

# **How Ice Melts Affects Water Levels 5<sup>th</sup> Grade**

## **Lesson A**

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Subject- Science- Humans Environmental Impact and Properties of Water

Intended Grade Level 5

### **Massachusetts State Frameworks – Standards addressed**

Life Sciences (Biology) Grades 3-5

Adaptations of Living Things

MA 7. Give examples of how changes in the environment (drought, cold) have caused some plants and animals to die or move to new locations (migration). Identify objects and materials as solid, liquid, or gas.

Recognize that solids have a definite shape and that liquids and gases take the shape of their container.

MA 10. Give examples of how organisms can cause changes in their environment to ensure survival. Explain how some of these changes may affect the ecosystem.

### **Summary of the Lesson**

Students will observe and recognize that ice that melts while already in water does not make water levels rise, while ice melt from land that flows into the body of water does make water levels rise. They will compare two different ice-melting scenarios, which represent an ice mass in water melting and an ice mass on land melting with its melt water running into a body of water. They will observe what happens to water levels as a result of ice melt and make predictions about how it will affect water levels. They will then use these observations to make predictions about what this means for our future on Earth. The students must then decide a way to address this issue and explain the steps they would take to stop this problem.

## **Learning Objectives for Students**

- Students will be able to explain why as ice melts in one scenario the liquid water level changes.
- Students will be able to follow the directions to observe and make predictions about two different ice melting scenarios.
- Students will correctly be able to determine if after the ice mass has melted if the water level has remained the same, decreased, or increased since before the melting.
- Students will be able to draw connections from the experiment to real life, specifically Antarctica and discuss the environmental impact the ice sheets melting have on the environment.
- Students will be able to devise a procedure to find a solution to the ice sheet-melting problem.

## **Before the Lesson:**

### **Engaging Experience:**

Prior to the lesson, I will activate the student's prior knowledge by asking them what happens to the ice cubes they use to keep a drink cold in the summer. When the students answer that they melt I will ask if that means they disappear and steer to conversation to have them explain that the ice cubes are still there, they are just liquid and combine with the drink. I will then fill a glass with water and another glass with ice cubes. I will draw a t-chart on the board and ask the students to say what they notice about each of the conditions. I will guide them to see that the liquid water takes the shape of the container while the ice cubes do not take the shape of the glass. I will then ask them what would the ice cube glass look like if we left it on the counter and looked at it the next day. I would then activate their prior knowledge about global warming by asking them if they have ever heard of the concern over ice sheets in the ocean melting.

## Materials to be used

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| Two large ice chunks made by filling an empty milk carton with water and freezing it. Once solid, the box is cut away so the ice is in the same of a large cube. |
| Two buckets  |
| Water  |
| Water-proof Marker to mark original level of water   |
| Heat lamp (to make melting speed faster)   |

## Students Prior Knowledge / Possible Misconceptions

Students will more than likely already know that ice is frozen liquid water and when it melts it turns back into is liquid shape. Students will most likely also know that humans impact the environment and our choices have caused environmental changes that results will not only effect us but also other organisms.

Students may have the misconception that an ice cube already in a liquid will increase the level of the liquid as it melts in it. Students may also think that liquid runoff from an ice mass will increase the water level the same as an ice mass already inside of a liquid.

**Carrying Out the Lesson** (approximate time: 60 minutes)

### **Description of Activities:**

Put one of the large ice cubes in one of the buckets and another on the counter with the device to channel the melt into. Together with the class will fill two buckets with water to the same level, which should be pre-marked inside of the buckets. The water should be the same temperature and the water levels should be the same in the two buckets. Turn on the heating lamp to quicken the melting of the ice cube “on land”. The teacher should then encourage the students to make predictions about which of the buckets will have more water once the ice is melted. Let the students observe the two

scenarios and talk about them together for a few minutes. As the ice continues to melt then call the class over to their seats to fill out the hypothesis worksheet.

Give the students the opportunity to go back to look at the ice cubes and take observations. Ask the students as time goes on to explain what they notice. Once the ice has completely melted bring the students together and discuss the results. Have the students explain their observations. Discuss the results and have the student try to explain why the results occurred the way they did. Explain to the students that the bucket with the ice cube already in the water did not raise in water level like the other bucket did because the ice was already in the water and as it became a liquid it does not take up more space than it did as a solid. The ice melt that ran off into the ice bucket however raised the water level because it added additional water that was not already in the bucket like the ice cube in the other bucket had been.

Then ask the students what this means for someone who is living close to the coast line or for an animal who lives on this ice sheet. Ask the student what may cause the oceans to be warming that cause the ice to melt. Then tell them that they are now the head of a conservation team whose goal is to try to preserve the ice sheets of Antarctica. They are to devise a plan and in the form of a letter to either the President of the United States or to the American people explain what must be done, their plan to save the ice, and why it is important.

### **Guiding Questions / Provisions for Student-directed Inquiry:**

In this lesson, the students are given the choice to decide which of the buckets will increase water levels more as the ice cubes melt. The students guide their experiment and take observations themselves. In order to encourage the investigation, the teacher should ask the students guiding questions as they work like: "Why is this bucket raising faster than this one?" or "Why is this bucket water not raising? Where is the water going?". This encourages the students to work on their own and investigate to find these answers. The teacher acts as a guide in this lesson, but the students make the choices and decisions of their predictions. The students also get to decide how it is they

are going to address the issue of the ice sheet melting and what they plan to do to stop it.

### **Provisions for Diverse Learners**

- English Language Learners (ELL) may have a difficult time in this activity forming a hypothesis and some of the other written work for this activity. In order to accommodate for this difficulty, a template slideshow could be made so the students only had to plug in a few words based on their results. In addition to this, if this lesson was performed in an ELL classroom the instructor should have some of the key words and phrases like “raising” and “solid and liquid” posted in the students native language as well as English so that they can learn the and understand the English phrases needed in this activity.

- Vision or hearing impaired students may have a hard time observing the ice cubes or viewing/listening to presentations. To accommodate for these students, microphone systems often used in classrooms with hearing impaired students should be used for presentations. In addition to this magnify glasses as well as projection systems would help students with vision issues to observe their core samples.

- Speech/Language impaired (Formation of sounds, verbal expression) students may have a difficult time during the letter portion of this lesson. To accommodate for this, the student could explain their plan to a smaller group like only the teacher.

- Motor impaired/orthopedic limitation (Disorders of motion, such as paralysis, fine motor problems) students may have a difficult time during the experimentation part of this lesson with the ice. An aid could work with the groups these students are with, or the teacher could pair them with a student who could help them with the more difficult aspects of the motor part of the experiment. Rulers and other measurement tools that are specifically designed to help students with motor issues could also be utilized to assist with aspects of this lesson.

## **Completing the Lesson / Closure** (approximate time: 25 minutes)

At the conclusion of the activity, the class will come back together to talk about their plan for saving the ice sheet. We will also talk about is currently being done in terms of conservation in the United States. We will also discuss the job fields related to conservation and what they can do in their own community to help our future on earth.

### **Rubric for Evaluation of Letter**

|                                | 2   | 1   | 0   | Score |
|--------------------------------|---|---|---|-------|
| The Environmental Problem      | Students presented the environmental problem of ice sheet melting and why finding a solution is important to the best of their ability. Student included 2 or more organisms affected by ocean levels rising. | Students presented the environmental problem, but did not include 2 or more organisms affected by ocean levels rising or explanation of problem was not clear.          | Students did not present the environmental problem, or include 2 or more organisms affected by ocean levels rising. |       |
| Demonstration of Understanding | Student demonstrated an understanding as to why it is vital we find a way to stop the ice sheets from melting.  | Student showed only partial understanding of why it is vital we find a way to stop the ice sheets from melting.   | Student failed to demonstrate an understating of why it is vital we find a way to stop the ice sheets from melting. |       |
| Plan of Action                 | Student had a clear plan that was explained visibly to the intended reader and clearly demonstrates an understanding on what we can do to help our environment.   | Student had a plan that was explained to help our environment They did not however explain their plan clearly to the intended audience or did not supply enough detail. | Student did not have a plan at all.   |       |
| Presentation                   | Student formatted their paper in the form of a letter with proper introduction and ending and was at least 2 pages in length.   | Student formatted their paper in the form of a letter with proper introduction and ending and was at least 1 1/2 pages in length.                                       | Student did not format their paper in the form of a letter or was less that 1 page in length.                       |       |

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## Melting Ice Hypothesis



Which ice bucket do you think will have more water once the ice melts? Explain your guess.

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