

Lesson 4: Tropical Climate Zone

Learning objectives:

1. Predict the behavior of ice melting in fresh water compared to salt water.
2. Explain why ice melts quicker in fresh water than in salt water.
3. Relate the idea of oceanic behavior to air circulation and rainfall over the tropical climate zones.
4. Identify on a world map where oceans are located relative to tropical climate zones.

Assessment criteria:

1. Predictions are based off of inferences from previous knowledge. Students may predict that ice will melt quicker in salt water because we use salt to melt ice on the roads.
2. Responses to explain phenomenon are well thought out and are written in a reflective manner, using observations and evidence from the demonstration to support claims.
3. Correct identification of bodies of water to show accurate map reading skills.

Benchmark/Standard:

Oceans have a major effect on climate, because water in the oceans holds a large amount of heat. *National Science Education Standards: Observe, Interact, Change, Learn*. Washington, DC: National Academy, 1996. 160. Print

Prior Knowledge/Prior Conceptions:

Students need to know the difference between an ocean and a lake, and that oceans are salt water and most lakes are fresh water.

Instructional strategies:

Instructional strategies that will be used are a demonstration at the beginning of the lesson, and a discussion will follow the demonstration. Phenomenon will be experienced after predictions are made, followed by an explanation of the behavior exhibited by the phenomenon. A lecture about the temperate climate zone will follow.

Instructional resources used:

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Materials and set-up needed:

1. Two containers of equal size (500 ml beakers)
2. Tap water
3. Salt water (M= 35g/L need approximately 17.5 g)
4. Ice
5. Food coloring
6. Map worksheet (from previous lesson)

Time required:

One class period (50 minutes)

Introducing the lesson:

The lesson will be introduced by asking the question *“Will ice melt faster in tap water or salt water?”* with tap water symbolizing fresh water lakes and salt water meaning oceans. A demonstration will be done to show the phenomenon of ice melting in a body of water. On the board, the teacher will write down predictions made by the students and examples of hypotheses that support predictions being made.

For example, a student may state a prediction *“Ice will melt faster in salt water.”* A hypothesis that could accompany this prediction may be *“If we compare the rates of melting of ice in salt water versus ice in fresh water, then the rate of melting will be faster in salt water because salt melts ice better.”* The opposite prediction and hypothesis can be produced.

Body of the lesson:

The demonstration will be done in the front of the room after predictions and hypotheses are written down. Two containers with equal volumes of water will be at the front. Colored ice cubes will then be put into each container simultaneously. Students will be able to see the ice melting, since it is colored, and the distribution of the color throughout the water. While the demonstration is proceeding, a discussion about what is actually happening will take place.

Teacher can pose questions such as *“Where is the ice water going in each of the containers?”* (top, middle, bottom) and *“Which body of water seems to be melting the ice quicker?”* Students may answer with explanations such as *“Ice in salt water is melting slower because the cold water is staying towards the top.”* By using colored ice cubes, students can visually see where the cold water is flowing.

After the students can orally comprehend what has occurred in the small-scale demonstration, the students in small groups will try to write a formal conclusion from the results of the activity. One student from each group will then come up to the board to write the conclusion and come to a consensus as to what had happened. The conclusions will then lead to a transition that relates to the large-scale of ice melting in lakes and in oceans. Conclusions may be written like *“Ice melts slower in salt water because cold water floats near the surface.”* or *“Ice melts faster in lakes than in ocean because oceans have salt.”* The demonstration has a goal of illustrating ice-melting rates in fresh water versus salt water.

Using the map worksheet from the previous day connections will be made explicit by having students identify where on the world map large bodies of water (oceans) are found, and where in relation tropical climate zones are found. Looking at the map, students can deduce that large bodies of water surround tropical zones. Water takes longer to heat and cool than land does. A goal of the demonstration is to show that oceans hold heat, and because they hold heat, the cool air can circulate and carry water vapor over the tropical climate zone. The climates of places near large bodies of water are moderated by the vapor behavior. *The teacher will ask students to compare and contrast tropical zones to the climate zones in which they live in.* Students will realize that where they live is seasonal in comparison to tropical zones because of the absence of oceans.

Wrapping up the lesson:

The lesson will be ended with a reflective journal entry about what students had learned during the time

period. Students will most likely be surprised about the results of the demonstration, so responses may look like *"I didn't know that ice melts slower in oceans because of salt"* and *"Tropical zones are not as seasonal because of the oceans."*

Evaluating learning:

In order to evaluate learning, the depth in which predictions and hypotheses are made will be critiqued. The amount of participation amongst groups will also show the teacher if the student is engaged and comprehending the scope of the demonstration. When a student is put in a position to explain a concept amongst peers it forces the student to be confident in their knowledge and work hard to display the content that he or she knows. Group discussion will be noted. The reflections made in journals will be evaluated to show the teacher what the students gained from the lesson. If reflections are superficial, then it shows the teacher that the topic should be revisited the next day.

Design Rationale:

For this lesson, I wanted to do a demonstration to display a difficult concept. The idea of phenomenon and then explanation is a technique used in this lesson. Because the demonstration focuses on oceans holding heat, the focus of the tropical climate zone is relevant because that climate zone behavior is deemed by oceanic behavior. The demonstration also portrays the convection of ocean water, showing that in salt water the cool water stays towards the top. I like the idea of using journal reflections because if students have questions that they are nervous to ask in front of the class or want to display their knowledge they are free to without judgment.