**Subject Matter Research #1**

**Topic: Adaptations (How Some Animals Stay Warm in the Winter)**

**Part One (Adult Explanation)**

Through my research, I learned how many animals who live and survive in extremely cold temperatures are actually warm blooded (endothermic). Endothermic animals have developed and adapted over time to the cold. Some animals have an extra layer of fat underneath their skin that helps insulate them, so they can maintain their warm core temperature. Whales have blubber which allows them to swim in extremely cold temperatures and polar bears have a similar layer underneath their thick fur that helps keep them warm. Other animals, such as the penguin, have oils on their feathers that repels the water so that they stay dry and warm when they transition from the water to the cool air. In addition to these adaptations, body type also plays a role in survival. Animals who thrive in cold temperatures tend to be larger in nature and/or have smaller appendages (which require less energy to keep warm).

**Part Two (Prior Knowledge)**

* **Prior Knowledge/Life Experience**: It is likely students already know some obvious animals who live in colder temperatures and understand the concept that things like fur, a jacket, and layers keep animals and people warm in the winter. Today we will expand on their prior knowledge and add some additional adaptations that also keep animals warm.
* **Day One**: Students learned about how camouflage is one of many adaptations that some animals use to stay alive during the winter. This knowledge is important to today’s lesson because we will talk about other adaptations that animals use to survive the cold. This prior knowledge, will make it easier for students to understand how there are other physical adaptations animals use to stay warm.

**Part Three (Future Knowledge)**

* **Day Three**: The students will learn about adaptations some animals use to protect themselves/to attain food during colder temperatures. By having a firm grasp on other adaptations from this lesson, students will have knowledge about adaptations and will have ideas to pull from for how animals may protect and provide for themselves during the cold. Students will see how all adaptations work together to help animals survive.
* **Day Four**: The students will learn that hibernation is a way that animals cope with cold weather. Using prior knowledge about animal fat in this lesson, students will be able to have a firm grasp on how eating a lot of food builds fat so that animals who hibernate can slowly burn it off while sleeping to survive.
* **Day Five**: The students will learn about how migration is another way animals survive colder temperatures. Using knowledge from this lesson, students will see not all animals can store fat or have feathers that repel the water so they fly to warmer climates to survive.
* **Day Six**: The students will be informally assessed on their understanding of the information taught in this unit through review games. It will not count as a grade.
* **Future Learning**: This is important for the future so that students can make sense of their environment by learning how animals deal with climate change. It is essential that students see these processes as important because climate change causes these processes to occur and if the climate changes due to pollution these animals will have to readapt or could die off.

**Part Four (Resources Used)**

* <http://www.coolantarctica.com/Antarctica%20fact%20file/science/cold_all_animals.php>
* <http://msue.anr.msu.edu/news/animal_adaptations_for_winter>

1. **Topic:** The topic of this second grade science lesson is adaptations animals use to stay warm during the winter. The students will build on their knowledge of what an adaptation is by completing the science stations on blubber, penguin feathers’ special oils, and animal adaptation cards. Students will use this knowledge to build their knowledge base on how animals survive/adapt to the winter climate.
   1. **Vocabulary**
      1. **Adaptation:** a body part or feature or a behavior that helps a living thing survive and function better in its environment.
      2. **Blubber:** the fat of various sea mammals (such as whales and seals).
      3. **Repel:** to keep (something) out or away.
      4. **Insulation:** material that is used to stop the passage of heat from one conductor to another.
2. **Objective(s):** 
   1. Given guided directions on the blubber station, TSWBAT determine whether blubber is a good insulator or not by explaining that their hand stayed warmer with the blubber.
   2. Given guided directions on the penguin feather station, TSWBAT determine that because oil repels water certain birds are able to stay warm because their feathers keep them dry by explaining that their papers stayed drier.
   3. Given guided directions on the animal adaptation cards station, TSWBAT determine that different animals have different instincts/physical adaptations that help them to survive in the cold by explaining the adaptations that were mentioned on the cards.
   4. Given the different science stations, TSWBAT determine that certain physical adaptations allow certain animals to thrive in colder temperatures while other animals cannot by explaining different adaptations animals use to stay warm.
3. **Standard(s): PA Environment and Ecology-** 4.1.2.E Identify how living things survive changes in their environment. 4.1.2. D Identify differences in living things (color, shape, size, etc.) and describe how adaptations are important for survival.
4. **Teaching Procedures:**
   1. **Anticipatory Set**: (3 minutes) I will stand in front of the class with a bag full of winter clothing. I will act as if I’m freezing and start pulling on all different winter clothing I brought with me (i.e. mittens, a jacket, a hat, a scarf, etc.). Once I have all my things on, I will sigh in relief and state that I’m so warm now. I will then ask students what they do when they get cold. Do they do what I did? Do they do other things? (Students might respond with drink hot chocolate, use hand warmers, run around, sit by a fire, etc.).
   2. **Development 1**: (5 minutes) I will then explain that all the things the class just came up with are examples of human adaptations to cold weather. I will ask if anyone remembers what an adaptation is from the lesson the day before. After reviewing what an adaptation is, I will ask the class if they know how animals might try to stay warm in the winter. I will listen for student responses and write them down on the easel for students to see. After brainstorming a list of adaptations, I will explain that today the class is going to explore three different adaptations at stations. I will explain what each student is to do at each station and model what students will be required to do. I will remind students to listen to the teacher at their table and to work together and take turns. I will then split the class into three groups. I will set a timer for 8 minutes. When the timer goes off, students will rotate clockwise to the next station. *They also will be reminded to listen for our quiet signal “wings up,” we may practice this once or twice as review. On the Promethean board will be a classroom noise monitor. When the sound gets to the orange level students lose five minutes of recess. This will act as a reminder that students need to use their indoor voices.*
   3. **Guided Practice 1:** (24 minutes) **Blubber Station**: (8 minutes) At this station, I will give the students the Blubber Experiment worksheet (**See Below**). I will explain to the students that they will be placing their hands in ice water. One hand will be bare and the other will be in a blubber glove. Students will read the question at the top of the worksheet and make a prediction as to whether the blubber glove will keep their hand warmer or not than their bare hand in the ice water. Each student will take a turn placing their hands in the ice water under teacher supervision. After they do this, the students will write down their observations on the worksheet. Once every student has gone, I will discuss what the students discovered from this activity. I will explain that the blubber kept their hands warmer because it is made of fat. Animals like whales and polar bears have a layer of fat underneath their skin that keeps them warm in cold weather. I will compare this to putting on a jacket. *Once the timer goes off, students will stop when the teacher uses the quiet signal. They will then rotate stations clockwise.*

**Penguin Feather Station:** (8 minutes) At this station, I will give students the Do Penguins Get Wet worksheet (**See attached**). I will have students color their penguins black and white. I will emphasize that the more crayon that is on the penguin the better this experiment will work. Then I will have students spray their penguins with water that is dyed blue. The crayon will make the water run off the paper. I will then ask students why they thought the water ran off the penguins. Then I will explain that penguins and some other birds have special oils on their feathers that repel the water. So that the penguins can stay dry and not get cold when they go in the water. *Once the timer goes off, students will stop when the teacher uses the quiet signal. They will then rotate stations clockwise.*

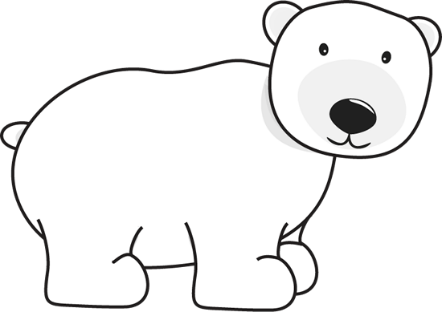
**Animal Adaptation Cards Station:** (8 minutes) At this station, students will fill out an animal adaptation cards worksheet (**See attached**). On this worksheet, students will label the animals on the cards. Students will write the name of the animal on the front of the card (the teacher will have an answer key for reference to guide student responses). I will discuss adaptations mentioned in the word box that they have not talked about already with the students. After writing on the cards, students will cut them out with scissors. The students can practice and review these cards with a partner if they finish early. *Once the timer goes off for the third time, the students will be instructed to return to their desks.*

* 1. **Independent Practice:** (10 minutes) With the remaining time in class, I will have students partner up and practice reviewing their adaptation cards that they made in the third station. I will model how this will go with a student volunteer. One student will hold up the card and the other student will try to list the adaptations written on the back. They will take turns doing both these roles.
  2. **Closure:** (2 minutes) I will have students come together on the carpet. I will ask students what adaptations animals use to survive cold weather? Students should respond with they have a layer of fat, some birds have feathers with oil that repels the water, and some have body parts that help them like small ears and tails, etc.

1. **Materials**

* Winter clothes (gloves, hat, scarf, jacket, etc.)
* Easel
* Dry Erase Marker
* Promethean board
* Timer
* Classroom noise level gauge (online)
* Two plastic bowls
* Water
* Ice
* Plastic bags
* Shortening
* Duct tape
* Blubber worksheet
* Pencil
* Penguin worksheet
* Newspaper/Paper towels
* Crayons
* Spray bottle
* Water
* Blue food dye
* Animal Adaptation Cards
* Scissors
* Plastic bags

1. **Adaptations/Plan Modifications:** The teacher will provide extra supervision and assistance for Markel to make sure he is understanding and keeping up with his peers. The movement from station to station and hands-on activities will help to occupy students with ADHD or students who have difficulty staying focused. If we run short on time, the independent practice will be done for homework. The students will review the cards with their parents or a sibling at home instead of with a partner in class. If we have extra time, I will give students more time to work on their adaptation cards and review them with a partner.
2. **Evaluation:**
   1. **Formative**: Students will be assessed through discussion during the development and at each station in the guided practice through their predictions and ability to draw conclusions from these stations. Additionally as I circulate during the independent practice, I will see and assess how well students are grasping the adaptations. In the sixth lesson of this unit, there will be review games that will be used to determine students’ overall understanding of the unit.
   2. **Summative**:None.
3. **Reflection:**

Blubber Experiment

**Scientist’s Name:**

**Scientific Method**

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| --- | --- |
| Ask a Question | Will my hand be cold or warm in the blubber? |
| Make a Prediction | I think my hand will feel \_\_\_\_\_\_\_\_\_\_ in the blubber glove. |
| Make a Plan and Follow it | 1. Put your hand in the ice water without blubber. 2. Stick your hand in the water for 5 seconds. 3. Do the same with the “blubber glove”. 4. Observe. How did your hand feel? |
| Record the Results | How did your hand feel **without** the blubber?  How did your hand feel **with** the blubber? |
| Draw a conclusion | Write in a complete sentence what you learned about blubber. |