A Whale of a Roller Coaster

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Summary

The use of technology is critical in studying Humpback whales. Students will explore the use of tagging technologies in the research being conducted in the southern ocean around Antarctica. Students will simulate this tagging data in the classroom and will need to analyze, model, and interpret their data.

*[TAGS:Whale, Technology, Multi-sensor tags, Modelling)*

Key Concepts

* Visualization of whale multi-sensor tag data
* Use of technology in field research
* Analysis of accelerometer data, used to determine movement of whales
* Use of accelerometer on a mobile device
* Modeling field research and data collection

Objectives

* Analyze and interpret accelerometer data
* Use technology to create a graph representing movement of whales
* Create a ribbon model to show movement of whales
* Create a graph that shows the pitch and lateral roll of whales
* Determine how the ribbon model correlates with the accelerometer
* Communicate movement results to other classmates
* Understand the role of technology in scientific research

Materials

* Humpback Whale PowerPoint (for students)
* Student worksheet: Sensor Kinetics
* Mobile device needed
	+ Cell phone or iPad
* Download free application: sensor kinetics
* Material per group:
* Adding machine paper (small rolls of paper) (50 cm)
* Colored pencils ( red, green, other color)
* Graph/ Grid paper
* Ruler
* Tape
* Shoe box or any small box, can be different size per group

Procedure

1. Present the student PowerPoint during class to introduce the activity. This PowerPoint will give a brief overview about humpback whales, the diet of humpbacks whales, multi-sensor tags being used to study whales, and information about Ari Friedlaender (lead scientific investigator on humpback whales in Antarctica)
2. The students will begin the activity by working with the *Sensor Kinetics app* on the mobile device. The students should be put into groups of two or three. Each group will only need one mobile device with the app.
3. Hand out the sensor kinetics worksheet, one per group.
4. Read the introduction on the worksheet together as a class.
5. Have each group follow the instructions on the first page of the worksheet to set up the app correctly on their mobile device.
6. Allow students to test the app by pressing the start button, stop button and clear button. At this time the students can move the phone around freely and see that the lines on the graph move as their phone moves.
7. Have all groups press the stop or clear button after a minute or so of exploring those three buttons on the app.
8. Have each group follow the instructions and complete the worksheet with their group members. The teacher should circulate around the classroom to each group to make sure the students are holding their phones flat with the screen facing the ceiling and the home button is away from the student holding the phone.
9. Review the worksheet together as a class. The student PowerPoint has slides that correlate with the worksheet.
10. At this point in the PowerPoint the students will be shown some data, a paper ribbon graph of that data and a video.
11. Students should use their apps to create a simple whale track. This should last no more than 10 seconds and should contain ascents, descents and one lateral role. Students should create a paper version of this graph, and then using adding machine tape and a box, create a model. (see sample in PowerPoint).
12. Pass out student materials. Box, 50 cm of adding machine paper, colored pencils (red,green,other color), one piece of graphing paper, tape, and one ruler. Students will still need their mobile device with the app.
13. Have students use their extra color (NOT green or red) to color one side of the adding machine paper. When the student is finished, one side will be white and one side will be the color that they chose. This helps diminish confusion when twisting the paper.
14. Once all students are finished, collect the hand-drawn student graphs.
15. Redistribute student graphs making sure each group receives the graph of another group. This should be done secretly because the students are now going to try to match the graph they receive with the correct ribbon model. Grouping example; If you have four groups, group 1 will receive the graph from group 2. Group 2 will receive graph from group 1. Group 3 will receive graph from group 4 and group 4 will receive the graph from group 3.
16. Students will now try to match their anonymous graph with a ribbon model that was created. Students should record their selection and use claim, evidence and reasoning to justify their selection.
17. Complete the extension work on the powerpoint slides. This will allow the students to apply their new knowledge to whale feeding patterns. This can be done individually or as group work depending on the teacher's preference.

Assessment

* **Formative assessments**— sensor kinetics student worksheet, question and answers throughout the lesson.
* **Summative assessments**— student ribbon model, student graph correlated to ribbon model, matching data to ribbon model with claim, evidence, and reasoning, krill concentration graph/questions.

Additional Resources

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

<http://www.nationalgeographic.com/animals/mammals/h/humpback-whale/>

<http://pal.lternet.edu/>

Extensions or adaptations

MBARI EARTH LESSONS:

Have an Eye in the Sky

Tackle Box of Tools and Technology