Gliders are 2 Cool!

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Summary

Underwater gliders used by scientists are the future of oceanic exploration. Follow the steps in this mini-unit to learn about data collected off the coast of Antarctica and how science and technology blend to collect data where humans cannot venture. Students will also engage in an engineering design challenge to assist scientists as they continue to develop cutting-edge technology. These activities will provide information about venturing deeper and under sea ice shelves to explore the amazing interactions between the chemistry of the ocean, physical oceanography, and species that inhabit these majestic ecosystems.

Tags

Data Analysis

Engineering Design Process

Antarctic Research

Key Concepts

* Engineering Design Process
* Graphing
* Data analysis
* Scientific Research and Writing

Objectives

Students will be able to decode and interpret scientific data using graphic models.

Students will gain a deeper understanding of underwater gliders and ocean technology.

Students will have a beginning understanding of Antarctic systems.

Students will engage in the engineering and design process to construct a model glider.

Students will engage in communication skills to submit a winning glider design to chief scientist.

Students will use CLOE reading skills to complete a web quest for scientific research.

Students will complete a CERR (Claim, Evidence, Reasoning, and Rebuttal) final assessment.

Materials

* Computers
* Document Camera
* Electronic Projection System
* Materials for constructing a model glider – glue, tape, tag board, popsicle sticks, construction paper, tape, paper clips, etc. (teacher discretion)
* Paper / pencil / writing supplies
* Engineering design challenge grading rubrics
* Documents from the lesson

Procedure

1. Students will complete a Quizlet (use terminology list) focusing on key vocabulary. This will introduce key concepts for students to become more familiar with the words used in these activities. 20-30 minutes
2. Once finished, students will work on the Webquest activity to gain a deeper understanding of the Antarctic system and technologies scientists are using to study this incredible area. During this time, students will also complete their own blog example and engage in discussion activities. 100 minutes

Cake Analogy: The blue glider is going up and down in the middle of the cake. The yellow and red gliders are moving in perpendicular lines to gather data at various depths (across the cake in different directions).

1. Once research is complete, the near-real-time data will be introduced. Students will use the highlighted data to plot points from the research stations into three graphs. Once the graphs are complete, students will engage in analysis questions to identify trends, connections, and questions from the data. 120 minutes
2. As a final summative assessment, students will work in groups to complete the claim, evidence, reasoning, and rebuttal format with information from their vocabulary, research, and data analysis. Students will present this information to the class with a question/answer portion. 30 minutes
3. Finally, students will be introduced to the details of gliders and they will have a chance to design and engineer their OWN glider following the parameters. 100 minutes

Assessment

* **Formative assessments**—Quizlets, Webquest, Data Analysis, Blog Project
* **Summative assessments**—Glider Presentations (see rubrics), CERR Document (see rubric)

Additional Resources

Polar-Ice: Interdisciplinary Coordinated Education

## A program designed to connect scientists, educators, and students using data and research from the Arctic and Antarctic regions.

<http://polar-ice.org/focus-areas/polar-data-stories/what-drives-patterns-in-ocean-change/>

United States Antarctic Program

<https://www.usap.gov/videoclipsandmaps/palwebcam.cfm>

CODAR Ocean Sensors: The Leaders in HF Radar Technology

<http://www.codar.com/intro_hf_radar.shtml>

NOAA (National Oceanic and Atmospheric Administration)

<http://oceanexplorer.noaa.gov/facts/ctd.html>

Rutgers School of Environmental and Biological Science: Center for Ocean Observing Leadership

<https://rucool.marine.rutgers.edu/>

CONVERGE (Impacts of local oceanographic processes on Adelie penguin foraging ecology over Palmer Deep)

<http://coseenow.net/converge/>

Quizlet: A great tool for studying vocabulary with games and flashcards.

<https://quizlet.com/>

Ross Sea Connection Connecting Classrooms with research in the Ross Sea

<http://coseenow.net/ross-sea/about/>

Rutgers School of Environmental and biological sciences Center of Ocean observing Leadership: About Slocum Autonomous Underwater Gliders

<https://rucool.marine.rutgers.edu/about-slocum-autonomous-underwater-gliders>

Extensions or adaptations

1. Students submit final design plan and pictures of model to chief scientist Dr. Josh Kohut for professional evaluation of final product. (kohut@marine.rutgers.edu)

2. Students build working prototype out of PVC pipe for final design plan. They can also design the glider to travel below an “ice shelf.”

3. Students can make a Cartesian diver experiment bottle to introduce changes in pressure and density.

4. Students can investigate the details and challenges (including real-time changes) about currents and other ocean processes for successfully controlling a glider.