**Lesson Plan: Sea Ice vs. Land Ice**

**Part of the 4th grade science curriculum centers around earth science and the make-up of the earth, including glaciers. The students study what glaciers are, and how they change the look of the earth through erosion. One experiment done with the students is using clean ice cubes and ice cubes with some coarse sand in them to show their effects of glacial ice on the earth. The lesson we are using for this assignment is one that is modified from Jennifer Chiarchiaro (**[**https://w.taskstream.com/ts/chiarchiaro/climatechange.html/anzbzlzdzkzoznzm**](https://w.taskstream.com/ts/chiarchiaro/climatechange.html/anzbzlzdzkzoznzm)**) which shows the effects of melting sea ice vs. melting glacial (land) ice on sea level. We chose this lesson because a lot of people are under the impression that sea levels will not rise because the ice is already in the ocean, much like ice in a glass of water melting does not cause the glass to overflow. This lesson is similar to one used in our science books, where students would just use a flat area in the water representing a land mass.**

**Montana Science Standards:**

* **Standard 1:** Students, through the inquiry process, demonstrate the ability to design, conduct, evaluate, and communicate the results and form reasonable conclusions of scientific investigations.
* **Standard 4:** Students, through the inquiry process, demonstrate knowledge of the composition, structures, processes and interactions of Earth’s systems and other objects in space.
* **Standard 5:** Students, through the inquiry process, understand how scientific knowledge and technological developments impact communities, cultures and societies.

**Objective:** Students will identify and demonstrate the effects of rising global temperatures on ocean waters.

**Anticipatory Set/** **Lesson Lead-In:** Before this lesson, students will have discussed how ice forms in the ocean (sea ice) as well as had some discussion of Greenland and Antarctica, and how they are landmasses that are covered in ice, not free-floating ice.

**Direct Instruction (Step-by-Step Procedures/Activities)**

1. Students will be told that they will be making a model of an island. They will be working in groups of three to four. Each group will have two plastic tubs and some clay, as well as gravel or sad.
2. The students will be given specific parameters for their island. These will be:
	1. There must be a flat area towards the top of your island where we will place a few items later.
	2. This flat area must be at least 3”x 3”.
	3. Your island must have rivers that flow to the bottom. You must leave space (at least one inch) to the sides of your island in the container to put water, and they must leave at least one inch from the top of the island to the top of their container.

**Modeling and Guided Practice**

1. The students will brainstorm different things their islands can have. Remind the students that this island will eventually be covered in ice, so they will not need trees or animals. Tell the students to only include geographic features, not living things.
2. At the front of the room, have an empty clear container like the ones the students will use for their islands. Fill the container with cold water and add five ice cubes to the water.
3. Mark the water level in the container using a marker on the outside.
4. Have the students predict what will happen to the water level in the container in 24 hours.
5. Next, once the groups are selected (either by the students or the teacher), give them 45 minutes to complete their island.
6. When the 45 minutes is up, have each student fill their container with water without covering their entire island.
7. Give each group 5 ice cubes and have them place these on their island above the water. Do not have any of the ice cubes floating in the water. Mark the water level as done in the class example with a marker.

**Sharing and Reflecting**

1. Have the students predict in their notebooks what they think will happen to the water level in the class model (only ice floating in water) and in the island model that they made.
2. After writing their predictions, have the students write why they made this prediction.
3. After enough time to complete writing their predictions, as a whole class, discuss the predictions made and why.

**Lesson Closure**

1. The next day, the students will examine the class model and their models.
2. Discuss what is different about the two models. Have the students identify why the island model’s water level rose more than the class model.
3. Students should be able to explain that like glaciers, the island models water level rose because the ice was sitting on top of a land mass, not freely floating in the ocean.