Saturday Science – Fall 2015

Lesson Plan

Adaptations

Our Habitat (Indiana)

3rd-4th Grade

**Week One**

**A) LEARNING OBJECTIVES**

* Students will identify their own basic needs for food, water, shelter, and space in a suitable arrangement.
* Students will generalize that all living beings have the similar basic needs
* Students will observe animals and plants in their habitat by recording written observations, drawings, and taking photos.

**B) STANDARDS (see http://www.doe.in.gov/standards/science)**

*● Core Standard: Observe and describe how natural materials meet the needs of plants and animals (including humans).*

* *3.2.5 Describe natural materials and give examples of how they sustain the lives of plants and animals.*
* 4.3.2 Observe, compare and record the physical characteristics of living plants or animals from widely different environments. Describe how each plant or animal is adapted to its environment.
* 4.3.3 Design investigations to explore how organisms meet some of their needs by responding to stimuli from their environments.

*● Process (Nature of Science and Design)*

* Keep accurate records in a notebook during investigations and communicate findings to others using graphs, charts, maps and models through oral and written reports.
* Perform investigations using appropriate tools and technologies that will extend the senses

**C) MATERIALS**

* 24 Observation worksheets
* 24 Pencils
* 24 Clipboards
* 24 Pieces of paper
* 24 sets of Crayons/ markers
* 24 Hand lens
* 3 chart papers

**D) TEACHER CONTENT KNOWLEDGE**

* Teachers will need to know what a habitat is and what the components are (food,water,shelter,space)
* Teachers will need to be aware of the habitat that they are taking students to during the activity (area outside education building)
* Teachers will need to be aware of what an adaptation is and what kind of adaptation that animals and plants need in the area observed
* Teachers need to know how an environment connects to the plants and animals adaptations

**E) REFERENCES**

Project WILD., Western Association of Fish and Wildlife Agencies (U.S.), & Council for

Environmental Education. (1992). *Project WILD: K-12 activity guide*. “What’s that

habitat?”. Pages 56-58. Bethesda, MD: Project WILD.

**F) DESCRIPTION OF YOUR LESSON**

**What’s that Habitat?**

|  |  |
| --- | --- |
| **Engage** | First we will do a KWL chart about what a habitat is so we can understand where the students are in their understanding of what a habitat is.  Introduce the terms; food, water, shelter, and space. |
| **engage** | Have the students draw a picture of where they live including where they find food, water, shelter and space. Have them label these parts of their drawings.  After drawings are complete write the words “arrangement” and “habitat” on the board. We will be adding these words onto the KWL chart as they are learned. |
| **engage** | Explain to the students that food, water, shelter and spaced are arranged into a ‘habitat’.  Ask students if they could live in a home where the bathroom was 4 miles in one directions and the kitchen was 12 miles in another direction. This arrangement is not suitable for a human to live. |
| **Elaborate** | **Claim: We hope students will come up with the claim that….**  We will repeat this activity- can be considered as the second part of the activity once we return inside but do it with an animal rather than their own home. |

**Outside Exploration**

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| **Engage** | [**https://www.youtube.com/watch?v=x-dwQx31xjw**](https://www.youtube.com/watch?v=x-dwQx31xjw) **(2:30-4:00)**  We will show this video to introduce the students to the outside environment that they may encounter. Some of the students may have been to the area where the video is filmed. If not, students will have at least seen a similar environment around their home. |
| **Explore** | Have students use the handout to guide them in their observations. They will be observing what they see when they look straight out, looking down and looking up. They can either draw or write their observations of what they see. 3 groups will be focusing on animals, 3 groups will be focusing on plants, and 2 groups will be focusing the relationship/interaction between plants and animals.  **Students will be divided into 8 groups (3 student per group).** |
| **Explain** | Each group will have a better idea on their topic after the observational activity. We will first have all the similar groups gather (3 plants, 3 animals, 2 plant/animal) and talk about what they observed. Then we will gather as a whole class and discuss their findings in their observations, by creating a list on the board. The discussion will include things that the students saw that relate to plants and animals. Focus on the relation to plants and animals in the environment with: What they use  What they don't use  What they may stay away from  Then transition the discussion by introducing adaptation. |
| **Elaborate** | **Claim: We hope that students come up with the claim that…**  Students will complete the animal habitat activity from above and finish L part of the KWL chart |

G) EMBEDDED FORMATIVE ASSESSMENT (the 5th “E”)

The students worksheets will be part of an formative assessment to look at their observational skills. Also the habitat activity will serve as their understanding of what an habitat is and how animal and human ones differ.

H) GEARING UP/GEARING DOWN

1. Gearing up:

If this appears too easy for students, we will let them to lead the discussion themselves to create their own understanding how habitats, environment leads to adaptation.

2. Gearing down:

If this appears too hard for the students we will do the last animal habitat creation as a group, not individuals.

**Week Two**

3-4: Adaptations

Aquatic

**A) LEARNING OBJECTIVES**

* Students will identify the needs of animals in an aquatic environment.They will do this by visiting the Jordan River and they will be performing an activity where they observe the animals that they find in the aquatic environment.
* Students will become familiar with a local aquatic habitat, they will do this by visiting the aquatic habitat outside of the school of ed. They will be spending a good amount of time at this environment.
* Students will observe animals and plants in an aquatic habitat by recording written observations, drawings, and taking photos. They will do this by using their scientific journals at the Jordan River.

**B) STANDARDS (see http://www.doe.in.gov/standards/science)**

*● Core Standard: Observe and describe how natural materials meet the needs of plants and animals (including humans).*

* *3.2.5 Describe natural materials and give examples of how they sustain the lives of plants and animals.*
* 4.3.2 Observe, compare and record the physical characteristics of living plants or animals from widely different environments. Describe how each plant or animal is adapted to its environment.
* 4.3.3 Design investigations to explore how organisms meet some of their needs by responding to stimuli from their environments.

*● Process (Nature of Science and Design)*

* Keep accurate records in a notebook during investigations and communicate findings to others using graphs, charts, maps and models through oral and written reports.
* Perform investigations using appropriate tools and technologies that will extend the senses

**C) MATERIALS**

* 24 Observation worksheets
* 24 Recording Worksheets
* 24 Pencils
* 24 Clipboards
* 24 Hand lens
* 8 large nets to collect insects in water
* 8 Buckets
* Aquarium
* Aquatic plants
* Water
* Soil based plants
* Microscope (6?)
* microscope slides 15, and covers (if not petri dishes)
* Plastic Baggies
* Mason jar (6)
* rulers (4)
* forceps/tweezers (4)
* eye dropper (6)

**D) TEACHER CONTENT KNOWLEDGE**

* Teachers will need to know what a habitat is and what the components are (food,water,shelter,space). Teachers will need to be aware of the habitat that they are taking students to during the activity (Aquatic area outside of education building). They will need to be familiar with the plants that are in the Jordan River. Teachers will need to be aware of what an adaptation is, a change or the process of change by which an organism or species becomes better suited to its environment. Teachers need to know how an environment connects to the plants and animals adaptations. Teachers need to know about plants that grow outside of water, by the water and in the water and insects that live inside of the water. Plants live outside of the water by using photosynthesis to get their food from the sun. They receive their water from the roots when it rains. Plants live underwater have three types of leaves, 1. **submersed leaves**, which are very thin and narrow, often highly dissected and very flexible 2. **floating leaves**, broader leaves that are firm or leathery but flexible enough to resist tearing by wave action 3.**emersed leaves** (aerial leaves), i.e., similar to typical leaves of terrestrial plants living nearby. An important adaptation for many freshwater aquatic plants is the formation of **aerenchyma**, which is parenchyma tissue having large intercellular air spaces. Aerenchyma functions both to store oxygen and to transport that gas to living tissues. This gas collection is important in leaves for buoyancy. In addition, the system of lacunae is a diffusion pathway for oxygen; the oxygen is, of course, made in the chloroplasts during the light reaction of photosynthesis. Oxygen, when released via photosynthesis, diffuses preferentially into the lacunae, because it cannot diffuse as rapidly into water and comes out of solution in the intercellular air spaces, where oxygen concentration of trapped air there may be one-third or greater. Here it can be used in constructive ways by aquatic plants. A leaf midvein, petiole, or stem develops an internal pressure, which enables oxygen to be transported via bulk flow in a lacunar network to rhizomes and roots located in the anaerobic mud and muck, permitting these organs to grow more rapidly. Gases can also move in bulk to young tissues, where the pressurized air helps expansion of developing lacunae near the growing tip. The cut end of an aquatic plant will give out bubbles (underwater, of course) from lacunar gas under pressure. Teachers need to know how to collect insects in aquatic areas using appropriate tools. We will be using large nets and tubs to collect the insects. They will be looking under rocks for these insects. Teachers need to understand that animals and plants need each other to survive in an aquatic environment. Insects, eat and live in the plants to survive.

**E) REFERENCES**

<http://steonline.org/circles/lessons/energy/PDFs/aquatic-animal3.pdf>

http://www.botgard.ucla.edu/html/botanytextbooks/lifeforms/aquaticplants/fulltextonly.html

**F) DESCRIPTION OF YOUR LESSON- Continue building KWL**

**Expectations: (9:30-9:35)**

Write expectations on the board as we go.

-*Does anyone remember the rules from last time?*

-*Today, we will have a few new rules. We want to be good scientists, so there are a few things that we all need to do in order to be good scientists.*

*-First, do good scientists play in their chairs? (NO). So since we are good scientists, we are not going to be playing in the chairs.*

*-Do good scientists talk out when their classmates or teachers are talking? (NO). What do we do if we want to talk? (raise our hands)*

*-Do good scientists play with the objects on the table when they are supposed to? (NO). So since we are good scientists, we are going to keep our hands to ourselves and listen when it is not time to touch the objects on the table. There are a few new scientific materials that we will be using today, but we are ONLY going to touch these when instructed.*

*-Good scientists also respect their classmates and listen to each other’s ideas.*

**Exploring Water Organisms**

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| **Engage (9:35-9:45)**  **Take students to bathroom after this before we go outside** | We will engage the students by asking them the focus question: “What kinds of things other than fish live in an aquatic environment?” Have students discuss question as a class. Then, we will have them make predictions of this on an activity sheet before we go outside. We will have them do this individually and then share with their table groups.  Explain to students exactly what they are doing when they go outside (find plants/animals and do worksheet) Also tell students that when we go outside, we will be collecting plant samples to use in the next activity when we come back inside. |
| **Explore (9:55-10:25)**  **(all teachers supporting own group)** | Have students go outside and explore the Jordan River. The students will be broken into groups of 3 and will use a net to try and find different organisms in the Jordan River. Each of the teachers will be working with one of the groups for assistance. Students will do this by collecting the water/dirt in the Jordan River. Once they place the water and dirt in the bucket, students will use the hand lenses to observe what they have found. They will be filling out their observation sheets about organisms that live outside of the water, near the water and under the water.  Students will receive a Key when looking for the insects they find. They will be looking at the insects and their characteristics, or adaptations, that they all have that allows them to live in water. They will be keeping track of these on their recording sheet. After they have spent time exploring we will come back together and tally the number of each type of organism. |
| **Explain (10:30-10:40)** | After students have explored the aquatic environment we will go back inside to discuss the students findings. For this discussion we will place the students into a group that is made up of one students from each area. They will share out what they have found out about the aquatic environment. We will ask the students how their predictions have changed now they have explored the habitat. Each group is going to come to the front of the class and show us what they found. We will have a group tally on the board and the group will write the tallies on the board. |
| **Elaborate (10:40-10:50)** | Connect this activity to exploring with plants. The elaborate will be to think about the things that different aquatic things may have compared to non-aquatic things. We will emphasize how important it is to have both plants and animals in our habitats and that one wouldn't survive without the other. The students will come to the claim that, “Both plants and animals live the aquatic environment and they need each other to survive.”  Ask them about the micro organisms they found and what they all have in common that allows them to live in the aquatic environment. Make a list of their comments on the board along with picture is possible. |

**IF RAINING:**

For this activity, if it is raining on Saturday we will get water from the Jordan River that we were originally going to go to ahead of time. Instead of going out to the river, the students will look at these jars and still use the key to see if they see any insects in the jars. They also can do further exploration by taking water samples and looking at the water and organisms under the microscopes that we already have in the classroom.

**-SNACK AND BATHROOMS- (10:50-11:05:) → engage video played during this**

**Exploring Aquatic Plants vs Non-Aquatic Plants**

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| **Engage (11:05-11:10)** | Students will watch a video based on plants that students will be watching during snack time. students will then take a few minutes to talk about the plants that they accumulated from outside.  <https://www.youtube.com/watch?v=Mbj_WQ76F1Q>  Video will start being shown during snack |
| **Explore(11:10-11:40)**  **(All teachers will be at a station helping groups)** | We will have stations for this section. There will be 6 stations. Three stations will be based on aquatic plants and Three will be based on soil based plants. 2 tables (from each type of plant) will involve observing the plants with a microscope. The first table will be using two different microscopes to observe water leaves and soil leaves. The second table will be a station with a microscope with water roots and one with soil roots. The third and fourth table will have soil plants and aquatic plants within their containments (ex. aquarium or pot with soil). Table three will be finding the similarities within the plants and table four will be differences. The fifth and sixth table will have the plants out on a tray for them to observe with tools (ex. ruler, hand lens, etc). The fifth table will be similarities and the sixth table will be differences. This whole time the students will be filling out a plant booklet that has the each table task on a designated page. |
| **Explain (11:40-11:50)** | Students will make a classroom chart on the board of what they observed (similarities, differences). We will then ask the students, based on these observations why they think that one plant can live underwater and the other plant can not.  “An important adaptation for many freshwater aquatic plants is the formation of **aerenchyma**, which is parenchyma tissue having large intercellular air spaces. Aerenchyma functions both to store oxygen and to transport that gas to living tissues” |
| **Elaborate (11:50-12:00)** | This activity will really emphasize how aquatic plants and soil plants have developed differently to be able to live in their environment, whether it be in a garden, a pot inside a house, an aquarium or river. |

G) EMBEDDED FORMATIVE ASSESSMENT (the 5th “E”) The students worksheets will be part of an formative assessment to look at their observational skills. Also the aquatic habitat activity will allow the teachers to evaluate the student's’ ability to categorize organisms based on characteristics or adaptations. . Plant booklet will be created based on students observations of the aquatic and soil based plants.

H) GEARING UP/GEARING DOWN

1. Gearing up:

If this appears too easy for the students, we can have them do the explore phase on their own, rather than in groups to see if they can find any different organisms than other groups found.

2. Gearing down:

If this appears too difficult for the students, we can model for the students how to find organisms in the Jordan River for added explanation or even work one-on-one with a student who is struggling for both of the activities.

**Week Three**

3-4: Adaptations

Prairie/Grassland

**A) LEARNING OBJECTIVES**

* Students will learn about what grasslands are and where they are through discussion during the engage section.
* Students will understand the correlation between prey and predators through the thicket and the rabbit game.
* Students will demonstrate an understanding of how rabbits and coyotes need to adapt in order to be able to survive.
* Students will develop an understanding for plant adaptations in the grassland regions and why these plants need to adapt to the grasslands regions.

**B) STANDARDS (see http://www.doe.in.gov/standards/science)**

Standard 3- Life Science (4th grade)

* 4.3.2 Observe, compare and record the physical characteristics of living plants or animals from widely different environments. Describe how each plant or animal is adapted to its environment.
* 4.3.3 Design investigations to explore how organisms meet some of their needs by responding to stimuli from their environments.
* 4.3.4 Describe a way that a given plant or animal might adapt to a change arising from a human or non-human impact on its environment.

*Process (Nature of Science and Design)*

* Keep accurate records in a notebook during investigations and communicate findings to others using graphs, charts, maps and models through oral and written reports.
* Perform investigations using appropriate tools and technologies that will extend the senses

**C) MATERIALS**

* Brown, yellow, green, and red full size construction paper (1 pack of each color)
* Scissors (24 if possible but it is not crucial to have 24)
* glue (5 bottles)
* tape (5 rolls)
* crayons and colored pencils for all 24 students to use
* popsicle sticks (5 packs) - around 100?
* Dry Erase Board (Christy has if we do not have access to a portable one)
* Dry Erase Markers (christy has)
* 4 small cones for rabbit game
* 2 Blindfolds
* About 30 feet of rope

**D) TEACHER CONTENT KNOWLEDGE**

* Teachers need to know that prairies and grasslands in the U.S. are mostly located in North and South Dakota, Nebraska, Kansas, Texas, Oklahoma, and Iowa. Some common plants that grow there are grass, sunflowers, Clover and Wild Indigos. Some common animals are coyotes, eagles, bobcats, wild turkeys, canadian geese, bison and crickets.
* Teachers will also need to know the correlation between prey and predator. Ideally, there is a balance between predator and prey. When something becomes unbalanced, problems can happen.
* When there is an abundance of food the predator can survive and reproduce. However, reproducing too much can lead to too many predators and the food will quickly become scarce.
* When there is an abundance of predators and not very much food, the predators could die out due to lack of food.
* Teachers will need to know that plants in the prairies and grasslands have to adapt to the conditions presented to them. Some of the conditions in grasslands and prairies include wind, extreme cold and head, predation (animals eating the plants), fires, and drought.
* Plants have developed long roots to prevent predation (animals can’t pull them out by the roots while eating the plants) and their long roots also help them absorb as much water as possible in the event of a drought.
* Some plants have developed preventative features against animals. For example, some plants will develop spikes so that when animals eat it, it will harm the animal.
* A lot of plants in prairies and grasslands are wind pollinated. They take advantage of windy conditions in the grasslands and prairies.
* Some plants actually use fire to their advantage. Fires are often good for prairies in grassland to get rid of any debris that is harmful to the land. Some plants even have seeds that are only released from heat from a fire.

\*\*Read through powerpoint to find more facts about plant adaptations

<http://www.blueplanetbiomes.org/grasslands.htm>

**E) REFERENCES**

<http://www.blueplanetbiomes.org/grasslands.htm>

<http://www.dnr.state.mn.us/biomes/prairie.html>

<http://www.mbgnet.net/bioplants/adapt.html>

<http://www.fws.gov/uploadedFiles/Region_1/NWRS/Zone_2/Inland_Northwest_Complex/Turnbull/Documents/EE/Field_Trip/The%20Thicket%20Game.pdf>

<http://kidszoo.org/wp-content/uploads/2014/02/Quick-Frozen-Critters.pdf>

http://www.britannica.com/plant/grama-grass

Thicket game: <http://www.fws.gov/uploadedFiles/Region_1/NWRS/Zone_2/Inland_Northwest_Complex/Turnbull/Documents/EE/Field_Trip/The%20Thicket%20Game.pdf>

**F) DESCRIPTION OF YOUR LESSON**

|  |  |
| --- | --- |
| **Engage**  **10 min** | We will show students a map of the United States and show them where prairies/grasslands are mostly located. We will have a list on the board and ask them if they know what type of animals/plants they find in prairies and grasslands. After that we will talk about prey and predator and which of the animals on the list are either a prey or predator.  plants: grass, sunflowers, Clover and Wild Indigos.  animals: coyotes, eagles, bobcats, wild turkeys, Canadian geese, bison and crickets.  <https://www.youtube.com/watch?v=KitxeFuqOro> |
| **Explore- Create your own plant activity** | Students will work with their table teams to create their own plant that lives in the grasslands or prairies. However, each plant must have a developed adaptation that helps it to survive the given condition (each table will have a condition to focus on). Students will use construction paper, scissors, tape, glue, popsicle sticks to create their plant as a group. The students will also keep a record of what features their plant has that makes them able to withstand the feature that has been assigned to them.  Each teacher will work with a table and actually help with the project and be part of the team. We can help them come up with ideas, cut things out, glue things, etc.  Instructions given to students below:  **With your table, create a plant that can survive a condition of grasslands and prairies.**  Make your plant able to survive your table’s grassland feature below.  Table 1: predation (animals eating the plant)  Table 2: wind  Table 3: fire  Table 4: drought  Table 5: extreme hot and cold conditions  Write down the features of your plant that helps your plant survive the grassland/prairie.  After students create their plants, they will come up to the front of the room to share their plant and their adaptations to the class. Then, we will show a real life example of a plant that adapted to that particular condition. These will be shown on a powerpoint. |
| **Explain** Plant Creations | After students create their plants, they will come up to the front of the room to share their plant and their adaptations to the class. We will discuss why they came up with the features that they came up with. Then, we will show a real life example of a plant that adapted to that particular condition. These will be shown on a powerpoint. |
| **Explore**  Rabbit Game  Thicket Game (15 min ) | **Thicket Game (we will only use this game if we have extra time):**  Directions-   1. Take the class to an area surrounded by trees. 2. Blindfold one student who will be the “predator.” 3. The remaining students will be the “prey.” 4. While the predator counts to 20, the prey will hide. The prey must be able to see some part of the predator from their hiding spot. 5. When the predator is done counting to 20, he or she will remove the blindfold and begin looking for the prey. The predator cannot move from his or her location. He or she may turn around, stand on their tip-toes, or squat. 6. When the predatory sees the prey, he or she must identify where the prey hiding. 7. Once the prey is “caught” he or she must stand by the predator and wait until the next round ( the next round the prey that has been caught will become a predator). 8. When the predator cannot see anymore prey, a new round starts. 9. The original predator and the new predators will be blindfolded. The original predator will count to 20 and the prey can move to a new hiding spot (must move 10 feet closer to the predators). 10. The predators will take their blindfolds off and try to find prey. 11. Play as many rounds until there are only 2 prey left. (play 2 rounds) 12. After the game have the students discuss what made them successful or what adaptations they had to make (either as a predator or prey).   Students will start to see the relationship between prey and predator while playing the game.  <http://kidszoo.org/wp-content/uploads/2014/02/Quick-Frozen-Critters.pdf> |
| **Explore - Rabbit Game** | Students will play the rabbit game in Dunn Meadow. We will set up 4 cones as the boundaries.   * First we will choose 1 volunteer to be the “coyote”. The rest of the students will be rabbits * The rabbits have to retrieve 3 pieces of food at the opposite side of the playing field in order to stay alive. Food must be retrieved one piece at a time. (they have to come back to the other side before they go get more food) * The coyote tries to tag the rabbits as they try to get their food   + once tagged, the rabbits will go to a designated area for being “out”   + Rabbits who do not retrieve 3 pieces of food will also be out * 2 rounds will be played with 1 coyote * at the end of each round, the number of coyotes will be written down and the number of rabbits who were out will be written down. * Since the coyote caught lots of rabbits, the coyote was able to “reproduce” so we will let 3 more students be a coyote. There will now be a total of 4 * the game can be continued with more and more coyotes. As long as all of the data is written down, we can try all kinds of variations. * If time allows, we can give the rabbits and/or coyotes “broken legs” by making them hop on one foot. * If time allows, we can add “hiding spots” for the rabbits to stand in. These will be made by using string and forming circles with the string. About 3 or 4 of them can be added depending on the space.   <http://kidszoo.org/wp-content/uploads/2014/02/Quick-Frozen-Critters.pdf> |
| **Explain - Rabbit Game** | **Explain: Rabbit game**   * After the game is played for several rounds, the students will all gather around a big markerboard for whole class discussion. We will draw a graph based on our data. The graph will represent the correlation between rabbits and coyotes based on how many we had. * After we draw the first graph of one coyote and lots of rabbits, we will have the students discuss what the graph means and why that happened * If time allows, we will make more graphs based on the different scenarios. * At the end, we will have the students discuss what kind of adaptations they think that rabbits and coyotes must have in order to survive.   + some might be “fast”, “sneaky”, “strong” * The overall understanding of the graphs will be:   + When there is an abundance of food the predator can survive and reproduce. However, reproducing too much can lead to too many predators and the food will quickly become scarce.   + When there is an abundance of predators and not very much food, the predators could die out due to lack of food. |
| **Elaborate** | Have students be in their table groups and discuss different adaptations that animals/plants need. Each teacher will lead a small group discussion. This can be based off of their plant creations too and traits that the rabbit had to get away from the coyote. Students will discuss what they learned about predator/prey and prairies/grasslands at their tables with one of the teachers. Students will write down on one piece of paper per table what they learned as their “exit slip”. |

**G) EMBEDDED FORMATIVE ASSESSMENT (the 5th “E”)**

Students will discuss what they learned about predator/prey and prairies/grasslands at their tables with one of the teachers. Students will write down on one piece of paper per table what they learned as their “exit slip”.

**H) GEARING UP/GEARING DOWN**

Gear up:

* If the game is too easy, teachers will assign some students to have different characteristics such as diseases, being blind, etc. If the graphing is too easy, we will have students do it themselves instead of talking them through it.
* If students want to or if they finish early, they can focus on more than one condition to adapt to while making their plant. They can do as many as they want to.

Gear down:

* If students are having trouble we will put them in smaller groups for the game.
* If students are having difficulty creating their plant, the teacher at the table can help give ideas and get them on the right track.

**Week Four**

3-4: Adaptations

Comparing Two extreme Habitats

A) LEARNING OBJECTIVES

* Students will identify the importance of arctic animals adapting to having a layer of blubber on their skin. They will do this by simulating having a layer of blubber of their own in the “Arctic Blubber Activity”.
* Students will identify the purpose of a cactus's adaptation to hold water. They will be doing this through the desert sponge activity and comparing the weights of the cactus with and without vaseline and sharing with the class.
* Students will be able to identify the differences in adaptations of arctic and desert animals. They will do this by splitting into groups and making lists of adaptations of their group then making a class list to discuss the differences.

B) STANDARDS (see http://www.doe.in.gov/standards/science)

● Content (Core Standards and substandards)

Core Standard: Observe and describe how natural materials meet the needs of plants and animals (including humans).

3.2.5 Describe natural materials and give examples of how they sustain the lives of plants and animals.

4.3.2 Observe, compare and record the physical characteristics of living plants or animals from widely different environments. Describe how each plant or animal is adapted to its environment.

4.3.3 Design investigations to explore how organisms meet some of their needs by responding to stimuli from their environments.

● Process (Nature of Science and Design)

- Keep accurate records in a notebook during investigations and communicate findings to others using graphs, charts, maps and models through oral and written reports.

-Perform investigations using appropriate tools and technologies that will extend the senses

C) MATERIALS

* 24 rubber Gloves
* 2 large tubs of crisco
* 6 baggies
* 6 Stopwatch
* 6 tubs filled with ice (possibly coolers)
* 24 Blubber Worksheets
* 12 sponges
* 6 containers for water
* 1 large tub of vaseline (13oz)
* 12 sheets of wax paper
* 6 digital scales
* 24 copies of Desert Sponge Worksheet
* 24 pieces of white paper
* 5 Desk lamps/ heat lamps

D) TEACHER CONTENT KNOWLEDGE

Some cacti are [tall](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/), [green](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/), and [prickly](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) which are a specific type of [cactus](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) called the S[aguaro](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) C[actus](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/). Many other cacti are much smaller and come in a variety of colors and shapes. Cacti are native to the Americas and can be found from the southern tip of South America to western Canada in North America. They usually live in areas that are relatively dry. Many cacti [thrive](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) in areas that are extremely dry, such as the Atacama [Desert](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) — one of the driest places on Earth. Like all living things, cacti need [water](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) to survive. Although, given the areas where they live, [water](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) is often [scarce](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/). In order to survive, cacti have developed special abilities that allow them to conserve the [water](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) they do receive and make it last a long time. The [prickly](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) [spines](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) of cacti are actually highly-[modified leaves](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/). [Spines](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) protect cacti from animals that eat plants and also help to reduce [water](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) loss by [restricting](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) air flow near the [cactus](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/). They also collect rainwater and funnel the drops of water to their roots. Most cacti have [extensive](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/), but shallow root systems that allow them to soak up any [rainfall](http://wonderopolis.org/wonder/what-is-a-gully-washer/) that may come their way. Specialized stems allow cacti to store [water](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) for a long time, since rainfall is often [sporadic](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) in the deserts that cacti call home. Cacti also have a waxy skin-like coating that helps retain moisture, this is similar to the vaseline that will be applied to the sponges in the first activity. Fun fact: a fully-grown [cactus](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) can soak up and store up to 200 gallons of [water](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) during a good [downpour](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/)! Many [desert](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) travelers have learned that, in an emergency, a [cactus](http://wonderopolis.org/wonder/how-does-a-cactus-live-without-water/) can be opened to find life-saving fluids.

Many animals that spend time in the frigid waters of the Arctic and around Antarctica that have a special layer of fat called “blubber:” whales (narwhals, belugas, orcas etc), seals, sea lions, elephant seals, walruses, polar bears, and even baby penguins. The blubber is right under the skin, and acts as an *insulator*. This means it holds in the warm-blooded mammals’ body heat, even when they are swimming in icy cold water as low as 40°.

E) REFERENCES

* http://kidworldcitizen.org/2013/02/11/the-classic-blubber-experiment-to-learn-about-arctic-adaptations/

F) DESCRIPTION OF YOUR LESSON

Desert Sponge Activity (First half will be done at the beginning, second half after arctic activity)

|  |  |
| --- | --- |
| Engage-  9:30-9:35 | We will review the environments that we have went over before and introduce the desert. We will start off by asking the students the focus question, “How do cacti get their water in the desert?”. Then we will be doing the first half of the sponge activity. |
| Explore-  9:35-9:50 | Students will stay in their table groups for this activity with a teacher helping each group. Each group will get 2 sponges, one will be covered in vaseline, except for one side and one will be plain. They will be dipping both sponges into a container of water. They will sit them off to the side to dry out. We will then ask the students which one will hold water better. They will be filling out their prediction on their worksheet.  We will sit them aside to dry out until the  **(Will move on to the arctic activity and come back to this)** |
| Explain-  10:40-10:50 | After sponges have had time to dry students will weigh each sponge and record it on their worksheet in their groups. Then we will make a class data table on their board where each group will fill out the weight about their two sponges. We will then have a discussion about what the students notice about the data they gathered. |
| Elaborate  10:50-11:00 | After the discussion we will explain to the students how cacti hold their water and why it is important that they do so. We will have the student revise their predictions on their worksheet.  Show video of desert environment <https://www.youtube.com/watch?v=WViUUMClAUQ>  Show actual catus Christy brings in (Barrel cactus) |

Arctic Blubber Activity

|  |  |
| --- | --- |
| **Bathroom Break:** 9:50-9:55  Engage  9:55-10:05  Have snack while watching video | Essential Question: Blubber is a layer of fat. If we try to mimic the layer of fat that arctic animals have, could we protect our hands from ice? Why or Why Not?  **Show video of arctic environment.**  [**https://www.youtube.com/watch?v=6sqpz3D41gY**](https://www.youtube.com/watch?v=6sqpz3D41gY)  We will introduce the arctic environment. Then we will ask the students the focus question. And they will record their hypothesis on their worksheet explaining why they think it will protect their hands. |
| Explore  10:05-10:25 | Students will placed at each table in groups. And they will explore the focus question.Teacher will give demo at the front of the class to show them how to conduct this activity properly. They will conduct the blubber activity to answer test their hypothesis. Students will be wear a rubber glove on one hand and nothing on the other. They will be sticking their gloved hand into a bag of criscoe and be placing both hands in a cooler of ice. They will be timing how long each hand can stay on the ice and recording it on their worksheet. They will have 4 spaces on their worksheet for each person in their group. |
| Explain  10:25-10:35 | After each student has had a chance to place their hands in the ice and record their data we will come together and record the classes data. Each student will call out their times and a teacher will record on the class data.Teacher will talk about the differences in the times they could keep their hands in the ice. Talk about the importance of blubber. We will then give the students the definition for blubber and how exactly it works. |
| Elaborate  10:35-10:40  **Go back to desert activity.** | We will discuss as a class how this is an adaptation that they have developed to protect the animals from the cold water. Ask the students why they think that we don’t need this protection?Have the students write this down in their worksheet. Lead the students to the idea that we don’t need the layer of blubber because we don’t live in cold water. After our discussion we will give them a chance to revise their hypothesis to come to a conclusion. Their conclusion should be similar to the claim that: The criscoe acted as a blubber and protected our hands from the ice.  **Go back to the desert activity** |

Discussion of Arctic vs. Desert

|  |  |
| --- | --- |
| Engage  11:00-11:05 | We will assign 3 of the tables to be arctic and 3 desert. There will be one teacher for each group. We will ask the students to come up with a list of characteristics of arctic or desert environments. They will also be coming up with a list of adaptations for their environment. Questions to include in Tchart ( (Conditions for survival):   1. What do they need to survive in these extreme environment? 2. How do they get their food? 3. How do they save their energy? (sleeping/ hibernation,) 4. How do they stay warm/cool? |
| Explore  11:05-11:15 | Students will work together in their groups to come up with the list of characteristics of the habitat and adaptations that plants and animals have in that environment based on the questions mentioned above in the Engage section.Teachers will be asking students guiding questions about what they learned in the day’s activities. |
| Explain  11:15-11:20 | We will go around the room and ask the group to share out one thing at a time to add to a class T-chart that will be on the board. We will continue this until the students have shared out all of their ideas. |
| Elaborate  11:20-11:25 | We will ask the students what they notice about the chart that they created. We will ask them why the animals from the different animals need different adaptations based on their environment. |

For the last 30 minutes we will give the teachers from the last week time to talk about the activity of creating their own habitat and give the students time to look through books.

G) EMBEDDED FORMATIVE ASSESSMENT (the 5th “E”)

The students worksheets will be part of an formative assessment to look at their observational skills. The activities will also give the teachers a chance to observe the students’ ability to perform investigations and revise their predictions based on the activity.

H) GEARING UP/GEARING DOWN

1. Gearing up:

* If students need a challenge, we will have them fill out the T chart without any guided questions from the teacher.
* If students finish early in the sponge activity, we could have the students find the difference between the weight of their two sponges.

2. Gearing down:

* We will ask more guided questions when we fill out the T chart if we feel that the students are struggling coming up with answers.
* We can demonstrate the activities for the whole class instead of having each student do the activity if they seem overwhelmed.

**Week Five**

3-4: Adaptations

Creating Your Own Ecosystem

A) LEARNING OBJECTIVES and CRITERIA FOR DETERMINING IF OBJECTIVES ARE MET(min of 2/ lesson)

* Students will be creating their own animal and habitat.
* Students will be creating specific adaptations and characteristics of their animal based on what they have learned so far in the previous lessons
* Students will have an understanding of what their animal may need depending on the environment they live in.

B) STANDARDS

● Standard 3: Life Science

Core Standard: Observe, describe and ask questions about structures of

organisms and how they affect their growth and survival.

* 4.3.2 Observe, compare and record the physical characteristics of living plants or animals from widely different environments. Describe how each plant or animal is adapted to its environment
* 4.3.3 Design investigations to explore how organisms meet some of their needs by responding to stimuli from their environments.
* 4.3.4 Describe a way that a given plant or animal might adapt to a change arising from a human or non-human impact on its environment.

● Process (Nature of Science and Design)

-Plan and carry out investigations—often over a period of several lessons—as a class, in small groups or independently.

-Perform investigations using appropriate tools and technologies that will extend the senses.

C) MATERIALS

* · Objects that students are already bringing in
* · Paper for planning
* · Pencils
* · Color pencils (enough for each table)
* · Markers (enough for each table)
* · Crayons (enough for each table)
* · Scissors (enough for each table)
* · Glue sticks (enough for each table)
* · A lot of Pipe cleaners- colored ones
* · two packages of Cotton balls
* · Cardboard
* · Rubber bands
* · Yarn, green but other colors too
* · Plastic wrap
* · Lots of Colored construction paper
* · Popsicle sticks
* · Thin string (similar to fishing line)
* · A single hole punch
* · Styrofoam cups
* · Toothpicks
* Materials we’ll gather from outside ourselves:
* · Dirt
* · Grass
* · Branches
* · Leaves

D) TEACHER CONTENT KNOWLEDGE

The teachers need know what a habitat is, as well as what makes up a habitat and its environment. Teachers will need to be knowledgeable about the different environments/ecosystems. Some of these include: desert, rainforest, arctic, prairie/grasslands, ocean, wetlands, etc. Since the students will be creating their own habitats, the teachers will need to know that although animals inhabit an enormous variety of different habitats, they all need the same things: water, food, shelter, air and space. Depending on the type of habitat that animals live in, they often find very different ways to get these three essentials. Teachers need to be aware of what an adaptation is- a change or process of change by which an organism or species becomes better suited to its environment. Plants and animals are able to survive in their unique habitats because their bodies and behaviors have adapted to their surroundings. There are two main types of adaptation: structural (or physical) and behavioral. A structural adaptation is part of the organism’s body, for example fish have fins to navigate in the water while monkeys have long tails to help them balance when they climb trees. Behavioral adaptations are the way the organism behaves that allows it to survive such as birds migrating in the winter or opossums playing dead to protect themselves from predators.

E) REFERENCES

I Love 2 Teach: Create-an-Animal, <http://ilove2teach.blogspot.com/2011/10/create-animal-create-plant-freebie.html>

F) DESCRIPTION OF YOUR LESSON

|  |  |
| --- | --- |
| Engage (9:30-9:45) | Essential Question: How does your animal adapt to your created habitat?   * Go over plan with each student. * We will be showing students some examples of dioramas on YouTube. |
| Explore (9:45- 11:15) | After planning in previous lessons, we will be having the students create their own ecosystems/environments and animal. They will already have most of the planning and materials, so they will just be actually making and creating their ecosystems. Students will be creating their ecosystem with a box. Students will use multiple materials, mostly recyclables or natural resources. Students will be creating their own dioramas. While they are creating their dioramas teachers will be going around and asking students questions, this transfers into the explain phase. |
| Explain (9:45-10:40)  (10:45-11) Bathroom break and snack  (11-11:30) Scaly Tailz | Questions to ask while the kids are working on their dioramas:  (Each teacher will have a set of these questions, depending on the students at the table she will choose which questions to ask to facilitate not only an student-teacher discussion, but peer-peer discussion)   * What is your environment? * Are you combining multiple environments? * Would an animal that lives in this habitat have everything that it needs to survive? (Food, shelter, water, air, space) * How did you come up with this? * Explain your planning process. * How does it include adaptations? * What kind of conditions does your environment include? * What do you think would happen if one thing in the environment changed? * What three animals it is made of? * Why did you choose the three animals? * What features does your animals have? * What animals are these features from? * Why did you choose these features? * What adaptations does your animal need to live in your environment? * What happens if…. |
| Elaborate (11:30-12:00) | Students will be broken into two groups. One group will sit with their presentations while the other walks around. Then these groups will switch. The presentation will involve an explanation of their environment, its characteristics. The children will then explain their animal:  -What three animals it is made of  -Why did you choose the three animals  -What features does your animal have?  -What animals are these features from?  -Why did you choose these features?  -What adaptations does your animal need to live in your environment?  A few kids, if they want to, can present to the whole class. |

G) EMBEDDED FORMATIVE ASSESSMENT (the 5th “E”)

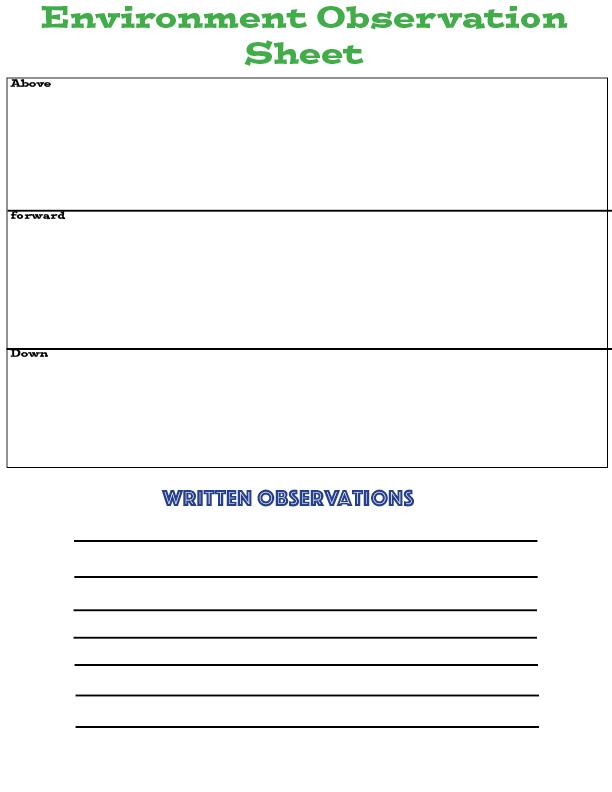
Students answering questions from teachers during explore/explain will serve as a formative assessment. Students will be able to share their knowledge of their environment and how their animal adapts. Also, the elaboration phase, where students are presenting their projects, can serve as a formative assessment.

H) GEARING UP/GEARING DOWN

1. Gearing up: Students will have to create two animals that will need to adapt to their environment. Also students will be thrown another environment and students will then have to adjust their created animal accordingly.

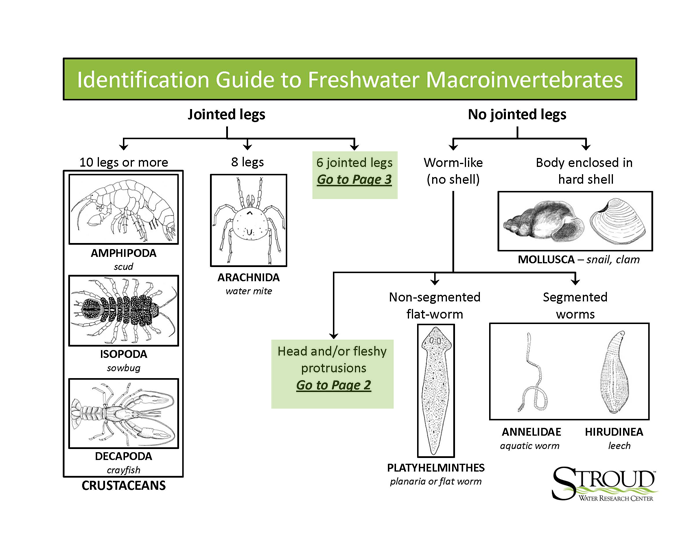
2. Gearing down: Instead of creating their own animal. Students will just be able to pick a set environment. The students will be finding an animal that lives in that environment. Students will need to just go about the project the same as others, just with a set environment and animals. Students will still need to tell us about that specific animal adaptation.

**Handouts**



Part1:

Use table to identify the insects you find and keep a tally in the box below. (USE YOUR HAND LENSE)



|  |  |  |
| --- | --- | --- |
| Jointed Legs | No Jointed legs | Adaptation |
|  |  | * Floats on the surface ( mosquito larvae) * Swims through water ( water boatman, water bugs) * Swims on water surface ( beetle) * Clings to weeds and vegetation ( Damselfly nymphs) * Hides in sediments ( burrowing mayflies) * Dives from surface of water to bottom ( beetle) * burrow into mud ( burrowing mayflies) * Fits between rocks and crevices ( stoneflies, flathead mayflies ) * Eats other insects ( dragonfly nymphs, water striders, water bugs) * Eating algae on rocks ( caddisfly larvae,mayfly nymphs) |

What kinds of things other than fish live in an aquatic environment?

Prediction: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Revised Prediction:

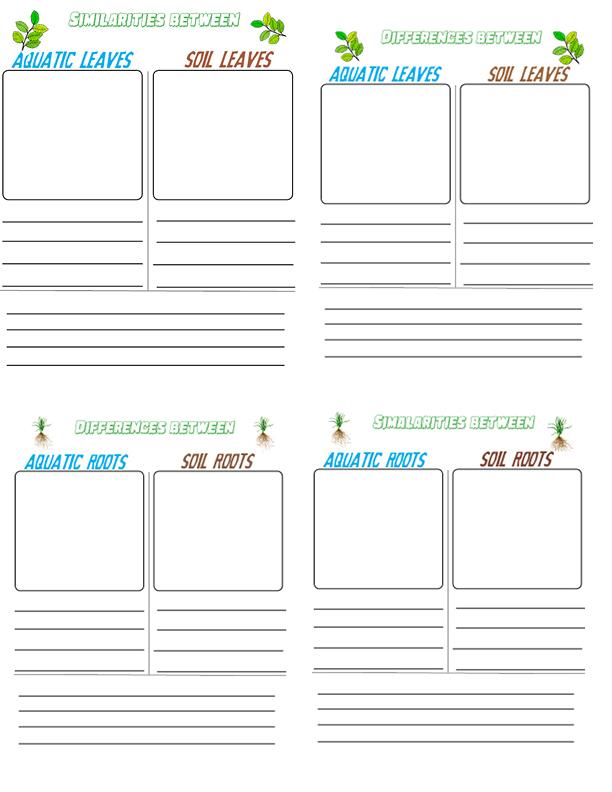
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\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Part 2: Collect plant samples from the water bed and from the water bank



Blubber Activity

Name:

If we try to mimic the layer of fat that arctic animals have, could we protect our hands from ice? Why or Why Not?

Hypothesis:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Cold Tolerance

|  |  |
| --- | --- |
| Unprotected hand (seconds) | Protected Hand (seconds) |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

Revised Hypothesis:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Why are we able to survive without blubber?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Name:

Desert Sponge Activity

Which sponge will hold more water? Why?

Prediction: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Weight of sponge with Vaseline:\_\_\_\_\_\_\_grams

Weight of sponge without Vaseline: \_\_\_\_\_\_\_\_grams

Revised Prediction: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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