Have an Eye in the Sky

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Summary

Students use photographs taken with satellites and drones to observe changes on Earth. The students will make inferences based on their observations and calculations to make claims about seasonal ice/snow coverage in the Arctic and whale size and behaviour in the Antarctic.

*[whales, marine technology, process of science]*

Key Concepts

* Recognize the importance of technology in scientific research
* Understand that analyzing photographic images reveal features and events that would be difficult to detect with other means of analysis.
* Calculate the size of marine mammals using mathematical methods
* Analyze images and draw conclusions using claims, evidence and reasoning about the changes seen in the photographs

Objectives

Include clear, measurable statements of what students will be able to do, such as:

* Ask questions and construct explanations
* Analyze and interpret data
* Use mathematics and computational thinking
* Engage in argument from evidence
* Obtain, evaluate, and communicate information

Materials

* + Student access to images powerpoints or color copies of the images
	+ Background information
	+ Student worksheets
		- Satellite images student worksheet
		- Drone Images student worksheet
	+ Overview Teacher powerpoint presentation

Procedure

Use the Teacher PowerPoint to deliver the lesson. You can complete Part A or Part B or both.

Part A

1. Introduce the idea of satellites, in particular Landsat, to make observations of the earth.
2. Students use Landsat images to make observations of the ice/snow coverage of Bathurst Island, Canada.
3. After making observations, students complete a Claim, Evidence, Reasoning about the ice/snow coverage
4. Students then use the information they have gained to answer questions about the technology
5. If time allows, students can complete the “think about it” activity about their own application of satellite data.

Part B

1. Introduce the idea of drones, to make observations of the earth.
2. Students use drone images to make observations of the humpback whales in Antarctica
3. Using the instructions provided, students can calculate the measurements of the whales and calculate the percentage error of their results. The answers to the images will be provided.
4. After making observations, students complete a Claim, Evidence, Reasoning about the body condition of the whales
5. Students then use the information they have gained to answer questions about the behavior of the whales and technology used.
6. Discuss the students’ answers and the comparison of the graph to their ideas.
7. If time allows, students can complete the “think about it” activity about their own application of drone data.

Assessment

**Formative assessments**—use the CER activity and question answers to assess the students’ understanding of the use of technology in scientific research.

Discuss the images with the students and go over their answers to the questions on the worksheet.

Assessment rubric for Claims Evidence Reasoning

|  |  |  |
| --- | --- | --- |
| Does not meet standard YET | Meets Standard | Exceeds Expectations |
|  | 1. Makes an accurate and complete claim
2. Provides appropriate and sufficient evidence to support the claim
3. Provides accurate and complete reasoning that links the evidence to the claim
 |  |

Additional Resources

Landsat imagery obtained from

<https://earthexplorer.usgs.gov/>

Articles

<http://www.nature.com/news/drones-in-science-fly-and-bring-me-data-1.13161>

<http://theweek.com/articles/625715/how-scientists-are-using-drones-measure-effects-climate-change>

Video

<https://news.science360.gov/obj/video/52c64827-0463-443a-bfa5-317073944ed7/digital-eye-sky>

Scientists

<http://mmi.oregonstate.edu/ari-friedlaender>

<https://sites.nicholas.duke.edu/johnston/>

Activity based on

<https://www.mbari.org/wp-content/uploads/2016/10/MBARI-EARTH-Friedlaender.pdf>

<http://polar-ice.org/focus-areas/polar-data-stories/finding-food/>

Extensions or adaptations

* You can do Part A or Part B as a standalone activity.
* In Part B, you can use the images as an observational activity without the measurements for younger students. The answers are provided for size comparison.
* “Think about it” activities can be used as an extension to relate the technology to the student's home location
* The advantage/disadvantage activity can be used in Part B if you want to focus on the technology aspect. A comparison of drones vs. satellite could also be made
* The concept of negative and positive buoyancy can be introduced in Part B to help explain the changes in the Humpback Whale behavior

Linked MBARI EARTH Lessons

Tackle Box of Tools and Technology

A Whale of a Rollercoaster