Summit Public Schools
Summit, New Jersey

Grade Level / Content Area: Marine Biology
Length of Course: 1 Semester

Curriculum

Course Description:

Course Outline
Unit 1: Oceanography (4 weeks)
   Sea floor
   Chemical and physical features
   Weather
Unit 2: Biology of Oceans (4 weeks)
   Overview (photosynthesis, CR, cells)
   Producers
   Invertebrates
   Vertebrates
Unit 3: Ecology (4 weeks)
   Marine Ecosystems
   Zones
Unit 4: Human Interactions (4 weeks)
   Resource management (Renewable vs. Non-renewable)
   History of Marine Legislation
Unit 1: Oceanography

**Standard**

**Big Ideas:**
Understanding how the physical characteristics of the oceans is essential to being able to study marine biology and understand Earth’s dynamic systems.

<table>
<thead>
<tr>
<th>Essential Questions</th>
<th>Enduring Understandings</th>
</tr>
</thead>
<tbody>
<tr>
<td>What provocative questions will foster inquiry, understanding, and transfer of learning?</td>
<td>What will students understand about the big ideas?</td>
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<tr>
<td>• How did the oceans, as they currently exist, form?</td>
<td>Students will understand that…</td>
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<tr>
<td>• How do tides affect the characteristics of coasts?</td>
<td>• Tides are a function of the Earth - Sun - Moon system.</td>
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<td>• How do global climate patterns affect ocean currents and marine “climate”?</td>
<td>• Salinity Ocean Floor Profile Bathymetry</td>
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<td>• How does the movement of water in the oceans affect where organisms can be found?</td>
<td>• Surface Currents allow movement of nutrients and are driven by wind.</td>
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<td>• How do rock particles from land affect the seafloor?</td>
<td>• The spin of the Earth and the Coriolis Effect determine the pattern in which surface currents flow.</td>
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<td>• How do plate tectonics relate to ocean basin formation?</td>
<td>• Density Currents allow for upwelling.</td>
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<td>• What measuring instruments are used to monitor the oceans?</td>
<td>• Rocks align based upon principles of density.</td>
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<td>• How can humans manage natural disasters without destruction of natural resources?</td>
<td>• The ocean has ridges and subduction zones where the ocean floor grows and shrinks.</td>
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**Areas of Focus: Proficiencies (Cumulative Progress Indicators)**

<table>
<thead>
<tr>
<th>Examples, Outcomes, Assessments</th>
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<tbody>
<tr>
<td>Students will:</td>
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<tr>
<td>Instructional Focus:</td>
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<td>5.1.12.A.2</td>
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<td>5.1.12.B.1</td>
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<td>5.2.12.A.2</td>
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<td>5.4.12.C.1</td>
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</table>
• Explain how temperature and salinity affect water density and how this determines upwelling location
• Analyze how seafloor features vary depending on tectonic forces
• Research how technology has changed throughout the history of oceanography

Sample Assessments:
• Periodic quizzes
• Class discussions and debates
• Mini in-class projects
• One long-term project
• One end-of-unit test

Instructional Strategies:
• Lecture-discussion
• Lecture-demonstration
• Cooperative learning
• Independent research projects
• Independent practice and reading
• Video presentations

Interdisciplinary Connections
• Physics of water movement
• Analyzing weather data
• Chemistry of sea water
• Geological features
• Government and conservation

Technology Integration
• Use of laptops to access web-based resources
• Analysis of Sonar, Radar, Loran, and GPS technology.
• Use of probeware for water quality monitoring.

Media Literacy Integration
• Use of NOAA website
• Exploration of various marine related websites including Scripps Oceanographic institute.

Global Perspectives
• International shipping laws
• Global climate patterns
Culturally Responsive Teaching
- Our reliance on the oceans is universal for all walks of human life
- Inuit and Polynesian societies were first to unlock the secrets of the oceans.

<table>
<thead>
<tr>
<th>The following skills and themes listed to the right should be reflected in the design of units and lessons for this course or content area.</th>
<th>21st Century Skills:</th>
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<tbody>
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**Unit 2: Biology of Oceans**

### Big Ideas: Course Objectives / Content Statement(s)

The oceans harbor a wide variety of living organisms, each exhibiting adaptations for survival in their particular marine niches.

### Essential Questions

*What provocative questions will foster inquiry, understanding, and transfer of learning?*

- How can microbes maintain a balance of nutrients in an ecosystem?
- How has evolution modified adaptations in marine organisms?
- How do organisms deal with osmotic balance in the marine environment?
- What evolutionary pressures or adaptive advantages may have driven marine mammal ancestors into the water?

### Enduring Understandings

*What will students understand about the big ideas?*

Students will understand that…

- Photosynthesis and cellular respiration are critical in the proper functioning of an ecosystem
- Cells are the basic unit of structure and function in all living organisms
- The characteristics of each organism is specific to its marine habitat and have developed through millions of years of natural selection
- Bacteria and protists are the basis of all food chains
- Producers, like plants and algae, provide food along the coasts, but very little in open oceans
- The diversity of invertebrate species far out-numbers the diversity of vertebrates in the marine environment
- Number of tissue layers and developmental complexity are indicators of evolutionary advancement in marine animals

### Areas of Focus: Proficiencies (Cumulative Progress Indicators)

**Students will:**

- Review the fundamentals of biology, including photosynthesis and cellular respiration
- Relate evolution and natural selection to adaptations in a marine environment
- Describe how autotrophs contribute to the survival of all organisms.
- Survey unicellular and multicellular algae as well as marine flowering plants
- Identify and describe all of the

### Instructional Focus: (Objectives)

- HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
- HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple
HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.

HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

Sample Assessments:
- Periodic reading quizzes
- Class discussions
- Mini in-class projects on specific marine animals.
- One end-of-unit test

Instructional Strategies:
- Lecture-discussion
- Lecture-demonstration
- Cooperative learning
- Independent research projects
- Independent practice and reading
- Video presentations
- Animal dissections (shark, squid)

Interdisciplinary Connections
- Veterinarian/medical

Technology Integration
- Use PowerPoint to present an invertebrate group
- Use GoogleEarth to track the movements of dolphins and whales

Media Literacy Integration
- Current events article

Global Perspectives
- Identify different types of fish species found in different parts of the world.
- Culturally Responsive Teaching
- Discuss how different cultures rely on certain animal species for food

21st Century Skills:
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