurs when particles are electrically charged, most of the time by friction. First, ask your child to rub one balloon on their hair and set that balloon on an insulator (wooden table, cutting board). Be careful not to let the balloon touch your clothing. Next, rub the second balloon on their hair. Holding the strings, lift one balloon in each hand with your arms outstretched in front of you. Carefully bring the balloons together and observe what happens. Did the balloons move when you got them closer together? Were they **attracted** (moved towards) or **repelled** (moved away from) to each other? Recharge one of the balloons and repeat the experiment, setting the balloon down and bringing the object close to the balloon. Observing the attraction or repulsion between the balloon and the plastic bag, the string, the small blanket, and the ground pepper. Explain that all of these reactions are due to static electricity and the charge that of the particles in the object. Particles with a positive charge (like the balloon after rubbing it in your hair) are attracted to particles in the other object if those particles have a negative charge (e.g. the pepper). If both objects have particles with a positive charge, however, they are repelled from each other. Point out that once the energy (static electricity) is discharged the balloon loses its positive charge, causing the reactions to change, too. Ask your child what charge they think their hair has. Standing in front of the camera or mirror, ask your child to rub the balloon on their hair (or use a family member who has longer hair if your child's hair is too short). What happened? Why? Explain that rubbing the balloon on your hair changes the charge of the particles, making the hair and the balloon attract to each other and your hair stick up. Ask your child to brush through their hair with the hairbrush and try again. Is your hair still attracted to the balloon? Why or why not? Allow your child to experiment with the plastic bag and the fuzzy blanket by rubbing them on their hair and watch what happens.

Title of Lesson 7: What is an Electric Circuit?

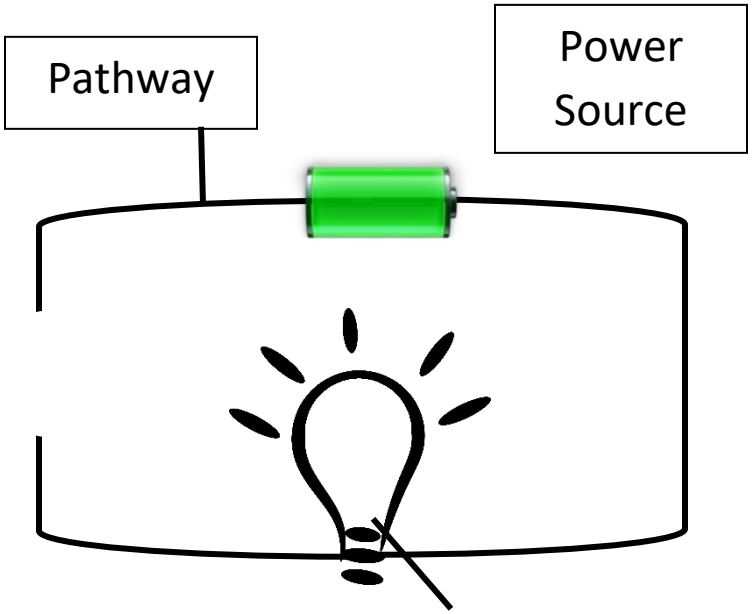
Standards Taught: 5.S.4.2		
Materials: Circuit Charts (2 pages) Circuit Worksheet	**Preparation:**	**Implementing the Lesson:** Tell your child that today we are going to learn more about electricity. Explain that electricity has a flow, like water. It moves in certain directions based on specific rules. Review examples of electric flow that we have discussed this week (lightning from the sky to the ground, the tin foil and the balloon). We call this flow **electrical current.** Explain that electricity flows through conductors and is stopped by insulators. Review the terms "conductors" and "insulators." Show your child the circuit charts (below). Explain that a circuit is a system of components that allow the flow of electricity. Using the charts and information, discuss **complete circuits**, **incomplete circuits**, and **switches**. Explain that the **power source** (**battery,** in this case) introduces electricity into the system. The electricity then flows through the **pathway** (usually wires) until it gets to the motor or light, where you can see it move (in the case of a motor) or light up (in the case of a lightbulb). The **load** is what the result of the electricity is, the movement or light. Answer any questions your child may have and review with them to ensure they understand, emphasizing vocabulary words and their meanings. Give your child the circuit worksheet. Ask your child if this is a complete or incomplete circuit. Have them label the parts of this circuit. Then, ask them to turn the page over and draw a complete circuit, complete with labels.

Circuit Chart (pg. 1)



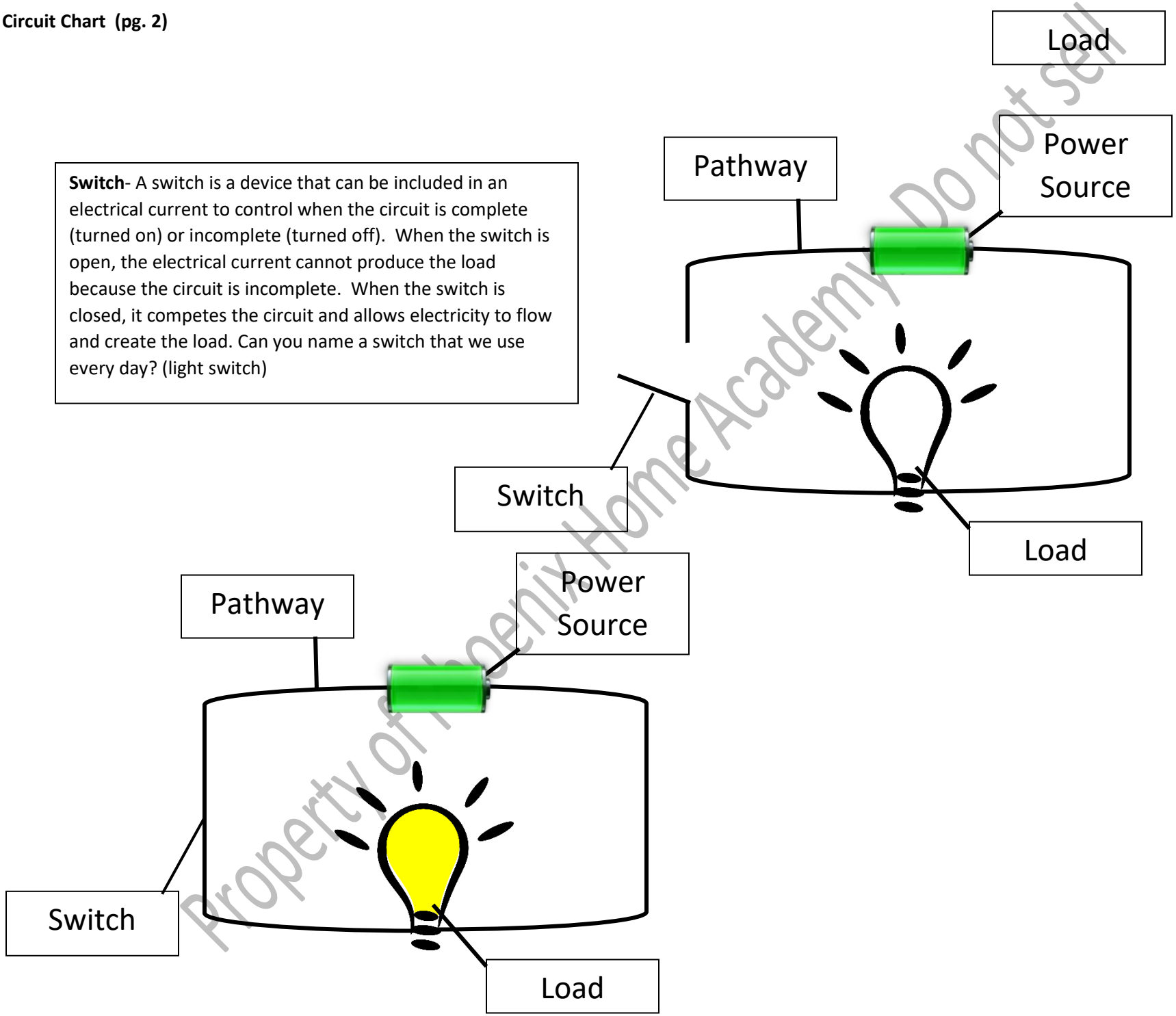
Complete Circuit (left)- A complete circuit has a power source (a **battery** or outlet where the electricity starts), a light or motor (where you see the **load**, or result of the electricity), and a **pathway** that the electricity flows through. In this case, the load is the light turning on.

Incomplete Circuit (right)- An incomplete circuit has a power source (a **battery** where the electricity starts), a light or motor (where you see the **load**, or result of the electricity), and a **pathway** that the electricity flows through. An incomplete circuit, however has been interrupted. The flow of electricity is stopped and the load does not show (the light is not on because the electricity does not reach it).



Circuit Chart (pg. 2)

Switch- A switch is a device that can be included in an electrical current to control when the circuit is complete (turned on) or incomplete (turned off). When the switch is open, the electrical current cannot produce the load because the circuit is incomplete. When the switch is closed, it competes the circuit and allows electricity to flow and create the load. Can you name a switch that we use every day? (light switch)

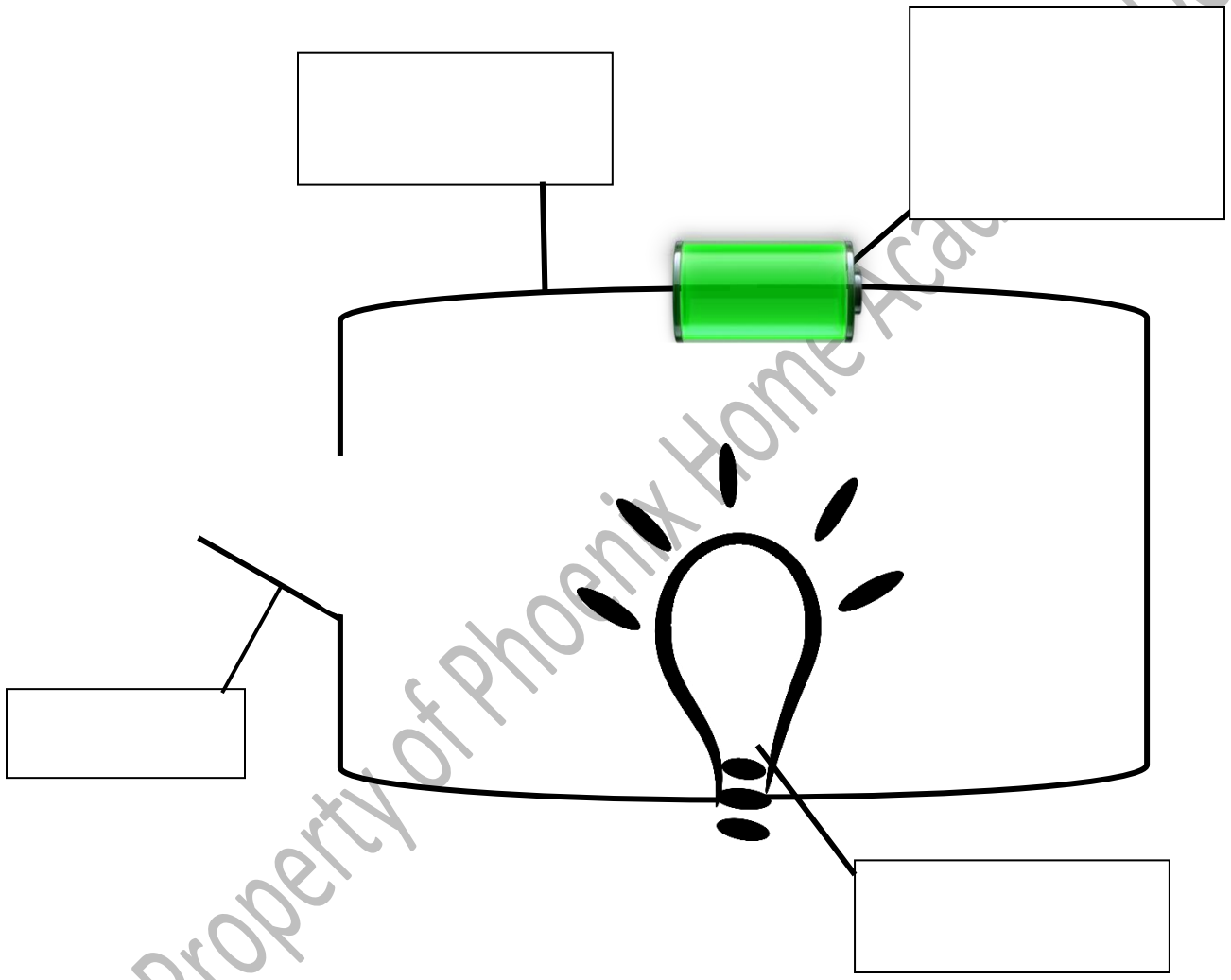


Circuit Worksheet

Is this a complete or incomplete circuit?

Label the parts.

On the back, draw and label a complete circuit.



Title of Lesson 8: Building an Electric Circuit

Standards Taught: 5.S.4.2, 5.S.4.2.b, 5.S.4.2.c, 5.S.4.2.d, 5.S.4.2.e

Materials:	**Preparation:**	**Implementing the Lesson:**
Circuit Charts (2 pages) from previous lesson Bulb holder and bulb that fits Battery holder Battery that fits in holder Switch 3 alligator leads Popsicle stick Observation Sheet Lesson 8	View this video for more info and instructions (https://www.youtube.com/watch?v=IQdorDQqUaM)	Briefly review the vocabulary and charts from the last lesson with your child. Explain that today we are going to build our own electric circuit. Tell your child that today we are going to create our own circuit. First, give your child the following: battery holder, battery, light bulb holder, light bulb, and alligator leads. Ask them to discuss, using the vocabulary words, the different parts of a circuit they see. Allow them to use the charts for reference. Ask your child to do the following in order: 1. Gently put the light bulb into the bulb holder until it is secure 2. Attach on alligator lead to the wire coming out of the battery holder. Be sure that the metal clip is attached to the metal part of the wire. 3. Connect the opposite end of the same lead to the light bulb holder (there should be a screw or exposed wire). 4. Attach the second lead to the second wire on the battery holder. 5. Attach the opposite end of the second lead to the switch, ensuring metal is connected to metal. 6. Attach the third lead to the opposite side of the switch, being sure that the alligator clips are not touching each other 7. Attach the opposite end of the third lead to the side of the bulb holder that is not yet connected. 8. Carefully add the battery to the battery holder, paying attention to the positive and negative markings on the battery and the battery holder 9. Carefully switch the circuit on and observe the load 10. If your light is not on, look for the reason. You have an incomplete circuit and you need to find out why and correct it. Allow your child to experiment with the following once they have their circuit working (remove the battery before making changes and replace it each time). Ask them to separate the materials into two piles: items that close the circuit and items that do not. 1. Replace the switch with a popsicle stick 2. Replace the popsicle stick with the plastic fork covered in tin foil from the previous lesson, ensuring that the alligator clips are attached to the tin 3. Remove the fork, take off the foil, and replace the fork in the circuit 4. Replace the fork with a rubber band 5. Remove the rubber band and attach the two alligator clips to each other, metal touching metal 6. Reattach the circuit as it was originally, ensuring that it works. Remove the battery and detach a single alligator clip. Replace the battery 7. Remove the battery. Attach the alligator clip that was previously detached to the plastic part of the wire it was originally attached to, not touching the metal 8. Rebuild the circuit as it originally was Do the observation sheet questions

Observation Sheet: Lesson 8

1. What do you notice about the items in the pile that did not complete the circuit (the light did not turn on)? What are some of the properties (size, shape, texture, material) of that these items have in common?

2. Do you think these items that do not complete the circuit are conductors or insulators? Why?

3. What do you notice about the items in the pile that completes the circuit (the light turned on)? Describe some of the properties these items have in common.

4. Do you think these items that complete the circuit are conductors or insulators? Why?

5. What happened to the circuit when you removed a piece? For example, when you removed the power source or disconnected a lead?

6. What kind of circuit is created when you remove a piece?

7. Name an item we did not test in the circuit. What do you think would happen if we added that item to the circuit?

Title of Lesson 9: What is a Magnet and How Do We Use It?

Standards Taught: 5.S.3, 5.S.3.1, 5.S.3.b		
Materials: Magnet set with several different types of magnets (bar, rings, horseshoe)	**Preparation:**	**Implementing the Lesson:** Explain that this week we are leaning about magnets and **magnetic force**. Like electricity, magnets can cause movement though attraction and repulsion. Magnets, like the electricity in our battery, have a positive side and a negative side. Point out the positive and negative symbols on the bar magnet and horseshoe magnet. Explain that magnets will repel like forces (both positive or both negative) and attract opposite forces (positive and negative). Demonstrate both of these forces using the magnets. Explain that this is the same force that we saw in electricity when we experimented with the balloons. This force is called **electromagnetism** and applies to both electricity and magnets**.** Allow your child to play and experiment with the magnets. Encourage them to explore the house and yard looking for things that are magnetic.

Title of Lesson 10: Types of Magnets and Magnetic Fields

Standards Taught: 5.S.3, 5.S.3.1, 5.S.3.1.a, 5.S.3.1.c, 5.S.3.1.d

Materials:	**Preparation:**	**Implementing the Lesson:**
Magnet set from previous lesson Magnetite 2 Identical Nails Copper wire C Battery Sand Observation Sheet Lesson 10 Shallow glass or ceramic pan or plate Ruler	Create a temporary magnet (see video for instructions) (https://www.youtube.com/watch?v=Gk-SBhNY-lM)	Ask your child what they've learned about magnets so far. Review the vocabulary words from the previous lesson. Tell your child that today we are going to learn more about magnets. There are different types of magnets. Learn the following vocabulary words with your child, providing each example in turn: 1. **Permanent magnets:** Permanent magnets are items that are always magnetic. The magnets we have in our set our permanent magnets. Discuss some ways permanent magnets are used in everyday life (on the refrigerator, **2. Temporary magnets:** Temporary magnets are not always magnetic. They can be made by passing electricity through metal coils. (Show your child the temporary magnet you have made. Demonstrate with the extra nail that the nails are not usually magnetic. Then show your child that the nail with the metal coils is magnetic when attached to the battery (power source). Discuss some ways temporary magnets are used in everyday life (cranes that move metal, TV's, computers). Explain that permanent and temporary magnets are both man-made, meaning humans makes them. Allow your child to experiment for a moment with both permanent magnets and the electromagnet, working to see which is strongest. Which one has the strongest **interaction** with different magnetic materials (grabs things further away, attracts or repels quickly, etc). 3. **Natural magnets:** Explain that natural magnets are not made by people, but found in nature. They are composed of a mineral that has iron in it called magnetite. Show your child the sand you have. Ask them to move a magnet from the set around in the sand. What is stuck to the magnet? Magnetite **Magnetic Fields**: Explain to your child that all magnets have a magnetic field, a certain distance their magnetic force extends. Ask your child to tell you what happens when two magnets get close together. (They attract or repel) What happens when they are far apart? (Nothing). This is because to affect each other, the magnets must be in each other's magnetic field. Show your child the magnetite. Explain that this is magnetite, the same as the stuff that you took out of the sand. Remind your child that magnetite is a natural magnet. Ask your child to carefully place the bar magnet in the center of the pan and begin to sprinkle the magnetite around the entire pan. Observe the patterns that are created in the magnetite. Discuss what happened. Explain that the magnetite is being effected by the magnetic field of the magnet. Point out the patterns in the magnetite and how they show the field. Ask your child to fill out field 1 on the observation sheet. Repeat for the ring and horseshoe magnets, each time removing the magnetite and sprinkling it back on. Help your child experiment with the electromagnet and magnetite by leaving the magnetite on the plate and slowly brining the nail closer. When the magnetite begins to react to the magnetite, as your child to measure the distance between the nail and the plate. Ask your child to do the questions in the center section of the observation sheet. Allow your child to experiment and play with the magnets and magnetite and share what they learn.

Observation Sheet: Lesson 10

In each box, draw an image of the magnetic field you observe in the magnetite for that magnet. Then, measure the distance between the end of the magnet and the outer reach of its magnetic field using the ruler. Record your results.

Bar Magnet

Reach of Magnetic Field:

Horseshoe Magnet

Reach of Magnetic Field:

Which magnet has the biggest magnetic field?

Which has the smallest?

Do you notice anything about the patterns of each magnet?

Ring Magnet

Reach of Magnetic Field:

Electromagnet

Reach of Magnetic Field:

Title of Lesson 11: The Earth: A Giant Magnet

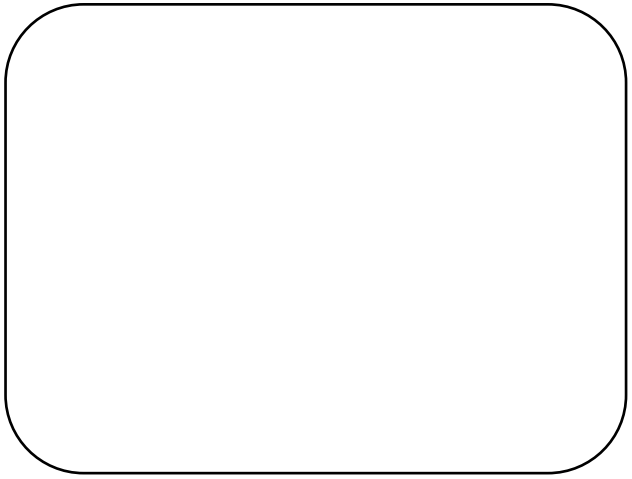
Standards Taught: 5.S.3, 5.S.3.1, 5.S.3.1.b, 5.S.3.1.d, 5.S.3.2, 5.S.3.2.a, 5.S.3.2.b, 5.S.3.2.c, 5.S.3.2.d

Materials:	**Preparation:**	**Implementing the Lesson:**
Compass Globe Magnet set from previous lesson Sewing needle Small bowl or container with a diameter larger than the sewing needle Water Small piece of cork Pliers	Check out the Earth's magnetic field. An image can be found here: https://fengshuinexus.com/wp-content/uploads/2016/06/Earth-Magnetic-Field.jpg Cut off about a ¼ in thick piece of the cork	Ask your child to review what they learned about magnetic fields. Tell your child that we are going to learn about the largest magnet on Earth today: the Earth. Using the globe, point out the North and South Poles. Explain that the poles create a giant magnet. Show your child where the magnetic field of the Earth is. Explain that, though the magnetic field is very large, the magnetic force isn't as strong as you would think. However, there is one way to see the magnetic field of the Earth. Give your child the compass. Ask them to explain what it is and what it does. A compass points north and helps you find your way. Ask your child why it points north. Explain that the needle of a compass is magnetic and is being pulled in the direction of the North Pole. Give your child one of the magnets. Ask them to experiment to see what happens when the magnet gets close to and moves around the compass. Explain that the magnetic field of the magnet is stronger than the magnetic field of the Earth when the magnet is very close to the compass. So, when a magnet is too close, the compass does not work properly. Tell your child that today they are going to make their own compass. Ask them to pour some of the water into the small container. Have your child carefully pick up the needle and rub it 50 times in only the same direction with the bar magnet. This makes the needle into a temporary magnet. Help your child grab the needle with the pliers and push it through the cork sides so that it sticks out either side evenly (see diagram below). Carefully place the cork and needle in the center of the container and place the entire container on a flat surface. Ask your child to observe what happens to the compass you have just made. It will be pulled towards the pole you are closest to. Ask your child to use the compass to tell you the directions of their surroundings (north, east, south, and west). Ask your child to experiment with what happens to this compass if other magnets get too close.

Title of Lesson 12: What's The Matter 2.0

Standards Taught: 5.S.5.2.1, 5.S.5.2.2., 5.S.5.2.3

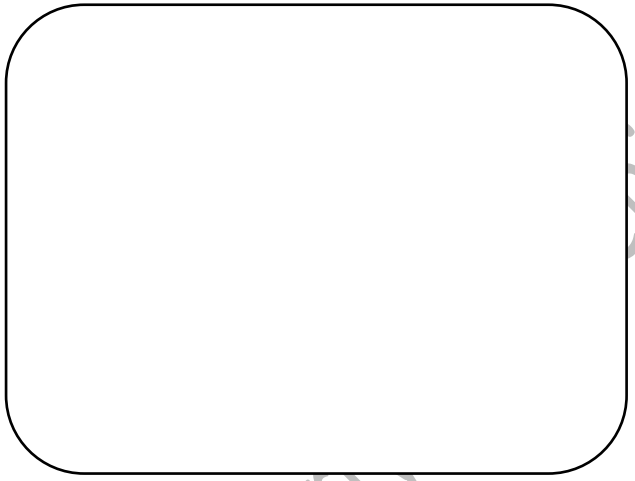
Materials:	**Preparation:**	**Implementing the Lesson:**
Bowl of Water Stove and Cooking Pot Ice cube Food coloring Spoon Observation Sheet 12		Review with your child what matter is (matter takes up space and has mass). Remind them that all matter is made up of tiny particles, so small that we cannot see them with our eyes. These particles determine properties such as color, harness, conductivity, solubility, and magnetism. They also determine the temperature, which affects the state of the matter (liquid, solid, or gas, or plasma). First, ask your child to observe your bowl of water. Discuss its properties. What does it look like? What does it feel like? Does it move? What state is it in? What temperature is it? Next, have them add a few drops of food coloring to the water and stir. Make the same observations again, noting the changes that adding food coloring particles made to the properties of the water. Explain that though it has changed color, the water is still in a liquid state. It is still at about the same temperature. Temperature change occurs when the particles of a substance gain kinetic energy. Kinetic energy is movement. If something is moving quickly, it has more kinetic energy. If it is moving slower, it has less. The particles in every substance have kinetic energy. By adding heat, we can increase the kinetic energy and change the state of the matter. By taking away heat (or cooling) the matter, we can decrease the kinetic energy and change the state as well. When particles have more kinetic energy, they spread out so that there is more space between them. See the image here (maxresdefault.jpg (960×720) (ytimg.com)) to see how particles are arranged in a solid, liquid, and gas and then draw what your particles of water look like in their current state on Observation Sheet 12. Pour your bowl of water into the cooking pot and place on the stove on high heat. As you add heat to the water, the particles will start to move faster and spread further apart. Point out that soon, you notice steam rising from the pot. Explain that this is water in its gas state. When you see steam, draw what your particles of water look like in the gas state on your Observation Sheet. Be sure to turn off the heat when you are finished. Next, give the ice cube to your child, asking them to observe water in this state. What state is this water in? What does it look like? What does it feel like? Does it move? What state is it in? Notice the temperature difference between liquid water and steam. It is much colder. Use Observation Sheet 12 to draw the particles in this solid form of water. Answer the questions on the Observation Sheet.



Liquid

Solid

In what stage is are the water particles the closest together?



Gas

Why?

How do you think this affects the ability of the water to move?

Does the ice still have kinetic energy?

Title of Lesson 13: Expansion and Contraction

Standards Taught: 5.S.5.2.1, 5.S.5.2.2., 5.S.5.2.3

Materials:	**Preparation:**	**Implementing the Lesson:**
Video here (https://www.youtube.com/watch?v=dWmaDgHWy1Q) 2nd Video here (https://www.youtube.com/watch?v=1PbmiskJ3Dg)		Watch the video with your child. Ask them if they can explain what is happening. Why does the ring fit over the ball when it is held over the fire? Why does it not fit after placed in the cold water? Explain that this experiment shows expansion and contraction. Expansion means that matter takes up more space (gets bigger). Most matter does this when it is heated. The ring expanded as its particles warmed. The particles began to have more kinetic energy. They moved more quickly and were, therefore, spaced further apart. This changes the size of the ring, though just a very small amount. Contraction means that matter takes up less space (gets smaller). Most of the time this happens when matter is cooled. (Liquid is an exception, ice cubes are bigger than in a solid than a liquid state). The ring no longer fit over the ball because the particles in the ring came closer together, making it more difficult for it to stretch. Watch the 2nd video with your child. Ask if this is an example of contraction or expansion. Explain that matter in a gas state expands from matter in a liquid state, though we often cannot see it. The particles in steam are hard to see, but try to expand to fit whatever container they are in. If the gas expands too much, pressure (how much the gas pushes on its container) can build up and pop the container. Briefly review the terms expansion and contraction with your child. For additional information/more activities your child can click on the links below section 5.2 here (https://www.ixl.com/standards/utah/science/grade-5)

Title of Lessons 14: Slow Change: Weathering, Erosion, and Deposition

Standards Taught: 5.D.5.1.3, Supplemental: 5.S.2, 5.S.2.1, 5.S.2.1.a, 5.1.S.2.1.b, 5.S.2.1.c, 5.1.S.2.3, 5.1.S.2.3.a, 5.1.S.2.3.b, 5.S.2.3.d, 5.S.2.3		
Materials: Photo of the Grand Canyon found here Photo of Arches National Park found here Photo of beach erosion here Photo of ice erosion here Photo of animal erosion here Photo of plant erosion here Photo of abrasion erosion here Photo of gravity erosion here Sugar Cube Glass of Water Bowl Observation Sheet 14	**Preparation:**	**Implementing the Lesson:** Ask your child if they know where rocks and sand come from. Explain that mountains are broken down by water and wind until they eventually become sand. Point out that this takes a very long time and we cannot see it happening. Over time, though, we can see that mountains get smaller or change shape. This process is called **weathering** or **erosion**. Weathering breaks down the rock without moving it. Erosion causes the pieces to move away and be deposited somewhere else (**deposition).** Slowly, these processes can change the surface of the earth by wearing away and/or moving very small pieces of material at a time. Explain that weathering, erosion, and deposition can be cause by several different processes that we see on earth. As you discuss each example, show your child the photo of it pointing out where erosion has affected the area and discussing how that changed what the land there looked like. Water flow (like a river or stream that cuts through a canyon or waves on a seashore that slowly wear away the beach), water fall (like the drip of a waterfall that cuts through a mountain), wind blowing (like the wind storms in Arches National Park creating the **arches** and **buttes**), ice (freezing, expanding and pushing the rock apart, and then melting and allowing the rock to break, or **glaciers** sliding across the land and creating valleys), animals (walking on and using the land, digging in the ground), plants (growing and spreading roots and breaking apart the land), abrasion (items rubbing on each other, like sand particles being blown through the air and hitting rocks), and gravity (items breaking away and falling down, like a rockslide on a mountain). Ask your child to answer question 1 on the Observation Sheet. Show your child the photo of the Grand Canyon again. Explain that this is a mountain that has been eroded and weathered over time. Ask your child to point to the river in the canyon. Explain that this river cut a path through the mountain. That is why there is a canyon, or gap, in the middle of it. This took a very long time (5-6 million years) and was a very slow process. Point out the layers you can see in the side of the canyon. Explain that these layers were created as particles of sand were blown across the area and landed there (deposition). Different materials came at different times, pressing on the particles below them until they built up a mountain. Then, the river came through and cut a canyon in it. There is a way we can see erosion at work without waiting for a long time. We can use a substance that is smaller and softer than a mountain. Give your child the sugar cube. Ask them to describe its properties. What color is it? Is it heavy or light? Smooth or rough? Hard or soft? What shape is it? Allow your child to draw their observations in the first box of the Observation Sheet. Ask your child to place the sugar cube in the center of the bowl. Then, give them the glass of water and ask them to slowly pour the water in the center of the sugar cube and observe what happens. Have your child record their observations in the second box of the Observation Sheet and answer question 2. Point out that erosion happens on a sugar cube much more quickly because of its properties. It is softer than rock and, therefore, breaks down more easily. Ask your child to answer the final questions on the observation sheet.

Observation Sheet 14

1. Name three things that can cause weathering, erosion, or deposition and give an example of each.

Draw a picture of your sugar cube before erosion	Draw a picture of your sugar cube after erosion

2. Was there any deposition in the weathering/**eroding** of your sugar cube? If so, add it to your pictures.

3. What do you think the earth would look like without the processes of erosion, weathering, and deposition?

4. Choose one of your examples from question one and draw a picture of what the land may look like if it hadn't been eroded.

Title of Lessons 15: Fast Change: Earthquakes and Landslides

Standards Taught: 5.S.5.1, 5.S.5.1.1, 5.D.5.1.3, Supplemental 5.S.2, 5.S.2.1.c, 5.S.2.2, 5.S.2.2.a, 5.S.2.2.a, 5.S.2.2.b, 5.S.2.2.c, 5.S.2.3

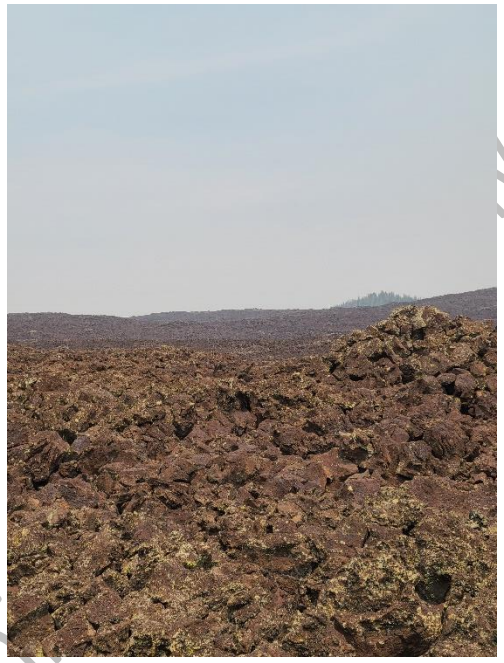
Materials:	**Preparation:**	**Implementing the Lesson:**
Wooden Board (at least 1 ft. X 1 ft.) Items you can stack (blocks, playing cards, small cups, etc) Several towels Two large boxes or storage containers This video (https://www.youtube.com/watch?v=EFWnppxgU1U) Photo of Rocky Mountain Range here (http://traveldigg.com/wp-content/uploads/2016/07/Rocky-Mountains-Street.jpg)		Ask your child to review what erosion and weathering are. Remind them that these two processes can change the earth very slowly over time. They can break mountains into rocks and sand, cut paths for rivers, and create huge canyons. Explain that there are some things that can change the earth very quickly. Things like earthquakes, landslides, and volcanos happen much faster than erosion and weathering, and can, therefore, change the earth faster. Briefly describe tectonic plates to your child. Tell them that the earth is made up of layers. One of those layers is magma, or lava. Above that layer is the ground that we walk on. The ground across the whole world is broken into several pieces, or plates. These plates float on the magma and move, very slowly. The movement of these plates sometimes causes quick and very big, events to happen which change the ground on them. For more info on tectonic plates see this video. (https://www.youtube.com/watch?v=3NKJgSDVCWQ) Tell your child that we are going to see one example of what happens when tectonic plates move today: earthquakes. Earthquakes happen when two or more of the tectonic plates bump into or push on each other. Fold the towels in half lengthwise and stack them on top of each other. Allow your child to help you and continue until you have enough towels to stack up for at least a foot. Place the boxes or storage containers on either side of the stacked towels. Ask your child to observe the towels, noting how flat they are all lying. Explain that the towels represent the land while the boxes represent the plates that the land is on. Ask your child to place their hands on one of the boxes (the opposite end from where the towels are) while you place your hands on the other. Slowly tell your child to push the box into the towels as you do the same from your side. The towels should start to rise up and fold over themselves. Explain that this shows us what can happen when two of the tectonic plates get close together. The flat land can change to mountains. Next, show your child the wooden board. Place it on a level surface that is stable and will not move. Give your child the items to stack and ask your child to build a structure with them. When they are satisfied with their structure, tell them that an earthquake is coming. Grab the board on opposite ends and shake it back and forth gently, explaining that this is what happens when there is an earthquake. Encourage your child to observe what is happening to their structure. Did it change slowly or quickly? What do you think would happen to a building or mountain that was standing where there was an earthquake? Finally, show your child the video listed in the materials section about landslides. Explain that sometimes earthquakes can cause the layers of earth on top of the magma to separate. This can result in a landslide, where the top layer of dirt and rocks slips over the layer underneath it. Landslides can affect the surface of the earth by breaking down mountains, cutting through mountainsides, and deposition of materials.

Title of Lessons 16: Fast Change: Volcanoes and Lava Flow

Standards Taught: 5.S.5.1, 5.D.5.1.3, Supplemental 5.S.2, 5.S.2.1.c, 5.S.2.2, 5.S.2.2.a, 5.S.2.2.b, 5.S.2.2.c, 5.S.2.3

Materials:	**Preparation:**	**Implementing the Lesson:**
Clay, playdoh, sand, or dirt Vinegar Baking soda Red Food Coloring An area where your volcano can erupt without making a mess Photo from Observation Sheet 16	Mix the red food coloring with about 1 c. of vinegar	Briefly review the following vocabulary words with your child: erosion, weathering, deposition, tectonic plates, earthquakes, and landslides. Explain that there is another way that the movement of tectonic plates can change the earth quickly: volcanoes. Ask your child to tell you what they know about volcanoes and watch this video (https://www.youtube.com/watch?v=mAa8eHiU1YU) together of a recent volcanic eruption in Hawaii. Ask your child if they noticed what they news anchor said happed just before the volcano: an earthquake. Explain that when the plates move, sometimes the magma (or lava) that is on the second layer of the earth can come up through the top layer (the ground we live on). This is called a **volcano**. Explain that, like other mountains, volcanoes are formed along fault lines or hot spots (places where magma is close to the surface in the middle of a plate). They are the result of igneous (volcanic) rock **uplift**. This type of uplift can also create islands. Show your child a map of the Hawaiian islands, explaining that the hotspot that created them is below the plate that they were formed on. As magma rose from the hotspot it was cooled by the ocean water, turning into rock and creating an island. As the plate moved, so did the island. The hotspot, however, stayed still. When another island was created, it was in a different place on the plate (because it moved) than the first. Now, there is a chain of islands in that area. Help your child build a volcano model from the clay, playdoh, sand, or dirt. Be sure to leave the center of your volcano hollow. When your volcano is built, put the baking soda (a few tablespoons) inside. If you want your lava to really erupt, add some dish soap in, too. Allow your child to pour the red vinegar into their volcano. This will make a mess so be sure to place it somewhere you don't mind the mess (bathtub, sink, outside). After the eruption, point out that there are some parts of the outside of their volcano where the lava flowed more. Ask them if the lava stayed only on their volcano. Explain that lava flows, like water, and can spread out over a large space very quickly. Discuss what would happen to trees, houses, or other buildings that were in the lava flow. Point out that they may burn, melt, be pushed away, or buried. Explain that lava flow can create very flat spaces at the bottom of the mountain very quickly. This can create valleys, canyons, new mountains, ponds, or even lakes. Lava flow can also leave behind areas that are flat, but contain several large rocks (made from cooled lava) where it is difficult to grow any plants for a very long time. Show your child the photos from Observation Sheet 16. Explain that these images show an area where a volcano erupted long ago. Point out how flat the land is (no mountains), how barren it is (few to no plants), and how many pieces of lava rock are still there. Explain that this area used to be a mountain with a forest growing on it. The lava swept away the trees and other plants. Ask your child to answer the questions on the observation sheet.

Observation Sheet 16



1. What are some landforms created by volcanoes and lava flow?

2. What do you think the area in the pictures would look like if a volcano hadn't erupted there?

3. Draw a timeline showing the difference in the time it takes for erosion, weathering, and disposition vs. uplift and volcanic eruption.

Title of Lessons 17: Slowing the Damage

Standards Taught: Supplemental 5.S.2.2.d

Materials:	**Preparation:**	**Implementing the Lesson:**
Videos listed in the lesson		Ask your child what it would be like to be in the middle of an earthquake or volcanic eruption. How would they feel? What would they do? Briefly discuss any examples they know of or experience they have in these areas. Explain that, because we cannot control earthquakes or volcanos and because they can cause so much damage, they can sometimes be scary to us. Learning more about how they work, where they normally occur, and what may happen helps us to prepare and train to be ready if one were to happen. Scientists work on new technology every day in these areas. They study geographic history (history of the earth) to find out when earthquakes and volcanoes have occurred. This helps give them a timeline of how often these things happen in each area, though it is often off by hundreds (or even thousands) of years because we are still learning. Scientists also the landforms around areas where there has been earthquake or volcanic activity in the past. This helps them to see what happened last time an earthquake of volcano happened. It shows them which spots we should avoid building homes in, what areas need to be evacuated if an event were to occur, and how we should prepare and react. Though we cannot yet predict exactly when an earthquake will start or a volcano will erupt, scientists have created new warning systems. Watch the video here (https://www.youtube.com/watch?v=lSw4ERz36MQ) to learn about how earthquake warning systems work. Briefly discuss it with your child and answer any questions they may have. Then, watch the video here (https://www.youtube.com/watch?v=03A2A2hBF8M) about what scientists are learning about volcanoes. Discuss how we cannot yet predict volcanoes and no system exists that can help us to warn others. However, there are warning signs that a volcano may erupt (earthquakes in the area, steam or ash coming from the volcano, a change in the temperature around the volcano, or an increase in magma in the volcano). Scientists watch for these warning signs and issue advisories to those living in the areas around volcanoes if they feel there may be a change of eruption.

Title of Lessons 18: Geosphere: Earth's Layers

Standards Taught: 5.S.5.1.4

Materials:	**Preparation:**	**Implementing the Lesson:**
This chart (https://allinonehomeschool.files.wordpress.com/2019/04/earth_layers_globe.png?w=636) Clay or playdoh A marble or small ball		Ask your child to review how volcanoes erupt. Discuss tectonic plates and the magma below the surface. Explain that these things are a part of the geosphere. (Geo= earth) The geosphere is one of the earth's four systems. It consists of all the layers that make up our planet. It helps our planet to be safe for us to live on. Using the chart, point out and explain The tectonic plates and the land on them (the ground) make up the crust of the earth. The crust is the outermost layer of the planet. The crust is very thin and it floats on the layer beneath it. The crust takes up only about 1% of our planet's composition. The magma found in volcanoes comes from a layer called the upper mantle. This layer is made of a thick, lava-like material. It is what allows the tectonic plates to move around. The lower mantle, just below the upper mantle, is also made of magma. The magma here is hotter and more liquid. The mantles make up over 80% of our planet. Next comes the core. Though we cannot yet dig deep enough to study the core, scientists believe that this part of the earth is mostly metal (iron and nickel) which has cooled since the planet's creation. The core is thought to be mostly solid because of pressure from the other layers sitting on it. It may be surrounded by some liquid, known as the outer core. It is thought that the core spins within the earth and is the source of the magnetic poles. Ask your child to create a model of the layers of the earth using the marble as the core and the clay as the other layers. Ask them to review each layer as they work. Finally, ask them to use their model to teach someone else about the geosphere.

Title of Lessons 19: Hydrosphere: Water Sources

Standards Taught: 5.S.5.1.2, 5.S.5.1.4		
Materials: This video (https://www.youtube.com/watch?v=_mM9W71_nVA) Materials for your child's water chart Observation Sheet 19	**Preparation:**	**Implementing the Lesson:** Ask your child to review the geosphere with you briefly. Tell them that today we are going to learn about another earth system: the hydrosphere. Point out that hydro means water. Watch the video with your child. Briefly discuss what you've learned from the video about **reservoirs**, **freshwater**, and **saltwater.** Ask your child to answer questions 1-2 on the observation sheet. Tell your child that today they are going to make a chart of some kind to represent the amount of fresh and saltwater in the world. This could be any type of chart. The man in the video used a pie chart. Your child may want to use coins, blocks, a bar graph, etc. Allow them to be creative and use methods they may not have used before. After your child has created their chart, ask them to answer the final questions on the observation sheet.

Lesson 19 Observation Sheet

1. What is the difference between freshwater and saltwater?

2. Name at least 5 reservoirs (places that hold water) found on the earth. Include at least on that is frozen, one that is below the ground, and one that is very large.

3. How much of the world's water is currently freshwater?

4. How much of the world's water is saltwater?

5. Why is it important to conserve (use wisely) our freshwater?

6. Can you destroy water?

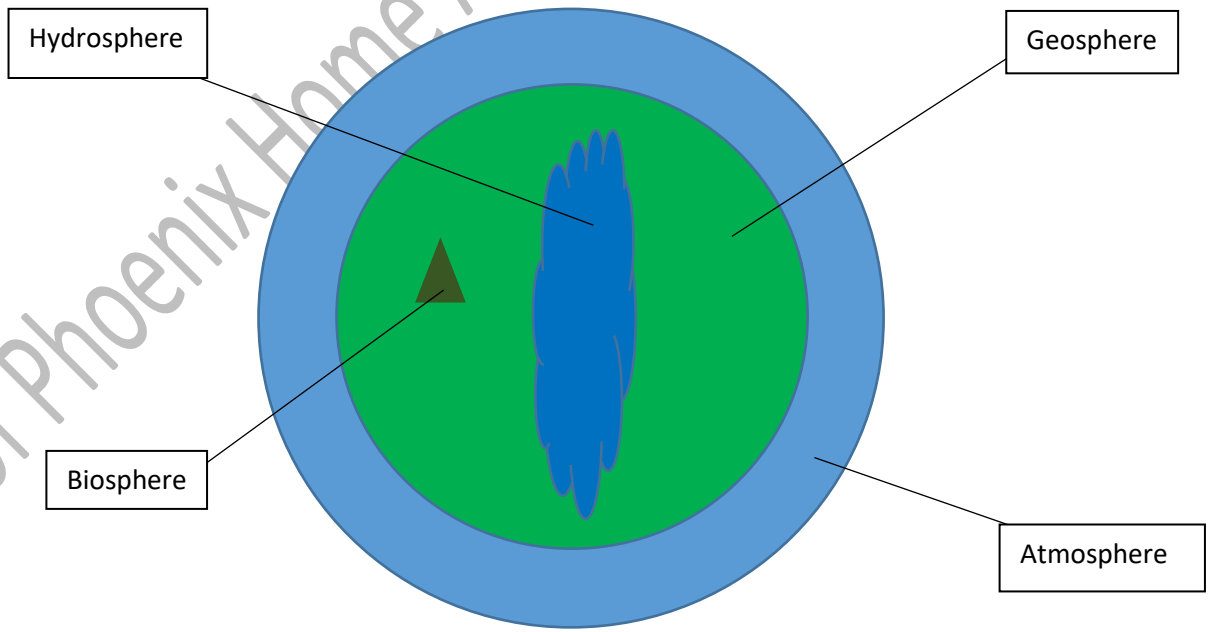
7. Can you name a way to make saltwater into freshwater that the man in the video did not talk about? (hint: water cycle)

Title of Lessons 20: Biosphere: Earth's Living Things

Standards Taught: 5.S.5.1.4		
Materials: Camera that your child can safely use	**Preparation:**	**Implementing the Lesson:** Ask your child to review the two systems we have learned about so far: the geosphere and hydrosphere. Explain that today we are going to learn about the biosphere. Bio means life so the biosphere deals with anything that is alive. Ask your child to name some of the things that make up the biosphere. Allow them to name several plants and animals. Tell your child that today we are going to document the local biosphere. Take them around your area allowing them to stop and take photographs of any plants or animals they may see that catch their attention. Remind your child that humans are animals and, therefore, a part of the biosphere system. As your child finds different living things, discuss their roles and impact on the world around them. Allow your child to develop their pictures and create a biosphere scrapbook.

Title of Lessons 21: Atmosphere

Standards Taught: 5.S.5.1.2

Materials:	**Preparation:**	**Implementing the Lesson:**
This video (https://www.youtube.com/watch?v=G4ZIa3qkFkI) Paper and something to color with		Tell your child that today we are going to learn about the last of the four earth systems: the atmosphere. Ask them if they know anything about the atmosphere. Take your child outside and ask them to look up. The atmosphere is a system that surrounds the entire earth. Watch the video with your child. Discuss what would happen if the atmosphere was not there to protect our planet. Discuss the differences in the environments on other planets and their atmospheres. Point out that other planets do not have life on them because they do not have the same atmosphere, hydrosphere, or geosphere as ours. Ask your child to draw and label a diagram of the four systems of the earth on the paper. It could look something like this: 

Title of Lessons 22: Interaction of Earth's Systems

Standards Taught: 5.S.5.1.4		
Materials: Video found here (https://www.youtube.com/watch?v=uJmfY19sTGk)	**Preparation:**	**Implementing the Lesson:** Read Genesis 1 with your child, asking them to point out which biosphere each section discusses. Point out that each system was created at different times, but for specific purposes. If we were to change any one system just a little bit, the earth would not be able to sustain life and we would not be here. Point out that each system protects a part of our lives, but they also work together. They hydrosphere working with the atmosphere, for example, creates rainstorms that help us to grow our food and have the water we need throughout the earth. The biosphere (plants) grows on the geosphere. Each system helps the other in some way. Ask your child if they can name a few examples of the systems working together to ensure we get what we need. Allow your child to watch the video and briefly discuss the different interactions shown. Answer any questions they may have.

Title of Lessons 23-26: Interaction of Earth's Systems

Standards Taught: 5.S.5.1.4, 5.S.5.1.5

Materials:	**Preparation:**	**Implementing the Lesson:**
Varies depending on what event your child chooses	Varies	This lesson is a week-long project covering Standards 5.S.5.1.5. The materials, prep, and method will vary depending on your child's choices. The idea behind this project is for your child to choose a single event in which the different earth systems affect human life and to design a way to mitigate the impact of that event on humans. The event examples given in the standard are: landslides, earthquakes, tsunamis, blizzards, and volcanic eruptions. This year, my child chose tsunamis. This is how we are going to carry out the experiment: Day 1- Discuss what a tsunami is (a giant wave) and which earth systems it is caused by (hydrosphere and geosphere). Discuss and research what happens to different earth systems when a tsunami occurs. Discuss and research the impact of tsunami's on human life. Day 2- Using a bathtub as an ocean, experiment with different ways to create your own min-tsunami. Using a wooden board that floats on top of the water to represent our tectonic plate, build a simple human village, city, or town complete with structures, human, and plant life using any supplies your child needs. Place the board in the "ocean" bathtub and create a tsunami. Ask your child to observe and record what happens to human life in the event of the tsunami. Compare this to the data previously researched. Day 3- Allow your child to think of and implement some ideas to protect their village from the next tsunami. Test each idea, noting which one works best and record the data. Ask your child to research ways that scientists have found to protect human life in the event of tsunamis. Allow your child to try those for their village if they like and record what happens. Day 4- Draw a conclusion about what method best protected their village. Write a one-page report on their findings including a summary of their problem, hypothesis, experimentation, data, and findings.

Title of Lesson 27: How Plants Get Energy: Photosynthesis

Standards Taught: 5.S.3.1

Materials:	**Preparation:**	**Implementing the Lesson:**
Solar panel and something it runs on (light, toy, etc) This image (https://www.science-sparks.com/wp-content/uploads/2020/04/Photosynthesis-Diagram-1024x759.jpg) A plant Two cups Potting soil Water Two seeds of the same type A dark place in your home A bright place in your home		Review with your child the basic needs of plants: water, soil, and sun. Explain that, like animals, plants also need air. However, plants do not use oxygen. They use carbon dioxide. Ask your child to take a deep breath in. Explain that when your body breathes in air, it is working to get oxygen molecules to survive. The lungs and heart work together to take that oxygen to different parts of your body through your circulatory system (in your blood). Ask your child to breathe out. When your body deposits oxygen in a part of your body, your body uses it as an ingredient to make energy. This process creates molecules of carbon dioxide, a gas that is poisonous to your body. Your blood then carries this gas back to your lungs where you breathe it out. Show your child the photosynthesis image. Explain that like us, plants take in certain things that they need to grow and exhale the things they don't. Ask your child what the roots of the plant bring in (water and minerals). Explain that below the ground, the plant works to get the nutrition it needs. However, above the ground is where most of the work is happening. Point out on the carbon dioxide on the image. Explain that plants need carbon dioxide to survive and take it in through the leaves. Next, point to the sunlight on the image. Explain that much of a plant's energy comes from the sun. The leaves also absorb sunlight, converting it into energy for the plant to grow, produce seeds, and live. Show your child the solar panel. Explain that the solar panel is like the leaves of a plant. It collects the energy that the sun gives us. Allow your child to attach the solar panel to the thing it will run if necessary. Next, ask your child to place the item in the sun until it is working. Discuss how this energy is the same energy plants use in the process of **photosynthesis.** Explain that the plant uses the water, carbon dioxide, and energy from the sunlight to produce new glucose (sugar) and new plant matter for growth. This is how plants get the energy they need to survive, to grow taller and wider, and to produce fruit. Most of the plant matter created comes from the water, sun, and carbon dioxide, not from the soil. Discuss the byproduct of photosynthesis, explaining that like our bodies, plants produce a gas that they do not want in their bodies. Plants use carbon dioxide and convert it into oxygen. This means that plants and animals have a mutualistic relationship. They help each other survive. Animals take the waste of plants, oxygen, and create carbon dioxide, which the plants need. Plants take the oxygen and produce the waste product of oxygen, which the animals need to survive. Using the plant you have as a model, ask your child to explain the process of photosynthesis to someone. Finally, allow your child to plant the two seeds, each in a different cup. Place one cup in a dark place in your home and another where it will get a lot of light. Point out that the plants have the same soil, so they should have access to the same nutrients in that way. Tell your child to water each plant with the same amount of water over a few week period. At the end of the experiment, place the plants together. The one that was in the dark area should be smaller than the one that had plenty of sun. Explain that this shows that the growth of plants and creation of plant matter requires sunlight.

Title of Lesson 28: How Animals Get Energy

Standards Taught: 5.S.5.3.2

Materials:	**Preparation:**	**Implementing the Lesson:**
This image (FullSizeRender.jpg (1235×758) (bp.blogspot.com)) This image (https://globalchange.umich.edu/globalchange1/current/lectures/kling/ecosystem/zebra2.gif) An apple or other sweet fruit		Briefly review the process of photosynthesis with your child. Then, ask your child how animals (like themselves) get energy. Discuss the needs of animals (food, water, shelter, air). Point out that we also need the sun, like plants, but most of our energy comes from the food that we eat. Hand your child the fruit. Ask them to take a bite. Then, ask them to explain how their bodies take that bite and turn it into energy. Help them explain as needed, using the first image as a reference. First, we take a bite of the apple with our teeth. The teeth and saliva (spit) in our mouths begin to break down the food into smaller pieces for our bodies to use. Next, we swallow the food, sending it down our esophagus and into our stomach. Here, acid in our stomach breaks down the food, separating the glucose (sugar) that was created in photosynthesis by the plant that grew the food. The glucose and other vitamins and minerals are then sent into the bloodstream, attaching to blood cells just like oxygen does when we breathe. Blood cells take this glucose, along with a chemical that our body produces called insulin, to each cell in your body. These cells then use it for energy to grow, heal itself, move, and keep you warm. Ask your child to repeat the four things our bodies use energy from the food that we eat for. The parts of the apple our body does not need continues on in the digestive system and exits our body as waste (pee and poop), which, in turn, helps give nutrients to plants through the soil so that they can continue to grow. Note that when we eat meat, we are eating the body of another animal. This animal has already eaten plants and has glucose in its cells, which is how we get energy from meat. Show your child the second image, explaining that every living thing gets most of its energy from the sun, whether through photosynthesis or eating a product of photosynthesis. Go through the cycle, showing your child that the sun that shines on plants allows them to grow and be eaten. They are called producers because they produce food. Then, the animal, a consumer, uses the glucose from the plant to grow. The waste from the animal, in turn, helps the plants to continue to grow. Explain that this system is called an ecosystem, with all the living organisms relying upon each other to survive. If there were no plants, the animals would have nothing to eat and would die. In turn, if there were no animals to fertilize the soil and produce oxygen, the plants would all die.

Title of Lesson 29: Decomposers

Standards Taught: 5.S.5.3.3

Materials:	**Preparation:**	**Implementing the Lesson:**
This image (from the previous lesson) This video (https://www.youtube.com/watch?v=zGkSDcgzOl4) Observation Sheet 29 Colored Pencils, Crayons, or Markers		Show your child the image from the previous lesson. Ask them to briefly review how both plants and animals get most of their energy from the sun. Ask your child to point out the step that we haven't discussed yet. Discuss decomposers. Explain that decomposers can be fungi, bacteria, or insects and worms. Decomposers are the things that break down dead plant and animal matter so that it can be absorbed back into the soil. This allows minerals and nutrients to be absorbed by plants through their roots. The process also produces different gases, like carbon dioxide and oxygen, which help plants and animals as well. Examples of decomposers are worms, flies, mushrooms, and mold. Watch the video with your child. Then ask them to answer the first question on Observation Sheet 29. Using the remainder of the observation sheet, have your child draw an example of an ecosystem including the things each organism uses and produces. Use the coloring materials for this project. Label the process with the following terms: photosynthesis, plant, sunlight, water, carbon dioxide, glucose, oxygen, producer, consumer, animal, waste, and decomposers. Ask your child to use their finished chart to teach someone else how the sun produces energy for all living things.

Observation Sheet 29

1. What types of decomposers may be working on this fallen tree?

Title of Lesson 30: Protecting the Ecosystem: Conservation

Standards Taught: 5.S.5.3.4

Materials:	**Preparation:**	**Implementing the Lesson:**
This video (https://www.youtube.com/watch?v=JjTH2CtneJA) This article (https://www.churchofjesuschrist.org/study/manual/gospel-topics/environmental-stewardship-and-conservation?lang=eng) Observation Sheet 30	Varies	This lesson will vary based on what your child chooses as their conservation project. Be willing to spend time helping your child collect data, research, test and try out different ideas, and work to find a solution on their own. Ask your child to review how an ecosystem works. Discuss what could happen to the other organisms if one were to disappear. List the resources (sunlight, water, soil, shelter) needed to sustain the ecosystem. Discuss what could happen if there was a shortage (not enough) of one of these resources. Explain that, as human beings, we have been asked by Heavenly Father to be stewards of the earth, trusted to take care of it. Ask your child to read the article and discuss some ways your family practices good stewardship. Some examples are: planting a garden, sharing produce with others, growing trees, making your property beautiful, recycling, reducing waste, being moderate in how you use resources, turning off water and/or lights when not in use, etc. Ask your child to choose a method of protecting the ecosystem that they are interested in. Allow them to research how that method works, using Observation Sheet 30 as a guide. Then, ask your child to design their own method of this type of conservation. If your child chooses recycling, for example, they may design a recycling organization station in your home. If they choose preserving food, they may find a method for collecting excess produce from grocery stores, farms, and restaurants and distributing them to a food bank. If they choose to conserve water, they may design a way to use wastewater from inside the home to water plants outside. Allow your child to test, modify, and correct their method as needed. Ask them to finish the questions on Observation Sheet 30 when they are finished.

Observation Sheet 30

1. What is stewardship and who has charge us with being good stewards over the earth?

2. How are you going to protect the ecosystem around you? What resource did you choose?

3. How much waste is produced in the U.S. each year from the resource you are trying to protect?

4. What methods already exist to conserve this resource?

5. Do you plan to improve upon an existing method of conservation or create a new one?

6. If you are going to improve upon an existing method, what is wrong with the way we are doing it now?

7. Draw a diagram of your method, including labels, and explain how it will help.

7. After the first test of your method, what went wrong? What went right? How might you improve your method?

8. After improving your method, does it work better than the methods that already exist?

9. Does your conservation method help solve the problem you identified?

10. How does your method help ensure every organism in your ecosystem has its needs met?

11. How can you share this method with others and encourage them to conserve resources, too?

Title of Lesson 31: What is a Trait?

Standards Taught: Supplemental: 5.S.5, 5.S.5.1, 5.S.5.1.a, 5.S.5.1.b, 5.S.5.1.c, 5.S.5.1.e

Materials:	**Preparation:**	**Implementing the Lesson:**
Image 1 (family_tree.gif (468×247) (berkeley.edu)) A program with the ability to create pie charts Family members your child can contact and interview Image 2 (https://qph.fs.quoracdn.net/main-qimg-ed8620d29e89c8788c1e9209e24577db) Image 3 (https://www.nsf.gov/news/mmg/media/images/1175636_orig.jpg)		Ask your child to describe their physical characteristics, or the way they look. This description may include hair color, eye color, body type, height, and distinguishing features (small nose, big feet, etc). Ask your child to compare their own physical features with those of their mother and father. What traits do you have in common with mom? How do you look like dad? Explain that all living organisms have some physical characteristics that come from their parents. Point out a few of the traits you have in common with your own parents, using photos to show them if you can. Explain that these are called inherited traits. Show your child the image, pointing out the traits that the children and grandchildren have in common with the first generation (hair color, eye color, bad eye sight). Explain that inherited traits are passed down from parents to children in our DNA. DNA is like a code that tells our body's cells how to develop. From the moment we started to grow in our mother's womb, these traits were a part of us. Sometimes these traits help us to survive. Other times, they may make life more difficult. For example, if we inherit good eyesight, it is easier for us to do the things we need to do. If we inherit bad eyesight, however, we face additional challenges. Using examples around your house (house plant, pets, etc), point out examples of parent-to-offspring trait similarities. Look online for images of young offspring (if your examples are older) or parents (if your examples are younger) and ask your child to point out similarities between the two. Point out some of the ways inherited traits help or hinder the survival of offspring. Some examples are: camouflage, small size, shells, athletic abilities, etc. Explain that variations in traits can put offspring at risk. For example, if a butterfly's coloring is different than the others, it may stand out to predators and be killed. Explain that in some cases offspring and parents look completely different. However, when the offspring mature, they show inherited traits. Use the second image (tadpole to frog) to illustrate this point. Ask your child to name a few more examples of this (caterpillars/butterflies, ladybugs, seeds/plants, etc). Use image 3 to point out that some inherited traits come in different variations. Tell your child that each of these flowers is the same species. Ask them to point out similarities they see. For example, each flower is the same shape and roughly the same size. They have the same amount of petals and same structure. Next, ask your child to tell you what is different. The color of each flower is different. This is call a variation and shows us that seeds one set of parent plants can produce different offspring variants. Finally, ask your child to choose five of their own traits and write them down on a piece of paper. Allow them to interview at least 10 family members (grandparents, aunts and uncles, father and mother, siblings, cousins), asking them if they exhibit these each of these traits. Encourage your child to put a tally mark down for each family member that exhibits each trait. Then, ask your child to create a pie chart for each trait, showing what percentage of their sample size exhibits each one. Allow your child to share their findings with the family members they interviewed, teaching them what a trait is and how it can be passed on to offspring. See if your child can trace any traits in their siblings or cousins back to their grandparents.

Title of Lesson 32: Inherited vs. Learned Traits

Standards Taught: Supplemental: 5.S.5.1.d		
Materials: Observation Sheet 32 (multiple pages)	**Preparation:** Cut the cards out on Observation Sheet 32 and mix them together	**Implementing the Lesson:** Ask your child to review what a trait is and explain how we gain inherited traits. Emphasize that inherited traits are passed from parent to offspring through DNA. Ask your child if they get to choose their inherited traits. Explain that they do not get to choose these because they are a part of them from the time they begin to grow. Migration and hibernation are other examples of inherited traits because animals just know how to do them from the time they are born. However, some traits, are chosen and learned. Ask your child to describe, step-by-step how they do one of their chores. Where did they learn to do that chore the way they do? Explain that they watched and were taught by a parent to do that chore in that way. Others may do it differently, based on what they saw and learned from their parents. For example, maybe your family loads a dishwasher with the cups on the top rack while another family puts them on the bottom. This is an example of a learned trait. Name a few more examples of learned traits: a parrot talking, a dog doing tricks, the language a person speaks. Point out that the animals listed were not born knowing how to do these things, but they learned them from their parents and others around them. Ask your child to name three examples of a learned trait. Separate the cards from Observation Sheet 32 into two piles. Place one pile face down in front of your child and the other in front of you. Tell your child that this game is a race. They must separate their cards into two piles: "inherited traits" or "learned traits" Whoever does it fastest, with the most correct answers, wins. Play the game a few times with your child, correcting them as needed and reminding them of the difference between inherited and learned traits.

Observation Sheet 32

blue eyes	blond hair	short stature	thin
speaking French	clothing style	hair style	raccoon opening a trash can lid
petal shape	leaf shape	petal color	spots on a cheetah
seagull chasing someone with food	cat meowing at a person to be pet	goldfish swimming up when it sees its owner	caterpillar growing a chrysalis

feather pattern	ear shape	skin color	migration
riding a bike	lion hunting for food	rolling your eyes	singing a song
curly hair	freckles	brown eyes	giraffe spots
fur color	tail length	eye-sight	a pig coming when they are called

Title of Lessons 33-36: Exploration

Standards Taught: These weeks are all about exploring things your child is interested in learning. They may be research projects, field trips, or experiments. Make it fun.		
Materials: Vary depending on the experiments you choose	**Preparation:** Vary depending on the experiments you choose	**Implementing the Lesson:** Part of science is being willing to ask questions and work to find answers. Ask your child to tell you what they would like to learn about or build in science this month. Maybe they've seen an experiment someone else did. Perhaps they've been wondering how something works. Or maybe they have a new book full of engineering ideas. Allow your child to choose four science experiments based on their own interests. Collect supplies, prepare, and carry out these experiments with your child. Spend time researching the science behind them and teach your child what you learn. Chart, graph, record, and collect and present data from your experiments. Encourage your child to share what they learn with family, friends, or others. *This is a great time for a co-op science fair