Oceanography Curriculum
Fall 2018
Board Approval Date: January 28, 2019

Topic 1: Diving into Ocean Ecosystems
Topic Overview:

- Observing migration routes
- Researching marine ecosystems
- Comparing biotic and abiotic factors

Standards:
3.1.10A1

Essential Question (Core Concepts)
What are the defining characteristics of different marine ecosystems?

Objectives (Skills/Knowledge)

- Observing migration routes of various organisms.
- Researching marine ecosystems.
- Comparing biotic and abiotic factors of marine ecosystems.

Vocabulary
Biotic
Abiotic
Substrates
Wetland
Biological Community
Ecosystem
Succession
Benthic
Brackish
Mangroves

Activities/Strategies/Study

- Lesson 1 Internet/Textbook Activity
- Classroom World Map lab
- EdPuzzle: Pole to Pole

Assessments
Lesson one quiz
Ongoing formative assessment

Additional Resources
Textbook, internet resources, NOAA, National Geographic.

Lesson 2 and Lesson 3: Water Properties
Topic Overview:

- Water Density, temperature, salinity activities
- Analyzing phase change diagrams

Standards:
3.1.B.A8
3.2.10.A3

Essential Question (Core Concepts)
What are the unique properties of water that make it such a vital substance?

Objectives (Skills/Knowledge)
- Compare and contrast the heating and cooling of fresh water and salt water.
- Determine whether substances will float or sink in water, based on their densities.
- Give examples of how the properties of water affect marine organisms.
- Describe the structure of the water molecule and relate its structure to water's unique properties.

Vocabulary
Basins
Renewable resource
Nonrenewable resource
Overfishing
Atom
Neutron
Proton
Electron
Valence electrons
Isotopes
Polar covalent bonds
Vaporization
Latent heat
Evaporation
Cooling
Condensation

Activities/Strategies/Study
- Lesson 2/3 Internet/Textbook Activity
- Lab Investigation: Freezing Ocean Water
- Lab Investigation: Water Density

Assessments
Lesson two/three quiz
Ongoing formative assessment

Additional Resources
Textbook, internet resources, NOAA, National Geographic.

Lesson 5: Migrations in the Sea
Topic Overview:
- Plotting and analyzing animal migration data
- Satellite and other animal tracking technology
- Studying physical parameters influencing sea migrations

Standards:
3.4.10.A2

Essential Question (Core Concepts)
What are the factors influencing animal migrations and what is the technology used to track marine animals?

Objectives (Skills/Knowledge)
- Compare and contrast migratory movements of different marine animals.
- Utilize mapping and plotting skills by plotting sample animal movement data.
- Relate satellite tagging of marine animals to principles of the Nature of Science.

Vocabulary
Baleen
Uplink
Downlink
Natural satellite
Artificial satellite
Remote sensing satellites
Polar satellites
Geostationary satellites
Pop-up Archival Tag

Activities/Strategies/Study
- Lesson 5 Internet/Textbook Activity
- Lab Plotting Animal Movement
- Lab: Marine Migrations

Assessments
Lesson five quiz
Ongoing formative assessment

Additional Resources
Textbook, internet resources, NOAA, National Geographic.

Lesson 6: Explore the Seafloor.
Topic Overview:
- Studying topographic/bathymetric images and maps
- Surveying a model of the seafloor

Standards:
3.4.10.A2

Essential Question (Core Concepts)
Bathymetry- the study of the seafloor features and topography

Objectives (Skills/Knowledge)
- Analyze bathymetric images and identify seafloor features.
- Describe how scientists map the ocean floor.
- Create a model of seafloor features.

Vocabulary
Plumb lines
Sonar
Terrigenous
Biogenous
Hydrogenous
Foraging

Activities/Strategies/Study
- Lesson 6 Internet/Textbook Activity
- Graphing Atlantic Seafloor Features with Google Earth Atlantic Seafloor Features with Google Earth
- EDPuzzle Assignment: "Deepest Ocean: Marianas Trench"

Assessments
Lesson 6 quiz
Ongoing formative assessment

Additional Resources
Textbook, internet resources, NOAA, National Geographic.

Lesson 7: Formation of the Ocean
Topic Overview:
- Examining maps of Earth continent changes over time.
- Understanding the Theory of Plate Tectonics

Standards:
3.3.10.A4

Essential Question (Core Concepts)
How do geologic processes shape Earth's surface over billions of years?

Objectives (Skills/Knowledge)
- Explain the Theory of Plate Tectonics by describing the processes involved, the geologic features used as supporting evidence, and the major changes in Earth's crust that have occurred as a result of crustal movement.
- Use the development of the Theory of Plate Tectonics to discuss how scientific ideas and research evolve into a unified theory.
- Identify the major layers of the Earth.

Vocabulary
Theory
Plates
Mid-Atlantic Ridge
Transform faults
Great Global Rift
Convection
Convergent Plate Boundary
Tsunamis
Astrology
Continental accretion

Activities/Strategies/Study

- Lesson 7 Internet/Textbook Activity
- Earth Changes Over Geologic Time
- Seafloor Spreading Activity
- EDPuzzle Assignment: "Ring of Fire: How the Earth was Made"

Assessments

Lesson seven quiz
Ongoing formative assessment

Additional Resources

Textbook, internet resources, NOAA, National Geographic.

Lesson 8: Seasons of Change

Topic Overview:

- Modeling Earth's revolution around the Sun and investigating changes in insolation with latitude.

Standards:

3.3.10.A5

Essential Question (Core Concepts)

How does Earth's position and behavior influence conditions on the planet?

Objectives (Skills/Knowledge)

- Explain seasonal changes on Earth in terms of the intensity of solar radiation energy and the Earth's tilt, and understand that Earth's slightly varying distance from the Sun has nothing to do with the cause of the seasons.
- Illustrate how the angle of insolation relates to differential heating of the Earth's surface.
- Differentiate between types of incoming solar radiation.
- Give examples of how marine mammals respond to seasonal cues.

Vocabulary

Insolation
Angle of insolation
Differential heating
Electromagnetic radiation
Electromagnetic spectrum
Albedo

Activities/Strategies/Study

- Lesson 8 Internet/Textbook Activity
- Seasons in 3-D Explorelearning Gizmo

Assessments

Lesson Eight quiz
Ongoing formative assessment

Additional Resources

Textbook, internet resources, NOAA, National Geographic.

Lesson 9: The Sea Surface "Great Energy Distributor"
Topic Overview:

- Creating and studying false color images of sea surfaces temperature.
- Studying the global pattern of ocean currents.

Standards:
3.3.10.A5

Essential Question (Core Concepts)
How is the energy transferred around the surface of the planet?

Objectives (Skills/Knowledge)

- Indicate that energy in the ocean is distributed through currents.
- Identify sea surface temperature and ocean currents from satellite imagery.
- Explain how Earth's ocean basins are interconnected through the flow of currents.
- Relate changes in sea surface temperatures to changes in animal movements.

Vocabulary
Current
Gyre
Coriolis Effect
Radiometer
Buoy
Currents
Surface currents
Convection
Prevailing winds

Activities/Strategies/Study

- Lesson 9 Internet/Textbook Activity
- SST Map Coloring Worksheet (this was a handout you received during week 1, bur may also be found here)
- EDPuzzle Assignment: Synthetic Seas
- Online Discussion: Captain Charles Moore at TED Talks

Assessments
Lesson nine quiz
Ongoing formative assessment

Additional Resources
Textbook, internet resources, NOAA, National Geographic.

Lesson 11: Weather, Climate, and the Ocean
Topic Overview:

- Analyze the correlation between sea surface temperature and hurricane strength.
- Describe the features of land, water and air that affect climate.

Standards:
3.3.10.A6

Essential Question (Core Concepts)
How is weather and the climate influenced by the ocean?

Objectives (Skills/Knowledge)

- Explain how energy and water are transferred from the ocean to the atmosphere through the formation of air masses and tropical weather systems.
- Describe how air masses, the water cycle, air pressure, and wind contribute to hurricane formation.
- Give examples of the ocean's influence on weather and climate.
- Describe how seabirds can be affected by wind patterns.

Vocabulary

Climate
Altitude
Fronts
Air Pressure
Equilibrium
Wind
Biogeochemical cycle
Jet stream
Dynamic soaring
Leeward

Activities/Strategies/Study

- Lesson 11 Internet/Textbook Activity
- Air Temp and Water Vapor Graph
- Cocos Island of the Sharks?

Assessments

Lesson 11 quiz
Ongoing formative assessment

Additional Resources

Textbook, internet resources, NOAA, National Geographic.

Lesson 12: Voyage to the Deep

Topic Overview:

- Investigate the construction and use of submersibles.
- Plot and analyze temperature, pressure, salinity, and density data with respect to depth.

Standards:

3.4.10.A2

Essential Question (Core Concepts)

What are conditions like deep within the ocean and how do scientists study these environments?

Objectives (Skills/Knowledge)

- Explain how pressure, temperature, density, salinity, and light change with increasing depth.
- Describe the characteristics of some animals that allow them to cope with changes in pressure, temperature, density, salinity, and light.
- Analyze and interpret plots of density, salinity, pressure, and temperature with respect to depth at various locations.

Vocabulary

Pressure
Thermocline

CTD device
Thermohaline circulation
Upwelling
Global conveyor belt

Activities/Strategies/Study

- Lesson 12 Internet/Textbook Activity
- Lab: Modeling Water Temp. with Depth
- Video: Blue Planet The Deep?

Assessments

Lesson 12 quiz
Ongoing formative assessment

Additional Resources

Textbook, internet resources, NOAA, National Geographic.

Lesson 13: Photosynthesis in the Ocean

Topic Overview:

- Plotting and analyzing animal migration data
- Satellite and other animal tracking technology
- Studying physical parameters influencing sea migrations

Standards:

3.3.10.A2

Essential Question (Core Concepts)

What is the Marine Primary Production and how is it changing with the changes to the environment?

Objectives (Skills/Knowledge)

- Identify the reactants and products of photosynthesis and note the sources of the reactants in the ocean.
- Describe how carbon is cycled through Earth's spheres.
- Analyze chlorophyll imagery, looking for evidence of blooms of phytoplankton that contribute to the food sources of marine animals.

Vocabulary

Autotrophs
Photosynthesis
Phytoplankton
Microbes
Cyanobacteria
Ozone
Chloroplast
Light
Decompose
Pigments
Algal bloom

Activities/Strategies/Study

- Lesson 13 Internet/Textbook Activity
- Viewed Blue Planet "Seasonal Seas"

Assessments
Lesson 13 quiz
Ongoing formative assessment

Additional Resources
Textbook, internet resources, NOAA, National Geographic.

Lesson 14: Biodiversity in the Ocean
Topic Overview:
- Discuss the importance of biodiversity on Earth.
- Compare and contrast characteristics of major groups of marine organisms.

Standards:
3.1.10.C1

Essential Question (Core Concepts)
Describe the great diversity of life within the ocean.

Objectives (Skills/Knowledge)
- Discuss the importance of biodiversity and provide examples of diverse organisms in the ocean.
- Describe the system of classification used by biologists.
- Classify organisms based on their characteristics.
- Analyze the similarities and differences between major groups of organisms.
- Explain how the structures of marine organisms support their functions.
- Identify the characteristics that all living things share.

Vocabulary
Biodiversity
Population
Genetic diversity
Plankton
Nekton
Domains
Microbes
Invertebrates
Fertilized
Chemosynthesis
Halophiles
Methanogens
Thermophiles
Common ancestor
Nutrition
Transport
Cytoplasm
Synthesis
Excretion
Homeostasis
Regulation
Stimulus
Reproduction
Metabolism

Activities/Strategies/Study

- Lesson 14 Internet/Textbook Activity
- CyberLab: Virtual Plankton Exploration
- Coral Reef Adventure Video (in-class only)

Assessments

Lesson 14 quiz
Ongoing formative assessment

Additional Resources

Textbook, internet resources, NOAA, National Geographic.

Lesson 15: Marine Populations

Topic Overview:

- Describe changes in human population over time.
- Interpret and summarize age structure diagrams

Standards:

3.1.10.C1

Essential Question (Core Concepts)

What are the "populations" and their characteristics?

Objectives (Skills/Knowledge)

- Explain the concepts of carrying capacity and population density.
- Identify the factors that increase or decrease population sizes and analyze changes in animal populations.
- Describe the importance of the Endangered Species Ace and give examples of species that are listed under the Act.

Vocabulary

Opportunists
Population dynamics
Carrying capacity
Population density

Activities/Strategies/Study

- Lesson 15 Internet/Textbook Activity
- Researching Endangered or Threatened Species Discussion

Assessments

Lesson 15 quiz
Ongoing formative assessment

Additional Resources

Textbook, internet resources, NOAA, National Geographic.

Lesson 16: Population Changes

Topic Overview:

- Modeling the process of natural selection
- Describe how populations change over time.

Standards:
3.1.10.C1

Essential Question (Core Concepts)
How and why do populations change over time?

Objectives (Skills/Knowledge)
- Explain how the process of natural selection influences the evolution of species.
- Determine how invasive species can result in biodiversity loss.
- Give examples of adaptation in diverse marine ecosystems.

Vocabulary
Evolve
Antibiotic resistance
Natural selection
Theory of Evolution
Fossil record
Transitional species
Extinct species
Homologous structure
Mutation
Fitness
Adaptation
Speciation
Non-native species
Introduced species
Native species
Ballast water

Activities/Strategies/Study
- Lesson 16 Internet/Textbook Activity
- Researching Aquatic Introduced Species Discussion

Assessments
Lesson 16 quiz
Ongoing formative assessment

Additional Resources
Textbook, internet resources, NOAA, National Geographic.

Lesson 17: Food Webs in Action
Topic Overview:
- Create a model food web
- Diagram the flow of energy and nutrients through ecosystems.

Standards:
3.1.B.A7

Essential Question (Core Concepts)
What factors influence marine feeding relationship?

Objectives (Skills/Knowledge)

- Construct a sample marine food web.
- Describe the critical role of phytoplankton in marine food webs.
- Make predictions about changes in food webs that result from natural disruptions and human activities.
- Explain why nutrient cycling is critical within the Earth system.

Vocabulary

Baleen
Food web
Producers
Autotrophs
Heterotrophs
Consumers
Detritus
Decomposers
Food chain
Trophic level
Primary consumers
Secondary consumers
Tertiary consumers
Nutrients
Cellular respiration
Organic compounds
Carbohydrates
Nutrient cycling
Proteins
Carbohydrates
Lipids
Nucleic acids
Vitamins
Minerals
Biogeochemical cycles
Assimilation
Nitrogen fixation
Upwelling
Toxins
Toxic
Pesticides
Bioaccumulation
Biomagnification

Activities/Strategies/Study

- Lesson 17 Internet/Textbook Activity
- CyberLab: Arctic Food Web

Assessments

Lesson 17 quiz
Ongoing formative assessment

Additional Resources

Textbook, internet resources, NOAA, National Geographic.