Township of Ocean Schools

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Office of Teaching and Learning

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Curriculum Development Timeline

School: Ocean Township High School

Course: Marine Science

Department: Science

Board Approval	Supervisor	Notes
September 2012	Patrick Sullivan	Born Date
August 2013	Patrick Sullivan	Revisions
December 2017	Patrick Sullivan	Revisions
August 2018	Patrick Sullivan	Revisions
August 2019	Patrick Sullivan	Review

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Pacing Guide			
Week	Marking Period 1	**Week**	Marking Period 3
1	Diving into Ocean Ecosystems	11	Photosynthesis
2	Water On Earth/Ocean Chemistry	12	Biodiversity in the Oceans
3	Water on Earth/Ocean Chemistry	13	Population Change/ Food Webs
4	The Ocean Over Time	14	Population Change/Food Webs
5	Migrations in the Sea	15	Marine Invertebrates
Week	Marking Period 2	**Week**	Marking Period 4
6	Seafloor floor Formation Ocean Voyage of the Deep	16	Biology of Fishes
7	Energy Distributor	17	Marine Reptiles and Birds
8	Weather	18	Marine Mammals
9	Hurricanes	19	Human Impact on Marine
10	Waves & Tides	20	Final

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Core Instructional & Supplemental Materials including various levels of Texts
Marine Science The Dynamic Ocean Meghan E. Marrero Ed.D 2012 – hardcopy & virtual Edpuzzle, Gizmo, Tedtalks. NOAA **Digital Resources** (D=differentiated) Edpuzzle (D) Gizmo (D) NOAA (https://www.noaa.gov/) US Satellite Laboratory Tedtalks

Time Frame	1 week

Topic
1 - Diving into Ocean Ecosystems

Essential Questions
• What is Oceanography? • What is the importance of laboratory safety? • How many oceans exist on Earth? • How are Earth's Oceans unique? • What are the seven seas? • What are the different ecosystems that are found in marine systems?

Enduring Understandings
• The ocean is three-dimensional, offering vast living space and diverse habitats from the surface through the water column to the seafloor • Most of the living space on Earth is in the ocean • Ocean habitats are defined by environmental factors • Due to interactions of abiotic factors, ocean life is not evenly distributed

temporally or spatially.

- Some regions of the ocean support more diverse and abundant life than anywhere on Earth, while much of the ocean is considered a desert

Alignment to Standards

HS-LS2-1
HS-LS2-2
HS-LS2-6
HS-LS2-7
HS-LS2-8
HS-ESS3-4

https://www.state.nj.us/education/cccs/2016/science/

Learning Activities & Key Concepts and Skills

- Recognize that while most of the planet is covered by ocean, it is not a uniform body of water
- Give examples of diverse marine ecosystems and their locations on Earth
- Characterize ecosystems components as abiotic and biotic factors and give examples of how they influence one another
- Describe the process of biological succession, explaining that marine ecosystems undergo natural, gradual changes over time including whales falls
- Discuss how humans affect marine ecosystems both positively and negatively
- Present results to fellow classmates on different marine ecosystems
- Project – Diving into Open oceans - exploration of oceans and locations
- Project - Marine Ecosystem Project
- Webquest: Marine sanctuary investigation
- Activity – Whales Falls on Marine Science Dynamic Ocean Online textbook

Assessments

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Formative:

- Identifying different marine ecosystems
- How Marine sanctuaries help conserve species
- DO NOW: How ocean is vast and contains so many species
- Human impact on Marine systems
- Diving into Open Oceans project
- Marine sanctuary investigation
- Ecosystems undergoing change

Summative:

- Diving into open oceans google forms multiple choice assessment with short answer critical thinking
- Marine ecosystem Project

Benchmark:

- Marine Free Response Essay

Alternative:

- Marine Ecosystem Project

Career Education

CRP5. – Students understand different technologies in marine systems.
CRP11. – Use technology to enhance productivity

21st Century Skills

- 9.3.12.ED.1Apply communication with students to enhance learning and a commitment to learning
- 9.3.12.ED.2 Demonstrate effective oral, written, and multimedia communications in multiple formats & contexts
- 9.3.12.ED-TT.5 – Establish a positive climate to promote learning
- 9.3.12.ED-TT.8 – Demonstrate flexibility and adaptability in instructional planning
- 9.3.ST.2 – Use technology to acquire, manipulate, analyze, and report data
- 9.3.ST-SM.3 – Analyze the impact that science and mathematics has on society

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Interdisciplinary Connections
• MA.9-12.N-Q.A.1 - Math: Map reading, Calculations within lab reports (ex-percentages, change). Students determine the amount of land and oceans in the world By completing percent problems and scaling on a map • SOC-9-12.1.1.2 - Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic being studied. Students investigate the historical significance of marine sanctuaries • LA-11-12 RST11-12.1, LA-11-12 RST11-12.3 - Language Arts: There is a writing component to each unit in the form of lab reports, and film questions. Additionally, each test includes an essay section.
Technology Integration
• TECH.8.1.12.A.3 - Whale Falls Interactive on Marine Science Online Interactive Textbook • TECH.8.1.12.A.CS1 – Interact with peers and complete extension activities on google classroom in order to reflect on their learning and expand their knowledge. • TECH.8.1.12.C.CS4 – Students will use google docs and google slides to submit all work via google classroom. • TECH.8.1.12.D.CS2 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

Time Frame	2 weeks
Topic	
2 - Water on Earth/Ocean Chemistry	

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Essential Questions

- What are the percentages of water in the ocean vs in freshwater?
- What does the "Blue Planet" contain?
- What is surface tension and how does it relate to adhesion and cohesion?
- What is the freezing point and boiling point of water?
- Why do certain objects float and other objects sink?
- How would aquatic ecosystems be different if ice formed on the bottom of these bodies of water?
- Why is the sea water salty?
- Why are estuaries important?

Enduring Understandings

- The ocean is the dominant physical feature on our planet Earth
- Most of Earth's water (97%) is in the ocean
- Seawater has unique properties
- The ocean is an integral part of the water cycle and is connected to all of the Earth's water reservoirs via evaporation and precipitation processes
- Density and Buoyancy affect how boats float in water

Alignment to Standards

HS-LS2-1
HS-LS2-2
HS-LS2-4
HS-LS2-6
HS-ESS2-5
HS-ETS1-1
HS-ETS1-2
HS-LS2-8
HS-LS2-7
HS-ETS1-3

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Learning Activities & Key Concepts and Skills
• Compare and contrast the heating and cooling of fresh water and salt water • Determine whether substrates 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 • Experiment - Different properties of water - surface tension, adhesion, cohesion • Webquest: Water properties - what makes water unique? • Experiment - Boats & Buoyancy Lab - which boat will float and which will sink? • Experiment - A Funny Tasty Lab - taste and investigate different salty bodies of water • Webquest: Osmoregulation and Fish - how does this affect water intake in fish • Simulation: Estuary card game - study the characteristics of estuaries
Assessments
Formative: • Identifying marine ecosystems • Edpuzzle on Cohesion, Adhesion, Surface Tension • DO NOW – how estuaries are important marine systems • Strategic questioning - Osmoregulation & how this affects organisms • Properties of water **Summative:** • Water Chemistry google forms multiple choice assessment with short answer critical thinking • Water Station Lab • Floating & Sinking Lab/Boats & Buoyancy Lab • Tasty Salty Lab **Benchmark:**

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Alternative:

Career Education

CRP1. – Students understand how they can make marine systems sustainable.
CRP2. – Students use knowledge and skills through their lab work.
CRP4. – Communicate clearly and effectively and with reason
CRP12. – Students work productively in collaborative groups using culturally global competence

21st Century Skills

- 9.3.12.ED.1Apply communication with students to enhance learning and a commitment to learning
- 9.3.12.ED.2 Demonstrate effective oral, written, and multimedia communications in multiple formats & contexts
- 9.3.12.ED-TT.5 – Establish a positive climate to promote learning
- 9.3.12.ED-TT.8 – Demonstrate flexibility and adaptability in instructional planning
- 9.3.ST.2 – Use technology to acquire, manipulate, analyze, and report data
- 9.3.ST-SM.3 – Analyze the impact that science and mathematics has on society
- 9.3.ST.ET.1 – Use STEM concepts and processes to solve problems involving design and production

Interdisciplinary Connections

- MA.9-12.N-Q.A.1 - Math: Map reading, Calculations within lab reports (ex-percentages, change). Students complete mass, volume & density in Floating & sinking Lab
- SOC-9-12.1.1.2 - Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic being studied.
- LA-11-12 RST11-12.1, LA-11-12 RST11-12.3 - Language Arts: There is a writing component to each unit in the form of lab reports. Additionally, each test includes an essay section.

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Technology Integration
TECH.8.1.12.A.CS1 – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge. TECH.8.1.12.C.CS4 – Students will use google docs to formulate and submit lab reports to google classroom. TECH.8.1.12.D.CS2 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content. TECH.8.1.12.A.CS2 – Select & use applications effectively – students use Edpuzzle to analyze cohesion, adhesion, and surface tension

Time Frame	2 weeks
Topic	
4 - The Ocean over Time/Migrations in the Sea	
Essential Questions	
• What has happened to oceans over time? • What regions of the world has been changed due to ocean explorations? • Why have humans relied on the ocean in the past and present? • What is Aquarius? • Why do animals migrate? • How is tagging animals important for marine research?	
Enduring Understandings	
• Different events throughout history have explored and exploited the ocean. • The oceans are used for trade and navigation, recreation, scientific exploration, national	

security, marine technology, and ecosystem protection and management

- From the ocean we get foods, medicines and mineral and energy resources
- The ocean is a source of inspiration, recreation rejuvenation and discovery
- Tagging marine animals helps biologists understand and conserve species
- Everyone is responsible for caring for the ocean
- The ocean sustains life on Earth, and humans must live in ways that sustain the ocean

Alignment to Standards

HS-LS2-1
HS-LS2-2
HS-LS2-6
HS-LS2-7
HS-LS2-8
HS-ESS3-4

https://www.state.nj.us/education/cccs/2016/science/

Learning Activities & Key Concepts and Skills

- Identify how humans have relied upon and utilized the ocean for thousands of years
- Construct a timeline of ocean events to scale
- Understand how and why marine animals are tagged
- Investigate the many technologies and tools that scientist use to make observations about ocean processes
- Activity – The Ocean in History – An Ocean Timeline
- Webquest: Human reliance on the Ocean in the past and present
- Webquest: Investigating Marine Algae - different types found
- Experiment: Plotting Animal Movements The Dynamic Ocean Lab - how migrations occur
- Video: Media clips on marine technology and Aquarius underwater habitat
- Webquest: Tagging Marine Mammals - who this is useful
- Video: Humpback Whale Documentary

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Assessments

Formative:

- How have humans relied on oceans in past?
- DO NOW – technologies and tools
- Human reliance on ocean in past and present
- Tagging Marine Animals – why is this useful

Summative:

- An Ocean Timeline
- Plotting Animal Movements
- Tagging Marine mammals webquest

Benchmark:

Alternative:

Career Education

CRP1. – Students understand how they can make marine systems sustainable.
CRP2. – Students use knowledge and skills through their lab work.
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CRP12. – Students work productively in collaborative groups using culturally global competence

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- 9.3.ST.2 – Use technology to acquire, manipulate, analyze, and report data
- 9.3.ST-SM.3 – Analyze the impact that science and mathematics has on society

Interdisciplinary Connections

- MA.9-12.N-Q.A.1 - Math: Map reading, Calculations within lab reports (ex- percentages, change)
- SOC-9-12.1.1.2, SOC.9-12.1.1.1 - Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic being studied. Students create a timeline to learn about past and present events
- LA-11-12 RST11-12.1, LA-11-12 RST11-12.3 - Language Arts: There is a writing component to each unit in the form of lab reports, and film questions. How do humans impact the marine environment? Additionally, each test includes an essay section.

Technology Integration

TECH.8.1.12.A.3 - Marine Technology & Aquarius on Marine Science Online Interactive Textbook
TECH.8.1.12.A.CS1 – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge.
TECH.8.1.12.C.CS4 – Students will use google docs to formulate and submit lab reports to google classroom.
TECH.8.1.12.D.CS2 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content. Students research how to tag marine animals.

Time Frame	1 week

Topic

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Lesson 6,7,12 - Sea Floor Formation, Ocean Voyage of the Deep

Essential Questions

- How does the seafloor form and what are the different components found there?
- How did the ocean form?
- Why do organisms live in different parts of the ocean?
- What is found in the deep ocean?
- What is echolocation and how does noise affect this?

Enduring Understandings

- The ocean is the last and largest unexplored place on Earth
- Understand the ocean is more than a matter of curiosity
- The sea floor is composed of different landscapes.
- It took millions of years for the ocean to form.
- Organisms are found in different zones of the ocean based on their needs and food preferences.

Alignment to Standards

HS-LS2-1
HS-LS2-2
HS-LS2-6
HS-LS2-7
HS-LS2-8
HS-ESS3-4

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Learning Activities & Key Concepts and Skills

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- Learn about continental drift and the formation of the ocean.
- Create a model of the different parts of the ocean floor
- Understand that during different geologic time frames oceans have changed and developed
- Media: Observe continental drift & Earth's oceans through time on media lesson: dynamic ocean.
- Activity - Identify different parts and features of the ocean floor.
- Experiment: Model the ocean floor utilizing clay
- Edpuzzle: Sea floor spreading
- Close Read: Case studies of Steph the Gray Seal & Miguel the Elephant - Marine textbook
- Close Read: Deep ocean - the largest migration on earth
- Ted talk: The Astonishing World of the Deep Ocean
- Video: Creatures of the Deep (Life Series) (different marine creatures found in ocean)

Assessments

Formative:

- DO NOW: Formation of ocean
- Strategic questions on continental drift
- Parts and features of ocean floor activity
- Reading Steph the Gray Seal & Miguel
- Google question: Deep ocean analysis

Summative:

- Sea Floor Formation & Voyage of deep google forms multiple choice assessment with short answer critical thinking
- Modeling ocean floor
- Sea Floor Spreading Edpuzzle
- Geologic time scale analysis

Benchmark:

Alternative:

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Career Education

CRP1. – Students understand how they can make marine systems sustainable.
CRP2. – Students use knowledge and skills through their lab work.
CRP4. – Communicate clearly and effectively and with reason

21st Century Skills

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Interdisciplinary Connections

- MA.9-12.N-Q.A.1 - Math: Map reading, Calculations within lab reports (ex- percentages, change)
- SOC-9-12.1.1.2 - Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic being studied. How have the oceans changed over time?
- LA-11-12 RST11-12.1, LA-11-12 RST11-12.3 - Language Arts: There is a writing component to each unit in the form of lab reports, and book questions. Additionally, each test includes an essay section Students read and analyze Case studies of Steph the Gray Seal & Miguel the Elephant. Students complete a Close Read: Deep ocean - the largest migration on earth

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Technology Integration
TECH.8.1.12.A.3 - Ted Talk – astonishing world of deep ocean, Media: Observe continental drift & Earth's oceans through time on media lesson Dynamic ocean. TECH.8.1.12.A.CS1 – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge. They complete a google question on Deep ocean TECH.8.1.12.C.CS4 – Students will use google docs to formulate and submit lab reports to google classroom. TECH.8.1.12.D.CS2 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content. TECH.12.A.CS2 – Select & use applications effectively – students use Edpuzzle to understand seafloor spreading

Time Frame	4 weeks
Topic	
9,10,11,23,24 – The Sea Surface: the great energy distributor, Weather, Hurricanes, Waves, Tides	
Essential Questions	

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- Does the ocean have the same temperature everywhere?
- How do the different currents in the ocean circulate and what are the SST?
- What is the anatomy of a wave and how do they contribute to storm systems?
- Is the Bermuda Triangle a real truth?
- How do tropical cyclones form and what environmental effects do they cause?
- What are different hurricanes throughout history?
- How does the temperatures different between oceans and land?
- What is the difference between Tidal and Wave Energy?
- What causes tides?
- How do organisms adapt to life in the intertidal zone?
- How does waves affect land?

Enduring Understandings

- Throughout the ocean there is one interconnected circulation system powered by wind, tides, the force of the Earth's rotation
- The shape of ocean basins and adjacent land masses influence the path of circulation
- The ocean has had, and will continue to have, a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water
- New technologies are creating more renewable energy sources from the ocean
- Use of mathematical models is now an essential part of ocean sciences

Alignment to Standards

HS-LS2-1
HS-LS2-2
HS-LS2-6
HS-LS2-7
HS-LS2-8
HS-PS3-4
HS-ESS3-4

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Learning Activities & Key Concepts and Skills

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- Indicate that energy in the ocean is distributed through currents
- Identify sea surface temperatures (SST) and ocean currents from satellite imagery
- Explain how Earth's ocean basins are interconnected through the flow of currents
- Define terms including current, gyre, and Coriolis Effect
- Relate changes in SSTs to changes in animal movements
- Understand how hurricanes take place and environmental effects
- Differentiate between tidal and wave energy
- Webquest: Ocean Great Distributor - how does heat transfer around oceans?
- Webquest: Introduction to Waves Worksheet - defining characteristics of waves
- Debate: Bermuda Triangle - is it real or pseudoscience?
- Video - Bermuda Triangle - the real truth (investigates the scientific vs pseudoscience claims)
- Project & Presentation - Tropical Cyclones - worst storms in history
- Experiment: Investigating Hurricane Data Lab - looks at temperatures and pressures found during tropical storms, depressions, and hurricanes.
- Experiment: Land vs Ocean Lab - which holds heat better?
- Guest speaker: Pat Sullivan - hurricanes and current activity
- Project: Tidal vs Wave Powerpoint - how systems work and advantages vs disadvantages
- Persuasive Waves essay
- Webquest: Life in the Intertidal Zone - how organisms adapt here
- Video: Blackfish Documentary - the truth behind killer whales - "orcas"
- Experiment: Amazing Waves Kit - how waves form and cause land erosion

Assessments

Formative:

- How does heat capacity & oceans relate? – google question
- Strategic questioning – tidal vs wave
- Do now: Hurricanes & their history
- How organisms adapt in intertidal zone analysis

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Summative:

- Energy multiple choice assessment with short answer critical thinking
- Amazing Waves Lab
- Heat Capacity Lab
- Persuasive Waves Essay
- Tidal vs Wave powerpoint

Benchmark:

Alternative:

- Tropical Cyclones Project

Career Education

CRP5. – Students understand different technologies in marine systems.
CRP7. – Employ valid & reliable research strategies
CRP8. – Utilize critical thinking to make sense of problems and persevere in solving them
CRP11. – Use technology to enhance productivity

21st Century Skills

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- 9.3.12.ED-TT.8 – Demonstrate flexibility and adaptability in instructional planning
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Interdisciplinary Connections

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- MA.9-12.N-Q.A.1 - Math: Map reading, Calculations within lab reports (ex- percentages, change). Investigating Hurricane Data by interpreting graphs
- SOC-9-12.1.1.2 - Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic being studied. Hurricanes through time and how they have impacted the environment
- LA-11-12 RST11-12.1, LA-11-12 RST11-12.3 - Language Arts: There is a writing component to each unit in the form of lab reports, and video questions. How have humans impacted the environment? Additionally, each test includes an essay section
- LA.11-12.WHST.11-12.1.A – Alternate or opposing claims - Students decide if the Bermuda triangle is a real science or pseudoscience. Students research alternating claims on tidal and wave and decide which energy system is better. Then they create a persuasive essay on the best way to treat beach erosion.

Technology Integration
TECH.8.1.12.A.CS1 – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge. Students complete google question on heat capacity. TECH.8.1.12.C.CS4 – Students will use google docs to formulate and submit lab reports to google classroom. TECH.8.1.12.D.CS2 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content. How do SST relate to hurricanes?

Time Frame	2 weeks

Topic
13,14,15 – Photosynthesis/Biodiversity in the Ocean

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Essential Questions

- What is the difference between an autotroph and a heterotroph?
- What is the difference between phytoplankton and zooplankton?
- Why is photosynthesis?
- Why are algal blooms harmful?
- What happens to fish that are trapped in a dead zone?
- What biodiversity exists in the ocean and how are they classified?
- How does populations of marine mammals change?
- Why are marine populations becoming endangered?

Enduring Understandings

- The first life is thought to have started in the ocean
- The earliest evidence of life is found in the ocean
- Ocean life ranges in size from the smallest plankton to the largest animal that has lived on Earth, the blue whale
- Most life in the ocean exists as microbes
- Phytoplankton are the most important primary producers in the ocean
- There are deep ocean ecosystems that are independent of energy from sunlight and photosynthetic organisms
- Marine Biodiversity is affected by human interactions

Alignment to Standards

HS-LS1-5	HS-LS2-5
HS-LS2-1	HS-LS2-6
HS-LS2-2	HS-LS2-7
HS-LS2-3	HS-LS2-8
HS-LS2-4	

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Learning Activities & Key Concepts and Skills

- 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
- Understand how human actions cause marine problems
- Experiment - Observing Photosynthesis Lab - how light affects photosynthesis, different algae species, how carbon cycle works
- Webquest: Harmful Algal blooms webquest
- Activity – Trapped in a Dead Zone - what it would like to be a fish with no oxygen
- Experiment: Oceans in a Box - different specimens found in marine life
- Virtual Lab: cyber-lab to analyze the characteristics of plankton
- Webquest: Dynamic Ocean website - Analyzing Marine Populations - how populations are increasing and decreasing of certain marine mammals
- Video: Marine Mammals - what defines a mammal and characteristics found
- Project: Endangered Species - pick an endangered species and outline why and the threat
- Video: Finding Nemo (shows impact of humans on marine life)

Assessments

Formative:

- DO NOW: Biodiversity found in the ocean
- Strategic questions – what are similarities and differences between organisms
- How human activities cause marine problems.
- Characteristics of Mammals interactive video

- How autotrophs and heterotrophs obtain food analysis

Summative:

- Photosynthesis google forms multiple choice assessment with short answer critical thinking
- Analyzing Marine populations – and populations increase and decrease
- Harmful algal blooms webquest
- Oceans in a Box Lab
- Photosynthesis Lab

Benchmark:

Alternative:

- Trapped in a Dead Zone activity
- Endangered Species Project

Career Education

CRP1. – Students understand how they can make marine systems sustainable.
CRP4. – Communicate clearly and effectively and with reason
CRP7. – Employ valid & reliable research strategies
CRP8. – Utilize critical thinking to make sense of problems and persevere in solving them
CRP12. – Students work productively in collaborative groups using culturally global competence

21st Century Skills

- 9.3.12.ED.1Apply communication with students to enhance learning and a commitment to learning
- 9.3.12.ED.2 Demonstrate effective oral, written, and multimedia communications in multiple formats & contexts
- 9.3.12.ED-TT.5 – Establish a positive climate to promote learning
- 9.3.12.ED-TT.8 – Demonstrate flexibility and adaptability in instructional planning
- 9.3.ST.2 – Use technology to acquire, manipulate, analyze, and report data
- 9.3.ST-SM.3 – Analyze the impact that science and mathematics has on society

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Interdisciplinary Connections
• MA.9-12.N-Q.A.1 - Math: Map reading, Calculations within lab reports (ex-percentages, change) • SOC-9-12.1.1.2 - Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic being studied. Why have species become endangered? • LA-11-12 RST11-12.1, LA-11-12 RST11-12.3 - Language Arts: There is a writing component to each unit in the form of lab reports, and book and video questions. Additionally, each test includes an essay section.
Technology Integration
TECH.8.1.12.A.3 - Cyber Virtual Lab Plankton Online Interactive Textbook, Analyzing Marine populations TECH.8.1.12.A.CS1 – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge. TECH.8.1.12.C.CS4 – Students will use google docs to formulate and submit lab reports to google classroom. TECH.8.1.12.D.CS2 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

Time Frame	2 weeks

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Topic
Lesson 16,17,22 – Population Changes, Invasive Species, Food Webs
Essential Questions
• What are different predators and prey in marine ecosystems • How are marine mammals adapted for life in the ocean? • Why are marine invasive species not welcome in the ocean? • How do species interact in the trophic levels of a marine ecosystem? • What are characteristics of different marine ecosystems? • How do symbiotic relationships exist among different marine ecosystems?
Enduring Understandings
• Ocean biology provides many unique examples of life cycles, adaptations, and important relationships among organism that do not occur on land • Everyone is responsible for caring for the oceans • The ocean sustains life on Earth, and humans must live in ways that sustain the ocean individual and collective actions are needed to effectively manage ocean resources for all • The ocean is three-dimensional, offering vast living space and diverse habitats from the surface through the water column to the seafloor. • Abiotic factors and biotic factors work together to create a marine ecosystem • Some regions of the ocean support more diverse and abundant life than anywhere on Earth
Alignment to Standards
HS-LS2-1 HS-LS2-7

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HS-LS2-2 HS-LS2-8
HS-LS2-6
HS-ESS3-4
https://www.state.nj.us/education/cccs/2016/science/

Learning Activities & Key Concepts and Skills

- Explain how predators and prey interact in an ecosystem
- Determine how invasive species result in biodiversity loss
- Give examples of adaptations in diverse marine ecosystems
- Determine different trophic levels in a marine ecosystem
- Identify different symbiotic relationships found in ocean
- Experiment – Modeling Changes Over Time in Sea Stars - how predators and prey interact through this simulation
- Activity: Adaptations in the Sea - how different organisms adapt in ocean examples
- Ted Talk: David Gallo, Underwater Astonishments
- Project: Invasive Species Awareness - why is this a potential problem?
- Edpuzzle: Lionfish Invasive Species
- Activity: Create a Marine Food Web - utilize cards to arrange a food web and discuss trophic levels
- Virtual Lab: Dynamic Marine Ocean: Arctic Food Web - how does temperature change makeup of this food web
- Activity: Symbiosis interactive - how marine life exhibits mutualism, parasitism, and commensalism

Assessments

Formative:

- Identifying marine ecosystems
- Symbiosis interactive
- Strategic questioning on different trophic levels in a marine ecosystem
- How invasive species result in biodiversity loss analysis
- Adaptations in the Sea

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Summative:

- Population changes google forms multiple choice assessment with short answer critical thinking
- Modeling Changes over time Lab
- Create a Food Web

Benchmark:

Alternative:

- Invasive Species Awareness

Career Education

CRP1. – Students understand how they can make marine systems sustainable.
CRP4. – Communicate clearly and effectively and with reason
CRP8. – Utilize critical thinking to make sense of problems and persevere in solving them
CRP12. – Students work productively in collaborative groups using culturally global competence

21st Century Skills

- 9.3.12.ED.1Apply communication with students to enhance learning and a commitment to learning
- 9.3.12.ED.2 Demonstrate effective oral, written, and multimedia communications in multiple formats & contexts
- 9.3.12.ED-TT.5 – Establish a positive climate to promote learning
- 9.3.12.ED-TT.8 – Demonstrate flexibility and adaptability in instructional planning
- 9.3.ST.2 – Use technology to acquire, manipulate, analyze, and report data
- 9.3.ST-SM.3 – Analyze the impact that science and mathematics has on society

Interdisciplinary Connections

- MA.9-12.N-Q.A.1 - Math: Map reading, Calculations within lab reports (ex-

percentages, change). Percentages of predators vs prey.

- SOC-9-12.1.1.2 - Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic being studied. How adaptations have happened through time
- LA-11-12 RST11-12.1, LA-11-12 RST11-12.3 - Language Arts: There is a writing component to each unit in the form of lab reports, and book questions. Additionally, each test includes an essay section. Why are invasive species taking over habitats?

Technology Integration
TECH.8.1.12.A.3 - Tedtalk – Underwater astonishments, Virtual Lab – Arctic Food web on Marine Interactive textbook TECH.8.1.12.A.CS1 – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge. TECH.8.1.12.C.CS4 – Students will use google docs to formulate and submit lab reports to google classroom. TECH.8.1.12.D.CS2 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content. TECH.12.A.CS2 – Select & use applications effectively – students use Edpuzzle to analyze Lionfish invasion

Time Frame	2 weeks

Topic
Lesson 18 & 19 – Introduction to Marine Invertebrates/Biology of Fish

Essential Questions

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- What is the difference between an invertebrate and a vertebrate?
- How are invertebrates adapted to function?
- What are external and internal structures of different invertebrates and vertebrates?
- What are the composition and structure of shells and sand lab?

Enduring Understandings

- Some major groups are found exclusively in the ocean
- The diversity of major groups of organism is much greater in the ocean than on the land
- Ocean biology provides many unique examples of life cycles, adaptations, and important relationships among organisms
- The ocean is three-dimensional, offering vast living space and diverse habitats from the surface through the water column to the sea floor.
- Most of the living space on Earth is in the ocean
- Human intervention can negatively affect marine ecosystems

Alignment to Standards

HS-LS2-1	HS-LS2-8	HS-ETS1-2
HS-LS2-2	HS-PS3-4	HS-ETS1-3
HS-LS2-6	HS-LS4-6	HS-ESS 3-4
HS-LS2-7	HS-ETS1-1	

https://www.state.nj.us/education/cccs/2016/science/

Learning Activities & Key Concepts and Skills

- Identify common organisms classified into the major invertebrate phyla
- Give examples of how the structures of marine invertebrates support their functions
- Describe diverse strategies for obtaining food in the ocean

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- Analyze the internal and external anatomy of the clam, starfish, and perch
- Compare differences between invertebrates and vertebrates
- Large scale commercial fishing can negatively affect marine ecosystems
- Activity – Invertebrate picture identification and research - can you describe different phylums
- Lab Activity – Investigating different invertebrates in an organizer - view specimen jars and determine what phylum they belong too
- Close Read - Bioluminance - how does this adaptation allow organisms to survive?
- Webquest: Jelly characteristics - what makes jellyfish unique and safety measure if bit
- Experiment: Clam Dissection - internal and external adaptations found
- Experiment: Trawling for Shrimp Lab - how this overfishing practice catches bycatch and how can we prevent this by creating a BRD - bycatch reduction device
- Virtual Lab: Starfish - view the internal and external anatomy
- Experiment: Perch Dissection - how does this vertebrate different from clam and starfish
- Lab Activity: Shells and Sand Lab - different shells and sand from across the world

Assessments

Formative:

- DO NOW: Difference between vertebrates and invertebrates
- Diverse ways to obtain food strategic questioning
- Large scale fishing affects marine ecosystems analysis
- Jellyfish webquest

Summative:

- Marine Invertebrates google forms multiple choice assessment with short answer critical thinking
- Shells and Sands Lab
- Clam Dissection
- Trawling for Shrimp Lab
- Perch lab

Benchmark:

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Alternative:

Career Education
CRP1. – Students understand how they can make marine systems sustainable. CRP2. – Students use knowledge and skills through their lab work.

21st Century Skills
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Interdisciplinary Connections
• MA.9-12.N-Q.A.1 - Math: Map reading, Calculations within lab reports (ex-percentages, change). Students determine the best bycatch reduction device for Trawling for Shrimp Lab • SOC-9-12.1.1.2- Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic being studied. How has fishing changed over time? • LA-11-12 RST11-12.1, LA-11-12 RST11-12.3 - Language Arts: There is a writing component to each unit in the form of lab reports, and book questions. Additionally, each test includes an essay section. Close read on Bioluminance

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Technology Integration
TECH.8.1.12.A.3 - Virtual Star Fish Lab TECH.8.1.12.A.CS1 – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge. TECH.8.1.12.C.CS4 – Students will use google docs to formulate and submit lab reports to google classroom. TECH.8.1.12.D.CS2 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

Time Frame	2 weeks

Topic
Lesson 20 & 21 – Marine Reptiles, Birds, & Mammals

Essential Questions
• What are the differences between marine reptiles, birds, and mammals? • What are the life stages of different sea turtles? • What are different species of penguins and how are they adapted to their function? • What is the difference between Crocodiles and Alligators? • How are mammals different from other vertebrates? • What makes dolphins unique? • How have whales evolved? • What are characteristics of sharks? • What are different types of sharks?

Enduring Understandings

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- The ocean is the dominant physical feature on our planet- Earth
- There is one ocean with many ocean basins, such as the North Pacific, South Pacific, North Atlantic, South Atlantic, Indian, and Artic
- The ocean is three-dimensional, offering vast living space and diverse habitats from the surface through the water column to the seafloor
- Most of the living space on Earth is in the ocean
- Food webs in oceans are complex and amazing
- Ocean biology provides many unique examples of life cycles, adaptations, and important relationships among organism that do not occur on land

Alignment to Standards

HS-LS2-1
HS-LS2-2
HS-LS2-6
HS-LS2-8
HS-ESS3-4

https://www.state.nj.us/education/cccs/2016/science/

Learning Activities & Key Concepts and Skills

- Compare and contrast the characteristics of marine reptiles and birds, and mammals
- Give examples of adaptations that allow some reptiles and bird species to inhabit the ocean
- Understand different sea turtle life cycles from hatchling, juvenile, sub-adult, and adult
- Penguins have unique characteristics that allow them to survive in different marine ecosystems.
- Crocodiles and Alligators are similar but also quite different.
- Investigate common behaviors of marine mammals
- Understand different evolutionary stages of whales.
- Dolphins are advanced marine species that have similarities to humans.
- Sharks are fish not mammals and not related to whales.
- Different species of sharks live in different marine ecosytems.

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- Project - Sea Turtle Life stages - hatchling, juvenile, sub-adult, adult
- Advertisement: Pick a Penguin for a Pet - which species would you choose
- Video: Mission Blue (Sylvia Earle's journey about exploring and protecting the ocean)
- Debate: Would you rather be a crocodile vs an alligator? Why?
- Cyber Lab - Dynamic Marine - Marine Mammal Behavior - different behaviors such as swimming and porpoising in marine life
- Video: Dolphins - Spy in Pod - how dolphins can be studied through marine tagging
- Webquest: Whale Evolution - how the whale has evolved through time
- Game: Whale Migration - why whales migrate through the ocean
- Webquest: Dolphin Behavior - what specific behaviors do you find with dolphins
- Reading: Short Shark Story - characteristics of shark
- Survey: Shark Fears - what fears do you have in common?
- Table: Shark Smart - ways to protect yourself in oceans
- Project: Meet the sharks powerpoint - different species of sharks and their location and characteristics
- Challenges: Shark Mystery - did you know these shark mysteries

Assessments

Formative:

- DO NOW: How do Reptiles, Birds, and Mammals compare
- How sharks are different from whales analysis
- Dolphins and their characteristics film analysis
- How to protect against sharks
- Short Shark Story
- How whales have evolved
- Strategic questions – do you know these shark mysteries?

Summative:

- Diving into open oceans google forms multiple choice assessment with short answer critical thinking
- Dolphin Behavior webquest
- Pick a Penguin
- Sea Turtle Life Stages

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Benchmark:

- Marine free response essay

Alternative:

- Meet the sharks powerpoint
- Pick a penguin for a Pet

Career Education

CRP6. – Demonstrate creativity and innovation
CRP7. – Employ valid & reliable research strategies
CRP8. – Utilize critical thinking to make sense of problems and persevere in solving them

21st Century Skills

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Interdisciplinary Connections

- MA.9-12.N-Q.A.1 - Math: Map reading, Calculations within lab reports (ex-percentages, change)
- SOC-9-12.1.1.2 - Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic being studied.

- LA-11-12 RST11-12.1, LA-11-12 RST11-12.3 - Language Arts: There is a writing component to each unit in the form of lab reports, and film questions. How have humans impacted the environment. Additionally, each test includes an essay section. Short Story on Sharks
- LA.11-12.WHST.11-12.1.A – Alternate or opposing claims - Students have a debate if they would rather be a crocodile or an alligator

Technology Integration
TECH.8.1.12.A.3 - Mission Blue Sylvia Earle's documentary on conserving oceans, Marine Mammal behavior cyber lab on online textbook TECH.8.1.12.A.CS1 – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge. TECH.8.1.12.C.CS4 – Students will use google docs to formulate and submit lab reports to google classroom. TECH.8.1.12.D.CS2 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

Time Frame	2 weeks

Topic
Human Impact on Marine Ecosystems

Essential Questions

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- How have humans impacted marine ecosystems?
- What impact is plastic pollution having on marine systems?
- What impact does trash and offshore drilling have on marine ecosystems?
- How are watersheds, human coastlines, and barrier islands affected by human interactions?
- What is point vs nonpoint pollution affecting marine organisms?
- Why are commercial fisheries negatively impacting ecosystems?
- How are Marine Protected Habitats regulated?
- How is climate change and sea level rise creating environmental problems

Enduring Understandings

- Ocean biology provides many unique examples of life cycles, adaptations, and important relationships among organism that do not occur on land
- The ocean is three-dimensional, offering vast living space and diverse habitats from the surface through the water column to the sea floor.
- Most of the living space on Earth is in the ocean
- Human intervention can negatively affect marine ecosystems

Alignment to Standards

HS-LS2-1	HS-LS2-8	HS-ETS-1
HS-LS 2-2	HS-LS4-6	HS-ETS-2
HS-LS2-6	HS-ESS3-4	
HS-LS2-7		

https://www.state.nj.us/education/cccs/2016/science/

Learning Activities & Key Concepts and Skills

- We must consider and correct the problems associated with human population growth that stress marine ecosystems

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- Address solutions to problems encountered with human interactions
- The ocean must be cared for and protected for future generation
- Experiment: Human Impact Ocean Trash - effect of garbage and oil on oceans
- Socratic Seminar: Offshore Drilling - should we allow this or be more concerned with environmental effect?
- Video: Plastic Paradise (uncovering the true of the Great Pacific Garbage Patch)
- Human Impact on Oceans Final project – watersheds, point pollution, nonpoint pollution, commercial fishing practices, protecting marine habitats, climate change, and coastlines and barrier islands

Assessments

Formative:
- How have humans disturbed or helped marine systems – strategic questioning
- Solutions to ocean problems analysis
- Great Pacific Garbage Patch impact on the ocean

Summative:
- Submit Ocean Analysis Film Analyis Book
- Human impact Ocean Trash Lab

Benchmark:
- Marine free response essay

Alternative:
- Human Impact on Oceans Final project

Career Education

CRP1. – Students understand how they can make marine systems sustainable.
CRP2. – Students use knowledge and skills through their lab work.
CRP4. – Communicate clearly and effectively and with reason
CRP12. – Students work productively in collaborative groups using culturally global competence

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Interdisciplinary Connections

- MA.9-12.N-Q.A.1 - Math: Map reading, Calculations within lab reports (ex- percentages, change)
- SOC-9-12.1.1.2 - Social Studies: All Lecture/Discussions Require the Historical Development of the Specific Topic being studied. How have humans impacted the marine environment through time.
- LA-11-12 RST11-12.1, LA-11-12 RST11-12.3 - Language Arts: There is a writing component to each unit in the form of lab reports, and book & film questions. Additionally, each test includes an essay section. Students will create a slides report on their Human impact topic.
- LA.11-12.WHST.11-12.1.A – Alternate or opposing claims – Socratic seminar – Should we allow offshore drilling or should be worry more about environment?

Technology Integration

TECH.8.1.12.A.CS1 – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge.

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TECH.8.1.12.C.CS4 – Students will use google docs to formulate and submit lab reports to google classroom.
TECH.8.1.12.D.CS2 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content. This will need to be done extensively to finish Final Human Marine Project

Modifications (ELL, Special Education, At-Risk Students, Gifted & Talented, & 504 Plans)

ELL:

- Work toward longer passages as skills in English increase
- Use visuals
- Introduce key vocabulary before lesson
- Teacher models reading aloud daily
- Provide peer tutoring
- Use of Bilingual Dictionary
- Guided notes and/or scaffold outline for written assignments
- Provide students with English Learner leveled readers.

Supports for Students With IEPs:

- Allow extra time to complete assignments or tests
- Guided notes and/or scaffold outline for written assignments
- Work in a small group
- Allow answers to be given orally or dictated
- Use large print books, Braille, or books on CD (digital text)
- Follow all IEP modifications

At-Risk Students:

- Guided notes and/or scaffold outline for written assignments
- Introduce key vocabulary before lesson
- Work in a small group
- Lesson taught again using a differentiated approach
- Allow answers to be given orally or dictated
- Use visuals / Anchor Charts
- Leveled texts according to ability

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Gifted and Talented:

- Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles)
- Provide options, alternatives and choices to differentiate and broaden the curriculum
- Organize and offer flexible small group learning activities
- Provide whole group enrichment explorations
- Teach cognitive and methodological skills
- Use center, stations, or contracts
- Organize integrated problem-solving simulations
- Propose interest-based extension activities
- Expose students to beyond level texts.

Supports for Students With 504 Plans:

- Follow all the 504 plan modifications
- Text to speech/audio recorded selections
- Amplification system as needed
- Leveled texts according to ability
- Fine motor skill stations embedded in rotation as needed
- Modified or constrained spelling word lists
- Provide anchor charts with high frequency words and phonemic patterns