



FUTURE U.

Discover the Ocean 360° Experience Activity

Objectives

Students will:

- Research land animal adaptations and hypothesize the adaptations marine animals may need to survive.
- Consider the challenges a marine animal may experience if their adaptations did not exist.
- Develop a proposal that details how the Echo Voyager could be used to further explore an oceanic zone and collect data for a specific research question.

Grade level

6–8

Overview

The Boeing 360 Oceans Experience brings students to the depths of the ocean through the eyes of an autonomous sea vehicle: [The Echo Voyager](#). As this ship dives deep below the ocean's surface, students will meet a variety of marine animals, explore the environments in which they live, and consider how they survive in such extreme conditions. Students will then investigate the specific adaptations of one marine animal in greater detail and will ultimately create a proposal that details how the Echo Voyager could be used to further science's understanding of an oceanic zone.

Materials

- Devices with Internet access, at least one per every 2–3 students
- Boot Up handout, one per student
- Experience handout, one per student
- Reorient #1 handout, one per student
- Reorient #2 handout, one per student

Boot Up

Tell students that they are about to participate in a simulation in which they follow an autonomous sea vehicle as it dives deep into the ocean. Along the way, they'll meet many animals and learn how they have adapted to living in different ocean depths.

To engage students in beginning to think more about animals' adaptations, explain that it's not just marine animals who have adapted to survive in extreme conditions. Divide students into pairs and distribute a Boot Up handout to each partnership. Instruct students to read the directions and perform Internet research to learn more about how these four* animals have adapted to their environment.

Once students' research is complete, regroup and discuss: Think about what you already know about the ocean. Based on what you have learned about the adaptations of land animals, to what conditions may

marine species have to adapt? Once several students have shared, tell students they will learn more about this when they participate in the 360 Oceans Experience.

*Depending on the time available, pairs may also focus on two of the four animals.

Experience

Distribute an Experience handout to every student and review the instructions. Explain that each student will be responsible for taking notes on this sheet as they move through the 360 Oceans Experience.

Reorient

Two activity options are available for students to summarize, apply, and synthesize their learning:

Reorient #1

In the 360 exploration, students were introduced to many marine species who have adapted to living in extreme environments. Students will now further investigate one species, and share their learnings with others. After using the Internet to learn more about one animal's adaptations, they will create a comic or cartoon that explains the animal's adaptations in greater detail and considers the difficulties this creature may have if these adaptations did not exist.

Reorient #2

Students will investigate how the Echo Voyager could be used to further the world's understanding of marine life. After considering what they learned about one of the oceanic zones during the Echo Voyager's initial exploration, students will develop research questions that the Echo Voyager could tackle on an upcoming expedition. Student groups will then create a proposal for the next voyage of this autonomous ship!

National Standards

<p>Next Generation Science Standards</p>	<p>MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.</p> <p>Disciplinary Core Idea: LS4.C: Adaptation Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)</p>
<p>Standards for Technological Literacy</p>	<p>1.F. New products and systems can be developed to solve problems or to help do things that could not be done without the help of technology.</p>
<p>Common Core English Language Arts Standards</p>	<p>CCSS.ELA-LITERACY.CCRA.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.</p> <p>CCSS.ELA-LITERACY.CCRA.W.7 Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation</p>

Directions: Below are a sampling of four land animals who have incredible adaptations that allow them to live where they do. Perform Internet research to learn more about these animals, and record notes about their adaptations in the space provided.

Wood Frog

Adaptation(s)	Why do they have this adaptation?

Kangaroo Rat

Adaptation(s)	Why do they have this adaptation?

Wood Frog

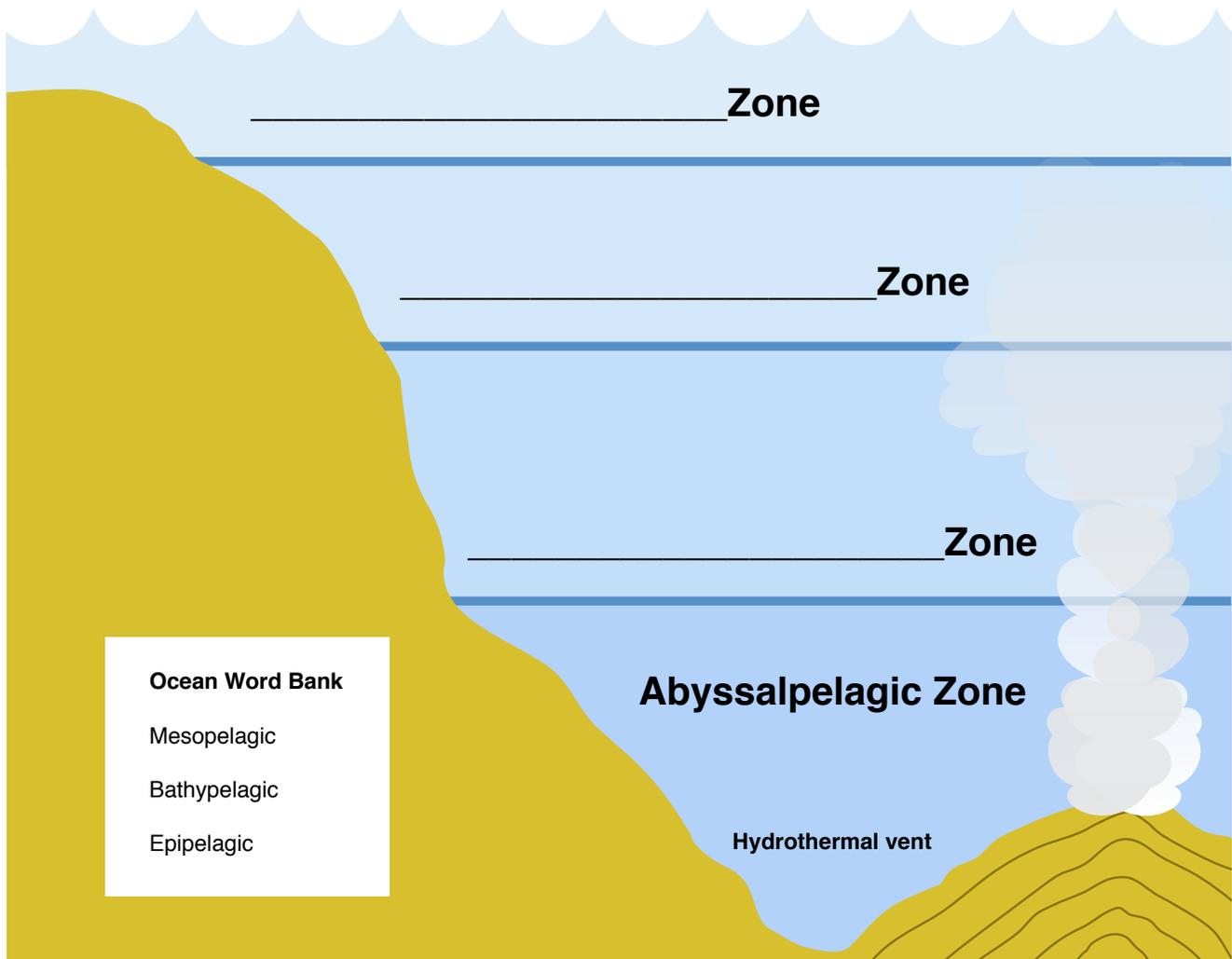
Adaptation(s)	Why do they have this adaptation?

Kangaroo Rat

Adaptation(s)	Why do they have this adaptation?

Directions: With the help of the Echo Voyager, you are about to explore three of the ocean's four zones. Take the following notes during your exploration:

- **Label:** Use the word bank to label the ocean zones that you visit.
- **Elaborate:**
 - Jot words or sketches to describe each zone.
 - Jot words or sketches to describe one animal in each zone and one of their adaptations!



Directions: Pretend that a local aquarium has heard about the Echo Voyager’s recent exploration, and they would like you to help create a new exhibit that focuses on marine adaptations! Complete Steps 1 and 2 to kick off this project.

1. Choose a marine animal from the 360 exploration that lives in the epipelagic or bathypelagic ocean zone. Then consider: How has this animal adapted to increase its chance of survival in its environment? Use what you learned during the Echo Voyager *and* perform additional Internet research. Jot notes in the space provided.

Adaptation(s)	How does this help this animal live in its environment?

2. Create a cartoon or comic that could teach aquarium visitors about the importance of your animal's adaptation(s):
 - In Box 1, imagine what your animal would look like if it *didn't* have these adaptations. In your drawing, be sure to also include how this may affect its daily life.
 - In Box 2, show what your animal actually looks like. In your drawing, be sure to include its adaptations and how these adaptations help it survive.
 - Label each box with a creative header that helps visitors understand the images.

1 _____	2 _____
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Directions: The Boeing Maritime Undersea Team is accepting ideas for the Echo Voyager's next excursion. Follow the steps below to complete your proposal.

Step 1: During the 360 exploration, you explored three ocean zones and learned about a variety of sea life. Choose one ocean zone that you would like to investigate further. Consider what you already know about this zone and how it impacts the animals that live there. Jot this information below:

Step 2: Now that you have considered what you already know, consider what you *don't* know. Develop at least three different questions that could help you learn more about this ocean zone, its marine life, and/or how this marine life has adapted to this zone. Record these questions in the **Research Question** column below.

Then apply what you learned about the Echo Voyager and brainstorm how this autonomous ship could help you answer each research question. What kind of data (pictures, videos, measurements, etc.) could it collect? Record this in the **Data Collection** column below.

Research Question	Data Collection
1.	
2.	
3.	

Step 3: Finally, select one research question that you think the Echo Voyager will be able to help with the most. On a separate piece of paper, write a concise proposal that:

- Introduces your research question.
- Describes how this research question will help you and other scientists better understand this ocean zone and the marine life that lives there.
- Explains how the Echo Voyager will help answer this question, including the data it will collect and how this data will be used.