

Problem-Based Learning Unit

VISTA

VIRGINIA INITIATIVE FOR SCIENCE TEACHING AND ACHIEVEMENT



A Commotion in the Ocean

Grade 5 - Ocean Science

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INNOVATING SCIENCE EDUCATION ACROSS VIRGINIA



UNIT OVERVIEW

TOPIC
Ocean Environments
THEME
Oceans: Characteristics, Ecosystems, and Human Impact
SCENARIO
Energy resources off the east coast of North America are very valuable. One of the most significant energy issues facing President Obama is whether to allow leasing of offshore land for drilling oil and natural gas, where production has been off-limits. Scientists are investigating areas off the coast of Virginia to develop these resources. Residents and tourists on the east coast are concerned about the development of these energy resources in the Atlantic Ocean. The Bureau of Ocean Energy Management (BOEM) will offer leases for drilling of oil and natural gas, and will also offer for auction the development of wind or tidal turbine farms off the east coast. The Virginia Department of Environmental Quality (DEQ) is enlisting you and your team to determine how to minimize the impact of these energy resources on our environment. As a member of the DEQ advisory task force you will investigate the issues, evaluate the impacts of the different energy options, and inform the public.
PROBLEM QUESTION
How can we minimize the impact to the ocean environment if the energy resources are developed off the coast of Virginia?
STUDENT ROLE
Researchers: Oceanographers/Oceanologists hired by DEQ: cover a wide range of topics including marine life and ecosystems, ocean circulations, plate tectonics and the geology of the sea floor, and the chemical and physical properties of the oceans.
CULMINATING ACTIVITY
Develop a report for the Virginia Department of Environmental Quality. Your report could include presentations, videos, interviews, and other forms of communication to address concerns, trends, and workable solutions for the impact of offshore energy resources.

UNIT BACKGROUND

This 5-9 week unit was created for 5th grade classrooms to address VA standards 5.5, 5.6, and 5.7 on ocean systems. The scenario and problem question for this unit are focused around developing strategies to minimize the impact to the ocean environment if the energy resources are developed in the ocean off the coast of Virginia. To do this, students will work through a number of other questions to help them develop their ideas.

First, students will learn about the general process of different forms of energy production.

Lesson 1: Student will research how oil and natural gas is found and extracted & how wind and tidal power is utilized & discourse findings.

Next, students will explore the geologic characteristics of the ocean.

Lesson 2: Students will use data to analyze depth and graph the structure of the ocean floor and then use this data to develop a model and topographic maps of different physical characteristics.

Next, students will explore the physical characteristics of the ocean water.

Lesson 3: Students will analyze the relationship between temperature and depth in the ocean.

Lesson 4: Students will explore salinity and changes in water pressure through the ocean.

Lesson 5: Students will inquire about what causes waves and tides and explore how the ocean water moves.

Lesson 6: Students will explore how we could get energy from the ocean using water turbines and currents.

Next, students will examine the ocean ecosystem.

Lesson 7: Students will examine what types of organisms live in the ocean, the different zones they live, the characteristics of each zone, and the survival strategies organisms use to live in these ecosystems.

Lesson 8: Students will explore energy flow in a food chain and web. How does understanding marine food webs help us to minimize the impact from energy extraction on this ecosystem.

Next, students will examine the land and ocean relationships.

Lesson 9: Students will explore the relationship between the oceans and land using stream tables.

Lesson 10: Students will investigate the impact on coastlines from storms and develop strategies for minimizing their impact on these ecosystems.

Finally, students will examine the human impacts on the ocean.

Lesson 11: Students will examine endangered species and the processes for how organisms become endangered.

Lesson 12: Students will explore how developing energy resources affects our oceans and beaches. Using all of their research and experimental data, they will develop a plan to minimize the impact of the development of these resources off the coast of Virginia.

UNIT RESOURCES

Bureau of Ocean Energy Management: www.boem.gov

BOEM Virginia: <http://www.boem.gov/State-Activities-Virginia/>

Virginia Department of Environmental Quality: www.deq.virginia.gov

Marine Mapping and Data Tools: www.marinecadastre.gov

NOAA Ocean Education Resources: www.education.noaa.gov

OCEAN SCIENCE QUESTION MAP

Level 1 Question

An over-arching unit question that is presented to effectively solve the problem presented in the scenario.

How can we minimize the impact to the ocean environment if the energy resources are developed off the coast of Virginia?

Level 2 Questions

An informational question needed to answer the Level 1 question which results from initial "what do we need to know to answer this question" brainstorming.

What are the geologic characteristics of the ocean?

What are the physical characteristics of the ocean?

What are ocean ecosystems?

What is the human impact on oceans?

Level 3 Questions

Question where the content and standards are being directly addressed. These are questions around which daily activities are centered.

What is underneath the ocean water? SOL 5.6 a

How deep is the ocean? SOL 5.6 b

What percentage of the Earth is covered by oceans? SOL 5.6 b

How do we find oil and gas under the ocean? SOL 5.6 a

Why is the ocean salty? SOL 5.6 b

How do oceans move? SOL 5.6 b

What changes in the ocean as it gets deeper? SOL 5.6 a, b

How can we get energy from the ocean? SOL 5.6 a, b

What is an ocean ecosystem? SOL 5.6 c

What plants and animals are in or near the ocean? SOL 5.5 c

Why do some animals live in deeper water than others? SOL 5.6 c

What do storms do to the coast and the energy resources? SOL 4.6

What organisms are endangered and why? SOL 5.7

How does our watershed affect the ocean? SOL 4.9

How does developing the energy resources affect our oceans and beaches? SOL 5.7 f, g

What is the relationship between the oceans and the land? SOL 5.7 f

