

OCEAN CLASSROOM LIVE!

Exploring the Deep for World Oceans Day (Episode 4)

EDUCATOR SUPPORT MATERIALS

THE
UNIVERSITY
OF RHODE ISLAND
GRADUATE SCHOOL
OF OCEANOGRAPHY

On this episode of Ocean Classroom (Live!) we're getting ready for World Oceans Day (June 8)! With virtual experiences and distance learning resources in high demand, GSO's Inner Space Center and Rhode Island PBS share the launch of a new immersive digital series for students and educators. Join Rhode Island educators Shannon Donovan of Scituate High School and Alison Murray of Central Falls High School, Colleen Kenyon from Rhode Island PBS and host Holly Morin of the Inner Space Center as they discuss the new 'Ocean Exploration' series, which pairs extraordinary deep-sea footage, provided by Ocean Exploration Trust, with creative lesson modules.

Discussion Questions

- What is a remotely operated vehicle (ROV)?
- Why is it important to explore the ocean?
- What other technologies are used to explore the ocean?

Resources

Graduate School of Oceanography

As one of the nation's premier academic oceanographic institutions, the University of Rhode Island's Graduate School of Oceanography (GSO) educates marine scientists, students, policymakers, business leaders and citizens and helps develop the knowledge and skills necessary to address present and future marine challenges.

- GSO: <https://web.uri.edu/gso/>
- Inner Space Center: <http://innerspacecenter.org/>
- Rhode Island Teachers At Sea: <https://web.uri.edu/gso/research/outreach/rhode-island-teachers-at-sea-program/>
- Narragansett Bay Classroom: <https://web.uri.edu/gso/research/outreach/narragansett-bay-classroom/>
- GSO Facebook: <https://www.facebook.com/URIGSO/>

PBS LearningMedia

Rhode Island PBS and PBS have curated FREE, standards-aligned videos, interactives, lesson plans, and more for educators.

- PBS LearningMedia: <https://www.pbslearningmedia.org>
- PBS LearningMedia: Ocean Exploration: <https://ri.pbslearningmedia.org/collection/ocean-exploration-inner-space/>

Ocean Exploration

- Inner Space Center: <http://innerspacecenter.org/>
- Nautilus/Ocean Exploration Trust: <https://nautiluslive.org>
 - OET Education Resources: <https://nautiluslive.org/education/resources>
- NOAA Office of Exploration and Research: <https://oceanexplorer.noaa.gov/welcome.html>
 - NOAA OER Education Resources: <https://oceanexplorer.noaa.gov/edu/welcome.html>
- World Oceans Day: <https://worldoceansday.org>

Suggested Standards

[Next Generation Science Standards](#) *K-12 Performance Expectations relating to collecting data, technology, engineering*

Elementary School

Grade K: Motion and Stability: Forces and Interactions

- K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
- K-PS2-2. Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.

Grade 1: Waves and their Applications in Technologies for Information Transfer

- 1-PS4-2. Make observations to construct an evidence-based account that objects can be seen only when illuminated.

Grade 2: Matter and its Interactions

- 2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
- 2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
- 2-PS1-4. Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.

Grade 2: Earth's Place in the Universe

- 2-ESS1-1. Use information from several sources to provide evidence that Earth events can occur quickly or slowly.

K-2.Engineering Design

- K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
- K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Grade 3: Motion and Stability: Forces and Interactions

- 3-PS2-1. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
- 3-PS2-2. Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

Grade 4: Waves and their Applications in Technologies for Information Transfer

- 4-PS4-1. Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.

Grade 4: Earth's Systems

- 4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.

Grade 5: Motion and Stability: Forces and Interactions

- 5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.

3-5.Engineering Design

- 3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- 3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Middle School

MS: Matter and Its Interactions

- MS-PS1-1.Develop models to describe the atomic composition of simple molecules and extended structures.
- MS-PS1-5.Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.

MS: Motion and Stability: Forces and Interactions

- MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
- MS-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

MS: Earth and Human Activity

- MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
- MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

MS: Waves and their Applications in Technologies for Information Transfer

- MS-PS4-1. Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.

MS: Engineering Design

- MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

High School

HS: Motion and Stability: Forces and Interactions

- HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
- HS-PS2-2. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
- HS-PS2-5. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.
- HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials

HS: Waves and their Applications in Technologies for Information Transfer

- HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
- HS-PS4-2. Evaluate questions about the advantages of using digital transmission and storage of information.

HS: Earth's Systems

- HS-ESS2-1. Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.
- HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems
- HS-ESS2-3. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.
- HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes
- HS-ESS2-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

HS: Earth and Human Activity

- HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
- HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth's systems.

HS: Engineering Design

- HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
- HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

[Ocean Literacy Principles](#)

OLP1: The Earth has one big ocean with many features.

OLP2: The ocean and life in the ocean shape the features of Earth.

OLP3: The ocean is a major influence on weather and climate.

OLP4: The ocean makes Earth habitable.

OLP5: The ocean supports a great diversity of life and ecosystems.

OLP6: The ocean and humans are inextricably interconnected.

OLP7: The ocean is largely unexplored