POLAR TREC
Learning Resources

Details

Completion Time: More than a week
Permission: Download and Share

Ssssno Seals

Overview

The title of this lesson, 'Ssssno Seals' is a play on words. Will the ice seals survive? Yes or No? Paul Lukosi is a high school teacher in the lower Yukon River Delta, 6 miles from the Bering Sea… as the slough goes. The village he teaches in is heavily focused on family and culture, and has survived for thousands of years by subsistence living. Ssssno Seals is an application of the lessons learned dealing with the Law of Conservation of Mass, the water cycle, and the food web. The lesson will tie into the life cycle of an ice seal and how we are all connected in nature. This will also include taking care of our environment as an additional topic of study.

Objectives

The students should know the following concepts with the associated vocabulary for:
1. The Scientific Method
2. The Law of Conservation of Mass
3. The basic needs of living things
4. The water cycle and the possible effects of the cycle on life and the land surfaces.
5. Food chains and food webs especially as they pertain to the Bering Sea
6. Seal life cycle and how it relates to the Yup'ik life
7. Recycling and proper trash disposal is important to preserving both life sets (additional activity)

Lesson Preparation

Cross team with math teacher on teaching students why histograms are important, how to set up and plot a histogram, and how to draw conclusions from the plotted data.

1. Prior knowledge of LOCOM (law of conservation of mass and energy) Each lab has their own set of supplies needed.

Materials

- White construction paper (ream)
- Markers (primary colors)
- Poster Board (3 ft x 4 ft)
- Glue (10 bottles)
- Popsicle sticks (1000)…2,3, and 4 if decide to do a mural for the earlier grades
- Computers with Internet access
- Test tubes with stoppers
- Electronic scale or beam balance
- Ice
- Sugar
- Alka Selzer tablet
- Copper beads
- PowerPoint presentation on Hawaiian Monk Seals
- Sample PowerPoint, 'Seals'

Learning Resources

Classroom Examples:
A. Ice melt lab (physical change):
1. Mass ice in test tube with a stopper (closed system)
2. Warm test tube with hand until ice melts
3. Re mass test tube, water, and stopper
4. Set up a histogram for class data for conclusion

B. Sucrose dissolved in water lab (physical change):
1. Mass out separately 3 grams of sugar and 20mL of water, put into test tube, stopper the test tube
2. Swirl test tube until sugar dissolved
3. Re mass system with dissolved sugar
4. Set up a histogram for class data for conclusion

C. Dissolve Alka-Seltzer lab (chemical change):
1. Mass AS tablet on side of test tube with 10mL of water in a test tube and stopper
2. Put the AS in water in test tube, quickly put on stopper, wait until it dissolves
3. Re mass the test tube with the dissolved AS
4. Histogram class data for conclusion

D. Heating of copper (chemical change)
1. Mass out 2 grams of copper beads. Put in a test tube
2. Mass out 1 gram of sugar. Put into test tube
3. Mix thoroughly and mass system
4. Heat contents until copper glows orange
5. Re mass system
6. Set up histogram for conclusion
5. Discuss how life forms are recycled (chemical change)
6. Application: recycling
Vocabulary taught: physical change, chemical change, and conservation

2. Students will be taught the basic needs of life: food (food energy is released as a product of cellular respiration), water, oxygen (released as a product of photosynthesis), and habitat:
Vocabulary taught: habitat, photosynthesis, cellular respiration.

3. Prior knowledge of the water cycle. Students will be taught how this applies to the LO-COM: how water is a necessity of all living things for life processes.
Vocabulary taught: melt, evaporate, boil, condensation, freeze, sublimation, deposition, sea, delta.

4. Prior knowledge ecosystems: Knowing and being able to identify the living and nonliving factors in an ecosystem and the relationship between living and nonliving things.
Vocabulary taught: biotic, abiotic, community, carbon cycle and population will be taught.

POLAR TREC
Learning Resources

5. Prior knowledge of food chains and food webs. Knowledge of the connection and interconnection of organisms with each other and their environment. Students are able to draw given food webs. Include detailed study of caribou population over past 100 years. This assignment is supplemented with discussions of fish bones and moose entrails, part of subsistence living. A visit to the cemetery to visit relatives' graves is added to this discussion. Discussion of what happens to the physical body of their ancestors. This helps them associate LOCOM with their relatives and allows them to see how their decomposed ancestors become a part of them through their daily food and water intake.
Vocabulary includes: producer, autotroph, consumer, heterotroph, and decomposers.

6. Classification and Taxonomy of organisms will be taught. Have students throw one of their shoes into a pile and organize shoes by similarities and differences. Extrapolate to plant and animal taxonomy: Kingdom, phylum, class, order, family, genus, and species (Kind people can often find good spouses). Students will particularly focus on classification of ice seals. New vocabulary: Taxonomy, domain, kingdom, phylum, class, order, family, genus, species, phocid.

7. Students are taught how to write a hypothesis and conclusion appropriate to their grade level as part of the scientific method.

8. The last item to be completed: creation of a PowerPoint presentation that students can use as a summary of their finished project. Alternate assessment would be to create a collage/drawing summarizing important information about their selected topic.

Procedure
1. Students write a hypothesis on the seal population using current climatic conditions.

2. Show students the PowerPoint presentation on Hawaiian Monk Seals. Students will use the information gathered on Hawaiian Monk Seals to engage them in the study of the Lower Yukon River Delta ecosystem. The Hawaiian Monk seal is distantly related to the bearded seal. Students will learn how the Hawaiian Monk seal's fate is extinction due to climate change and other human impacts. Their research will describe:
a. Taxonomy of the ice seal
b. Description of the ice seal.
c. Habitat of the ice seal required for their survival. A condition which if changed will cause the seal to seek other areas to live in.
d. Diet of the ice seal
e. Life cycle of the ice seal.
f. Population of the ice seal over the last 30 years including trends in population numbers
g. Predators of the ice seal

3. The students will make a cyclic PowerPoint presentation of their findings (demonstrate ex-

ample of the kind of PowerPoint expected, see attached PowerPoint called 'Seals').

4. Students will, using a food web in their conclusion, show the effect of global warming on ice seal populations and on the Yup'ik way of life in the village. Use caribou population data and other collected data from above to support conclusion.

Extension
Other activities to support this lesson:
1. Ask students how pollution and what kinds of pollution can change the habitat of the seal causing a decrease in their population?

2. Students make spears in the class. Yup'ik culture and science meet. The science behind making the spears will be Newton's 3 laws of motion.

Resources
1. North Pacific Research board website (http://www.nprb.org/) and scientists.
2. NMML scientists
3. Community elders

Assessment
A rubric could be created to assess the ice seal PowerPoint.

Credits
Paul Lukosi, plukosi@loweryukon.org
Maggie Prevenas collaborating, prevenas@hawaiiantel.net

Learning Resources

National Science Education Standards (NSES)

Content Standards, Grades 9-12

Content Standard A: Science As Inquiry
b. Understandings about scientific inquiry

Content Standard B: Physical Science
c. Chemical reactions
e. Conservation of energy and increase in disorder
f. Interactions of energy and matter

Content Standard C: Life Science
d. Interdependence of organisms
e. Matter, energy, and organization in living systems
f. Behavior of organisms

Content Standard D: Earth ad Space Science
a. Energy in the earth system