

**East Penn School District**  
Curriculum and Instruction

**Curriculum for: Oceanography**

**Course(s): Oceanography**

**Grades: 10-12**

**Department: Science**

**Length of Period (average minutes): 42**

**Periods per cycle: 6**

**Length of Course (yrs): 0.5**

**Type of offering: elective**

**Credit(s) awarded: 0.5 4.0/4.0**

**Developed by: Kim Kneller and Michael Mihalik**

**ADOPTED: 2018**

Enduring Understandings	Essential Questions	Knowledge	Skills	Standards
<ul style="list-style-type: none"> <li>• Our understanding and experiences with the oceans have changed greatly</li> </ul>	<ul style="list-style-type: none"> <li>• How have the oceans and our understanding of the oceans changed?</li> <li>• What do the oceans mean to humans?</li> <li>• What role have oceans played in the development and advancement of life?</li> </ul>	<ul style="list-style-type: none"> <li>• Human use and understanding of the oceans have changed greatly throughout history</li> <li>• Different bodies of water have differing characteristics.</li> <li>• Humans have relied on the oceans for a variety of resources throughout history.</li> <li>• The oceans are key players in maintaining a habitable Earth.</li> <li>• Our understanding of the oceans is recent in human history.</li> <li>• The oceans mean a lot to people - we use them to symbolize the darkest and also brightest moments in life.</li> </ul>	<ul style="list-style-type: none"> <li>• Constructing an argument about the development of water on Earth's surface</li> <li>• Locating/labeling coastal U.S. States and bodies of water around the world</li> <li>• Creating a Viking longboat to gain perspective of how advanced some past civilizations were and the basics of floatation</li> </ul>	<p>NGSS Standards:</p> <ul style="list-style-type: none"> <li>• HS-ESS2-3. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection</li> <li>• HS-ESS2-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.</li> </ul>
<ul style="list-style-type: none"> <li>• What would the oceans be like without plate tectonics?</li> <li>• How do actions inside</li> </ul>	<ul style="list-style-type: none"> <li>• Food/lifestyle/human activities have been greatly affected by plate tectonics</li> </ul>	<ul style="list-style-type: none"> <li>• The oceans have not always looked the way that they look today.</li> <li>• Radioactive decay in</li> </ul>	<ul style="list-style-type: none"> <li>• Create a model that summarizes how plate tectonics has impacted the oceans over time.</li> </ul>	<p>NGSS Standards:</p> <ul style="list-style-type: none"> <li>• HS-ESS2-1. Develop a model to illustrate how Earth's internal and</li> </ul>

<p>the Earth affect Earth's surface?</p> <ul style="list-style-type: none"> <li>• How do plate tectonics harm and help life on Earth?</li> </ul>	<ul style="list-style-type: none"> <li>• Plate tectonics and associated events create natural disasters and beauty</li> </ul>	<p>the Earth's core is the driving force behind plate tectonics.</p> <ul style="list-style-type: none"> <li>• Plate tectonics are responsible for most ocean floor features.</li> <li>• The movements, characteristics, and examples of various plate boundaries.</li> <li>• Different plate boundaries result in different land features and those features have pros and cons for life.</li> <li>• The supporting evidence for continental drift and how continental drift differs from plate tectonics</li> <li>• The sequence of events that led to the creation of different seafloor features</li> </ul>	<ul style="list-style-type: none"> <li>• Determine plate boundary types based on aerial images and evidence of surroundings</li> <li>• Draw/identify land/seafloor features that were created by tectonic forces</li> <li>• Plot/link earthquake foci to the distance from oceanic trench</li> <li>• Create a profile of the Atlantic Ocean and identify various seafloor features</li> <li>• Calculate the rate of plate motion of the Hawaiian Islands</li> </ul>	<p>surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.</p> <ul style="list-style-type: none"> <li>• HS-ESS1-5. Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.</li> </ul>
<ul style="list-style-type: none"> <li>• Processes happening on and inside Earth's surface and in the atmosphere affect the composition of water</li> </ul>	<ul style="list-style-type: none"> <li>• Why does water matter?</li> <li>• How has water shaped our planet?</li> <li>• Water has changing</li> </ul>	<ul style="list-style-type: none"> <li>• The chemistry of the ocean is important to many forms of life.</li> <li>• The oceans are a heat sink.</li> </ul>	<ul style="list-style-type: none"> <li>• Predicting what will happen if current global temperature trends continue.</li> <li>• Explaining how water changes in response</li> </ul>	<p>NGSS Standards:</p> <ul style="list-style-type: none"> <li>• HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the</li> </ul>

	<p>properties - so what?</p>	<ul style="list-style-type: none"> <li>• Water has unique properties that allowed for life to evolve on Earth.</li> <li>• Earth's surface is mostly covered in salt water, leaving a small amount available for direct human use.</li> <li>• Water has unique properties that allow it to take on different appearances.</li> <li>• The different parts of the water cycle and changing water properties results in different forms of life found</li> <li>• The effects of drinking salt water on humans' bodies</li> </ul>	<p>to various inputs.</p> <ul style="list-style-type: none"> <li>• Applying the concept of buoyancy to build a miniature floating vessel</li> <li>• Applying the concept of density to create liquid layers that do not mix</li> <li>• Reading and interpreting ocean temperature profiles</li> <li>• Turning saltwater into freshwater</li> </ul>	<p>hydrosphere, atmosphere, geosphere, and biosphere.</p> <ul style="list-style-type: none"> <li>• 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</li> <li>• HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.</li> </ul>
<ul style="list-style-type: none"> <li>• Moving/circulating water drives weather/climate and has local effects on the beach landscape.</li> </ul>	<ul style="list-style-type: none"> <li>• How does water move?</li> <li>• How does the moving ocean harm and help life on Earth?</li> <li>• How is moving water both fun and deadly?</li> </ul>	<ul style="list-style-type: none"> <li>• Ocean water moves in a variety of ways both vertically and horizontally throughout the oceans.</li> <li>• Ocean currents are used by marine animals and humans for travel.</li> <li>• Warm and cold</li> </ul>	<ul style="list-style-type: none"> <li>• Establishing travel routes across the ocean using ocean currents</li> <li>• Calculating average velocities for ocean currents</li> <li>• Creating/interpreting a tide calendar/table and making decisions based on that data</li> </ul>	<p>NGSS Standards:</p> <ul style="list-style-type: none"> <li>• 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.</li> </ul>

		<p>currents significantly alter climate.</p> <ul style="list-style-type: none"> <li>• Ocean waves are transfers of energy through the ocean, but their appearance at the shore depends on beach topography.</li> <li>• Tsunamis are caused by seismic events and can be deadly.</li> <li>• Humans build structures to prevent erosion; often with consequences.</li> <li>• Ocean movements can be harnessed to generate electricity.</li> <li>• Ocean movements are a source of recreation, but can also be very harmful.</li> </ul>	<ul style="list-style-type: none"> <li>• Identifying the type of tide based on lunar phase</li> <li>• Differentiating between types of waves</li> <li>• Calculating the speed of a tsunami and how much time one has to evacuate for a tsunami.</li> <li>• Recognizing threats from different sources of moving water</li> </ul>	<ul style="list-style-type: none"> <li>• HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.</li> </ul>
<ul style="list-style-type: none"> <li>• Humans rely on the ocean for a variety of things.</li> <li>• Humans are having a permanent impact on the ocean and its ecosystems.</li> </ul>	<ul style="list-style-type: none"> <li>• How is technology/science used to help the oceans?</li> <li>• How do people make a living off of the ocean?</li> <li>• Why do we need to understand the oceans?</li> </ul>	<ul style="list-style-type: none"> <li>• Humans are having an impact on marine life across trophic levels.</li> <li>• Humans employ the use of satellites to gather a vast amount of data about the ocean.</li> <li>• How the crab fishing</li> </ul>	<ul style="list-style-type: none"> <li>• Using Seafood Watch to make responsible seafood decisions</li> <li>• Interpreting Seafood Watch to know why some forms of seafood are more responsible than others.</li> <li>• Proposing a solution</li> </ul>	<p>NGSS Standards:</p> <ul style="list-style-type: none"> <li>• 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</li> </ul>

		<p>industry works</p> <ul style="list-style-type: none"> <li>• How gold can be mined off the ocean floor</li> <li>• SONAR is used to map the ocean</li> <li>• Captivity and the seafood industry have significantly changed the populations in the ocean.</li> <li>• There's much more to fishing than just technique and gear</li> </ul>	<p>to the problem of overfishing.</p> <ul style="list-style-type: none"> <li>• Identifying the uses for different forms of instruments in the ocean</li> <li>• Calculating SONAR</li> <li>• Interpreting echo sounding profiles and side scans</li> </ul>	<ul style="list-style-type: none"> <li>• 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.</li> <li>• HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity</li> </ul>
<ul style="list-style-type: none"> <li>• Predators in the ocean are essential for keeping the rest of the ecosystem in balance.</li> <li>• Every organism in the ocean has a niche, which, when removed, has a cascading effect on all other organisms.</li> <li>• Factors outside of the marine environment have an impact on the marine environment.</li> </ul>	<ul style="list-style-type: none"> <li>• How do animals adapt to the oceans?</li> <li>• How are form and function related?</li> <li>• Why are ocean organisms important?</li> </ul>	<ul style="list-style-type: none"> <li>• Every marine organism fills a niche that is of value to other organisms.</li> <li>• Marine organisms have unique traits that allow them to survive in the marine environment.</li> <li>• Different locations on the planet have very different marine ecosystems.</li> <li>• Marine organisms connect to topics previously learned</li> </ul>	<ul style="list-style-type: none"> <li>• Identifying major marine organisms based on physical appearance.</li> <li>• Comparing/contrasting various marine organisms</li> <li>• Recognizing factors that alter an ecosystem and/or have a cascading effect on other organisms</li> <li>• Giving examples of adaptations, development, reproduction, and</li> </ul>	<p>NGSS Standards:</p> <ul style="list-style-type: none"> <li>• HS-ESS2-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth</li> <li>• HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.</li> </ul>

		<p>about in this course - water, circulation, seafloor features, etc...</p> <ul style="list-style-type: none"> <li>• Marine mammals have different characteristics and behaviors than non-mammals</li> <li>• Animals respond and behave differently in captivity than they do in the wild</li> <li>• Factors that contribute to diversity, or lack thereof.</li> </ul>	<p>behavior of various marine organisms</p> <ul style="list-style-type: none"> <li>• Explaining the flow of energy and nutrients through the ocean</li> </ul>	
--	--	--	---	--

**Materials and Resources: Internet Resources**