

Ocean Mini Labs. (n.d.). Retrieved June 5, 2019, from <http://www.us-satellite.net/nasa/endeavor/resources/oceanlinks.cfm?cat=oceanminilabs>

The Ocean mini-lab called “Mapping the Ocean” is an activity which introduces students to the echolocation, called SONAR (sound navigation ranging) strategies used to map the depths of the Ocean. The activity provides students experiences doing activities in the context of the work of Oceanographers and integrates mathematics through data analysis, algorithm application, conversions, and data display.

Students are asked to calculate the depths of locations from a data set of time in which sound traveled from a sound distributor to a sensor after echoing from the floor of the ocean, at a distance from a fixed point in the Ocean. The depths are found by multiplying the speed of sound in the water and the distance traveled from the sound source to the sensor. The information from the product is then used to map of the depths Ocean’s floor by creating a line graph with the axis “depth (kilometers)” and distance from the shore (kilometers).

After the activity, a discussion involving the design of this solution can enrich students’ understanding of science and engineering practices. The inquiry which initiated this type of action began from the curiosity for the depths of the Ocean and the resources which are located in different areas and processes became necessity because of the inherent dangers people face exploring below the Ocean’s photic zone.

For further enrichment, students can explore the natural phenomenon of echolocation exhibited by animals such as dolphins and bats, and draw comparisons. This type of analysis could lead to other problem solving techniques derived from natural adaptations exhibited in other biological contexts (bioluminescence, aeronautics, etc.).

Moreover, an investigation onto the physical properties of substances could ensue. By doing this activity, students become familiar the speed of sound in Ocean water. The investigation could include the research into the speed of sound in other matter: non-salinated water, air, etc., and the properties which affect the speed in each.

Be mindful, there is an error on the “Mapping the Ocean’ graph sheet: 110 kilometers from the shore does not appear in the sequence

Mapping the Ocean

Grade 6/7/8/9

OBJECTIVES

Students will use a formula to solve a problem. They will use a two-dimensional coordinate grid to represent data points and to graph a simple figure that communicates the concept of ocean depth.

MATERIALS

- copies of Mapping the Ocean data sheet on page 20 and Mapping the Ocean worksheet on page 21.
- pencil and paper
- calculators

BACKGROUND

The ocean floor can be mapped by sending sound waves from a ship's transmitter to the ocean bottom at an angle. The sound bounces back to the ship at the same angle and is picked up by a receiver. The speed of sound in water is about 1,507 meters per second. By using this information and applying a formula, ocean depths can be measured and mapped. In this activity your students will use data to map a section of the ocean floor.

ACTION

- Describe the process of how the ocean floor can be mapped using soundings. Write the formula for measuring ocean depth on the board.
- Distribute Mapping the Ocean data sheet and formula to each student. Explain that they are looking at data that was gathered from a ship that was traveling straight east from shore. Every 10 km the ship stopped to collect sounding data.
- Students use the sounding formula and the data information given to determine the depth of the ocean at each data point. They record these depths on the data sheet. (Suggestion: ask students to record their answers in the nearest 100 meters.)
- Next, students map the ocean floor on the Mapping the Ocean worksheet. They locate the distance from shore across the x-axis, then plot the correct depth found in the nearest 100 meters on the y-axis.

Mapping the Ocean data sheet

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FORMULA FOR MEASURING OCEAN DEPTH

$D = V \times T$

D = depth (in meters) V = speed of sound in water = 1,507 meters per second

T = time (in seconds)

distance from shore (km)	time (sec)	depth (m)	depth (km)
10	0.13	78	0.078
20	0.27	203	0.203
30	0.53	249	0.249
40	2.65	1,417	1.417
50	2.65	1,417	1.417
60	2.82	2,202	2.202
70	4.25	3,202	3.202
80	4.25	3,202	3.202
90	7.65	1,402	1.402
100	1.86	1,402	1.402
110	1.33	1,002	1.002
120	3.98	2,418	2.418
130	4.51	3,243	3.243
140	6.10	4,596	4.596
150	6.90	5,199	5.199
160	8.49	6,397	6.397
170	14.60	11,001	11.001
180	6.64	5,003	5.003
190	7.96	5,998	5.998
200	7.43	5,599	5.599

