Thinking Sinking

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Summary

Students will have personal experience of increasing pressure. Those experiences can be extended to understand animals at different depths. Then they will use MBARI’s Deep Sea Guide to find animals, and put them on a vertical crosscut of the bay.

*Pressure, depth, deep-sea*

Key Concepts

* Experience changes in pressure and light
* Understand that the ocean is 3 dimensional.

Objective

* Students will develop and use scaled models.
* Students will recognize 5 species from the deep ocean.

Materials

* Teacher materials
	+ [Slideshow](https://docs.google.com/presentation/d/1J5pqiMf38HcWMOMyfi5d--Um0kvviStfGiU03hZySo8/edit?usp=sharing)
* Classroom materials
	+ [Depth chart](https://docs.google.com/spreadsheets/d/1ecRtB5tEHyKhEyLF_n7yHUSJAjWvMmT-tH1tWWrGKJg/edit?usp=sharing) (optional to share with students or have students draw a scale)
	+ Large shoe boxes for vertical dioramas OR wire hangers for hanging mobiles
	+ access to a printer for animal images or paper and pencils for drawing
	+ Access to [MBARI Deep Sea Guide](http://dsg.mbari.org/dsg/home)
	+ Photo page with 6 animals ([optional](https://docs.google.com/document/d/1fTV-l7FaJfWM49hqrblzfwWoo2B9e6ZRrqOCrlgp5nM/edit?usp=sharing)) (1 copy per student of front, 1 of back for teacher)
* Demo materials
	+ Road bike (inflates to 100 psi), deflated tires
	+ 10m measuring tape (cheat with a 33 foot length of string)
	+ Bike pump with pressure gauge
	+ Sidewalk chalk.
	+ Up to a 264ft straight line of sidewalk, playground, etc (you can use a shorter space)

Procedure

1. Share the MBARI pressure video from Slides 1 and 2 of PPT
2. Indoor demo (optional, messy)- Have students try to crush old styrofoam pieces in their hands. Crumbling is not allowed. Compare how much they compressed the foam with the video.
3. Introduce concepts of pressure in the deep ocean- Every 10 meters one additional atmosphere of pressure is applied to everything.
4. Outdoor demo of pressure with bike tire and pump with measuring tape/chalk
	1. Take students outside and mark a 0 depth line representing the surface of the ocean. Have them squeeze the deflated bike tire, and explain that they are squeezing against 0 psi.
		1. Move 10m farther, inflate one tire to 14psi, and have them squeeze again, noting how they feel the change in pressure. Leave the other tire deflated for comparison. Repeat until the maximum pressure listed on the tire, or students can’t squeeze.
5. Return to class and create a shoebox diorama or hanging mobile with at least 5 animals of different depths of Monterey Bay from the [MBARI Deep-Sea Guide](http://dsg.mbari.org/dsg/home) . (Use ones provided or if you have time and students have the ability to search on their own, allow them to explore the Deep-Sea Guide and choose their own).
	1. Have students put a scale of depths on the back of their diorama, or to measure strings for their mobile.
	2. Have students look up the depths that an animal lives, mark it on their measurement, at and draw a picture of their animal. They can then attach the animal to the scale at the appropriate level.
6. After students have practiced with preselected animals, have them explore the MBARI Deep Sea Guide to find and enter more animals.

Assessment

* **Summative assessments**— A diorama/mobile showing their animals and labeling the proper depth.

Additional Resources

Videos are included on the Deep-Sea Examples guide

Scientific paper on:

New bone eating worms <https://www.mbari.org/new-osedax-species/>

Virtual reality and deep-sea exploration <https://www.mbari.org/underwater-virtual-reality/>

Deep-Sea Buffet <https://www.mbari.org/squid-graveyard/>

Underwater Field Guide for Big Sur <https://www.mbari.org/illustrated-field-guide-shows-deep-sea-animals-off-the-big-sur-coast/>

Extensions or adaptation

Demos of pressure-

1. Indoor demo (optional, do over trash)- Have students try to crush old styrofoam pieces in their hands. Crumbling is not allowed. Compare how much they compressed the foam with the video.
2. Purchase a grip dynamometer and measure force.
3. Have student push down on a bathroom scale. The force they are pushing with a thumb is about X psi.
4. Make a force-sensitive-resistor to indicate pressure exerted <http://www.instructables.com/id/DIY-Force-Sensitive-Resistor-FSR/>

**References**

Jacobsen Stout, N., L. Kuhnz, L. Lundsten, B. Schlining, K. Schlining, and S. von Thun (eds.). The Deep-Sea Guide (DSG). Monterey Bay Aquarium Research Institute (MBARI). Consulted on: 2018-06-28.