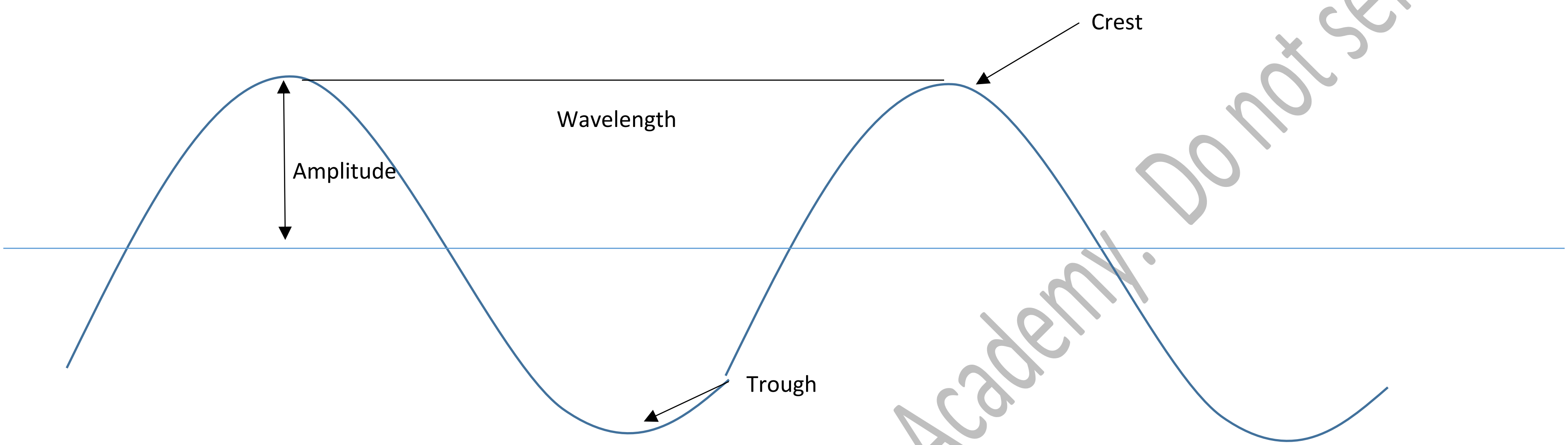
***Standards listed in bold font are Utah Core Science Standards. Those that are not in bold are supplemental.**
****Words that are in bold font in the lesson are vocabulary words that your child should know by the end of the lesson.**
*****Cited Sources: OER Textbook, 4th Grade**

Title of Lesson 1: Wave Patterns (2 pages)

Standards Taught: 4.3.1		
Materials: Baking Dish or Bowl Water Stopwatch/Timer Observation Sheet 1	**Preparation:**	**Implementing the Lesson:** Fill a shallow baking dish or bowl ¾ full of water. Set the dish in front of your child and let the water calm until it is still. Then, ask your child to make small waves in the water without spilling it out of the dish. Explain that there may be more than one way to make waves and encourage them to experiment. Ask your child if they see any patterns in the waves they create. Next, show your child this video of ocean waves. Again, ask them to describe any patterns they see in the waves. Explain that waves can occur in any body of water. Watch this video of waves in a lake and this one of waves in a river. Discuss the patterns and similarities your child sees in all four examples of waves. Point out that waves move water up and down, often coming over and over again at regular time intervals. All waves have crest (the highest point of the wave) and a trough (the lowest point of the wave). Waves can be measured in amplitude (or height) and wavelength (distance between crests). See the image on Observation Sheet 1 to point out these important terms. Explain that there is one more measurement in observing waves: frequency. Frequency is simple the number of waves that pass one place in a given amount of time. Waves with high frequency are closer together and come quickly, one right after another. The lower the frequency, the fewer waves pass through in the same amount of time. Ask your child to make waves in their dish/bowl again, this time finding a way to alternate frequencies. Ask your child to create a wave pattern with a high frequency, then have them choose a spot in the dish/bowl to count the number of waves that pass by in 15 seconds. Use the stopwatch or timer to help them keep time and ask them to record their count on the observation sheet. Repeat the experiment, this time at a slower frequency. Discuss differences and similarities in amplitude and wavelength at different frequencies. Point out that waves with higher amplitudes and wavelengths are more likely to travel further before they calm. This is because the waves are actually moving energy. Explain that when your child creates waves in their dish/bowl, they are adding energy to the water, causing it to move up and down. This force moves through the water, pushing an up and down motion throughout the entire bowl. As the energy pushes more water, it starts to diminish, or lessen. Eventually, there won't be enough energy left to move the water any longer and the waves stop. Ask your child to look at their water now. Are there still waves? Why or why not? Point out that the bigger the wave, the more energy it has, so it will move water for a longer amount of time and through further distances. Likewise, a smaller wave will run out of energy more quickly and not be able to travel as far or long. Next, ask your child if they can explain why there are waves in different bodies of water. Point out the fact that there isn't someone pushing the water in the ocean or lake, like in their experiment. Where do waves come from? Explain that

		though the movement of people or animals can create waves, most are created by the wind. As the wind blows across the top of the water, it transfers energy into the water, causing it to move. Hurricanes are an extreme example of this. Ask your child to blow across the top of the water in their dish/bowl until they cause waves. Another cause of waves is gravity and interactions with objects. Most rivers and streams flow downwards because the water is being pulled by gravity. As the water moves downwards, it bumps against objects such as rocks, sticks, or the sides of the river. This causes the energy from the downward pull of gravity to change direction and create waves. Ask your child to tilt their bowl/dish slightly to observe waves created by downward motion. Waves can be caused by earthquakes under the body of water. In the ocean, especially, there are several large fault lines that can cause earthquakes. The energy of the earthquake causes motion in the water. While this motion usually doesn't seem any different than other waves while out in the open sea, as the waves reach shore their amplitude increases. By the time the energy of a tsunami reaches shore, the waves can be hundreds of feet tall. Tsunamis have a long wavelength, meaning the crests are usually far apart from each other. However, they can cause entire cities and islands to be destroyed and put humans and animals in danger. See the image here of the recent tsunami in Japan. Then, ask your child to shake the sides of their dish/bowl to see how an earthquake could cause a tsunami. Finally, ask your child to answer the remaining questions on the observation sheet.

Observation Sheet 1



	High Frequency	Low Frequency
Number of Waves		

What are some causes of waves?

____

What is a tsunami and does it start?

____

What are some patterns all waves share?

____

Title of Lesson 2: What Affects Waves?

Standards Taught: 4.3.1		
Materials: Bowl/dish of water from the previous lesson 2 eyedroppers full of water Rope Doorknob or other fixed object a rope can be tied to	**Preparation:**	**Implementing the Lesson:** Briefly review the previous lesson on waves with your child, asking them to define the following terms: wavelength, amplitude, tough, crest, and frequency. Discuss some of the causes of waves and the energy transfer that occurs, reminding your child that waves are a movement of energy through water. Then, ask your child what they think happens as two waves traveling in different directions meet. Point out that this means energies are traveling in opposite directions and interacting with each other. What happens to the energy? Give your child the two eyedroppers. Ensure the water in the bowl/dish is calm. Then, ask your child to squeeze a drop of water out of each eyedropper on opposite ends of the dish/bowl and observe what happens. Pay close attention to the result when the waves meet. Ask your child to discuss what happens to the wavelength, amplitude, and frequency of the waves that have met? Explain that, because the energies of the waves are moving in opposite directions, they cancel each other out. This makes smaller waves with less energy (destructive interference). Likewise, if two waves meet that are traveling in the same direction, they will add to each other, creating a stronger wave (constructive interference). This is known as wave interference. Allow the water to settle in the bowl/dish. Then, ask your child what they think happens if a wave meets an object that will not move, such as a wall or a rock. Point out that the energy of the wave has to go somewhere, but cannot transfer into the solid object. Ask your child to squeeze out a single drop of water at the center of the bowl/dish. Point out that the sides of the bowl/dish are solid and will not move. Ask your child to observe what happens to the waves as they meet the sides of the bowl/dish. Why do they think this is the result? Explain that this concept is known as wave reflection. The waves hit the solid object and the energy bounces back in the opposite direction. This creates interference with the waves behind it, which lessens the energy of both waves. This destructive interference may create standing waves (or a smooth surface). Finally, to demonstrate the concept of reflection again, tie a rope to a doorknob or other secure object. Ask your child to hold the rope far enough from the doorknob that it is not touching the ground, but still has some slack. Then, ask your child to create waves in the rope by quickly moving it up and down. What happens to the waves when they meet the doorknob?

Title of Lesson 3: Light and Sound Waves

Standards Taught: 4.3.2		
Materials: Observation Sheet 3 Mirror	**Preparation:**	**Implementing the Lesson:** Ask your child to tell you what they've learned about waves so far this unit. Remind them of the definitions of the following terms and ask them to give you an example of each from their previous observations: amplitude, wavelength, crest, trough, wave interference, and reflection. Next, ask your child if water is the only material waves can travel through. Remind them of their experiment with the rope, which created waves. Explain that, since waves are a transfer of energy through matter, they can travel through things other than water. One example of this is light waves. Explain that light waves are waves of energy that travel through the air and produce light. Our bodies use light waves every day to see. These waves travel through the air, hit the objects we see, reflect off of them, and travel into our eyes and brain. These pathways are called rays. The pathway light waves travel on to reach an object is called incident rays while the path reflected waves take is called reflected rays. See the Image 1 on the Observation Sheet 3 for more information. The reflected light then travels into our eyes through the pupil, the black dot in the center of your eye. At the back of the eye, the light waves hit the retina, which converts the light waves into signals that our brain can understand. Signals from the retina travel up the optic nerve and into the brain. Signals from both eyes meet and the brain turns two images into one using information from both eyes. See the image here to help explain this concept. Explain that the brain does something else with the signals from our eyes. It turns the upside down image right-side up so we can understand it. Put your child in front of a mirror. Explain that the reflection they see is a result of light waves reflecting from the shiny surface of the mirror. Next, ask your child to read the word in Image 2 of the Observation Sheet. Ask them if there is anything strange about the words (they are backwards). Ask your child to hold the edge of the image up to the mirror and read the reflection. What happens to the words? Point out that, because the mirror is a reflected wave, it shows the opposite direction of reality. Use Image 3 from the Observation Sheet to point out the same concept in light wave reflection. Note that the cabin in the water is upside down. Explain that our brain automatically understands that the image our eyes see is a reflection and turns it right-side up so that we can understand what we are seeing. Likewise, our eyes and brain work together to interpret color. Ask your child to look around the room and name the colors he/she sees. Explain that all light waves carry every color. Why, then, do we only see one color when we look at an object? Explain that each object's surface reflects some light waves. However, each surface also absorbs, or swallows up, some light waves. If an object is red all of the different colors in a light wave are absorbed except one: red. The red light waves are reflected, allowing our eyes and brain to see the color. Ask your child to answer the questions on the Observation Sheet.

Observation Sheet 3

Image 1

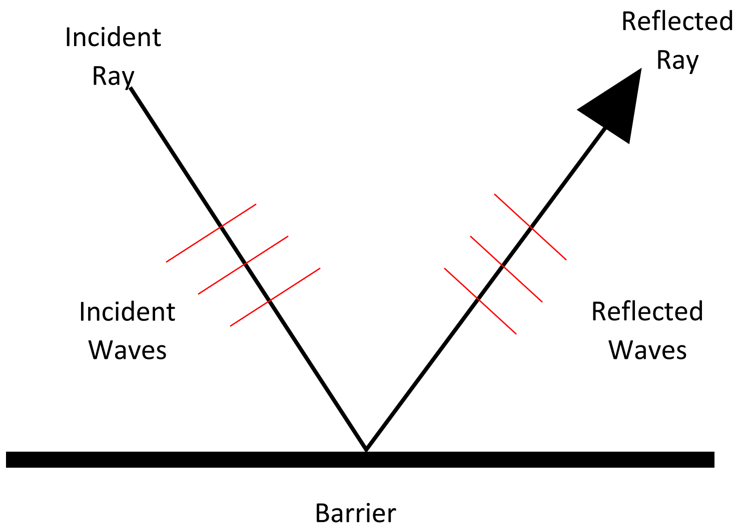


Image 2

Image 3

1. How do water waves and light waves act in similar ways?

____

2. What happens when light is reflected off a barrier and enters our eyes?

____

3. Why does a sunflower look yellow?

____

Title of Lesson 4: Sharing Information Using Waves

Standards Taught: 4.3.3		
Materials: Varies, depending on the method your child decides to use to transfer information	**Preparation:**	**Implementing the Lesson:** Briefly review what your child has learned about waves so far. Discuss both water and light waves and remind them of important definitions. Next, read the following situations to your child. Ask them to choose one they would like to solve using waves. You are camping with a friend and it starts to get dark. You decide to walk into the forest, but become lost. As it gets darker out, you call your friend on your radios, telling them you can't find your way back to camp. However, not knowing where you are, your friend can't tell you how to get back to camp. You know you aren't far from camp, but you don't know which way to go. Your friend has a flashlight, matches, a whistle, and a camera with them. How do you use waves to find your way? (some possible solutions are: ask your friend to light a campfire that you can see, ask your friend to blow a whistle or make noise, ask your friend to flash a flashlight or flash their camera). You are living across the country from your aunt and uncle when an earthquake hits. The force of the earthquake knocks out power and phone lines and television. You want to let your aunt and uncle know you are safe. How can you use waves to do this? You have access to a telegraph, a charged satellite phone, and a charged laptop. (some possible solutions are: use Morse code and a telegraph system to communicate across long distances, use a satellite phone, use a laptop with a charged battery to send an email, which uses radio waves and satellites). You need to study a certain star for school, but it is difficult to see because it is so far away. You need to map its exact location for your project, but can't find it with your naked eye. You have a dark night with a clear sky, a set of binoculars, and a telescope. (some possible solutions are: use binoculars, use telescopes- both of which use mirrors and can gather more light than your eye alone). You are exploring a cave with several twists and turns. The cave is dark, but you use your headlamp to see ahead of you. You are carrying ropes, a first aid kit, and some small mirrors. Ahead of you, there is a sharp turn and you cannot see any further. You hear a noise, a thunk and a scream. You know your friend is ahead of you and likely fell. He tells you not to come around the corner because there is a slippery rock you can't see. How do you use light waves to get around the corner without falling to help your friend? (some possible solutions are: hang the mirror on the corner to reflect light from your lamp and see what is ahead, ask your friend to describe the area and how to get around the slippery rock) You are walking home one day when fall into an old well. You scream for help, but no one can hear you for a long time. You start to lose your voice and can no longer call for help. You hear people talking above you, but they don't know where you are. You know they can help you get to safety, but they have to find you first. You have a backpack with a flashlight, mirror, whistle, and phone in it. There is a large stick lying beside you. How can you use waves to help you out? (some possible solutions are: turn the flashlight on and off to signal the others, use the mirror to reflect light and

		signal the others, blow the whistle, call someone on your phone, bang the stick against something to make noises the others can hear). Using the scenario you used, re-create the situation in a safe way. Perhaps you have a small grove of trees that can serve as a campground (or a room with lots of furniture), family living far away, a telescope, a hallway with a sharp turn, or a large box you can use as a pretend well. If possible, give your child the same supplies that are listed in the scenario they've chosen. Then, ask them to search for a way to use waves to signal the other party. Remind your child that light, sound, water, and radio waves all act in similar ways. Ask your child to explain how the waves in their solution work. If they don't know, help them to research the answer.

Title of Lesson 5: Utah's Wetlands

Standards Taught: 4.S.5, 4.S.5.1, 4.S.5.1.a, 4.S.5.1.b, 4.S.5.1.c, 4.S.5.1.d, 4.S.5.1.e, 4.S.5.2, 4.S.5.2.a, 4.S.5.2.b, 4.S.5.2.c, 4.S.5.2.d, 4.S.5.4, 4.S.5.4.c, 4.S.5.4.d		
Materials: Observation Sheet 5	**Preparation:**	**Implementing the Lesson:** Review with your child what they know about wetlands. Remind them that wetlands are an **environment** in which the ground is wet year-round or during a certain season. Places like rivers, streams, lakes, and marshes are wetlands. Many plants and animals are adapted to live in wetlands. Explain that one of Utah's biggest area of wetlands is in and around the Great Salt Lake. However, wetlands exist throughout the state as well, especially near Sevier Lake, the Bonneville Salt Flats, near rivers, and along streams. Wetlands are rare in Utah, making up only about 3-4% of the state. There are many different types of wetlands, ranging from those that are heavily populated with plants such as cottonwood, cattail, and bulrush to those, like the Salt Flats, which have little vegetation. Review the images found here with your child, comparing and contrasting the different types of wetlands shown. Ask your child to remind you what adaptations are. Discuss different adaptations of plants and animals familiar to your child and point out ways these physical or behavioral changes help them to survive in their environment. Then, discuss the unique challenges and needs found in a wetland environment. What adaptations would you expect to see here? Discuss the following plants with your child, explaining that these are commonly found in Utah's wetlands and discussing the **adaptations** of each. Cottonwood trees grow throughout Utah, though they flourish near wetlands. These trees can reach up to 90 feet in height and are characterized by their widely spread branches (which help them reduce competition from other plants) and thick, cracked bark (which protects them from pests and other injuries). Cottonwood trees are known for growing quickly and live for more than 100 years once established. Cattail plants are salt tolerant, allowing them to live in wetlands near the Great Salt Lake. However, they also flourish in freshwater. Cattails often grow in tightly-packet groupings and have adapted to allow the entire plant to live floating on the water. They reproduce through fuzzy, floating seeds or by sending out shoots, which grow into a new plant. However, they have adapted to prevent overpopulation. Cattails can release a toxin that prevents seeds from growing when there are not enough resources available. Their narrow leaves and strong stems prevent them from being moved around by running water. Within their stems is a hollow opening, which allows for the movement of oxygen and other gases the plant needs, so cattails are able to live in low-oxygen environments. Bulrush is a broad term for several different types of plants. These grass-like plants grow in groups and can reach up to 12 feet tall. The stems are pointy, with few leaves, which have serrated edges for protection. These plants need full sun

to make the most of the few leaves they carry. Like cattails, bulrushes can spread through seeds or shoots. Many of the bulrushes in Utah are salt-tolerable and can survive periods of drought.

Next, discuss the following animals, commonly found in Utah's wetlands, with your child. Discuss the adaptations of each and ask your child to identify whether the adaptations are physical or behavioral.

Beavers often make their homes in or near wetlands, especially where cottonwood trees are available. These animals do not hibernate and are often nocturnal. Beavers have a broad tail, which helps them move through the water, and four large teeth that never stop growing and help them to fell trees and build their dams. Beaver dams can create new or expanded wetlands by stopping the flow of water. These areas often create environments for fish, insects, and other animals.

Muskrats look much like beavers, though they have a thinner tail. These animals live in burrows near the water and have webbed back feet, which help them to swim. Their front feed are clawed, allowing for defense, digging, and hunting of small fish and insects. Muskrats are generally nocturnal. They have two, thick layers of fur, which help them adapt to colder temperatures.

Utah wetlands are home to several species of frogs and on specie of salamander, the Tiger salamander. These **amphibians** (they can live in the water and on land) have specific adaptations that allow them to thrive in wet environments. With wet skin and webbed feet, these animals can easily move through the water. They eat small insects and fish that live in the wetlands. Each of these species has adapted to match their surroundings, proving camouflage and protection from predators. They also tend to stay near dense plants or under rocks, giving them coverage from predators as well as protection from the sun. Frogs also **hibernate**, or sleep through the winter, to protect themselves from cold weather and conserve their energy for spring and summer.

Other animals commonly found in Utah's wetlands are: catfish, carp, and trout, as well as several species of **fish**, **birds** and **insects**. Each of these animals has adapted to the natural and man-made environment in which they live in unique ways. Watch this video with your child, then ask them to complete Observation Sheet 5.

Observation Sheet 5

1. What physical adaptations did you observe while watching the trout in the video? How do these adaptations help the fish survive?

2. What behavioral adaptations did you observe while watching the trout in the video? How do these adaptations help the fish survive?

3. What interactions did you see between the trout and other animals? (e.g. other trout, humans, worms)

4. How does observing animals in their natural habitat help us to understand them?

Title of Lesson 6: Utah's Deserts

Standards Taught: 4.S.5, 4.S.5.1, 4.S.5.1.a, 4.S.5.1.b, 4.S.5.1.c, 4.S.5.1.d, 4.S.5.1.e, 4.S.5.2, 4.S.5.2.a, 4.S.5.2.b, 4.S.5.2.c, 4.S.5.2.d, 4.S.5.4, 4.S.5.4.b, 4.S.5.4.e

Materials:	**Preparation:**	**Implementing the Lesson:**
Observation Sheet 6		Ask your child to briefly review what they learned about wetlands and the plants and animals that live in them in the previous lesson. Discuss some adaptations, both physical and behavioral, that your child remembers. Then, explain that today we are going to learn about Utah's deserts. Ask your child to discuss the characteristics of a desert environment. Remind them that deserts tend to have little precipitation (rain or snow) and are dry and arid. Deserts can be warm and sandy or cold and icy, however the deserts in Utah are warm. Utah deserts are mainly found in the western and southern parts of the state, though elevation can vary. This means that some Utah deserts are sandy and contain few plants, while others contain more plant and wildlife. Fewer people live in these areas so cities are spread further apart and there is open land. Though Utah's deserts are difficult to survive in, several species have adapted to life with little water and warm temperatures. Review the following with your child, discussing adaptations as you go. Sagebrush is a plant that is well-adapted to Utah's deserts. With thick, deep roots, these plants are able to gather water more efficiently and further away that most others. The leaves are covered in small hairs, allowing for insulation against cold winters and winds. Sagebrush keeps its leaves year-round and is able to produce food for itself, even in the winter. Pinyon pine, a **coniferous** (having thin, pointy leaves that do not fall off each year), has deep, thick roots like the sagebrush. However, these roots can reach up to 40 feet deep, giving the plant the ability to find water where others can't. The seeds it produces help birds and small animals survive. Prickly pear cacti have shallow roots that are very dense. This allows them to collect high amounts of water very quickly after rainstorms. The leaves of the prickly pear are broad and thick, allowing the plant to store water for future use. The leaves are coated in a waxy substance, preventing the sun from evaporating too much of the water. Utah Juniper trees are extremely drought-hardy and can live for as much as 650 years. Seeds are cone shaped, and leaves are thin and pointy, making this tree a coniferous tree. Thick skin around branches and the trunk preserve water and allow this tree to live at higher elevations than sagebrush. Juniper trees provide food for wildlife as well as wood which humans use to build fences, as it is highly resistant to rot. Jackrabbits and cottontails are types of rabbits that thrive in Utah's deserts. With brown fur that helps them blend into the surrounding sand and trees, these animals tend to freeze upon the appearance of a threat, trusting that the predator won't

		see them. They have large ears, which allow them to hear sounds from far away and provide a method for cooling their bodies. Many rabbits in the desert dig burrows, preferring to stay in the cooler underground area during the day and live a nocturnal life. The red fox lives across Utah, including in the desert. The red fox digs burrows under the ground, like many desert animals. Here, it stashes food to be saved for times of scarcity. They rely on their speed and intelligence to hunt and protect themselves, outrunning many of the animals around them. Coyote are perhaps the most adaptable species on earth. They can live in nearly any environment and change behaviors to ensure survival. Coyote are mainly scavengers, eating the food others leave behind, but can hunt small game alone or larger game in packs. Their fur provides protection from the weather as well as camouflage. Mule deer, bobcats, kangaroo rats, snakes, and lizards are also highly adapted to the desert environment. Ask your child to choose one of these **mammals** or **reptiles** and help them research its adaptations and answer questions 1-4 on the observation sheet for this lesson. Finally, watch this video with your child, asking them to observe the behavior of a Desert Stink Beetle. Discuss the adaptations your child notices or hears discussed in the video. Then, ask your child to answer the remainder of the questions on the observation sheet.

Observation Sheet 6

1. Which animal did you choose to research? Why?

2. Is this animal a mammal or reptile? Explain your answer

3. What adaptations does this animal have that help it survive in the desert?

4. Name a way this animal interacts with another plant or animal in the desert in order to ensure survival.

5. What physical adaptations did you notice about the Desert Stink Beetle?

6. What behavioral adaptations did you notice about the Desert Stink Beetle?

Title of Lesson 7: Utah's Forests

Standards Taught: 4.S.5, 4.S.5.1, 4.S.5.1.a, 4.S.5.1.b, 4.S.5.1.c, 4.S.5.1.d, 4.S.5.1.e, 4.S.5.2, 4.S.5.2.a, 4.S.5.2.b, 4.S.5.2.c, 4.S.5.2.d, 4.S.5.4, 4.S.5.4.a		
Materials: Observation Sheet 7 Craft supplies, varies	**Preparation:**	**Implementing the Lesson:** Ask your child to briefly review what environments they've learned about so far: deserts and wetlands. Explain that Utah has one more common environment: forests. A forest is an area that has several trees growing together. Though forests can be made up of any type of tree, the type of tree found in different forests in Utah is mainly determined by elevation. In lower, warmer areas where there is less moisture, forests may be made up of Utah Juniper or Pinyon Pine. At higher elevations where the weather is cooler and wet, oak, spruce, or aspen trees will grow. Oak trees are characterized by their uniquely shaped leaves and ability to grow acorns. They are a **deciduous** tree, meaning they shed their leaves each year to conserve energy through the winter. Spruce trees, however, are a coniferous type of tree that grows at higher elevations. Many people connect these trees to Christmas as their height and smell make them perfect indoor seasonal trees. These trees keep their leaves year-round, though leaves are narrow and pointed to conserve energy and protect the plant. Quaking aspen trees have a unique root-system, linking all the trees in one forest with each other. The trees in a forest provide shelter, food, and protection for wildlife and many animals can be found in forests. Like trees, however, different species will be better adapted to different conditions such as moisture, elevation, and temperature. Some animals commonly found in Utah's forests are squirrels, chipmunks, elk, moose, cougars, and deer mice. In addition, several insects and birds make their home in Utah. Help your child research and answer questions 1-3 on the observation sheet for this lesson. Watch this video with your child, discussing the adaptations of a barn owl and ways the forest may provide food, shelter, and protection for them. Ask your child to answer questions 4-5 on the observation sheet. Briefly discuss the fact that some birds **migrate**, or move to warmer places in the winter and return in spring, as a behavioral adaptation. Finally, gather craft supplies and ask your child to create a model of the three types of environments they've learned about. This may consist of construction paper, clay, sand, moss, artificial leaves, or natural materials. Allow your child to reflect what they've learned in their own way. Ask them to pay special attention to the physical features such as terrain, weather, and temperature. They may choose to include model plants and/or animals.

Observation Sheet 7

1. Name one vertebrate and one invertebrate found in Utah's forests. What is the main difference between a vertebrate and an invertebrate?

2. What is an adaptation of the **vertebrate** you chose?

3. What is an adaptation of the **invertebrate** you chose?

4. How would the forest provide food, shelter, and protection for barn owls?

5. Why can some plants and animals survive in one environment and not another?

Title of Lesson 8: Classification and Endangered Species

Standards Taught: 4.S.5.2, 4.S.5.2.a, 4.S.5.2.b, 4.S.5.2.c, 4.S.5.2.d, 4.S.5.2.e, 4.S.5.3, 4.S.5.3.a, 4.S.5.3.b		
Materials: Paper or plastic examples of plants and animals from each of Utah's environment small enough to fit into your child's model	**Preparation:**	**Implementing the Lesson:** Review Utah's three environments with your child, asking them to describe each one on their model. Then, give your child the plants and animals you've gathered. Ask them to place each one in the proper environment. If an animal is unfamiliar to your child, encourage them to note the physical characteristics of the plant or animal and classify where it most likely belongs. Explain that classification helps scientists find things that are common or different between species and learn more about how these plants and animals adapt and behave. Finally, ask your child to choose one of the following endangered Utah species: desert tortoise, cutthroat trout, Columbia spotted frog, Gila monster, American three-toed woodpecker, bald eagle, American white pelican, burrowing owl, sage-grouse, monarch butterfly, Atwood's columbine, prairie clover, Greenwood's daisy, Utah spurge. Help them research their choice, looking for ways this plant or animal is being preserved by the federal, state, and local governments as well as individual citizens. If possible, help your child find a small way they can help with preservation or education.

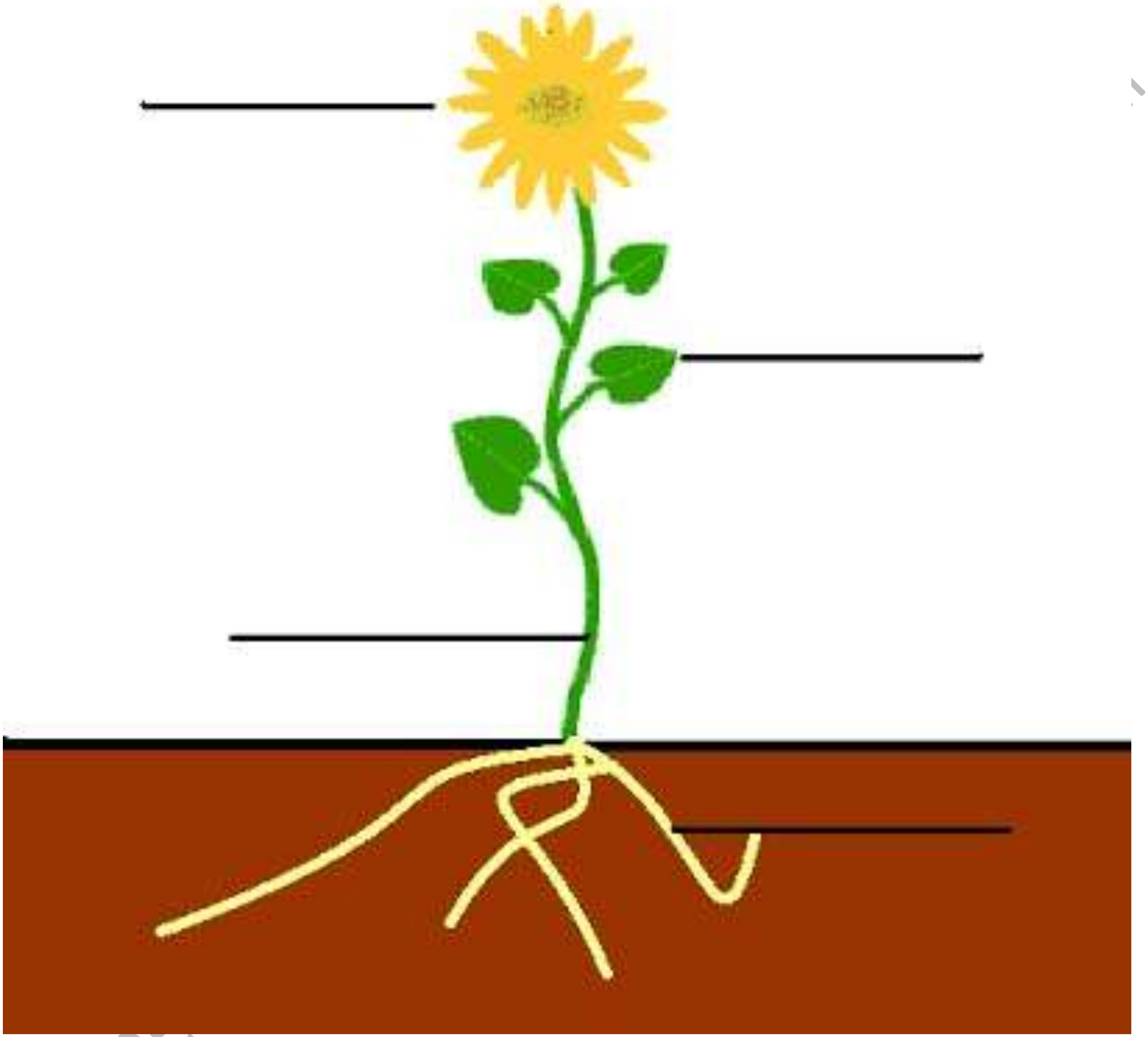
Title of Lesson 9: Survival Structures: Plants (2 pages)

Standards Taught: S.4.1.1

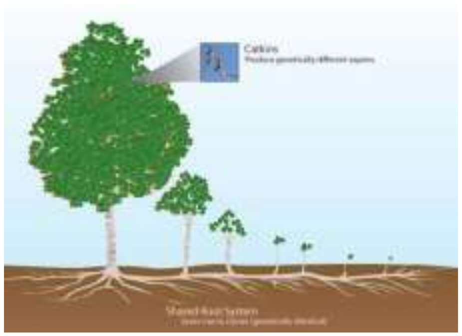
Materials:	**Preparation:**	**Implementing the Lesson:**
Observation Sheet 9 (2 pages)		Briefly review methods for classifying plants and animals with your child. Point out that many techniques sort **organisms** into categories based upon the adaptations they have that help them survive in their natural environment. For example, animals who live in the water often have gills to help them gather oxygen for breathing. Plants in the desert usually have thick skin to aid in water conservation. Next, ask your child to describe the Utah environments they've learned about. Discuss some of the physical structures plants in each area have (e.g. thin needles on a pine tree, wide-spread roots on a prickly pear cactus, floating roots of cattails) which aid in their survival. Point out that different environments require different structures and a desert plant would not survive well in the forest. Show your child the image on Observation Sheet 9. Point out that, though different plants have different survival structures, they all have the same basic parts: roots, stems, leaves, flowers, and seeds. Point out each of these parts on the Observation Sheet as you share the following information. Ask your child to label and record something they learned on the line near each plant part. Roots are the underground part of the plant that absorbs water from the soil. Primary roots grow straight down while secondary roots branch out to the sides. The mixture of these types of roots allows the plant to gather as much water as possible. Roots also help hold the plant down, stabilizing it against wind, water, and other disturbances. Unlike animals, plants do not move. They cannot travel to another location to find more food. Extra food is stored in the roots. The stem holds the plant upright, just as the skeleton of an animal does. It supports the weight of the leaves, allowing the plant to gather energy from the sun. Stems allow for water and food to travel to all parts of the plant and, in some plants, help store extra food. The leaves of the plant absorb the sunlight, converting it into food and energy for the whole plant. Flowers are a part of the reproductive cycle of the plant. They carry pollen, which helps the plant grow fruit or seeds. Flowers often have sweet smells or bright colors to attract insects, which help move the pollen. The pollinized flower then grows into a seed or fruit (which carries seeds) and allows for a new generation of plants to grow. Give your child page 2 of Observation Sheet 9. Ask them to name the plant parts they see in the images there. Point out that there are two examples of each. However, each example shows a different structure. Discuss the following information with your child, one plant part at a time. Then, ask your child to describe how each of these differences in structure (or the way they are built) would help the plant survive in its particular environment.

		Roots: Image 1 of roots shows the interconnected roots of a group of aspen trees. Utah's forests are home to several groups of aspen trees. One tree in a forest may be connected to every other tree around it for miles and miles. How would this help aspens survive in a forest environment? (Aspens reproduce by sending out new roots, which grow into new trees. The fact that they are connected means that energy can be shared through the roots between trees. The group may send extra nutrients to a sick tree. It also allows for the collection of nutrients from a larger area.) Image 2 of roots shows the individual roots of two dandelion plants. Each plant has a strong, deep primary root and a few secondary ones. How could this help dandelion plants survive in several different environments? (The primary root of a dandelion plant helps secure the plant to the ground, making it hard to pull out or remove. It also allows the plant to gather water from deeper in the ground. The secondary roots allow the plant to gather water from a larger area than just where the primary root is). **Stems:** Image 1 in stems shows a Utah Juniper. The stem, or trunk, of this tree is strong and sturdy. Its covering is thick and rough. The Utah Juniper lives in higher elevations and can survive even when there is little water. How does this stem structure help the plant survive? (The Utah Juniper's thick trunk allows the plant to support the weight of several branches, increasing the number of leaves and amount of energy it can gather from the sun. The thick skin helps protect water from evaporation, allowing the plant to store water for times of drought). Image 2 shows a cattail. These wetland plants have a hollow stem, which bends and sways as the wind blows. How might this be an advantage in its environment? (Cattails live in the water and a hollow stem allows for water transfer and storage. It also allows the plant to move slightly, protecting it from the wind or waves of the water. The hollow stem also allows the plant to move oxygen and CO_2, helping it to "breathe" in low-oxygen environments. **Leaves:** Image 1 shows the leaves of a ponderosa pine. These leaves are coated with a wax. They are thin and pointed, giving them a needle-like appearance. Pines are coniferous and do not shed their leaves in the winter, often living in mountain environments at higher elevations. How do these leaves help the trees survive cold weather environments? (The thin needs provide protection from animals as well as weather. They allow snow to fall off easily, leaving the tree with less weight to bear than larger leaves would. Their coniferous nature allows for energy absorption, even throughout the winter). Image 2 shows the leaves of an oak tree, which usually lives at lower elevations than the pine. The leaves are wide and broad. The oak is a deciduous tree, meaning the leaves drop off the tree each fall and new ones grow in the spring. How might this allow the oak to survive? (The broad leaves allow for the absorption of energy more quickly, helping the plant store excess for winter. The leaves fall off the tree to protect it from the weight of the snow and the tree lives off its stores until new leaves grow). **Flowers and Seeds:** In order of appearance: prickly pear (desert), sycamore tree (near wetlands), sego lily (desert), and cherries (valley orchards). The prickly pear has brightly colored flowers and fruits, protected by sharp spikes. The sycamore produces seeds with "wings", allowing them to fly through the air. The sego lily's flower is white with a bright middle, which attracts pollinators. Cherries contain pits, or seeds, within the fruit. How do you think each of these allows the plant to survive and/or reproduce? (The prickly pear's bright colors attracts pollinators, helping it to grow fruit. The tough, protected fruit is safe from animals who may eat them because of its needles. The sycamore tree's seeds travel on the wind, allowing new plants to land and grow where it will not take resources away from its parent plant. The sego lily grows small flowers, allowing it to conserve energy. The flowers are brightly colored, making it stand out in the desert environment. Cherry pits fall to the ground, where they may become planted. The fruit around the pit nourishes the new seed, allowing it to begin growing.

Observation Sheet 9



Roots:



Stems:

Leaves:

Fruit/Seeds:

Title of Lesson 10: Survival Structures: Animals

Standards Taught: S.4.1.1		
Materials: Blank paper Crayons/Markers	**Preparation:**	**Implementing the Lesson:** Briefly review the previous lesson with your child, discussing the structures of different plants and how those structures allow them to flourish in their natural environments. Then, point out that animals also have internal and external structures which help them be better adapted for their own environments. Ask your child to share some of the adaptations they learned about previously. Point out that, unlike plants, animals are able to move around. This means that they can travel to find different resources. Unlike plants, animals cannot make their own food from the sun. They must consume, or eat, something for energy. This means that animals need plants or other animals to survive. Moving allows them to find, hunt, and consume this food. Animals move by using a skeleton (either within or on the outside of) their body and muscles. Animals may have wings, fins, tails, hands, legs, or other structures to help them move. Ask your child to describe an animal from each of the following environments and discuss one structural characteristic that allows them to move: desert, lake, forest, and wetland. Next, help your child research the following animal structures online, discussing how they help the animal survive in its environment: Jackrabbit's ears, June sucker's camouflage, beaver tails, cougar's camouflage, snake's jaws, porcupine's quills, male hummingbird colors. Finally, ask your child to draw an image of one of the animals you researched together and label it with structural (internal and external) aspects that aid in survival. Allow them to research more if needed. They should list at least 5 characteristics.

Title of Lesson 11: Survival Structures: Senses

Standards Taught: S.4.1.2		
Materials: *Encyclopedia of Body* by Miles Kelly This video Observation Sheet 11	**Preparation:**	**Implementing the Lesson:** Briefly review the previous lessons on structural characteristics of plants and animals. Then, ask your child what else helps animals survive. Discuss behavioral adaptations, or actions the plant or animal takes that help them, such as burrowing underground in the hot desert, holding very still in the presence of a predator when camouflaged, or building a spider web to catch food. Point out that each of these actions require the animal to think and act based on what they know about the world around them. If the animal didn't feel the heat of the sun, it likely wouldn't think to burrow somewhere cooler. If it didn't hear or smell the predator, it wouldn't know to hold still. If it didn't feel the vibrations of prey on the web, it wouldn't catch the prey. Animals make decisions based on the information their sense give them about the world. Ask your child to name the five senses humans use most. Explain that most animals use these senses, too. However, some animals have one or two senses that are stronger than the others. A fox can hear so well that it can sense where prey is even as it burrows underground. Bats can hear high-pitched sounds, allowing them to use echolocation. Sharks can smell blood in the water for great distances. Ask your child to share other animal senses they are familiar with. Then, ask your child to describe how senses affect and use the nervous system. Using the image on page 103 of the book, remind them that the nervous system consists of the brain, the spinal cord, and a serious of nerves throughout the body. These nerves gather information from what you see, hear, smell, touch, and taste. The information is changed into an electric signal that travels to the brain. The brain then processes the signal and creates something (a sight, sound, scent, feeling, or flavor) you can understand, sending the signal back to the area where it originated. This is why our finger feels hot when we touch the hot stove or our tongue can taste the sweet flavor of a candy. Explain that the brain processes the information, but it also stores that information for future use. We don't have to touch a stove twice to know it's hot because our brain remembers that it is. Likewise, we remember what that candy tasted like so that next time we see one, we already know the flavor. Animal's brains also store information, which helps them to remember where food and water is, what areas to avoid, and what actions to take in unsafe situations. Finally, give your child the Observation Sheet for this lesson. Point out the wolf and the caribou. Explain that the wolf is a natural predator of caribou, but caribou have a super-sense that protects them and helps them avoid being caught. Watch the video with your child, then ask them what the super-sense is (ability to see UV light) and how it helps them (they can see through the wolf camouflage and be better prepared for an attack). Finally, ask your child to fill in the blank lines on the Observation Sheet, adding the steps that caribou senses and nervous systems go through if a wolf begins to hunt them.

Observation Sheet 11

In the images above, the wolf has spotted a mother caribou and her calf. How might the senses and memory of the mother protect her and her baby? What steps would she take to ensure they are safe?

Step 1: Wolf approaches

Step 2: Mother caribou's eyes see a dark figure

Step 3: Mother caribou's eyes send a signal to her ______________

Step 4: The brain processes the signal and tells her it is a wolf

Step 5: Mother caribou remembers that wolves eat caribou

Step 6: Mother acts to protect her baby and herself by

____

Title of Lesson 12: Survival Structures: Evolution and Environmental Change

Standards Taught: S.4.1.3, S.4.1.4,		
Materials: Observation Sheet 12 Sand Art Kit like the one found [here]	**Preparation:**	**Implementing the Lesson:** Remind your child of their history lesson in which you read an article about human footprints found in Utah dating back thousands of years. Ask them to remind you what scientists learned from these footprints. (Humans were in Utah earlier than we first thought, Utah was covered in mud at the time these humans were here). Then, ask them to remind you where the Great Salt Lake came from. (A giant glacier once covered Utah, melted, and drained into the ocean, leaving behind the Great Salt Lake and two other lakes). Ask your child if the environments in Utah have always been the way they are now. Have them explain some of the changes that have taken place over time. Next, remind your child that certain plants and animals have structural and behavioral characteristics that allow them to survive in specific environments. Ask them to explain what happens if an environment or **climate** (temperature, levels of precipitation, or weather) changes. For example, what would happen to the animals in the wetlands if there were a drought that dried up all the water? What would happen to the plants in the desert if it snowed there? Why? Point out that, over time, the environments in Utah have changed. What was once an area covered in a huge glacier warmed and the ice melted. As it did, the water drained into the ocean, leaving behind dry places. Today, Utah continues to become warmer and drier. These changes took thousands of years. However, the animals living in the area (and their descendants) found these changes difficult to survive. Some went **extinct** (none were left alive). Others adapted, or changed their behavior, or evolved, changed their structure, over time, and survived. Scientists know that the environment changed because they have found evidence in Utah's landforms that show the changes. The benches on Utah's mountains were created when the glacier cut into them as it moved. The image on Observation Sheet 12 shows a Utah mountain. In it, you can see where the layers change colors. These layers were build up over time as different things happened in the area. Wind and water moved particles of sand to the area, leaving them behind and building each layer. These particles reflected what was happening in the area at the time. These are called **sedimentary** layers. Scientists know that the bottom layers are older than the ones above them. They can examine each layer, looking for different minerals, fossils, and characteristics of the rocks. This gives them clues as to when each layer was formed and what the climate and environment was like at the time. As they learn about each layer, they can **infer** (make an educated guess) what changes took place between the time one layer ended and the next began. Within the layers, **fossils** (or preserved/saved bones, footprints, leaves, or other parts of an organism) are left. When scientists find these fossils in a certain layer, they can guess what time period that plant or animal lived. This sometimes allows them to see what structures that specific plant or animal had, giving them more clues about what the environment was like at the time. Fossils also provide clues into evolution, or the changes organisms undergo over time. A fossil of

		an animal in a lower layer may show that it had webbed feet, indicating the presence of water. Later, a fossil in higher layers may show that the webbed feet changed or went away, indicating that the water left and the descendants of the first animal changed to survive in their new environment. Give your child the sand art kit, asking them to use different colors to create sedimentary layers. Then, ask them to complete the questions on the Observation Sheet.

Observation Sheet 12

1. What does the picture on the left tell you about the changes to the environment over time?

2. How many sedimentary layers do you see in the picture?

3. What might cause the changes in colors between the layers?

4. Which of the layers is the oldest? How do you know?

5. If a fossil was found in the middle layer and another was found below it, which fossil is likely older?

6. What types of changes might scientists learn about while studying the layers?

Title of Lesson 13: Change Over Time: Utah Environments

Standards Taught: 4.1.3, 4.1.4, 4.1.a, 4.1.c, 4.2, 4.2.a, 4.2.b

Materials:	**Preparation:**	**Implementing the Lesson:**
Petrified Wood example Example of various types of fossils (such as here or here) A printed copy of this image		Review the previous lesson about sedimentary layers with your child. Remind them that layers are created slowly, over long periods of time. The bottom layers are the oldest and they become newer the further up you go. Ask your child to remind you what can be learned from these layers and the fossils within them. Remind your child that the layers can give scientists clues about the environment, plants, and animals living at different times throughout history. Fossils are the remains or **impression** (as in a footprint or leaf print) of a **prehistoric** organism (a plant or animal that lived before humans began to write down history) that has been preserved as a mold or cast or by being petrified. When something is petrified, it slowly absorbs the minerals around it. These **minerals** (a solid, inorganic substance of natural occurrence) **replace** the things it was originally made of, causing chemical reactions and making the organism hard and rock-like. This process takes years. When something is molded or cast, it leaves behind an impression, or stamp, of the living thing. A dinosaur footprint is an example of this. Most fossils are preserved in sedimentary rock, as other types of rock take high temperatures and lots of pressure to create. These extreme circumstances don't allow the organic material to survive long enough for fossilization to occur. Sedimentary rock, however, is created at a low temperature and with far less pressure. Give your child the petrified wood and various fossils. Have them review the fossilization and petrification processes with you. Then, ask them to use the information provided to classify, or sort the fossils. Discuss what animals each fossil comes from, the structure of the animal based on what you see in the fossil, what type of environment that animal may have lived in (and why you think that), and any other interesting notes your child makes. Allow time to explore and ask questions. Research online if an answer is not presented in the included information. Point out that your child made several observations about an organism based on what they saw in the fossil. Explain that they never saw the animal/plant that is fossilized but they could infer, or guess, what it looked like, what size it was, what type of environment it lived in, and how it moved. Explain that this is how scientists use fossils to learn about how the earth has changed over time. If a scientist finds a clam shell fossil in a bottom layer, for example, they can guess that there was water in the area during the time that layer was being created. If, a few layers later, the clam shell fossils are not present, the scientist can guess that the water went away. This is one way scientists learned about Lake Bonneville and its eventual shrunken size. Fossils were found throughout the area of creatures that lived in a water-filled environment. Though these areas no longer have water, the fact that the fossils are there suggests that it once was. Next, visit this website with your child and give them the blank map of Utah you printed. Take time to explore the different places in Utah where fossils have been found. Discuss the type of fossil in each area and what you might learn from them. Ask your child to note the locations on their own map. Discuss the current climate and environment of each area and discuss how it might have changed over time based on the fossils found there.

Title of Lesson 14: Change Over Time: Evolution and Adaptation

Standards Taught: 4.1, 4.1.a, 4.1.b,		
Materials: *Utah: Know Your State Activity Book* by Megan Hansen Moench Images here and here Crinoid example or image here	**Preparation:**	**Implementing the Lesson:** Review the previous lesson with your child by studying the information on pages 228-230 of *Know Your State*. Discuss the differences in how fossils are formed and compare and contrasts molds, casts, and petrification. Review the information that can be learned about changing environments based on the fossils found in each location and how sedimentary layers help provide clues. Explain that, in addition to learning what an organism may have looked like, how it may have moved, when it lived, and what its environment was like, scientists can learn how that organism may have changed, adapted, or evolved based on changes to fossils found in different layers. A fossil from a lower and older layer may have characteristics that do not exist in higher and newer layers. Likewise, an animal plant from newer layers may show a new characteristic that its ancestors did not. Fossils can be compared to each other to learn about how, as the environment changed, plants and animals adapted to survive. Fossils can also be compared to animals that are alive today. For example, Utah's most common fossil is a **trilobite**. If your fossil kit has a trilobite example, allow your child to find it. If not, use the images on the website here. A trilobite is an **extinct** (meaning that the species is now dead and no more living examples exist) species. It lived in ocean environments millions of years ago. A trilobite body is broken into three segments: the head, body, and tail. Fossils show that these animals lived for thousands of years in ocean water. Discuss how these fossils could be found in Utah, where it is now dry and arid, though they lived in oceans. Explain that oceans once covered far more land than they presently do and that Lake Bonneville provided salty water to much of the state. Explain that many have compared the trilobite to present-day horseshoe crabs. Show your child the images of the horseshoe crab and compare it to their trilobite example. Discuss the body structure, size, shape, and environment in which they live. Then, explain that these two animals are not believed to be related, though they look alike. However, their similarities allow us to learn more about trilobites by observing the still-alive horseshoe crab. Explain that some fossils show slow, gradual changes occurring as the environment changed. Some species of fish, for example, began to survive in more shallow water, where they couldn't before. Their bone structure changed those who couldn't survive died and those who could had babies. This is a process known as evolution, or the changing of a species over time based on environmental factors. Additionally, some organisms that have been fossilized are still in existence today. Fossils of the crinoid, or sea lily, have been found in Utah from thousands of years ago. This plant-like creature is still found in oceans today and is structured in almost the exact same way it was then. Show your child the image/example of the crinoid fossils.

Title of Lesson 15: Fossils in Utah: Dinosaurs

<table>
<tr><td colspan="3">Standards Taught: 4.1.4, 4.2.b, 4.2.c,</td></tr>
<tr><td>Materials:

This poster, printed</td><td>Preparation:</td><td>Implementing the Lesson:

Ask your child to review what they've learned about fossils and how scientists use them to learn about past and present life in Utah. Then, ask them to discuss evolution, adaptation, and extinction.

Point out that some of the most well-known fossils in Utah haven't been discussed in their lessons yet. Ask your child if they can name a type of fossil that they know about. Explain that Utah was once home to several species of dinosaurs. Dinosaurs lived on the earth, including in Utah, millions of years ago. Show your child the poster and ask them to hypothesize how scientists know about all the dinosaurs shown. What might scientists have found that teach them about different dinosaurs? How might scientists know how old each fossil or footprint is? How might they know which animals lived at the same time as each other? What might the existence large dinosaurs in Utah indicate about the environment at that time?

Discuss the fact that fossils have been found in several areas throughout Utah. Return to the map here for examples. Point out that these fossils can give scientists clues about what these animals looked like, how they moved, how fast they were, or what they ate. For example, those with flat teeth likely ate plants while those with sharp teeth probably ate meat, which needed to be torn and ripped apart into smaller pieces. Scientists can guess at the order in which each species lived based on the layer of rock the fossils were discovered in. They can also make guesses about the environment type based on the minerals found in each layer. For example, the large size of many of Utah's dinosaurs found in Emery and Uintah Counties indicates the need for an abundant food source. The depth, width, and type of footprints found indicate that the ground was, at least in part, saturated with water. This could lead to the conclusion that during the time of large dinosaurs, those areas were tropical or swampy environments.

Together, learn about some of Utah's most common dinosaur species using this website. Ask your child to choose their favorite and tell you about it.

Point out that today there are no giant dinosaurs roaming the earth. The dinosaurs have all gone extinct. Ask your child to tell you what they know about the extinction of dinosaurs. Then, focus on two of the scientifically supported theories they mentioned. Explain that we don't know for sure why dinosaurs disappeared. Humans were not yet on the earth and there is no record of it. However, scientists have made several different guesses, or theories, based on the things they've learned from sedimentary layers and fossils. For more information on different theories visit this website.

Finally, ask your child to write down three questions they have about the extinction of dinosaurs or the theories presented. Help them research these questions and search for answers. Ask them to record evidence or theories that may help explain these answers.</td></tr>
</table>

Title of Lesson 16: Fossils in Utah: Field Trip

Standards Taught:		
Materials: Vary, depending on the trip you choose	**Preparation:**	**Implementing the Lesson:** Choose a field trip which will allow your child to learn more about fossils, dinosaurs, or sedimentary layers in Utah. Allow them to explore, ask questions, and share what they've learned. Review changes to environments, adaptation, evolution, and extinction as shown in the fossils found at your location. For field trip ideas visit here, here, and here or page 231 of *Utah: Know Your State.*

Title of Lesson 17: Rocks and Minerals

Standards Taught: 3, 3.1, 3.1.a, 3.1.b

Materials:	**Preparation:**	**Implementing the Lesson:**
A set of minerals like the one found here A set of rocks, like the one found here A magnifying glass Table Salt Rocks and Minerals Identification Book like the one found here This printout-print 2		Ask your child to review what they've learned about fossils and sedimentary layers. Remind them of the following: sedimentary layers are created as sand and other materials cover the area and are deposited there, layers can help us see changes to the earth over time, layers can help us age fossils and see how animals and plants have changed over time, fossils are parts of dead plants or animals that were slowly replaced by hard minerals over time. Ask your child if they know what a mineral is. Can they name any? Explain that minerals are naturally occurring, meaning they are produced by nature, not by people. They are inorganic, or **nonliving.** They are solid, contain a crystalline structure (are made of crystals), and contain chemical compounds. A mineral is made up of one substance. Well-known minerals include salt, pyrite, quartz, copper, gold, lead, nickel, silver, and zinc. Give your child the table salt and magnifying glass. Ask them to observe the salt's structure. Discuss the color, shape, size, and look of the salt. Explain that salt allows us to see the crystals in it. All minerals have a crystal shape like this, but sometimes it is difficult to see in the sample you have. Discuss the following properties of minerals: Since there are so many minerals in the world, scientists use clues to help classify, or sort them. First, they sort by color. Color can give clues as to what type of mineral you have. Hardness is another property used. Different minerals are softer or harder than others. For example, diamond is very hard and is difficult to scratch. However, gold can be molded and scratched using just your hands. Scientists also look at the shape of the mineral. Minerals are made up of crystals, which affect the way the pieces bond, or stick, to each other. Minerals may be identified by the shape of their crystals or the way in which the bonds break apart. Another property of minerals is luster, or how much the mineral shines and reflects light. Silver reflects light well while gypsum does not. Give your child the minerals set. Ask them to use the properties to sort the minerals they have found. Use the sheet included to discuss the name and properties of each mineral presented. Discuss the crystal structures you can see. Then, ask your child to explain their classification by describing the similarities and differences between the minerals. Next, explain that rocks, like minerals, are naturally occurring solids. Rocks sometimes contain minerals. However, rocks are often a mixture of substances and do not have a uniform shape. Rocks can be a variety of shapes. They may contain several minerals stuck together or organic (living or once-living **organisms**) materials. Rocks are often classified by color, texture, shape, size, location they were found, how they were made, and materials found within them. There are three basic categories, or types, of rocks: **sedimentary, igneous,** and **metamorphic**. Give your child the rocks set. Ask them to observe and classify the rocks presented. Discuss the color, texture, shape, size, and composition of each. Discuss any minerals seen within the rocks and try to identify it. Finally, as your child to use the printout to record their observations of two rocks and two minerals they've looked at today, skipping the tile test.

Title of Lesson 18: Types of Rocks

<table>
<tr><td colspan="3">Standards Taught: 3, 3.1.c, 3.1.d</td></tr>
<tr>
<td>Materials:

A sample group of several rocks including sedimentary, igneous, and metamorphic

Chalk

The following images of common Utah rocks: sandstone, conglomerate, shale, basalt, granite, obsidian, marble, gneiss, and schist</td>
<td>Preparation:</td>
<td>Implementing the Lesson:

Ask your child to review what they learned about rocks and minerals in the previous lesson. Discuss the properties of each. Then, ask if they can name the three types of rocks you discussed: sedimentary, igneous, and metamorphic.

Remind your child that rocks are often a composition of several materials. They can include minerals and organic materials (including fossils). Rocks are created in three different ways, creating the three different classifications. Discuss the following:

Sedimentary rocks are small versions of sedimentary layers. They are created near the earth’s surface when materials are moved until they reset on each other. These layers are then pressed together (usually by the weight of water or rain) and stick together into a solid rock over time. Some sedimentary rocks crumble easily (e.g. sandstone). Others, like shale, show the layers within them. Show your child the chalk and explain that this is one type of sedimentary rock. It was created as the pieces of sand piled on top of each other and rain fell, sticking it together. The rain water evaporated, leaving behind a rock. Allow your child to crumble a piece of the rock. Then, ask them to search through the samples you’ve gathered and separate all the sedimentary rocks. Next, show your child the images of common Utah rocks. Ask them to sort the three sedimentary rocks from the group and place them with the others. Help your child identify the sandstone, conglomerate, and shale, naming each as you go.

Igneous rocks are created from magma as it warms and cools. Magma, or lava, is heated and melted rocks. As these rocks leave the area which provides the heat, they cool. This creates a solid rock, often composed of several different substances that were melted together. These rocks often have holes throughout them, due to bubbles present during the cooling process, or very smooth surfaces. At times, you can see the different materials that have melted into one rock and stuck together. Ask your child to search through the samples you’ve gathered and separate all the igneous rocks. Next, show your child the images of common Utah rocks. Ask them to sort the three igneous rocks from the group and place them with the others. Help your child identify the basalt, granite, and obsidian, naming each as you go.

Metamorphic rocks are created when the materials that make them up are heated to a certain temperature and put under enough pressure. The heat and pressure cause the rocks to physically or chemically change. Metamorphic rocks don’t melt, but the heat and pressure causes the shape and composition of the materials to alter. Metamorphic rocks can include rocks that were previously sedimentary or igneous. Metamorphic rocks usually have a smaller grain size (the pieces within it are very small) and may look like a rock that has been stretched out. The can also contain precious gems and stones. Next, ask your child to search through the samples you’ve gathered and separate all the metamorphic rocks. Show your child the images of common Utah rocks. Ask them to sort the three metamorphic rocks from the group and place them with the others. Help your child identify the marble, gneiss, and schist, naming each as you go.</td>
</tr>
</table>

Title of Lesson 19: Making Soil

Standards Taught: 3, 3.2, 3.2.a, 3.2.b, 3.2.c, 3.2.d		
Materials: This [video](#) Sand, a large baking pan, water, and a cup or bottle Ruler A location where the layers of soil in your local area are easily seen (e.g. a canyon or hillside that has been cut)	**Preparation:**	**Implementing the Lesson:** Ask your child to review the three types of rocks and how each is created. Discuss some of the properties and characteristics of each. Point out that minerals are naturally occurring. Rocks consist of minerals, organic items, and other materials. Then, ask your child if they know how a rock becomes soil. Explain that a mountain is simply a large rock, or a collection of rocks. Mountains are created when the ground is pushed upwards, as when two plates crash into each other during an earthquake. Mountains don't stay the same size, however. They slowly break down over time because of **weathering** and **erosion**. After long periods of time, these processes can break mountains into smaller rocks, small rocks into pebbles, and pebbles into soil. Weathering is the breaking down of rocks and minerals through contact with water, gases, and other biological materials. Weathering occurs in one place, the area in which the rock or mineral exists. The material breaks down, but does not leave the area. Remind your child of the previous lesson where they broke the solid chalk into smaller pieces. Explain that this is an example of weathering. The three types of weathering are chemical, mechanical, and biological. Examples of weathering are: a rainstorm or waterfall falls on a piece of a mountain, tiny pieces of the mountain rock are broken apart from the others, creating smaller rocks or soil; water that falls into cracks and holes within the rock may **freeze** and expand (or become bigger) breaking pieces of the mountain into boulders which fall apart from the mountain when the water **thaws;** wind blowing sand at a large rock can, over time, break pieces off, just as sandpaper would if rubbed against it; falling rocks or other items that rub on the mountain do the same thing over time; tree roots growing through cracks in rocks and breaking them off as the roots grow; or minerals within the rock rusting and breaking apart due to water exposure. Ask your child to watch the video and give a few examples of weathering and how it breaks rocks and minerals down into soil over time. Erosion is much like weathering, in that different elements help to break down a large rock or mineral into something smaller. However, in erosion, the smaller pieces move away from their original location. For example: a stream running through a mountain, breaking off pieces of the rock and moving it downstream, wind blowing the top layer of sand from one area to another, waves on the shoreline pulling rocks out to sea, and landslides moving rocks from the top of a mountain to the bottom due to gravity. Give your child the baking pan. Ask them to fill it with sand, building a mountain on one end and a lower area on the other. Ask your child to dig out a small pond in the lower area, making sure the sand slants towards it. Have your child measure and record the height of the mountain and depth of the pond. Then, ask your child what they think will happen if it rained on the mountain. Point out that, over time, small pieces of the mountain would be broken off and flow down the mountain into the pond. Give your child the water and cup or bottle. Ask them to simulate a rainstorm on their mountain and observe what happens to the sand. Point out that this is showing a quick version of weathering and erosion. The

		materials on the mountain are being broken down and moved. Gravity is pulling the water and sand pieces downwards, creating small canyons in the mountain and land. The water is eventually pulled into the pond, where the sand that came from the top of the mountain also ends up. Ask your child to measure the height of the mountain and pond once again and compare it to the original measurements. Discuss how this models weathering and erosion. Visit the location where the local soil layers can be seen. Discuss the colors and composition of each layer. Together, observe the pieces at the bottom of this location where evidence of weathering and erosion can be seen. Ask your child to guess where each type of soil/small rock came from. Then, examine the soil on your own property and discuss whether or not it matches the layers in the visited location. Discuss how it may have moved to your property.

Title of Lesson 20: Plants and Soil (2 pages)

Standards Taught: 3, 3.3, 3.3.a, 3.3.b, 3.3.c, 3.3.d, 3.3.e		
Materials:	**Preparation:**	**Implementing the Lesson:**
A sample of potting soil, sand, pebbles, clay 5 Empty water bottles, with one side cut off (see image here) 5 Empty water bottle bottoms String Water A clear cup or glass Chocolate chips Crushed Oreos One whole Oreo Chocolate pudding Coconut flakes died green	In one of the empty water bottles with the side cut off, plant a fast-growing plant (e.g. wheat grass) in potting soil. Allow it to grow for at least 2 weeks before this experiment	Briefly review the previous lesson on how soil is formed through weathering and erosion and how this affects soil composition in different areas. Then, ask your child if plants grow in your area. Name a few types of plants native to your area. Ask your child to discuss the needs of these plants (e.g. water, soil, sun, air, and minerals). Point out that all plants have common things they need to survive. However, each type of plant needs different types of minerals to thrive. For example, a rose bush doesn't need the same minerals as a tomato plant. Point out that the plants native to your area likely are those that receive their most-needed nutrients from the soil present. These nutrients come from the minerals in the soil. Show your child the different types of soil you have collected samples of. Ask them to discuss the different properties and characteristics of each. Which soils have minerals in them? Which hold water well? Which ones contain items that were once alive (e.g. plant parts or decomposed animals)? Point out that different plants may thrive in each sample while other types of plants would die. Potting soil is perfect for house plants and garden vegetables. It contains minerals and organic matter (broken down plants and animals that have died) that feed the plants. It also helps to hold enough water for the plant's roots to gather. Ask your child to fill the first water bottle with the side cut off with potting soil. At the top of the bottle, tie one empty water bottle bottom to the potting soil bottle as seen in the image. Repeat the process for the sand (which is perfect for carrot growth), pebbles (where orchids thrive), and clay (where crab apples grow well). Finally, give your child the water bottle that already has a plant growing in it. One by one, ask your child to pour two cups of water into each bottle and observe its movement through the soil. Discuss which plants hold water, giving the plants time to absorb it, and which ones allow the water to pass through. What characteristics might a plant need to thrive in each one. Ask your child what they observed about the erosion caused by the water on each soil. How might erosion affect plants growing in the soil? Which soil is most stable? Why? Point out that the bottle with the plants growing in it has the same soil as the one with just potting soil. The plants, however, helped cut down on how much soil was moved by the water. Explain that many people plant crops in soil that is easily eroded to help keep the needed soil in place. The plants create barriers, keeping the soil from being displaced. Next, ask your child if some plants can grow without soil. Ask them to explain their answer. Point out that they've likely planted seeds in a wet paper towel, where the seeds grew into healthy plants. How is this possible? Where did the plants get their nutrients? Remind your child that much of the energy plants need comes from the sun. This allows some types

Gummy worms		of plants to thrive without soil. Some plants, such as lily pads, live by floating on water. Minerals in the water help provide necessary nutrients to the plant. Additionally, fertilizers can be added to help the plants get what they need. Finally, explain that the soil most plants used is known as topsoil. It is the layer that contains small grains and nutrients from organic matter. Allow your child to watch this video. Then, help them use the food and glass to create a model of these soil layers. Start with bedrock (the whole Oreo), then parent material (chocolate chips), then subsoil (pudding), then topsoil (crushed Oreos). Ask your child to add the gummy worms here, explaining that this is where worms live and help break down nutrients in the soil for plants. Then, add the coconut flakes (organic material). Allow your child to eat their model if they'd like.

Title of Lesson 21: Energy and Speed

Standards Taught: 4.2.1		
Materials: Heavy table Chair Marbles (various sizes) and a Marble Circle Observation Sheet 21	**Preparation:**	**Implementing the Lesson:** Ask your child if they can describe what energy is. Discuss their responses. Then, explain that energy is the ability to do work, or to cause change. Energy can transfer from one object to another, as in when a baseball player uses the energy in their body to move a bat, which then hits the ball and changes its direction. Energy doesn't always change the direction of an object, it can also change its speed, as in when the gas petal on a car is pressed down further and the car goes faster from the extra energy. If an object is moving, it has energy and can cause change. Discuss the following examples, asking your child to point out what work the energy involved is doing: a hammer hitting a nail into a board, a child jumping, a bird flying, a flag blowing in the wind, a domino hitting another and falling along a line, a waterfall. Point out that each of these things has a different amount of energy. The amount of energy in something that is moving depends on mass and speed. The higher the mass and speed, the higher the energy. Ask your child to push the table. Discuss how difficult it was to move it. Then, ask them to push the chair. Point out that the chair has less mass and, therefore, takes less energy to move. Next, ask your child to walk around the room for a full minute. Discuss their speed. Then, ask them to increase their speed and run. Point out that it takes much more energy to run than it did to walk. Though their mass did not change, their increased speed uses more energy. It also means that if they ran into something while running, they would cause a bigger change (and hurt more) than they would if they were walking. This is because they have more energy when running. Draw a circle on the ground with chalk or tape. Then, ask your child to add energy to one marble by pushing it across the circle. Discuss what happens. Then, ask your child to complete the Observation Sheet for this lesson. Point out the differences in speed and mass and how they affect energy by making it stronger or weaker as each aspect changes.

Observation Sheet 21

1. Why did the marble move across the circle when you pushed it?

2. Push the same marble across the circle again, this time at a slower speed. What happened? Why? Did the mass change? What did change?

3. Push the same marble across the circle again, this time at a faster speed. What happened? Why? Did the mass change? What did change?

4. Choose a larger marble. Push it across the circle and observe the change in energy. Compared to your first marble, what happened?

5. Push the larger marble across the circle again, this time at a slower speed. What happened? Why? Did the mass change? What did change?

6. Push the same marble across the circle again, this time at a faster speed. What happened? Why? Did the mass change? What did change?

7. If an object's mass increases without a change to speed, it has ___________________ energy.

8. If an object's speed increases without a change in mass, it has ___________________ energy.

9. If an object's speed decreases without a change in mass, it has ___________________ energy.

10. If an object's speed decreases without a change in mass, it has ___________________ energy.

Title of Lesson 22: Collisions and Energy

Standards Taught: 4.2.2

Materials:	**Preparation:**	**Implementing the Lesson:**
Marbles and circle from previous lesson OR Pool/Billiards table, cue stick, and balls Toy cars, various sizes Observation Sheet 22		Briefly review the previous lesson with your child, discussing what energy is and how speed and mass affect it. Then, point out that we previously learned that one form of energy is motion, or movement of an object. However, there are other forms as well. Heat and sound are also forms of energy. For example, when you turn on an electric stove or heater, the coils heat up, transferring heat energy to the surface of the stove or the air around them. Likewise, when a drum is struck, the energy from the drummers hand transfers to the drum batter-head (the part you hit). That energy then becomes vibrations, which transfer the sound into the air and to our ears. Next, discuss the following example, asking your child to name and point out the three different types of energy they've learned about: motion, heat, and sound. You grab a glass and fill it with cold milk. (movement) Then, you place the glass in the microwave and run it for a minute and thirty seconds. (heat) Finally, you get your glass, add hot cocoa mix, and begin to stir it. (movement) You hear the clank of the spoon as it touches the sides of your glass. (sound) When you are finished stirring, you pick up your glass, planning to enjoy your drink by the fireplace. (movement) On the way, you drop it, shattering your glass and making a huge *crash!* (movement, heat, sound) Give your child the marbles or go to the pool table. Rack the balls or gather all but one marble in the center of the circle. Remind your child that, in the previous lesson, they learned that the speed and mass of an object affect the amount of energy it has. A large marble traveling slowly has less energy than a small marble traveling quickly. Ask your child what they think happens to energy when two objects collide, or crash into each other. Then, ask your child to roll the marble left out into the ones in the center or break the balls on the pool table using the cue stick and observe what happens to those being hit. Point out that in pushing the marble or hitting the ball, they added motion energy to it. This is also known as kinetic energy. When the marble/ball collided with the others, the energy was transferred and they moved as well. Finally, work through the Observation Sheet for this lesson with your child. Emphasize the fact that collisions result in a change or transfer of energy, large objects have more energy and affect smaller objects differently, and some energy is converted to heat or sound when collisions occur. Point out that transfer of energy may result in changes to speed, motion, or direction as well.

Observation Sheet 22

1. Grab two marbles/balls which are the same size (mass). Carefully roll them together, working to push them at the same speed. What happens to their direction when they collide? Why?

2. Next, push one marble/ball away from you at a slow speed. Then, push another of the same size towards it. What happens to the first ball when the second one collides with it? Why?

3. Using the same two marbles/balls, place one in front of you, keeping it still. Then, push the other into it. Try various speeds, observing what happens to the first (still) ball when the collision is stronger or weaker. Note your observations below.

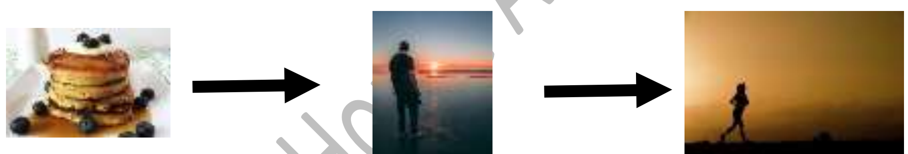
4. Place one toy car on the floor and push it into a wall? What happens? What does this tell you about the energy transferred?

5. Collide one large car with a smaller one, both traveling in opposite directions. What happens? How does the mass of an object affect energy transfer?

6. Place the small car in front of you and keep it still. Then, collide a larger car into the back of the smaller one. What happens?

7. These collisions all affect the motion energy of the objects involved. What two additional types of energy were involved? How do you know?

Title of Lesson 23: Energy Input and Output (2 pages)

Standards Taught: 4.2.3		
Materials: Stovetop/Heater /Fireplace Room with a lightbulb and few drafts Musical instrument (e.g. drum, piano, guitar) Phone/Tablet (with less than 100% battery charge) and charger Scrap paper and pencil to take notes Observation Sheet 23	**Preparation:**	**Implementing the Lesson:** Review the previous lessons on motion, sound, and heat energy with your child. Discuss what they've learned about collisions and transfer of energy. Answer any questions they may have. Then, remind your child that energy can be transferred from object to object, such as in collisions. Explain that energy can also be transferred from place to place through various means. Sound, light, heat, and electrical currents are examples of this. These are energy outputs, or results of the work being done. Ask your child what they had for breakfast this morning. Point out that these foods give their body energy as they are digested and taken to the cells in their body. That energy is used to allow them to move, think, and work hard. It also warms their body to the correct temperature and allows them to speak. The energy they get from food is input energy. Their bodies then turn it into work, heat, and movement, which is considered output energy. See the image below and ask your child to point out the input and output energies.  Next, ask your child to feel the stovetop, heater, or fireplace before turning it on. Point out that these things do not currently have an output of energy. Carefully turn it on, allowing a few minutes for it to heat up. Then, ask your child to put their hand near enough to the object that they can feel the heat, but be careful not to burn themselves. Point out that the electrical current (or electricity coming through the wires in the house) was transferred to the object, warmed it up, and that heat is now being transferred to the air around it. This is an example of electrical current input creating a heat output. In contrast, if yours is a gas stove or a wood-burning fireplace, the energy comes from the gas or wood rather than electric current. We sometimes use this heat to cook or warm ourselves up. Then, ask your child to enter the room where the lightbulb you will be using is. Ensure the light has been off for long enough that it is cool. Ask them to note the temperature of the room (using the thermometer) and feel the lightbulb. Turn on the light, leave the room, and close the door. While waiting, show your child the phone/tablet. Ask them to note the current battery level. Point out that the phone/tablet needs energy to work correctly and give a light and heat output needed for you to complete your tasks. Plug the phone into the charger and wait.

		While waiting, give your child the musical instrument. Ask them to play something (even just a few notes) on it. Point out that there is energy input and output in this scenario. Ask them to explain the input (them moving their hands to move the instrument) and output (the instrument vibrating and creating sound waves in the air). Point out that movement and sound are forms of energy. Return to the room with the light bulb. Ask your child to note the temperature again. Likely they will see a slight increase. Then, ask them to place their hand near the lightbulb (but not close enough to burn themselves). Ask them what inputs and outputs can be observed here. Point out that the electric current (input) creates heat and light energy. Finally, return to the phone/tablet and charger and ask your child to note the current battery level. Point out that the phone/tablet holds this energy to use as you work on your phone, play games, or take pictures. The light and heat produced are the output energies given from this stored energy. The input energy is the electrical current which travels through the charger from the outlet. Ask your child to complete the Observation Sheet for this lesson.

Observation Sheet 23

Using the table below, complete the energy input and output for each item. Remember, energy can come in the form of motion, sound, light, heat, and electrical current.

Input	**Object**	**Output**
		
		
		
		
		

Title of Lesson 24: Converting Energy (2 pages)

<table>
<tr><td colspan="3">Standards Taught: 4.2.4</td></tr>
<tr><td>Materials:

Circuit kit (such as the one seen here)

Various supplies, depending on which project your child chooses</td><td>Preparation:</td><td>Implementing the Lesson:

Briefly review the input-output process of energy and the different forms of energy with your child. Then, point out that we use energy all the time, in different forms. Many times, this energy has been converted from one form to another before we use it. For example, when eating a pancake breakfast, our bodies take the food input and convert it into heat and movement. Those pancakes were made with eggs, wheat, milk, and other ingredients. The eggs and milk came from animals who used their own food (grains and grasses) to create them. The wheat, grains, and grasses all converted heat and light energy from the sun to grow. So, our pancakes were once energy from sunlight, which was converted over and over again until we are able to use it.

Explain that there are several natural resources that we use to create the energy we need. Wind, sunlight, water, heat from the earth, oil, coal, and natural gas are others we use. Some, like coal and oil, are non-renewable. In order to get energy we can use from these, we burn them. Once the coal and oil we have are burned up, there is no more to use. Renewable sources, or energy sources that won't run out, include wind, heat, water, and sunlight. These sources come from nature and can be used to create energy for us to use. Solar panels convert sunlight into usable energy by taking the light and heat and converting it into electrical currents. Movement of wind and water can be captured using mills and converted in the same way.

Once converted to an electrical current, energy can be moved through wires using conductors. Conductors are materials, such as certain metals, that allow the energy to move through them. Power lines above and below ground help move the energy through electrical currents across large distances, to power stations and substations, then into our homes. These currents travel into our homes through wires, providing energy to run our homes. The electrical current can be stopped and started using switches, which is why we can turn lights on and off. Objects that the currents flow into convert the energy into light, heat, movement, and/or sound that we use. Allow your child to experiment with the circuit kit, discussing the way that electrical currents can be changed, used, and altered to be safer and easier to use. Point out that electric current can produce each of the other types of energy as well.

Ask your child to briefly review what they've learned from this lesson. Point out that, without converting energy to the correct forms, much of the energy we use would be useless. We cannot grow or power our homes with sunlight unless that light is converted into food and electrical current. Converting energy helps us survive and complete the tasks we need to.

Finally, ask your child to identify a problem in their life that could be solved with energy. Perhaps they need to cook food when the power is shut down (heat). Maybe they need an alarm so their little sibling doesn't go into their room without permission (sound). Perhaps there is a hard job they are responsible for that may be made easier by using electricity (movement). Discuss ways they could build a device that would convert energy they have available into the</td></tr>
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		energy they need. Some examples include: a solar oven, a marble run-alarm, a bell above their door, a robot that uses solar energy, a flashlight or charger that uses solar or motion energy, a wind-powered toy boat, a water mill pulley to lift heavy objects, or a potato-powered light bulb for their room. Research methods, gather supplies, and help your child build their own device.

Title of Lesson 25: The Sun and Other Stars (2 pages)

Standards Taught: 4.1.1

Materials:	**Preparation:**	**Implementing the Lesson:**
An everyday item (e.g. ball, drinking glass, book, etc.)		Start by stating that this unit is all about things we see in the sky that are actually in space. Ask your child to discuss things they've learned about space already. Discuss the stars, sun, moon, planets, rotation of the earth, and orbits. Point out that we can't see all the things in space from our place on Earth. Additionally, we can only see certain things at certain times. For example, what do we see in the day that we don't see at night? The sun. What do we see at night that we don't see during the day? Stars? Explain that the sun is actually a large star. It is the star closest to our earth, making it appear to be much larger than the stars we see at night. The sun is 93 million miles away while the next closest star to earth is 260,000 times further away. Next, ask your child to tell you what they know about the sun. Discuss the fact that the sun is mostly made up of gases that are burning at a very hot temperature. This gives off light, energy, and warmth that makes life on Earth possible. The sun is much larger than the earth, about 100 times wider, and at the center of our solar system. Though it sometimes appears to be the same size as the moon, it is actually much larger. The increased distance away from the Earth makes the moon and sun appear to be similar in size, though they really are not. Illustrate this concept by asking your child to observe the everyday item close up. Ask your child to measure the item with their fingers, holding their index finger so it matches with the top of the item and their thumb matches the bottom. Point out that their fingers are very far apart, indicating a larger size. Then, carry the item across the room, down a hall, or to the other side of your yard. Ask your child not to move, but to measure the item with their fingers again. Observe that the item looks much smaller now and their fingers are much closer together. Explain that the item did not change size, it simply got further away and now appears smaller. This explains why the sun looks smaller to us than it actually is. Using this image, ask your child to point out on which planet the sun would appear to be very large (Mercury) and which would make it appear to be very small (Neptune). Emphasize the fact that it is distance that changes this perception and the actual size of the sun does not change. Next, explain that because the moon and sun look the same size from Earth, the sun can sometimes appear to be blocked out by the moon. When the moon and sun line up in our view, a solar eclipse happens. Watch this video and discuss the eclipse, explaining that the moon is simply passing between the Earth and sun. Finally, point out that the sun is the only star within our solar system. This makes it much brighter than the others and, when the sun is out, we usually cannot see the other stars. At night, however, many other stars appear in the sky. Explain that these stars don't actually go away during the day, they are simply less bright than our own sun. Point out that each of

		these stars is actually about the same size as our sun, though much further away making them seem smaller. Explain that there are solar systems and, likely, planets around many of these other stars. Then, introduce the concept of a lightyear by explaining that light from each of these stars, including our sun, travels very quickly. Light can travel around the entire Earth seven times in a single second. However, because the sun and stars are so far away, it takes time for the light to travel from them to our eyes here on earth. The light you see from the sun took 8 minutes to travel to Earth while the light from the next nearest star is 4 years old before you see it. The amount of time it takes for light to travel across space helps us measure the distance between objects that are very far apart. Instead of using feet or inches, we use lightyears to measure things in space. If possible, take your child stargazing and review this lesson as you observe the night sky.

Title of Lessons 26: The Earth

<table>
<tr><td colspan="3">Standards Taught: 4.1.2</td></tr>
<tr><td>Materials:

Image from previous lesson

Globe

Flashlight

Small sticker</td><td>Preparation:</td><td>Implementing the Lesson:

Briefly review the previous lesson with your child, discussing the things they've learned about the sun and stars. Then, ask your child to remind you of what they know about the Earth's movement around the sun. Use the image from the previous lesson to discuss the fact that the planets are orbiting the sun. Point out that each planet is moving at a very high speed. However, the gravity from the sun's mass is pulling the planets in, too. The planets' movement plus the pull of the sun creates a circular motion around the sun, or orbit. The Earth travels around the sun every 365 days, or once a year.

Next, show your child the globe. Explain that the Earth is also moving in another way. Ask your child what they remember about Earth's rotation. Explain that rotation simply means spin. With the globe, demonstrate the rotation of the earth. Point out that this happens while the Earth is orbiting around the sun. The Earth rotates in a full circle in 24 hours, or one day. This rotation creates day and night and makes it appear like the things in the sky are moving.

Ask your child to hold the globe. Hold the flashlight above it, pretending to be the sun. Then, ask your child to put a sticker on the part of the globe in which you live. Finally, ask your child to rotate the globe as Earth rotates and observe what happens during the rotation. Point out that your home is in the light at sometimes during the rotation and in the dark at others. This represents day and night. Then, ask your child what happens to the sun throughout the day and into the night. Discuss the lesson from previous years in which your child observed the sun moving across the sky, lengthening shadows, and disappearing at night. Point out that you did not move the flashlight. Instead, your child moved the Earth. Explain that, though the items in the sky appear to be moving, it is actually the Earth that moves.

Point out that the Earth and planets are constantly moving around the sun. This means that they are further away and closer to each other at different times. Each planet moves across different distances and at different speeds, explaining why some planets are visible to Earth during certain times of the year but not seen during others.

Finally, watch this video with your child. Point out that the movement of the Earth and other planets around the sun changes what we can see in the sky. It also creates seasons on Earth. Discuss the fact that seasons are created by Earth's axis, which pushes certain parts of the planet closer to the sun (creating warmer weather) in the summer and further away from it (creating colder weather) in the winter.

Today, help your child make observations about the movement of Earth and the differences they observe in the sky. This may be done with a pendulum, a sundial, by observing the length and direction of shadows at different times of the day, or by observing the movement of the sun or stars across the sky over time. Remind your child to never look directly at the sun.</td></tr>
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Title of Lessons 27: Constellations I (2 pages)

<table>
<tr><td colspan="3">Standards Taught: 4.1.2</td></tr>
<tr><td>Materials:

Make or purchase a star finder (like the one here)

Additionally, you can use this website or one of these apps

Flashlight or lamp

Globe

Star stickers, various colors</td><td>Preparation:

Before the lesson begins, clear an area in your home that can act as a model for the solar system. Place the flashlight/lamp at the center of this area. Place the globe in an area where it can orbit around the light. Then, place clusters of stars around the sun, organizing them by color. For example, create a red cluster east of the light, a green one west, and a silver one to the north.</td><td>Implementing the Lesson:

Ask your child to review the previous lessons with you. Discuss the sun and its role in the solar system. Talk about the Earth, its movement, and how that movement affects seasons, days, years, and what we can see in the sky. Point out that the things we can view from Earth change throughout the day. However, because the Earth is also orbiting, the things we see in the sky change throughout the year. We cannot see the same stars in the winter as those we see in the summer. The Earth travels to a different part of space between those times, changing what is around us.

Ask your child to tell you what they’ve observed in the sky at night. Remind them that each of these stars is a large ball of gas, like our own sun. However, they are very far away and look much smaller. Ask your child if our sun moves. Point out that, like our sun, the other stars stay in a fixed place in space. However, the planets are constantly rotating and orbiting, making it appear as if the stars were moving.

Show your child this image, explaining that the left side shows the night sky in the summer and the right shows it in the winter. Ask your child to compare the stars and the patterns they make in the two pictures. Point out that each picture shows different stars. Ask your child why they think this is.

Show your child the model you have prepared. Point out that the light represents the sun, the globe is the Earth, and several star clusters exist around space, represented by the stickers. Then, ask your child to move to the globe. Which stars would be easily visible from this point? Point out that one group of stars is likely closer to the sun, making them appear bigger and brighter to the people on Earth. Next, ask your child to move the globe in Earth’s normal orbit. As they do, point out that Earth gets closer and further away from different groups of stars. Ask your child to call out the nearest stars colors as they move. Point out that, at times, some stars are completely hidden from Earth’s view by the sun. Explain that other planets, too, may shield them from our eyes. Finally, ask your child if any of the stars moved. Then, ask them to explain why certain stars are seen in the winter on Earth while others are seen during the summer.

Next, explain that humans love to see patterns in things. Early humans observed the differences in stars throughout the year and began to create images and stories with them to help them remember. These pictures were made by drawing imaginary lines between certain stars until they made a character or item from the story. These imaginary pictures became known as constellations. Constellations help humans easily find stars and remember which ones are visible at different times of the year. Review some of the constellations on this website. Take the time to read some of the stories with your child. Throughout the week, learn about more constellations and encourage your child to share the stories behind them with friends or family.</td></tr>
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		Show your child the star map and teach them how to use it. Point out that you need to know the hemisphere in which you live and the date and month it is. This map helps you see which stars are visible at different times of the year and where to find them. In the evening, take your child outside to observe the stars found on their star map.

Title of Lessons 28: Constellations II

Standards Taught: 4.1.2

Materials:	**Preparation:**	**Implementing the Lesson:**
The star finder from the previous lesson Blank black or blue paper, star stickers, marker/crayon		Review the previous lesson with your child, discussing what they learned about the stars and how the movement of the Earth affects what we see in the night sky. Ask your child to review the constellations you've learned about so far. Next, ask your child to set the star finder from the previous lesson to your area and the correct date. Using this website, help your child find the constellations that should be visible in your area today. Discuss the stories behind them and the patterns they make. This evening, take your child outside and search for at least one of these constellations, asking them to share the story behind it with your family. Repeat this process often and during different times of the year. During the day, ask your child to place several star stickers randomly on the blank paper. Then, ask them to find a picture within their design, create a constellation by drawing lines between the stars, and write a made-up story about their new constellation on the back of their paper.

Title of Lessons 29: Types of Water

<table>
<tr><td colspan="3">Standards Taught: 4.1, 4.1.1.a, 4.1.2.c</td></tr>
<tr>
<td>Materials:

Humidifier

Ice cubes

Glass of Water

Container of a different shape that will hold water (e.g. bowl, vase, smaller glass)

Observation Sheet 29

Highlighter</td>
<td>Preparation:</td>
<td>Implementing the Lesson:

Explain that today we will begin a new science unit. The previous lessons focused on things we can observe in the sky. The next lessons will focus on water and the water cycle. Ask your child to share what they already know about water and the water cycle. Give them time to discuss and ask questions.

Then, point to the supplies you have gathered. Point out that these items each have something in common: they all contain water. However, in each example, the water is in a different state. Explain that matter can be in three states: solid, liquid, or gas. In a solid state, the matter does not take the shape of the container it is put in. It simply stays the same shape it is. Ask your child to name a few solids and identify the solid water form in your examples (ice cubes). Next, explain that in a liquid state, matter takes the shape of whatever container is holding it. It stays the same size, but can change into different shapes. Pour the water from the glass into the second container. Point out that the water easily flowed from one container into the next. However, it is now a different shape than it was in the glass. Ask your child to describe this new shape, comparing it to the shape of the water in the first glass. Then, ask your child to name further examples of liquids and how they can change shape (e.g. swimming pool, bathtub, etc.). Finally, explain that the humidifier shows the final state: gas. The humidifier creates water vapor which is then pushed into the air. This vapor expands to fill the room, changing size and shape as it does. Point out that, eventually, the vapor molecules (or pieces) get spread out so far you can no longer see them. However, the water does not disappear, it simply turns into an expanded gas. Ask your child if they can name other examples of gases (e.g. steam).

Next, ask your child to feel each example of water and note the temperature or amount of heat associated with each. Point out that ice, the solid, is very cold, water, the liquid is warmer than the ice, and water vapor, the gas, is warmest of them all. Point out that steam is also a water vapor and is very, very warm. Explain that each of these items is made of water. However, the temperature of the water affects the way the water acts. If water is cooled, it turns into solid ice. If the ice warms, it turns back into a liquid. If that liquid is warmed further, it turns into a gas. Each state holds the same amount of water, however the way the water acts changes.

Finally, ask your child to list a few examples of water they know about. Explain that this water can be in any state: liquid, solid, or gas. Ask your child to list these examples on their paper below, discussing the relative temperature of each as they go and how that temperature affects the state in which water is in. They may include rivers, streams, reservoirs, oceans, ponds, glaciers, snowfields, snow on a mountaintop, water vapor in the atmosphere, clouds, dew, steam, ice, or ground water. Discuss each of these examples with your child, naming the ones they miss and asking them to add each to the appropriate column. Then, ask your child which of these water sources are safe for humans to drink. Point out that the Earth’s oceans hold most of the water in the world, but are salt water, making it unsafe to drink. Then, explain that much of our drinking water comes from glaciers and snowfields.</td>
</tr>
</table>

Observation Sheet 29

Liquid	Solid	Gas

Title of Lessons 30: The Water Cycle: Heat, Evaporation, Condensation, and Precipitation

Standards Taught: 4.1.1, 4.1.1.b, 4.1.1.c, 4.1.1.d, 4.1.2.c		
Materials: Observation Sheet 30 Pot with a clear lid Several Ice Cubes Stovetop	**Preparation:**	**Implementing the Lesson:** Review the previous lesson on states of water with your child. Ask them to remind you of the three states, provide examples of each, and discuss the differences in temperature. Then, ask your child to review some of the water sources found on Earth and their respective states. Next, ask your child why they believe water exists in different states around the world. Point out that, in some areas, the oceans and rivers flow as liquids. In other areas, the water is frozen into ice, snow, and glaciers. In the atmosphere, water vapor surrounds the earth in a gas state. Remind your child of the connection of different states to the temperature of the water. Ask your child what heats and warms the earth. Point out that the sun shines light and heat energy onto the earth. Seasons exist because the earth is further from or closer to the sun, making the earth warmer or cooler. Certain points of the earth, like he poles and the equator, are further from or closer to the sun, making them very cold or very warm. Explain that the heat from the sun can help water to warm and change states. The sun can melt glaciers and snow or heat water until it **evaporates** into a gas. Evaporation warms to water until it turns into a water vapor, or gas, which then floats above the liquid water. Ask your child what they think happens to the water vapor after it is heated. Discuss some of their ideas. Then, explain that, as the water vapor rises, it begins to cool down. When it reaches a certain temperature, the gas turns back into a liquid. However, the liquid is in the form of very small droplets. These droplets gather together to create clouds. The change from a gas, water vapor, to liquid droplets, clouds, is called **condensation.** Alternatively, if water vapor experiences lower temperatures closer to the ground, **dew** may form as a type of condensation. This is why the grass is sometimes wet in our yards in the early morning. The water vapor around the grass cooled overnight and became liquid droplets, which gathered on the grass. When several of these droplets gather in one area, they become too heavy to stay in the air. Droplets begin to fall and, depending on the temperature of the sky around them, reach the ground as rain, snow, hail, or sleet. This is called **precipitation.** Precipitation allows liquid or solid water, made from cooled water vapor, to return to Earth's surface. Show your child the ice cubes. Explain that they represent the glaciers found on earth. Ask your child to place the ice cubes in the pot. Explain that, as ice, water is at a temperature of 0˚ C or lower. Turn on the stove and allow the ice cubes to change into a water state. Point out that the stove is our heat source, but on Earth, it would be represented by the sun. Explain that the temperature of the water has increased because it was warmed by the stove. The water is now above 0˚ C. Continue to heat the pot watching until it begins to steam. Ask your child to watch as water vapor (steam) is formed. Explain that the water is now above 100˚C, turning it into a gas. It is evaporating. Turn off the stove, explaining that as there is no more heat being provided, the air around the pot will begin to cool it and the water inside of it. Place the clear lid on top of the pot. Ask your child to observe as the water vapor (steam) cools and gathers in droplets on the lid. Point out that the cooled water is condensation, much like clouds in the sky. As the water begins to fall, explain that this show precipitation, just as when rain falls from the clouds.

Observation Sheet 30

Use the words from the word bank to fill in the blanks below.

temperature	**liquid**	**precipitation**	
fog	**evaporation**	**sun**	**condensation**

1. As the ice in the pot melted, it was changing from a solid state to a ________________________________.

2. When the water began to turn to steam, it was going through the process of _________________________.

3. As the water vapor cooled it began to form droplets. This process is known as ________________________.

4. When the droplets began to fall from the lid, the water was going through ___________________________.

5. The ____________________ of water affects what state it is in.

6. Water on Earth gains heat from the _________________.

7. Another example of condensation is _______________________ on a bathroom mirror when a warm shower is running.

Title of Lessons 31: The Water Cycle (2 pages)

Standards Taught: 4.1.2, 4.1.2.a, 4.1.2.b, 4.1.2.e

Materials:	**Preparation:**	**Implementing the Lesson:**
Glass of Water Salt Spoon A few warm, sunny days or a pot and stove		Review the previous lessons on water with your child. Discuss places on Earth where water can be found, how it changes state, and the definitions of evaporation, condensation, and precipitation. Next, point out that every living thing on Earth needs water to survive. However, not everyone lives near water sources. Likewise, most of the water we have is found in the ocean, where the water is filled with salt and undrinkable. Then, ask your child how we get water to different areas so that we can use it to grow food, care for pets, and drink ourselves. Explain that, through evaporation, condensation, and precipitation, water is naturally moved throughout the earth. When water is evaporated and condenses, it forms clouds. These clouds, and other water vapor, are pushed around by wind. Wind can carry water vapor from the ocean all the way to the center state in the U.S. As the clouds move, they change temperature based on the temperature of the air around them. They may pick up more water vapor or cool and create more condensation. When they become dense enough for precipitation to occur, the water falls from the sky and is left behind in the area below the cloud. This water is used by the people in that area. Ask your child if they know why the water evaporated from the ocean is not salty when it falls as rain, hail, sleet, or snow. Explain that you are going to show them how. Show your child the glass of water. Ask them to add salt to the water and stir it until the salt dissolves. Then, heat the water until it is all evaporated. This can be done by placing the glass in the sun for a few days or by heating the water in a pot. When the water is gone, point out that the salt remains behind. Explain that the salt heavier than the water and has a higher temperature at which it turns into a gas. This means that only the water is evaporated and the salt is left behind. Next, explain that many communities have found ways to save and spread out the water that falls in their area because they don't have constant access to water and must rely on the weather. Some communities pull water that fell from the sky and sank into the ground up, clean it, and send it through a series of pipes into homes. Some store water in huge reservoirs, such as lakes or man-made structures. If no rain falls for a long time, these reservoirs are used to supply water to residents. However, if a drought (a long time period with no precipitation), reservoirs can run out. It's important to plan and save water for these times before they occur. Point out that after water falls, some of it evaporates again, moving on to provide water to a new area. Alternatively, it may be absorbed into the ground where it gathers and flows in underwater streams. Water can also flow naturally from place to place, as in rivers and streams. This allows water to move to even more places. Used water, too, flows back into the pipes of our homes and ends up in various places. Water never is destroyed, though it sometimes becomes unusable through use and needs to be treated again before it is safe. Even the water we drink leaves our bodies (e.g. sweat, tears, urine) and is eventually transported to another area.

		Explain that water always flows downhill, moving it across vast distances and back to the ocean, which is lower than other areas on Earth. As water reaches the ocean again, it is mixed with the salty water already there. Then, the sun once again heats it and the process begins again. The movement of water in this process is called the **water cycle**. Show your child this image and ask them to review what they've learned, going through the water cycle and explaining the processes taking place along each step. Answer any questions they may have and make corrections as needed. Discuss the water cycle throughout the week, encouraging your child to discuss where the water they use daily came from and how it got to your table.

Title of Lessons 32: Building the Water Cycle

Standards Taught: 4.1.2.d		
Materials: Varies, depending on what type of model/diagram your child chooses to make	**Preparation:**	**Implementing the Lesson:** Review the previous lesson on the water cycle, using the image from that lesson to discuss the various aspects of the cycle. Ensure your child understands evaporation, condensation, precipitation, and the processes which move water through the cycle. Then, ask your child to create a model or diagram of the water cycle on their own. Ideas can be found here or through an internet search. Help your child gather supplies and materials needed and encourage them to use their model to teach a friend or family member about the water cycle.

Title of Lessons 33: Weather Patterns and Predictions (2 pages)

Standards Taught: 4.2, 4.2.1, 4.2.1.b, 4.2.1.c, 4.2.2, 4.2.2.a, 4.2.2.b, 4.2.2.c, 4.2.3, 4.2.3.a, 4.2.3.b, 4.2.3.c, 4.2.3.d, 4.2.3.e

Materials:

Weather forecast on the news

Observation Sheet 33

Website, news channel, or tools with which you can check the required weather elements each day

Preparation:

Implementing the Lesson:

Briefly review the Water Cycle with your child, asking them to discuss the processes involved. Then, ask your child to describe how the water cycle is tied to the weather. Point out that weather can make life fun or uncomfortable, cold or warm, wet or dry, and windy or calm.

Explain that weather can change quickly and seems to be unpredictable. However, if we understand the different **components**, or pieces of information, that affect weather, we can begin to predict the types of weather we will experience. **Meteorologists**, or scientists who predict the weather, use specific tools to accurately measure precipitation, air temperature, wind speed and direction, and air pressure. Using this information and previous weather patterns, they can begin to guess what weather is coming with some accuracy.

Ask your child why it is colder in the winter than in the summer. Remind them that, because we've experienced these seasons before, we understand that this is a pattern that happens over and over again. We understand how the Earth moves in relation to the sun and can guess when it will become colder or warmer based on our position in the solar system. This is one example of predicting weather and is known as seasonal accuracy. Seasonal accuracy gives us a range (high and low) of weather that has been experienced before and allows us to begin to predict what the weather will be like in the future.

However, meteorologists use smaller and more local measurements to predict the temperature, precipitation, and likelihood of wind or clouds on any given day. They share their guesses with others (e.g. the weatherman on the news) so that people can decide on what activities they would like to do that day and what they would like to wear. This way, it's less likely you will be caught wearing shorts in a snowstorm or a hot jacket on a summer day. Their prediction is known as a **weather forecast**.

Meteorologists measure the humidity, or amount of water vapor in the air using a hygrometer. This tool tells them how wet or dry the air is. They can use this information to determine how likely it is that clouds will form in the area or **precipitation** will fall. When the humidity level reaches 100%, it is likely raining, snowing, hailing, or sleeting. A **rain gauge**, or container that measures how much precipitation falls, is used to gather information and look for patterns to predict how much rain may fall in the future on days with similar weather patterns.

Meteorologists also measure the **air temperature** using a **thermometer.** Over time, recordings of these temperatures help them predict the normal temperature for any given weather pattern on any given day. Since the air around us is made up of molecules and takes up space, the temperature can change throughout the day. However, predicting the lowest and highest temperature for a day helps meteorologists share information and people decide how to react to the weather before it even happens. Likewise, meteorologists use a tool called a **barometer**. A barometer measures the **air**

		pressure in a specific location. Changes in air pressure can create wind, which then can blow clouds and other water vapor around and change the weather and temperature. As the air pressure changes, the weather does, too. A lower air pressure can result in rain while a higher air pressure (especially with a drop in temperature) can result in clear skies. Wind is created when air molecules are cooled or heated and change place with other molecules of a different temperature. Warm air rises while cool air falls. As these two groups of molecules move, they create wind. Meteorologists use information about air temperature and weather patterns recorded from the past to predict the **wind speed** and direction on any given day. Wind moves clouds and changes temperatures based on the air temperature they carry with them. This means that information about wind can help meteorologists better predict weather for that day. These tools and weather patterns, when used together, create fairly accurate weather predictions. Though meteorologists are sometimes wrong, they are far more accurate than superstitions of the past (e.g. my knee hurts so it will rain). Explain that, over the next two weeks your child will gather information about weather patterns in your area. Then, the week after that, they will gather data from meteorologists and predict the weather themselves. Give your child the Observation Sheet for this lesson. Ask them to track weather information for two weeks using a local weather source or your own tools to gather data. At the end of two weeks, discuss how accurate the meteorologist was and what information probably led him/her to make those guesses. For the third week, give your child only the information provided by the meteorologist, but note the meteorologist's predictions yourself. Ask your child to record their own predictions. At the end of each day, ask your child to compare their prediction to the actual weather and to the prediction of the weatherman/woman that morning.

Observation Sheet 33 (2 pages)

Day 1: Wind Speed: Wind Direction: Air Pressure: Humidity: Temperature: Precipitation: Prediction: Correct: Yes/No	**Day 2:** Wind Speed: Wind Direction: Air Pressure: Humidity: Temperature: Precipitation: Prediction: Correct: Yes/No	**Day 3:** Wind Speed: Wind Direction: Air Pressure: Humidity: Temperature: Precipitation: Prediction: Correct: Yes/No	**Day 4:** Wind Speed: Wind Direction: Air Pressure: Humidity: Temperature: Precipitation: Prediction: Correct: Yes/No	**Day 5:** Wind Speed: Wind Direction: Air Pressure: Humidity: Temperature: Precipitation: Prediction: Correct: Yes/No	**Day 6:** Wind Speed: Wind Direction: Air Pressure: Humidity: Temperature: Precipitation: Prediction: Correct: Yes/No	**Day 7:** Wind Speed: Wind Direction: Air Pressure: Humidity: Temperature: Precipitation: Prediction: Correct: Yes/No
Day 8: Wind Speed: Wind Direction: Air Pressure: Humidity: Temperature: Precipitation: Prediction: Correct: Yes/No	**Day 9:** Wind Speed: Wind Direction: Air Pressure: Humidity: Temperature: Precipitation: Prediction: Correct: Yes/No	**Day 10:** Wind Speed: Wind Direction: Air Pressure: Humidity: Temperature: Precipitation: Prediction: Correct: Yes/No	**Day 11:** Wind Speed: Wind Direction: Air Pressure: Humidity: Temperature: Precipitation: Prediction: Correct: Yes/No	**Day 12:** Wind Speed: Wind Direction: Air Pressure: Humidity: Temperature: Precipitation: Prediction: Correct: Yes/No	**Day 13:** Wind Speed: Wind Direction: Air Pressure: Humidity: Temperature: Precipitation: Prediction: Correct: Yes/No	**Day 14:** Wind Speed: Wind Direction: Air Pressure: Humidity: Temperature: Precipitation: Prediction: Correct: Yes/No

Day 1:	**Day 2:**	**Day 3:**	**Day 4:**	**Day 5:**	**Day 6:**	**Day 7:**
Wind Speed:	Wind Speed:	Wind Speed:	Wind Speed:	Wind Speed:	Wind Speed:	Wind Speed:
Wind Direction:	Wind Direction:	Wind Direction:	Wind Direction:	Wind Direction:	Wind Direction:	Wind Direction:
Air Pressure:	Air Pressure:	Air Pressure:	Air Pressure:	Air Pressure:	Air Pressure:	Air Pressure:
Humidity:	Humidity:	Humidity:	Humidity:	Humidity:	Humidity:	Humidity:
Temperature:	Temperature:	Temperature:	Temperature:	Temperature:	Temperature:	Temperature:
Precipitation:	Precipitation:	Precipitation:	Precipitation:	Precipitation:	Precipitation:	Precipitation:
Your Prediction:	Your Prediction:	Your Prediction:	Your Prediction:	Your Prediction:	Your Prediction:	Your Prediction:
Correct: Yes/No	Correct: Yes/No	Correct: Yes/No	Correct: Yes/No	Correct: Yes/No	Correct: Yes/No	Correct: Yes/No
Weatherman prediction:	Weatherman prediction:	Weatherman prediction:	Weatherman prediction:	Weatherman prediction:	Weatherman prediction:	Weatherman prediction:
Correct: Yes/No	Correct: Yes/No	Correct: Yes/No	Correct: Yes/No	Correct: Yes/No	Correct: Yes/No	Correct: Yes/No

Title of Lessons 34: Types of Clouds

Standards Taught: 4.2.1		
Materials: Blue papers Cotton balls Black marker Glue	**Preparation:**	**Implementing the Lesson:** Discuss the previous lesson with your child and encourage them to keep working on their weather observations. Ask them if they've discovered any interesting information or noticed any patterns yet. Then, explain that today you are going to give them another tool to help predict the weather: types of clouds. Ask your child to go outside and observe the sky. Are there clouds today? What do they look like? How do they differ from clouds they've seen before? Do they look like rain clouds? Why or why not? Point out that, based on what they already know, your child has noted that there are different types of clouds. Rain clouds are usually dark and grey and lower to the ground while fluffy-looking white clouds usually pose no threat of rain. Explain that there are actually several different types of clouds which categorized by their height in the **atmosphere**, or the area between Earth and outer space, color, density, and appearance. Discuss the following with your child: The highest types of clouds are **cirrus** clouds. Cirrus clouds are white, wispy, and thin and often accompany sunny weather. Show your child this image of cirrus clouds. **Stratus** clouds are very low in the sky, gray, and spread across the whole sky. These can bring a light rain. Show your child this image of stratus clouds. Stratocumulus are lumpy, low in the sky, and gray. They are usually puffier than stratus clouds but can also produce rain. Show your child this image of a stratocumulus cloud. **Cumulus** clouds are white and positioned in the mid-to-low level of the sky. They have flat bottoms and usually mean good weather unless they become too tall turning into cumulonimbus clouds. Show your child this image of a cumulus cloud. Cumulonimbus clouds are thunderstorm clouds and look like tall mountains. These tall clouds bring rain, thunderstorms, hail, and even tornados. Show your child this image of a cumulonimbus cloud. Finally, ask your child to make a model of each of the types of clouds they've learned about using cotton balls, glue, the marker, and the blue papers. Use this image as a guide and encourage your child to make their model as accurate as possible. Throughout the week, help your child note the type of clouds in the sky and what that might mean for the weather.

Title of Lessons 35: Extreme Weather

Standards Taught: 4.2.1.d		
Materials: Information and sources for the weather phenomena your child chooses.	**Preparation:**	**Implementing the Lesson:** Discuss the previous lessons on weather with your child. Ask them to tell you what they've learned and observed in using tools and patterns for predicting weather. Encourage them to continue to use this knowledge to guess, or predict, the weather throughout the week. Point out that, at times, Earth experiences weather that is not a part of the normal pattern or that is **severe** and dangerous to people, plants, and animals. Severe weather can occur when weather patterns and the water cycle interact in specific ways and create unique weather **phenomena**, or events. Lightening, tornadoes, blizzards, extreme freezes, hurricanes, flooding, and droughts are examples of severe weather phenomena. Each event brings different dangers and challenges to the people and other living things in the area. Watch this video with your child. After the video, discuss each type of severe weather and how it differs from normal weather patterns. Discuss ways humans can prepare for, react to, or help prevent damage during these phenomena. Allow your child to choose one of these phenomena that interests them and research it further. Encourage your child to learn more through videos, books, and online sources. Then, ask your child to give an oral presentation of their findings to a friend or family member.