

Ocean Academy Charter High School
Curriculum Guide
Grade 10-12



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Ocean Academy Charter High School Marine Biology Curriculum	
Content Area: Science	
Course Title: Marine Biology	Grade Level: 10th-12th
Unit 1 : The Dynamic Ocean: Systems, Life & Motion Climate Change	15 Days
Unit 2: Ocean Life & Biodiversity Climate Change	10 Days
Unit 3: Ocean Life & Adaptations	15 Days
Unit 4: Ocean Life and Human Impact Climate Change	5 Days

Course Introduction

Marine Science is an engaging, inquiry-driven elective that explores the dynamic and complex world of the ocean and its importance to life on Earth. Through laboratory investigations, hands-on activities, research, and scientific problem-solving, students will develop a deeper understanding of marine environments and the organisms that depend on them.

Students will investigate a variety of topics, including oceanography, marine organisms and ecosystems, ocean habitats, tides and waves, coastal processes, marine resources, and current environmental concerns. Particular emphasis will be placed on the relationship between humans and the ocean, including the ways human activities influence marine ecosystems on both local and global scales. Students will evaluate environmental challenges, analyze evidence, and consider potential solutions for protecting and sustaining ocean resources.

The course is designed to encourage curiosity, critical thinking, collaboration, and the application of scientific practices to real-world issues. Students will develop skills in observation, data collection and

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analysis, scientific reasoning, and evidence-based communication while exploring questions that have important environmental, economic, and societal implications.

Marine Science supports the goals of the **Next Generation Science Standards (NGSS)** and provides opportunities for students to apply higher-order thinking and scientific practices. The course also reinforces skills relevant to New Jersey Department of Education (NJDOE) science assessments. Whether students are interested in science, environmental issues, marine careers, or simply curious about the world beneath the surface, Marine Science provides a foundation for continued exploration and appreciation of our oceans.

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Ocean Academy Charter High School
Unit 1 Overview

Content Area: Science

Target Course/Grade Levels: 10-12

Unit Title: Unit 1: The Dynamic Ocean:
Systems, Life & Motion

Duration: 15 days

Unit 1 Introduction

This unit establishes the foundational concepts and scientific practices students will use throughout their study of marine science. Students begin by exploring marine biology as a field of science and examining how scientists investigate questions about the ocean through observation, experimentation, data collection, and evidence-based reasoning.

Students will examine the fundamental principles of ecology and apply them to marine ecosystems, investigating how organisms interact with one another and with the physical environment. Topics will include relationships among organisms, energy and matter within ecosystems, population and community dynamics, biodiversity, and the factors that influence the health and stability of marine ecosystems.

The unit also introduces the physical characteristics of the ocean environment and explores how factors such as temperature, salinity, pressure, light, density, and water movement shape marine habitats. Students will consider how these conditions influence where organisms live, how they survive, and how marine ecosystems function.

Throughout the unit, students will engage in the Science and Engineering Practices by developing questions, constructing and testing hypotheses, planning and conducting investigations, analyzing and interpreting data, using mathematical and computational thinking, developing explanations from evidence, and communicating scientific information. By connecting biological concepts with the physical processes of the ocean, students will build a foundation for understanding the complex and interconnected nature of marine systems.

This unit is based on HS-ESS1-5, HS-SS2-1, HS-ESS2-2, HS-ESS2-4, HS-ETS1-3 and HS-ETS1-4.

Standard 9.1 Personal Financial Literacy: This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.

Standard 9.2 Career Awareness, Exploration, Preparation and Training. This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.

Standard 9.4 Life Literacies and Key Skills. This standard outline key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy* that are critical for students to develop to live and work in an interconnected global economy.

Standard 8.1 Computer Science

Computer Science outlines a comprehensive set of concepts and skills, such as data and analysis, algorithms and programming, and computing systems.

Standard 8.2 Design Thinking

Technology, outlines the technological design concepts and skills essential for technological and engineering literacy. The framework design includes Engineering Design, Ethics and Culture, and the Effects of Technology on the Natural world among the disciplinary concepts

Amistad Law: N.J.S.A.

18A:52:16A-88 Every board of education shall incorporate the information regarding the contributions of African-Americans to our country in an appropriate place in the curriculum of elementary and secondary school students.

Holocaust Law: N.J.S.A.

18A:35-28 Every board of education shall include instruction on the Holocaust and genocide in an appropriate place in the curriculum of all elementary and secondary school pupils. The instruction shall further emphasize the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens.

LGBT and Disabilities Law:

N.J.S.A. 18A:35-4.35 A board of education shall include instruction on the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, in an appropriate place in the curriculum of middle school and high school students as part of the district's implementation of the New Jersey Student Learning Standards (N.J.S.A.18A:35-4.36) A board of education shall have policies and procedures in place pertaining to the selection of instructional materials to implement the requirements of N.J.S.A. 18A:35-4.35.

Diversity and Inclusion

C.18A:35-4.36a Curriculum to include instruction on diversity and inclusion.

1. The instruction shall:
 - (1) highlight and promote diversity, including economic diversity, equity, inclusion, tolerance, and belonging in connection with gender and sexual orientation, race and ethnicity, disabilities, and religious tolerance;
 - (2) examine the impact that unconscious bias and economic disparities have at both an individual level and on society as a whole; and
 - (3) encourage safe, welcoming, and inclusive environments for all students regardless of race or ethnicity, sexual and gender identities, mental and physical disabilities, and religious beliefs.

Asian Americans and Pacific Islanders (AAPI)

Ensures that the contributions, history, and heritage of Asian Americans and Pacific Islanders (AAPI) are included in the New Jersey Student Learning Standards (NJSLS) for Social Studies in kindergarten through Grade 12 (P.L.2021, c.416).

21st Century Themes and Skills

“Twenty-first century themes and skills” means themes such as global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; learning and innovation skills, including creativity and innovation, critical thinking and problem solving, and communication and collaboration; information, media, and technology skills; and life and career skills, including flexibility. Career readiness, life literacies, and key skills education provides students with the necessary skills to make informed career and financial decisions, engage as responsible community members in a digital society, and to successfully meet the challenges and opportunities in an interconnected global economy.”

Focus Standards Unit 1

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. [Clarification Statement: Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust decreasing with distance away from a central ancient core of the continental plate (a result of past plate interactions).]

HS-ESS2-1 Develop a model to illustrate how Earth’s internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. [Clarification Statement: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, mass wasting, and coastal erosion).] [Assessment Boundary: Assessment does not include memorization of the details of the formation of specific geographic features of Earth’s surface.]

HS-ESS2-2 Analyze geoscience data to make the claim that one change to Earth’s surface can create feedbacks that cause changes to other Earth systems. [Clarification Statement: Examples should include climate feedbacks, such as how an increase in greenhouse gasses causes a rise in global temperatures that melts glacial ice, which reduces the amount of sunlight reflected from Earth’s surface, increasing surface temperatures and further reducing the amount of ice. Examples could also be taken from other system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion; how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent.]

HS-ESS2-4 Use a model to describe how variations in the flow of energy into and out of Earth’s systems result in changes in climate. [Clarification Statement: Examples of the causes of climate change differ by timescale, over 1-10 years: large volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth’s orbit and the orientation of its axis; and 10-100s of millions of years: long-term changes in atmospheric composition.] [Assessment Boundary: Assessment of the results of changes in climate is limited to

changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.]

HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

HS-ETS1-4 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<u>Developing and Using Models</u> Modeling in 9-12 builds on K-8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed world(s). Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-ESS1-1) <u>Analyzing and Interpreting Data</u> Analyzing data in 9-12 builds on K-8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.	<u>ESS1.C: The History of Planet Earth</u> - Continental rocks, which can be older than 4 billion years, are generally much older than the rocks of the ocean floor, which are less than 200 million years old. (HS-ESS1-5) - Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history. (HS-ESS1-6)	<u>Cause and Effect</u> - Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-ESS3-1) <u>Systems and System Models</u> - When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models. (HS-ESS3-6) <u>Stability and Change</u> - Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes

- Analyze data using computational models in order to make valid and reliable scientific claims. (HS-ESS3-5) <u>Using Mathematics and Computational Thinking</u> Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions. - Create a computational model or simulation of a phenomenon, designed device, process, or system. (HS-ESS3-3) - Use a computational representation of phenomena or design solutions to describe and/or support claims and/or explanations. (HS-ESS3-6) <u>Constructing Explanations and Designing Solutions</u> Constructing explanations and designing solutions in 9-12 builds on K-8 experiences and progresses to explanations and designs that are supported by	ESS2.B: Plate Tectonics and Large-Scale System Interactions - Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. (ESS2.B Grade 8 GBE) (secondary to HS-ESS1-5) <u>ESS2.D: Weather and Climate</u> - Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere. (secondary to HS-ESS3-6) <u>ESS3.A: Natural Resources</u> - Resource availability has guided the development of human society. (HS-ESS3-1) All forms of energy production and	are irreversible. (HS-ESS3-3), (HS-ESS3-5) - Feedback (negative or positive) can stabilize or destabilize a system. (HS-ESS3-4) - Much of science deals with constructing explanations of how things change and how they remain stable. (HS-ESS1-6) Patterns - Empirical evidence is needed to identify patterns. (HS-ESS1-5) <u>Scale, Proportion, and Quantity</u> - The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. (HS-ESS1-1) - Algebraic thinking is used to examine scientific data and predict the effect of a change in one variable on another (e.g., linear growth vs. exponential growth). (HS-ESS1-4) <u>Energy and Matter</u> - Energy cannot be created or destroyed-only moved between one place and another place, between objects and/or fields, or
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multiple and independent student-generated sources of evidence consistent with scientific knowledge, principles, and theories. - Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-ESS3-1) - Design or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-ESS3-4) <u>Engaging in Argument from Evidence</u> Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed world(s). Arguments may also come from current	other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. (HS-ESS3-2) <u>ESS3.B: Natural Hazards</u> - Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (HS-ESS3-1) <u>ESS3.C: Human Impacts on Earth Systems</u> - The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (HS-ESS3-3) - Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (HS-ESS3-4) <u>ESS3.D: Global Climate Change</u>	between systems. (HS-ESS1-2) - In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved. (HS-ESS1-3) ----- <i>Connections to Engineering, Technology, and Applications of Science</i> <u>Influence of Science, Engineering, and Technology on Society and the Natural World</u> - Modern civilization depends on major technological systems. (HS-ESS3-1), (HS-ESS3-3) - Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (HS-ESS3-2), (HS-ESS3-4) - New technologies can have deep impacts on society and the environment, including some that were not anticipated. (HS-ESS3-3) - Analysis of costs and benefits is a critical aspect of decisions
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scientific or historical episodes in science. - Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations). (HS-ESS3-2) Connections to Nature of Science Scientific Investigations Use a Variety of Methods - Science investigations use diverse methods and do not always use the same set of procedures to obtain data. (HS-ESS3-5) - New technologies advance scientific knowledge. (HS-ESS3-5) Scientific Knowledge is Based on Empirical Evidence - Science knowledge is based on empirical evidence. (HS-ESS3-5) - Science arguments are strengthened by multiple lines of evidence supporting a	- Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts. (HS-ESS3-5) - Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities. (HS-ESS3-6) <u>ETS1.B: Developing Possible Solutions</u> - When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (secondary to HS-ESS3-2), (secondary HS-ESS3-4) <u>ESS2.A: Earth Materials and Systems</u> - Earth's systems, being dynamic and interacting, cause feedback effects that can increase or	about technology. (HS-ESS3-2) <u>Interdependence of Science, Engineering, and Technology</u> - Science and engineering complement each other in the cycle known as research and development (R&D). Many R&D projects may involve scientists, engineers, and others with wide ranges of expertise. (HS-ESS1-2), (HS-ESS1-4) Connections to Nature of Science Scientific Knowledge Assumes an Order and Consistency in Natural Systems - Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future. (HS-ESS1-2) - Science assumes the universe is a vast single system in which basic laws are consistent. (HS-ESS1-2) Science is a Human Endeavor - Science is a result of human endeavors, imagination, and creativity. (HS-ESS3-3)
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single explanation. (HS-ESS3-5)	decrease the original changes.	Science Addresses Questions About the Natural and Material World - Science and technology may raise ethical issues for which science, by itself, does not provide answers and solutions. (HS-ESS3-2) - Science knowledge indicates what can happen in natural systems—not what should happen. The latter involves ethics, values, and human decisions about the use of knowledge. (HS-ESS3-2) - Many decisions are not made using science alone, but rely on social and cultural contexts to resolve issues. (HS-ESS3-2)
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Unit 1 Supporting and Additional Standards/Interdisciplinary Connections

ELA/Literacy -

RI.CR.11-12.1. Accurately cite a range of thorough textual evidence and make relevant connections to strongly support a comprehensive analysis of multiple aspects of what an informational text says explicitly and inferentially, as well as interpretations of the text
(HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-4),(HS-ESS3-5)

RI.CI.11-12.2. Determine two or more central ideas of an informational text and analyze how they are developed and refined over the course of a text, including how they interact and build on one another to provide a complex account or analysis; provide an objective summary of the text. (HS-ESS3-5)

RI.MF.11-12.6. Synthesize complex information across multiple sources and formats to develop ideas, resolve conflicting information, or develop an interpretation that goes beyond explicit text information (e.g., express a personal point of view, new interpretation of the concept).(HS-ESS3-5)

RI.CT.11-12.8. Analyze and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) documents of historical and scientific significance for their purposes,

including primary source documents relevant to U.S. and/or global history and texts proposing scientific or technical advancements. (HS-ESS3-2),(HS-ESS3-4)

W.IW.11-12.2. Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

- A. Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- B. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- C. Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- D. Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.
- E. Establish and maintain a style and tone appropriate to the audience and purpose (e.g., formal and objective for academic writing) while attending to the norms and conventions of the discipline in which they are writing.
- F. Provide a concluding paragraph or section that supports the argument presented (e.g., articulating implications or the significance of the topic). (HS-ESS3-1)

Mathematics -

MP.2 Reason abstractly and quantitatively.

(HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-5),(HS-ESS3-6)

MP.4 Model with mathematics. (HS-ESS3-3),(HS-ESS3-6)

HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems;

choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-ESS3-1),(HS-ESS3-4),(HS-ESS3-5),(HS-ESS3-6)

HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.

(HS-ESS3-1),(HS-ESS3-4),(HS-ESS3-5),(HS-ESS3-6)

HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

(HS-ESS3-1),(HS-ESS3-4),(HS-ESS3-5),(HS-ESS3-6)

Unit 1 New Jersey Student Learning Standards Connections:

Disciplinary Concepts

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Career Awareness and Planning, Creativity & Innovation, Critical Thinking & Problem Solving, Digital Citizenship, Global & Cultural Awareness and Technology Literacy	
<i>Core Ideas</i>	<i>Performance Expectations (Identified with Standard Number and Statement)</i>
<i>There are strategies to improve one's professional value and marketability</i>	9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.
With a growth mindset, failure is an important part of success.	9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12 prof.CR3a).
Innovative ideas or innovation can lead to career opportunities.	9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12 prof.CR2b, 2.2.12.LF.8).
Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.	9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a). 9.4.12.CT.3: Enlist input from a variety of stakeholders (e.g., community members, experts in the field) to design a service learning activity that addresses a local or global issue (e.g., environmental justice).
Network connectivity and computing capability extended to objects, sensors and everyday items not normally considered computers allows these devices to generate, exchange, and consume data with minimal human intervention. Technologies such as Artificial Intelligence (AI) and blockchain can help minimize the effect of climate change.	9.4.12.DC.8: Explain how increased network connectivity and computing capabilities of everyday objects allow for innovative technological approaches to climate protection.
Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.	9.4.12.GCA.1: Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political, economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).

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Digital tools differ in features, capacities, and styles. Knowledge of different digital tools is helpful in selecting the best tool for a given task.	9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.). 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.
Collaborative digital tools can be used to access, record and share different viewpoints and to collect and tabulate the views of groups of people	9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments. 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).
Unit 1 New Jersey Student Learning Standards:	
Disciplinary Concepts Data Analysis, Engineering Design	
Core Ideas	
Individuals select digital tools and design automated processes to collect, transform, generalize, simplify, and present large data sets in different ways to influence how other people interpret and understand the underlying information.	8.1.12.DA.1: Create interactive data visualizations using software tools to help others better understand real world phenomena, including climate change.
Engineering design is a complex process in which creativity, content knowledge, research, and analysis are used to address local and global problems. Decisions on trade-offs involve systematic comparisons of all costs and benefits, and final steps that may involve redesigning for optimization.	8.2.12.ED.3: Evaluate several models of the same type of product and make recommendations for a new design based on a cost benefit analysis. 8.2.12.ED.4: Design a product or system that addresses a global problem and document decisions made based on research, constraints, trade-offs, and aesthetic and ethical considerations and share this information with an appropriate audience.
New Jersey Student Learning Standards: Climate Change Mandate	
Core Ideas	Performance Expectations (Identified with Standard Number and Statement)
The foundation for Earth's global climate systems is the electromagnetic radiation	HS-ESS2-2: Analyze geoscience data to make the claim that one change to Earth's surface can create

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from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.	feedbacks that cause changes to other Earth systems.
The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate.	HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
All forms of energy production and other resource extraction have associated economic, social, environmental and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics and to consider social, cultural and environmental impacts.	HS-ESS3-2: Evaluate competing design solutions for developing, managing and utilizing energy and mineral resources based on cost-benefit ratios.
Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict and manage current and future impacts.	HS-ESS3-5: Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs.	HS-ETS1-4: Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Unit 1 Evidence of Student Learning

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Performance Tasks/Use of Technology:	Other Assessments
• ducks/sneakers current activity • Mapping the seafloor • Water testing • Storm surge labs • Measurement of tides based on moon cycles	Formative • Observation • Homework • Class participation • Graphic Organizers • Projects • Student Response Systems • Do-Now/Exit Cards • Laboratories/Lab Reports • Maintaining a Notebook • Writing Assignments • Graphs, Models, and Tables Summative • Chapter/Unit Test • Writing Assignments • Presentations • Laboratory Reports/Practical • Unit Projects Benchmark • Common Assessments • Final Exams • Performance Assessment • Link-it assessment Alternative • Quizz • Blooket • Kahoot • CER (claim, evidence, reasoning)

Unit 1 Essential Questions

- What is marine science, and what fields contribute to our understanding of the ocean?
- How do scientists investigate marine systems and use data to answer questions?
- How have scientific discoveries and contributions from diverse cultures shaped our understanding of the ocean?
- What tools, technologies, and strategies are used to observe and study the marine environment?
- How can scientists use evidence and data to explain patterns and changes in ocean systems?
- How do ocean conditions and cycles influence marine organisms and ecosystems?
- What drives ocean movement, including waves, tides, and circulation?
- How does ocean circulation influence weather and climate on land?
- How are marine and terrestrial ecosystems connected?
- How do human activities affect ocean ecosystems and marine resources?
- Why is understanding the ocean important to our lives and our future?

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- How can scientific knowledge help us address challenges facing the marine environment?

Unit 1 Knowledge and Skills

Enduring Understandings	Learning Targets
<i>Students will know...</i> • Marine science is an interdisciplinary field that draws on biology, chemistry, physics, geology, environmental science, and other areas to understand the ocean and its complex systems. • Scientific inquiry provides a framework for understanding the marine environment. Scientists use observation, questioning, investigation, evidence, and data analysis to develop explanations, solve problems, and make informed decisions about ocean-related issues. • Safe and responsible scientific practices are essential in the classroom, laboratory, and field. Proper use of equipment, attention to personal and environmental safety, and respect for others and the marine environment are fundamental to effective scientific investigation. • The ocean is a dynamic and interconnected system. Physical processes such as waves, tides, currents, and ocean circulation continuously move energy and water, influencing marine ecosystems as well as weather and climate on land. • Conditions within the ocean shape the distribution and survival of marine organisms. Factors such as temperature, salinity, depth, pressure, light, and water movement influence marine habitats and the organisms that depend on them. • Marine and terrestrial environments are interconnected. Changes in ocean systems can influence atmospheric conditions, climate, weather, coastal environments, and ecosystems both in and beyond the ocean. • Human activities can significantly alter marine ecosystems and ocean resources. Pollution, habitat destruction, overfishing, climate change, and other human pressures can affect biodiversity,	<i>Students will be able to..</i> • be able to explore various marine science disciplines and areas of study • be able to apply the scientific method in hands-on activity. • be able to understand human impacts on the ocean. • be able to demonstrate safety in the classroom. • be able to understand human impact on the ocean. • be able to understand how plants and animals are interconnected within the marine ecosystem.

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ecosystem health, and the availability of marine resources. Understanding the ocean is essential for making informed decisions about its future. Scientific knowledge can help individuals and communities recognize environmental challenges, evaluate potential solutions, and make responsible choices that support healthy and sustainable marine ecosystems.	
Unit 1 Instructional Plan	
Suggested Activities	Resources
Daily Learning Routines: Do Now activities, lesson closures, maps, and brief formative checks. Interactive Lessons: PowerPoint/slide presentations, demonstrations, and technology-integrated activities. Hands-On Investigations: Conduct laboratory activities and classroom investigations focused on ocean properties, processes, and marine systems. Density & Salinity Investigation: Explore how temperature, salinity, and density influence ocean water and circulation. El Niño Case Study: Analyze the causes and effects of El Niño on ocean conditions, weather, climate, and ecosystems. Ocean Pollution Investigation: Examine the Great Pacific Garbage Patch through a short United Streaming video and discuss the impacts of marine debris. Waves & Surfing Analysis: Use <i>Step Into Liquid</i> and live surfing footage to identify beach topography, wave characteristics, and patterns of wave movement. Wave Observation & Identification: Analyze real-time surf conditions using resources such as NJ Surfer and Magicseaweed to identify and compare wave characteristics. Tides & Marine Organisms Case Studies: Investigate how tidal cycles influence marine organisms and their behaviors, including horseshoe crabs, grunion, and Christmas Island crabs.	- Gizmos - Current textbook - Supplementary textbooks - Internet articles (NEWSELA) - Websites - Multimedia video clips - Lab materials

Student Projects & Labs: Complete individual or collaborative projects and laboratory investigations that apply concepts from the unit.

Technology Integration: Use digital tools, online resources, maps, simulations, and multimedia to investigate and communicate marine science concepts.

Unit 1 Suggested Options for Differentiation: Content-specific Accommodations and Modifications for Subgroups

Multilingual Learners

- Speak slowly, distinctly, and write down key terms
- Closed Captioning
- Emphasize visual literacy
- Graphic Organizers
- Use charts, graphs and figures
- Group projects & cooperative learning
- Partner English learners with strong English speakers
- Consistent routines
- Outlines
- Language-based science games
- Picture glossary
- Root words

Students with 504 Plans

- At the beginning of a course, have a conversation about the value of understanding one's learning profile and/or let students take a learning style survey.
- Explicitly share with students your observations about their learning strengths and challenges as the course progresses.
- Build metacognitive reflection into assignments.
- Instead of relying on large unit tests or exams, build in more frequent forms of assessment.
- Use grade-keeping software and make updated grade reports accessible to students.
- Provide direct personalized feedback to students
- Provide (or assign) some form of study guide for students to review before any quiz or exam.
- Provide scoring rubrics that describe the qualities of excellent work for the various components of each assignment.
- Make a direct connection, orally and in writing, between each class task and its associated learning objective.
- Distribute all important assignment handouts in the same format and structure.
- Establish and rationalize a routine for how class operates
- Post and review daily agendas for all class activities and assignments.
- Consider making available, in the classroom or learning support center, emerging assistive technologies such as text-to-speech screen readers, which are designed to assist students with difficulties decoding or attending to written text.
- Teach students to use some form of course planner or calendar that shows assignment due dates in a clear, graphical format.

Special Education

- At the beginning of a course, have a conversation about the value of understanding one's learning profile and/or let students take a learning style survey.
- Explicitly share with students your observations about their learning strengths and challenges as the course progresses.
- Build metacognitive reflection into assignments.
- Instead of relying on large unit tests or exams, build in more frequent forms of assessment.
- Use grade-keeping software and make updated grade reports accessible to students.
- Provide direct personalized feedback to students
- Provide (or assign) some form of study guide for students to review before any quiz or exam.
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- Make a direct connection, orally and in writing, between each class task and its associated learning objective.
- Distribute all important assignment handouts in the same format and structure.
- Establish and rationalize a routine for how class operates
- Post and review daily agendas for all class activities and assignments.
- Consider making available, in the classroom or learning support center, emerging assistive technologies such as text-to-speech screen readers, which are designed to assist students with difficulties decoding or attending to written text.
- Teach students to use some form of course planner or calendar that shows assignment due dates in a clear, graphical format.

Gifted and Talented

- Interdisciplinary and problem-based assignments with planned scope and sequence
- Advance, accelerated, or compacted content
- Abstract and advanced higher-level thinking
- Allowance for individual student interests
- Assignments geared to development in areas of affect, creativity, cognition, and research skills
- Complex, in-depth assignments
- Diverse enrichment that broadens learning
- Variety in types of resources
- Open-ended questions for higher-level thinking
- Higher-level text

Students at Risk of School Failure

- Small group instruction
- Frequent breaks
- Increased parent communication
- Daily log

Diversity and Inclusion:

- Involve families in student learning
- Respect cultural traditions
- Provided students with necessary academic resources and materials
- Allow for alternative assignments
- Provide visuals
- Assign peer tutor

- Collaborate with language professionals and ESL teachers
- Establish a positive connection with parent
- Utilize closed captioning when available
- Provide road maps or outlines for difficult concepts
- Provide sufficient wait time before calling on any student to help keep students who may need more time engaged
- Speak clearly and slowly, avoid slang and idiomatic expressions
- Create a nurturing environment with structured routines

Unit 1 Core Instructional and Supplemental Materials and Additional Resources

Instructional Materials

- Textbook
- Textbook resources
- Laboratory manuals and equipment
- Translation apps (Google etc)

Supplemental Materials

- School databases
- Multimedia Resources
- Printers and Computers
- Online Resources and videos
- Interactive Projector
- Rubrics
- POGIL
- Science Websites:
 - ACS Chemistry for Life
 - Periodic table
 - PBS Learning Media
 - Khan Academy
 - Bozeman Science
 - Science Magazine
 - US National Science Foundation
 - Newsela
 - Next Generation Science Standards
 - Chem Spider
 - Amoeba Sisters
 - HHMI
 - Gizmos
 - Edpuzzle

Intervention Materials

- Anchor activities: Anchor activities provide meaningful options for students when they are not actively engaged in classroom activities (e.g., when they finish early, are waiting for further directions, are stumped, first enter class, or when the teacher is working with other students). Anchors should be directly related to the current learning goals.

- Choices of review activities: Different review or extension activities are made available to students during a specific section of the class (such as at the beginning or end of the period).
- Homework options: Students are provided with choices about the assignments they complete as homework. Or, students are directed to specific homework based on student needs.
- Student-teacher goal setting: The teacher and student work together to develop individual learning goals for the student.
- Flexible grouping: Students might be instructed as a whole group, in small groups of various permutations (homogeneous or heterogeneous by skill or interest), in pairs or individuals. Any small groups or pairs change over time based on assessment data.
- Varied computer programs: The computer is used as an additional center in the classroom, and students are directed to specific websites or software that allows them to work on skills at their level.
- Varying scaffolding of same organizer: Provide graphic organizers that require students to complete various amounts of information. Some will be more filled out (by the teacher) than others.
- Think-Pair-Share by readiness, interest, and/or learning profile: Students are placed in pre-determined pairs, asked to think about a question for a specific amount of time, then are asked to share their answers first with their partner and then with the whole group.
- Games to practice mastery of information and skill: Use games as a way to review and reinforce concepts. Include questions and tasks that are on a variety of cognitive levels.
- Multiple levels of questions: Teachers vary the sorts of questions posed to different students based on their ability to handle them. Varying questions is an excellent way to build the confidence (and motivation) of students who are reluctant to contribute to class discourse. Note: Most teachers would probably admit that without even thinking about it they tend to address particular types of questions to particular students. In some cases, such tendencies may need to be corrected. (For example, a teacher may be unknowingly addressing all of the more challenging questions to one student, thereby inhibiting other students' learning and fostering class resentment of that student.)
- Stations/ Learning Centers: A station (or simply a collection of materials) that students might use independently to explore topics or practice skills. Centers allow individuals or groups of students to work at their own pace. Students are constantly reassessed to determine which centers are appropriate for students at a particular time, and to plan activities at those centers to build the most pressing skills.

Social and Emotional Learning New Jersey SEL

Competencies and Sub-Competencies Social and emotional learning (SEL) involves the process through which children and adults acquire and apply the knowledge, attitudes and skills necessary to understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions. The purpose of the SEL competencies is to provide schools with guidelines for integrating SEL across grades and subject areas.

Self-Awareness

- Recognize one's feelings and thoughts
- Recognize the impact of one's feelings and thoughts on one's own behavior
- Recognize one's personal traits, strengths and limitations
- Recognize the importance of self-confidence in handling daily tasks and challenges

Self-Management

- Understand and practice strategies for managing one's own emotions, thoughts and behaviors
- Recognize the skills needed to establish and achieve personal and educational goals
- Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals

Social Awareness

- Recognize and identify the thoughts, feelings and perspectives of others
- Demonstrate awareness of the differences among individuals, groups and others' cultural backgrounds
- Demonstrate an understanding of the need for mutual respect when viewpoints differ
- Demonstrate an awareness of the expectations for social interactions in a variety of settings

Responsible Decision-Making

- Develop, implement and model effective problem solving and critical thinking skills
- Identify the consequences associated with one's actions in order to make constructive choices
- Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills

- Establish and maintain healthy relationships
- Utilize positive communication and social skills to interact effectively with others
- Identify ways to resist inappropriate social pressure
- Demonstrate the ability to prevent and resolve interpersonal conflicts in constructive ways
- Identify who, when, where, or how to seek help for oneself or others when needed

Teacher Notes

Ocean Academy Charter High School Unit 2 Overview

Content Area: Science

Target Course/Grade Levels: 10-12

Unit 2: Ocean Life & Biodiversity

Duration: 10 days

Unit 2 Introduction:

Marine ecosystems are diverse, dynamic environments shaped by the interactions between living organisms and the physical conditions that surround them. In this unit, students will explore how factors such as sunlight, temperature, salinity, depth, water movement, nutrients, available resources, and seafloor characteristics influence the structure and productivity of marine ecosystems.

Students will investigate the characteristics of major marine environments, including the intertidal zone, estuaries, coral reefs, continental shelves and the neritic zone, the pelagic zone of the open ocean, and the deep ocean. Through comparisons of these environments, students will examine how differences in physical conditions and resource availability determine which organisms can survive, how organisms interact, and how communities develop within each habitat.

The unit will emphasize the adaptations and ecological relationships that allow marine organisms to thrive in diverse environments. Students will consider how organisms compete for resources, interact through food webs, occupy ecological niches, and respond to changes in their surroundings. They will also examine how marine ecosystems are connected and how energy, nutrients, and organisms move between different environments.

Because the ocean is a constantly changing system, students will explore how waves, tides, currents, and ocean circulation influence marine ecosystems. They will investigate how ocean processes transport heat and nutrients, shape habitats, affect biological activity, and contribute to weather and climate patterns both in the ocean and on land.

Throughout the unit, students will apply the Science and Engineering Practices to investigate marine ecosystems and demonstrate their understanding of core scientific ideas. Students will analyze data, interpret maps and models, conduct investigations, develop evidence-based explanations, and communicate their findings. By examining the ocean as an interconnected system, students will develop an appreciation for the diversity, complexity, and importance of marine ecosystems.

This unit is based on HS-LS2-5.

Standard 9.1 Personal Financial Literacy: This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.

Standard 9.2 Career Awareness, Exploration, Preparation and Training. This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.

Standard 9.4 Life Literacies and Key Skills. This standard outline key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy* that are critical for students to develop to live and work in an interconnected global economy.

Standard 8.1 Computer Science

Computer Science outlines a comprehensive set of concepts and skills, such as data and analysis, algorithms and programming, and computing systems.

Standard 8.2 Design Thinking

Technology, outlines the technological design concepts and skills essential for technological and engineering literacy. The framework design includes Engineering Design, Ethics and Culture, and the Effects of Technology on the Natural world among the disciplinary concepts

Amistad Law: N.J.S.A. 18A 52:16A-88 Every board of education shall incorporate the information regarding the contributions of African-Americans to our country in an appropriate place in the curriculum of elementary and secondary school students.

Holocaust Law: N.J.S.A. 18A:35-28 Every board of education shall include instruction on the Holocaust and genocide in an appropriate place in the curriculum of all elementary and secondary school pupils. The instruction shall further emphasize the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens.

LGBT and Disabilities Law: N.J.S.A. 18A:35-4.35 A board of education shall include instruction on the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, in an appropriate place in the curriculum of middle school and high school students as part of the district's implementation of the New Jersey Student Learning Standards (N.J.S.A.18A:35-4.36) A board of education shall have policies and procedures in place pertaining to the selection of instructional materials to implement the requirements of N.J.S.A. 18A:35-4.35.

Diversity and Inclusion

C.18A:35-4.36a Curriculum to include instruction on diversity and inclusion.

1. The instruction shall:
 - (1) highlight and promote diversity, including economic diversity, equity, inclusion, tolerance, and belonging in connection with gender and sexual orientation, race and ethnicity, disabilities, and religious tolerance;
 - (2) examine the impact that unconscious bias and economic disparities have at both an individual level and on society as a whole; and
 - (3) encourage safe, welcoming, and inclusive environments for all students regardless of race or ethnicity, sexual and gender identities, mental and physical disabilities, and religious beliefs.

Asian Americans and Pacific Islanders (AAPI)

Ensures that the contributions, history, and heritage of Asian Americans and Pacific Islanders (AAPI) are included in the New Jersey Student Learning Standards (NJSLs) for Social Studies in kindergarten through Grade 12 (P.L.2021, c.416).

21st Century Themes and Skills

“Twenty-first century themes and skills” means themes such as global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; learning and innovation skills,

including creativity and innovation, critical thinking and problem solving, and communication and collaboration; information, media, and technology skills; and life and career skills, including flexibility. Career readiness, life literacies, and key skills education provides students with the necessary skills to make informed career and financial decisions, engage as responsible community members in a digital society, and to successfully meet the challenges and opportunities in an interconnected global economy.”

Unit 2 Focus Standards

HS-LS2-5 Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. [Clarification Statement: Examples of models could include simulations and mathematical models.] [Assessment Boundary: Assessment does not include the specific chemical steps of photosynthesis and respiration.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<u>Developing and Using Models</u> Modeling in 9-12 builds on K-8 experiences and progresses to using, synthesizing, and developing models to predict and show how relationships among variables between systems and their components in the natural and designed worlds. Develop a model based on evidence to illustrate the relationships between systems or components of a system. (HS-LS2-5) <u>Using Mathematics and Computational Thinking</u> Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions,	<u>LS2.A: Interdependent Relationships in Ecosystems</u> Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS2-1), (HS-LS2-2)	<u>Cause and Effect</u> - Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS2-8) <u>Scale, Proportion, and Quantity</u> - The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. (HS-LS2-1) - Using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale. (HS-LS2-2) <u>Systems and System Models</u>

exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

- Use mathematical and/or computational representations of phenomena or design solutions to support explanations. (HS-LS2-1)
- Use mathematical representations of phenomena or design solutions to support and revise explanations. (HS-LS2-2)
- Use mathematical representations of phenomena or design solutions to support claims. (HS-LS2-4)

Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 9-12 builds on K-8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

- Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems

- Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS2-3)
- Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved. (HS-LS2-4)
- Photosynthesis and cellular respiration are important components of the carbon cycle, in

- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. (HS-LS2-5)

Energy and Matter

- Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS2-4)
- Energy drives the cycling of matter within and between systems. (HS-LS2-3)

Stability and Change

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-LS2-6), (HS-LS2-7)

investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS2-3) • Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-LS2-7) <u>Engaging in Argument from Evidence</u> Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science. • Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS2-6) • Evaluate the evidence behind currently accepted explanations	which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological processes. (HS-LS2-5) <u>LS2.C: Ecosystem Dynamics, Functioning, and Resilience</u> • A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-2),(HS-LS2-6) • Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can	
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to determine the merits of arguments. (HS-LS2-8) ----- Connections to Nature of Science Scientific Knowledge is Open to Revision in Light of New Evidence • Most scientific knowledge is quite durable, but is, in principle, subject to change based on new evidence and/or reinterpretation of existing evidence. (HS-LS2-2),(HS-LS2-3) • Scientific argumentation is a mode of logical discourse used to clarify the strength of relationships between ideas and evidence that may result in revision of an explanation. (HS-LS2-6),(HS-LS2-8)	disrupt an ecosystem and threaten the survival of some species. (HS-LS2-7) <u>LS2.D: Social Interactions and Group Behavior</u> • Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. (HS-LS2-8) <u>LS4.D: Biodiversity and Humans</u> • Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). <i>(secondary to HS-LS2-7)</i> • Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. <i>(secondary to HS-LS2-7)</i>	
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	<i>(Note: This Disciplinary Core Idea is also addressed by HS-LS4-6.)</i> PS3.D: Energy in Chemical Processes • The main way that solar energy is captured and stored on Earth is through the complex chemical process known as photosynthesis. <i>(secondary to HS-LS2-5)</i> <u>ETS1.B: Developing Possible Solutions</u> • When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts. <i>(secondary to HS-LS2-7)</i>	
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Unit 2 Supporting and Additional Standards/Interdisciplinary Connections

ELA/Literacy -

RI.CR.11-12.1. Accurately cite a range of thorough textual evidence and make relevant connections to strongly support a comprehensive analysis of multiple aspects of what an informational text says explicitly and inferentially, as well as interpretations of the text. *(HS-LS2-1), (HS-LS2-2), (HS-LS2-3), (HS-LS2-6), (HS-LS2-8)*

RI.MF.11-12.6. Synthesize complex information across multiple sources and formats to develop ideas, resolve conflicting information, or develop an interpretation that goes beyond explicit text information (e.g., express a personal point of view, new interpretation of the concept). *(HS-LS2-6), (HS-LS2-7), (HS-LS2-8)*

RI.CT.11-12.8. Analyze and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) documents of historical and scientific significance for their purposes, including primary source documents relevant to U.S. and/or global history and texts proposing scientific or technical advancements. *(HS-LS2-6), (HS-LS2-7), (HS-LS2-8)*

W.IW.11-12.2. Write informative/explanatory texts (including the narration of historical events,

scientific procedures/ experiments, or technical processes) to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

- A. Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- B. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- C. Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- D. Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.
- E. Establish and maintain a style and tone appropriate to the audience and purpose (e.g., formal and objective for academic writing) while attending to the norms and conventions of the discipline in which they are writing.
- F. Provide a concluding paragraph or section that supports the argument presented (e.g., articulating implications or the significance of the topic). *(HS-LS2-1), (HS-LS2-2), (HS-LS2-3)*

W.WP.11-12.4. Develop and strengthen writing as needed by planning, revising, editing, rewriting, trying a new approach; sustaining effort to complete complex writing tasks; tracking and reflecting on personal writing progress (e.g., using portfolios, journals, conferencing); or consulting a style manual (such as MLA or APA Style), focusing on addressing what is most significant for a specific purpose and audience. *(HS-LS2-3)*

W.WR.11-12.5. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. *(HS-LS2-7)*

Mathematics-

MP.2 Reason abstractly and quantitatively. *(HS-LS2-1), (HS-LS2-2), (HS-LS2-4), (HS-LS2-6), (HS-LS2-7)*

MP.4 Model with mathematics. *(HS-LS2-1), (HS-LS2-2), (HS-LS2-4)*

HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. *(HS-LS2-1), (HS-LS2-2), (HS-LS2-4), (HS-LS2-7)*

HSN.Q.A.2 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. *(HS-LS2-1), (HS-LS2-2), (HS-LS2-4), (HS-LS2-7)*

HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. *(HS-LS2-1), (HS-LS2-2), (HS-LS2-4), (HS-LS2-7)*

HSS-ID.A.1 Represent data with plots on the real number line. *(HS-LS2-6)*

HSS-IC.A.1 Understand statistics as a process for making inferences about population parameters

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based on a random sample from that population. (HS-LS2-6)

HSS-IC.B6 Evaluate reports based on data. (HS-LS2-6)

Unit 2 New Jersey Student Learning Standards Connections:

Disciplinary Concepts

Career Awareness and Planning, Creativity & Innovation, Critical Thinking & Problem Solving, Digital Citizenship, Global & Cultural Awareness and Technology Literacy

Core Ideas

Performance Expectations

(Identified with Standard Number and Statement)

There are strategies to improve one's professional value and marketability

- 9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.

With a growth mindset, failure is an important part of success.

- 9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12 prof.CR3a).

Innovative ideas or innovation can lead to career opportunities.

- 9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12 prof.CR2b, 2.2.12.LF.8).

Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.

- 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
- 9.4.12.CT.3: Enlist input from a variety of stakeholders (e.g., community members, experts in the field) to design a service learning activity that addresses a local or global issue (e.g., environmental justice).

Network connectivity and computing capability extended to objects, sensors and everyday items not normally considered computers allows these devices to generate, exchange, and consume data with minimal human intervention. Technologies such as Artificial Intelligence (AI) and blockchain can help minimize the effect of climate change.

- 9.4.12.DC.8: Explain how increased network connectivity and computing capabilities of everyday objects allow for innovative technological approaches to climate protection.

Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.

- 9.4.12.GCA.1: Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political.

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	economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).
Digital tools differ in features, capacities, and styles. Knowledge of different digital tools is helpful in selecting the best tool for a given task.	9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.). 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.
Collaborative digital tools can be used to access, record and share different viewpoints and to collect and tabulate the views of groups of people	9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments. 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).
Unit 2 New Jersey Student Learning Standards:	
Disciplinary Concepts Interaction of Technology and Humans , Nature of Technology, Effects of Technology on the Natural World and Ethics & Culture	
Core Ideas	
Decisions to develop new technology are driven by societal and cultural opinions and demands that differ from culture to culture	8.2.12.ITH.1: Analyze a product to determine the impact that economic, political, social, and/or cultural factors have had on its design, including its design constraints.
Changes caused by the introduction and use of a new technology can range from gradual to rapid and from subtle to obvious, and can change over time. These changes may vary from society to society as a result of differences in a society's economy, politics, and culture.	8.2.12.ITH.2: Propose an innovation to meet future demands supported by an analysis of the potential costs, benefits, trade-offs, and risks related to the use of the innovation. 8.2.12.ITH.3: Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture.

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Engineers use science, mathematics, and other disciplines to improve technology. Increased collaboration among engineers, scientists, and mathematicians can improve their work and designs. Technology, product, or system redesign can be more difficult than the original design.	8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product. 8.2.12.NT.2: Redesign an existing product to improve form or function.
Development and modification of any technological system needs to take into account how the operation of the system will affect natural resources and ecosystems. Impacts of technological systems on the environment need to be monitored and must inform decision-making. Many technologies have been designed to have a positive impact on the environment and to monitor environmental change over time.	8.2.12.ETW.1: Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation, and maintenance of a chosen product. 8.2.12.ETW.2: Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment. 8.2.12.ETW.3: Identify a complex, global environmental or climate change issue, develop a systemic plan of investigation, and propose an innovative sustainable solution.

New Jersey Student Learning Standards: [Climate Change Mandate](#)

Core Ideas	Performance Expectations (Identified with Standard Number and Statement)
The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate.	HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.

Unit 2 Evidence of Student Learning

Performance Tasks/Use of Technology:	Other Assessments
Bycatch Reduction Design Challenge: Develop and evaluate fishing-net modifications or protocols designed to reduce unintended marine bycatch while maintaining effective harvesting practices. Oil Spill Response Investigation: Model an oil spill and test different cleanup methods to determine which techniques	- Observation - Homework - Class participation - Graphic Organizers - Projects - Student Response Systems - Do-Now/Exit Cards - Laboratories/Lab Reports - Maintaining a Notebook

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are most effective while considering their environmental impacts. ● Albatross Diet Investigation: Conduct a bolus dissection to identify ingested materials and analyze how human debris and marine pollution can affect seabirds and ocean ecosystems.	● Writing Assignments ● Graphs, Models, and Tables Summative ● Chapter/Unit Test ● Writing Assignments ● Presentations ● Laboratory Reports/Practical ● Unit Projects Benchmark ● Common Assessments ● Final Exams ● Performance Assessment ● Link-it assessment Alternative ● Quizz ● Blooket ● Kahoot ● CER (claim, evidence, reasoning)
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Unit 2 Knowledge and Skills

Enduring Understandings:	Learning Targets:
<i>Students will know...</i> ● Marine environments are diverse and highly variable. Differences in depth, temperature, salinity, light availability, water movement, nutrients, and physical features create distinct habitats with unique communities of organisms. ● The distribution and survival of marine organisms are influenced by environmental conditions. Organisms possess adaptations that allow them to obtain resources, reproduce, and survive within the specific conditions of their habitat. ● Marine organisms are interconnected through complex ecological relationships. Competition, predation, cooperation, and food-web interactions connect species and contribute to the structure and stability of marine ecosystems.	<i>Students will be able to..</i> ● Identify and compare the physical and biological characteristics of major marine ecosystems. ● Explain how environmental factors influence the distribution and abundance of marine organisms. ● Analyze how marine organisms interact and depend on one another within interconnected food webs and ecosystems. ● Explain how waves, tides, currents, and ocean circulation drive movement within the ocean. ● Describe how ocean processes influence marine ecosystems, weather, climate, and terrestrial environments. ● Evaluate the effects of human activities on marine ecosystems and explore strategies for protecting ocean biodiversity and resources.

- The ocean is a dynamic and interconnected system. Waves, tides, currents, and other forms of ocean circulation continually move water and energy, influencing conditions throughout marine environments.
- Ocean processes affect life both in and beyond the ocean. The movement of ocean water transports heat, nutrients, and organisms and plays an important role in biological productivity, weather, and climate patterns.
- Marine and terrestrial systems are closely connected. Changes in ocean conditions can influence coastal environments, atmospheric processes, weather, climate, and ecosystems on land.
- Biodiversity contributes to the health and resilience of marine ecosystems. The variety of organisms and their ecological roles helps marine communities respond to environmental changes and maintain ecosystem functions.
- Understanding marine ecosystems requires examining their physical and biological components together. Scientists use observations, data, models, and evidence to investigate how changes in one part of an ecosystem can affect organisms and processes throughout the system.

Essential Questions:

- How do the physical characteristics of marine ecosystems influence the organisms that live there?
- What makes each marine ecosystem unique, and how do organisms adapt to different marine environments?
- How are marine organisms interconnected through food webs and ecological relationships?
- How do energy, nutrients, and organisms move through and between marine ecosystems?
- What causes waves, tides, currents, and other forms of ocean circulation?
- How does the movement of ocean water influence marine ecosystems and the organisms within them?
- How does the ocean influence weather, climate, and ecosystems on land?
- How are marine and terrestrial environments interconnected?
- How do human activities alter marine ecosystems and ocean biodiversity?
- What can scientists and communities do to protect and sustainably manage marine ecosystems and resources?

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Unit 2 Instructional Plan	
Suggested Activities	Resources
• Complete hands-on laboratory investigations and classroom activities related to marine ecosystems. • Create and interpret maps to examine the location and distribution of marine environments. • Develop three-dimensional shoebox models to represent ocean and coastal topography. • Construct models of different marine ecosystems, incorporating representative organisms and environmental features. • Conduct the “Wetland in a Pan” investigation, adapted from <i>Wonders of Wetlands</i>, to explore wetland functions and processes. • Participate in the Catskill Center program to extend learning through an environmental education experience. • Design and create a deep-sea creature based on the unique environmental conditions and adaptations of the deep ocean. • Use technology and digital resources to investigate, model, and communicate marine science concepts. • Use PowerPoint or other digital presentation tools to present research, project findings, and scientific explanations. • Complete individual and collaborative projects and laboratory investigations that apply unit concepts. • Food Webs and Energy Transfer Activity: Analyze food chains and food webs to trace the flow of energy through an ecosystem. • Sponge Lab: Conduct a hands-on investigation modeling how sponges interact with and filter their surrounding environment. • Algal Bloom Ecosystem Investigation: Examine the causes and effects of algal blooms and evaluate their impact on aquatic ecosystems.	• Gizmos • Textbook ○ Untamed Science video clips ○ Chapter mysteries ○ Section worksheets • Lab materials

- Use digital tools, multimedia, and interactive resources to investigate, model, and communicate ecological concepts.

Unit 2 Suggested Options for Differentiation: Content-specific Accommodations and Modifications for Subgroups

Multilingual Learners

- Speak slowly, distinctly, and write down key terms
- Closed Captioning
- Emphasize visual literacy
- Graphic Organizers
- Use charts, graphs and figures
- Group projects & cooperative learning
- Partner English learners with strong English speakers
- Consistent routines
- Outlines
- Language-based science games
- Picture glossary
- Root words

Students with 504 Plans

- At the beginning of a course, have a conversation about the value of understanding one's learning profile and/or let students take a learning style survey.
- Explicitly share with students your observations about their learning strengths and challenges as the course progresses.
- Build metacognitive reflection into assignments.
- Instead of relying on large unit tests or exams, build in more frequent forms of assessment.
- Use grade-keeping software and make updated grade reports accessible to students.
- Provide direct personalized feedback to students
- Provide (or assign) some form of study guide for students to review before any quiz or exam.
- Provide scoring rubrics that describe the qualities of excellent work for the various components of each assignment.
- Make a direct connection, orally and in writing, between each class task and its associated learning objective.
- Distribute all important assignment handouts in the same format and structure.
- Establish and rationalize a routine for how class operates
- Post and review daily agendas for all class activities and assignments.
- Consider making available, in the classroom or learning support center, emerging assistive technologies such as text-to-speech screen readers, which are designed to assist students with difficulties decoding or attending to written text.
- Teach students to use some form of course planner or calendar that shows assignment due dates in a clear, graphical format.

Special Education

- At the beginning of a course, have a conversation about the value of understanding one's learning profile and/or let students take a learning style survey.

- Explicitly share with students your observations about their learning strengths and challenges as the course progresses.
- Build metacognitive reflection into assignments.
- Instead of relying on large unit tests or exams, build in more frequent forms of assessment.
- Use grade-keeping software and make updated grade reports accessible to students.
- Provide direct personalized feedback to students
- Provide (or assign) some form of study guide for students to review before any quiz or exam.
- Provide scoring rubrics that describe the qualities of excellent work for the various components of each assignment.
- Make a direct connection, orally and in writing, between each class task and its associated learning objective.
- Distribute all important assignment handouts in the same format and structure.
- Establish and rationalize a routine for how class operates
- Post and review daily agendas for all class activities and assignments.
- Consider making available, in the classroom or learning support center, emerging assistive technologies such as text-to-speech screen readers, which are designed to assist students with difficulties decoding or attending to written text.
- Teach students to use some form of course planner or calendar that shows assignment due dates in a clear, graphical format.

Gifted and Talented

- Interdisciplinary and problem-based assignments with planned scope and sequence
- Advance, accelerated, or compacted content
- Abstract and advanced higher-level thinking
- Allowance for individual student interests
- Assignments geared to development in areas of affect, creativity, cognition, and research skills
- Complex, in-depth assignments
- Diverse enrichment that broadens learning
- Variety in types of resources
- Open-ended questions for higher-level thinking
- Higher-level text

Students at Risk of School Failure

- Small group instruction
- Frequent breaks
- Increased parent communication
- Daily log

Diversity and Inclusion:

- Involve families in student learning
- Respect cultural traditions
- Provide students with necessary academic resources and materials
- Allow for alternative assignments
- Provide visuals
- Assign peer tutor
- Collaborate with language professionals and ESL teachers
- Establish a positive connection with parent
- Utilize closed captioning when available

- Provide road maps or outlines for difficult concepts
- Provide sufficient wait time before calling on any student to help keep students who may need more time engaged
- Speak clearly and slowly, avoid slang and idiomatic expressions
- Create a nurturing environment with structured routines

Unit 2 Core Instructional and Supplemental Materials and Additional Resources

Instructional Materials

- Textbook
- Textbook resources
- Laboratory manuals and equipment
- Translation apps (Google etc)

Supplemental Materials

- School databases
- Multimedia Resources
- Printers and Computers
- Online Resources and videos
- Interactive Projector
- Rubrics
- POGIL
- Science Websites:
 - ACS Chemistry for Life
 - Periodic table
 - PBS Learning Media
 - Khan Academy
 - Bozeman Science
 - Science Magazine
 - US National Science Foundation
 - Newsela
 - Next Generation Science Standards
 - Chem Spider
 - Amoeba Sisters
 - HHMI
 - Gizmos
 - Edpuzzle

Intervention Materials

- Anchor activities: Anchor activities provide meaningful options for students when they are not actively engaged in classroom activities (e.g., when they finish early, are waiting for further directions, are stumped, first enter class, or when the teacher is working with other students). Anchors should be directly related to the current learning goals.

- Choices of review activities: Different review or extension activities are made available to students during a specific section of the class (such as at the beginning or end of the period).
- Homework options: Students are provided with choices about the assignments they complete as homework. Or, students are directed to specific homework based on student needs.
- Student-teacher goal setting: The teacher and student work together to develop individual learning goals for the student.
- Flexible grouping: Students might be instructed as a whole group, in small groups of various permutations (homogeneous or heterogeneous by skill or interest), in pairs or individuals. Any small groups or pairs change over time based on assessment data.
- Varied computer programs: The computer is used as an additional center in the classroom, and students are directed to specific websites or software that allows them to work on skills at their level.
- Varying scaffolding of same organizer: Provide graphic organizers that require students to complete various amounts of information. Some will be more filled out (by the teacher) than others.
- Think-Pair-Share by readiness, interest, and/or learning profile: Students are placed in pre-determined pairs, asked to think about a question for a specific amount of time, then are asked to share their answers first with their partner and then with the whole group.
- Games to practice mastery of information and skill: Use games as a way to review and reinforce concepts. Include questions and tasks that are on a variety of cognitive levels.
- Multiple levels of questions: Teachers vary the sorts of questions posed to different students based on their ability to handle them. Varying questions is an excellent way to build the confidence (and motivation) of students who are reluctant to contribute to class discourse. Note: Most teachers would probably admit that without even thinking about it they tend to address particular types of questions to particular students. In some cases, such tendencies may need to be corrected. (For example, a teacher may be unknowingly addressing all of the more challenging questions to one student, thereby inhibiting other students' learning and fostering class resentment of that student.)
- Stations/ Learning Centers: A station (or simply a collection of materials) that students might use independently to explore topics or practice skills. Centers allow individuals or groups of students to work at their own pace. Students are constantly reassessed to determine which centers are appropriate for students at a particular time, and to plan activities at those centers to build the most pressing skills.

Social and Emotional Learning New Jersey SEL

Competencies and Sub-Competencies Social and emotional learning (SEL) involves the process through which children and adults acquire and apply the knowledge, attitudes and skills necessary to understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions. The purpose of the SEL competencies is to provide schools with guidelines for integrating SEL across grades and subject areas.

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Self-Awareness

- Recognize one's feelings and thoughts
- Recognize the impact of one's feelings and thoughts on one's own behavior
- Recognize one's personal traits, strengths and limitations
- Recognize the importance of self-confidence in handling daily tasks and challenges

Self-Management

- Understand and practice strategies for managing one's own emotions, thoughts and behaviors
- Recognize the skills needed to establish and achieve personal and educational goals
- Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals

Social Awareness

- Recognize and identify the thoughts, feelings and perspectives of others
- Demonstrate awareness of the differences among individuals, groups and others' cultural backgrounds
- Demonstrate an understanding of the need for mutual respect when viewpoints differ
- Demonstrate an awareness of the expectations for social interactions in a variety of settings

Responsible Decision-Making

- Develop, implement and model effective problem solving and critical thinking skills
- Identify the consequences associated with one's actions in order to make constructive choices
- Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills

- Establish and maintain healthy relationships
- Utilize positive communication and social skills to interact effectively with others
- Identify ways to resist inappropriate social pressure
- Demonstrate the ability to prevent and resolve interpersonal conflicts in constructive ways
- Identify who, when, where, or how to seek help for oneself or others when needed

Teacher Notes

Ocean Academy Charter High School
Unit 3 Overview

Content Area: Science

Target Course/Grade Levels: 10th -12th

Unit 3: Ocean Life & Adaptations

Duration: 15 days

Unit 3 Introduction:

The ocean is home to an incredible diversity of organisms, from microscopic plankton and algae to complex invertebrates, fish, marine reptiles, birds, and mammals. In this unit, students will explore the remarkable variety of life found in marine environments and develop an understanding of how these organisms are structured, how they function, and how they interact with one another and their surroundings.

Students will begin by building a foundation in essential biological concepts that are necessary for understanding marine life. Topics will include the chemical basis of life, cell structure and function, energy transfer within biological systems, evolution, and biological classification. These concepts will provide students with the background needed to investigate how marine organisms have adapted to survive in diverse ocean environments.

As students progress through the unit, they will examine the major groups of marine organisms and investigate their unique characteristics, adaptations, ecological roles, and evolutionary relationships. Organisms will be studied in the context of their feeding relationships, beginning with primary producers that capture energy and create organic matter and progressing through consumers and other organisms that depend on marine food resources. Students will explore how energy moves through food chains and food webs and how each group contributes to the stability and productivity of marine ecosystems.

The unit will include the study of marine invertebrates and vertebrates, highlighting the adaptations that allow organisms to survive in environments ranging from coastal waters and coral reefs to the open ocean and deep sea. Students will consider how organisms obtain food, reproduce, defend themselves, respond to environmental conditions, and interact with other species. Through these investigations, students will develop an appreciation for the interconnectedness of marine life and the important role each organism plays within the larger ocean ecosystem.

Throughout the unit, students will apply science and engineering practices to investigate questions, analyze and interpret data, develop and use models, construct explanations, and communicate scientific information. Hands-on investigations, laboratory activities, technology-based explorations, and analysis of real-world marine science examples will allow students to connect biological concepts to authentic ocean-related phenomena.

By the end of the unit, students will understand that marine ecosystems are complex, interconnected systems in which organisms depend on one another and their environment. They will be able to explain how the structure, function, adaptations, and ecological roles of marine organisms contribute to the overall diversity and health of the ocean.

This unit is based on HS-LS4-2 and HS-LS4-5.

Standard 9.1 Personal Financial Literacy: This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.

Standard 9.2 Career Awareness, Exploration, Preparation and Training. This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.

Standard 9.4 Life Literacies and Key Skills. This standard outline key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy* that are critical for students to develop to live and work in an interconnected global economy.

Standard 8.1 Computer Science

Computer Science outlines a comprehensive set of concepts and skills, such as data and analysis, algorithms and programming, and computing systems.

Standard 8.2 Design Thinking

Technology, outlines the technological design concepts and skills essential for technological and engineering literacy. The framework design includes Engineering Design, Ethics and Culture, and the Effects of Technology on the Natural world among the disciplinary concepts

Amistad Law: N.J.S.A. 18A 52:16A-88 Every board of education shall incorporate the information regarding the contributions of African-Americans to our country in an appropriate place in the curriculum of elementary and secondary school students.

Holocaust Law: N.J.S.A.

18A:35-28 Every board of education shall include instruction on the Holocaust and genocide in an appropriate place in the curriculum of all elementary and secondary school pupils. The instruction shall further emphasize the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens.

LGBT and Disabilities Law:

N.J.S.A. 18A:35-4.35 A board of education shall include instruction on the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, in an appropriate place in the curriculum of middle school and high school students as part of the district's implementation of the New Jersey Student Learning Standards (N.J.S.A.18A:35-4.36) A board of education shall have policies and procedures in place pertaining to the selection of instructional materials to implement the requirements of N.J.S.A. 18A:35-4.35.

Diversity and Inclusion

C.18A:35-4.36a Curriculum to include instruction on diversity and inclusion.

1. The instruction shall:
 - (1) highlight and promote diversity, including economic diversity, equity, inclusion, tolerance, and belonging in connection with gender and sexual orientation, race and ethnicity, disabilities, and religious tolerance;
 - (2) examine the impact that unconscious bias and economic disparities have at both an individual level and on society as a whole; and
 - (3) encourage safe, welcoming, and inclusive environments for all students regardless of race or ethnicity, sexual and gender identities, mental and physical disabilities, and religious beliefs.

Asian Americans and Pacific Islanders (AAPI)

Ensures that the contributions, history, and heritage of Asian Americans and Pacific Islanders (AAPI) are included in the New Jersey Student Learning Standards (NJSLS) for Social Studies in kindergarten through Grade 12 (P.L.2021, c.416).

21st Century Themes and Skills

“Twenty-first century themes and skills” means themes such as global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; learning and innovation skills, including creativity and innovation, critical thinking and problem solving, and communication and collaboration; information, media, and technology skills; and life and career skills, including flexibility. Career readiness, life literacies, and key skills education provides students with the necessary skills to make informed career and financial decisions, engage as responsible community members in a digital society, and to successfully meet the challenges and opportunities in an interconnected global economy.”

Unit 3 Focus Standards

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. [Clarification Statement: Emphasis is on using evidence to explain the influence each of the four factors has on the number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.] [Assessment Boundary: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.]

HS-LS4-4 Construct an explanation based on evidence for how natural selection leads to adaptation of populations. [Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading 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. [Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.]

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
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<u>Analyzing and Interpreting Data</u> Analyzing data in 9-12 builds on K-8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data. • Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible. (HS-LS4-3) <u>Using Mathematics and Computational Thinking</u> Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions. • Create or revise a simulation of a	<u>LS4.A: Evidence of Common Ancestry and Diversity</u> • Genetic information, like the fossil record, provides evidence of evolution. DNA sequences vary among species, but there are many overlaps; in fact, the ongoing branching that produces multiple lines of descent can be inferred by comparing the DNA sequences of different organisms. Such information is also derivable from the similarities and differences in amino acid sequences and from anatomical and embryological evidence. (HS-LS4-1) <u>LS4.B: Natural Selection</u> • Natural selection occurs only if there is both (1) variation in the genetic information between organisms in a population and (2) variation in the expression of that genetic information—that is, trait variation—that leads to differences in performance among individuals. (HS-LS4-2), (HS-LS4-3) • The traits that positively affect survival are more likely to be reproduced, and thus	<u>Patterns</u> • Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-LS4-1), (HS-LS4-3) <u>Cause and Effect</u> • Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS4-2), (HS-LS4-4), (HS-LS4-5), (HS-LS4-6) ----- <i>Connections to Nature of Science</i> Scientific Knowledge Assumes an Order and Consistency in Natural Systems • Scientific knowledge is based on the assumption that natural laws operate today as they did in the past and they will continue to do so in the future. (HS-LS4-1), (HS-LS4-4)
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phenomenon, designed device, process, or system. (HS-LS4-6) <u>Constructing Explanations and Designing Solutions</u> Constructing explanations and designing solutions in 9-12 builds on K-8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories. Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-LS4-2),(HS-LS4-4) <u>Engaging in Argument from Evidence</u> Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural	are more common in the population. (HS-LS4-3) <u>LS4.C: Adaptation</u> - Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment. (HS-LS4-2) - Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait and	
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and designed world(s). Arguments may also come from current or historical episodes in science. - Evaluate the evidence behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS4-5) <u>Obtaining, Evaluating, and Communicating Information</u> Obtaining, evaluating, and communicating information in 9-12 builds on K-8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs. - Communicate scientific information (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-LS4-1) ----- <i>Connections to Nature of Science</i> Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena	to a decrease in the proportion of individuals that do not. (HS-LS4-3),(HS-LS4-4) - Adaptation also means that the distribution of traits in a population can change when conditions change. (HS-LS4-3) - Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline-and sometimes the extinction-of some species. (HS-LS4-5),(HS-LS4-6) - Species become extinct because they can no longer survive and reproduce in their altered environment. If members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost. (HS-LS4-5) LS4.D: Biodiversity and Humans - Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on	
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- A scientific theory is a substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment and the science community validates each theory before it is accepted. If new evidence is discovered that the theory does not accommodate, the theory is generally modified in light of this new evidence.
(HS-LS4-1)

biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.
(HS-LS4-6) *(Note: This Disciplinary Core Idea is also addressed by HS-LS2-7.)*

ETS1.B: Developing Possible Solutions

- When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts.
(secondary to HS-LS4-6)
- Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to

	test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. (secondary to HS-LS4-6)	
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Unit 3 Supporting and Additional Standards/Interdisciplinary Connections

ELA/Literacy -

RI.CR.11-12.1. Accurately cite a range of thorough textual evidence and make relevant connections to strongly support a comprehensive analysis of multiple aspects of what an informational text says explicitly and inferentially, as well as interpretations of the text. (HS-LS4-1), (HS-LS4-2), (HS-LS4-3), (HS-LS4-4)

RI.CT.11-12.8. Analyze and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) documents of historical and scientific significance for their purposes, including primary source documents relevant to U.S. and/or global history and texts proposing scientific or technical advancements. (HS-LS4-5)

W.IW.11-12.2. Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

- A. Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- B. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- C. Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- D. Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic.
- E. Establish and maintain a style and tone appropriate to the audience and purpose (e.g., formal and objective for academic writing) while attending to the norms and conventions of the discipline in which they are writing.
- F. Provide a concluding paragraph or section that supports the argument presented (e.g., articulating implications or the significance of the topic).
(HS-LS4-1), (HS-LS4-2), (HS-LS4-3), (HS-LS4-4)

W.WP.11-12.4. Develop and strengthen writing as needed by planning, revising, editing, rewriting, trying a new approach; sustaining effort to complete complex writing tasks; tracking and reflecting on personal writing progress (e.g., using portfolios, journals, conferencing); or consulting a style manual (such as MLA or APA Style), focusing on addressing what is most significant for a specific purpose and audience. (HS-LS4-6)

W.WR.11-12.5. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation (HS-LS4-6)

SL.PI.11-12.4 Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. (HS-LS4-1), (HS-LS4-2)

Mathematics-

MP.2 Reason abstractly and quantitatively. (HS-LS4-1), (HS-LS4-2), (HS-LS4-3), (HS-LS4-4), (HS-LS4-5)

MP.4 Model with mathematics. (HS-LS4-2)

Unit 3 New Jersey Student Learning Standards Connections:

Disciplinary Concepts

Career Awareness and Planning, Creativity & Innovation, Critical Thinking & Problem Solving, Digital Citizenship, Global & Cultural Awareness and Technology Literacy

Core Ideas	Performance Expectations (Identified with Standard Number and Statement)
<i>There are strategies to improve one's professional value and marketability</i>	9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.
With a growth mindset, failure is an important part of success.	9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12 prof.CR3a).
Innovative ideas or innovation can lead to career opportunities.	9.4.12.CI.2: Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12 prof.CR2b, 2.2.12.LF.8).
Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.	9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a). 9.4.12.CT.3: Enlist input from a variety of stakeholders (e.g., community members, experts in the field) to design a service

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	learning activity that addresses a local or global issue (e.g., environmental justice).
Network connectivity and computing capability extended to objects, sensors and everyday items not normally considered computers allows these devices to generate, exchange, and consume data with minimal human intervention. Technologies such as Artificial Intelligence (AI) and blockchain can help minimize the effect of climate change.	9.4.12.DC.8: Explain how increased network connectivity and computing capabilities of everyday objects allow for innovative technological approaches to climate protection.
Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.	9.4.12.GCA.1: Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political, economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).
Digital tools differ in features, capacities, and styles. Knowledge of different digital tools is helpful in selecting the best tool for a given task.	9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.). 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.
Collaborative digital tools can be used to access, record and share different viewpoints and to collect and tabulate the views of groups of people	9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments. 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).
Unit 3 New Jersey Student Learning Standards:	
Disciplinary Concepts Computing Systems (8.1), Impacts of Computing (8.1), Data Analysis (8.1), 8.2 Addressed in 9.4 Standards	
Core Ideas	

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The design and use of computing technologies and artifacts can positively or negatively affect equitable access to information and opportunities.	8.1.12.CS.2: Model interactions between application software, system software, and hardware.
Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices.	8.1.12.IC.1: Evaluate the ways computing impacts personal, ethical, social, economic, and cultural practices
The accuracy of predictions or inferences made from a computer model is affected by the amount, quality, and diversity of data.	8.1.12.DA.6: Create and refine computational models to better represent the relationships among different elements of data collected from a phenomenon or process.

Unit 3 Evidence of Student Learning

Suggested activities: - Work on projects and/or labs - Participate in various hands-on classroom activities - Create PowerPoint/Google Slides presentations - Integrate technology into investigations and projects - Analyze maps, charts, graphs, and marine science data - Conduct marine organism observation and identification activities - Complete marine organism classification activities - Create 3-D models of marine cells and organisms - Investigate marine organism adaptations and survival strategies - Construct marine food chains and food webs - Participate in marine food-web and energy-flow simulations - Create energy pyramids representing marine ecosystems - Conduct photosynthesis investigations using aquatic plants - Investigate osmosis and salinity using models or laboratory materials - Conduct ocean chemistry investigations involving pH, salinity, temperature, and other abiotic factors - Complete squid, fish, clam, or other	Other Assessments - Observation - Homework - Class participation - Graphic Organizers - Projects - Student Response Systems - Do-Now/Exit Cards - Laboratories/Lab Reports - Maintaining a Notebook - Writing Assignments - Graphs, Models, and Tables Summative - Chapter/Unit Test - Writing Assignments - Presentations - Laboratory Reports/Practical - Unit Projects Benchmark - Common Assessments - Final Exams - Performance Assessment - Link-it assessment Alternative - Quizz - Blooket - Kahoot - CER (claim, evidence, reasoning)
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appropriate specimen dissections • Examine shells and other structures to investigate adaptations • Design and create an imaginary marine organism adapted to a specific environment • Create a deep-sea creature based on actual deep-sea environmental conditions • Create models of marine ecosystems • Create a coral reef ecosystem model • Create a tide pool or wetland ecosystem model • Construct marine phylogenetic trees and cladograms • Create a marine life evolutionary timeline • Participate in natural selection and survival simulations • Conduct camouflage and predation investigations • Investigate blubber and insulation using a hands-on model • Conduct a hydrodynamic design challenge • Explore marine adaptations through biomimicry • Investigate marine mammals, reptiles, birds, fish, and invertebrates through research stations • Complete marine organism research projects • Develop “A Day in the Life of a Marine Organism” projects • Conduct an oil spill cleanup simulation and engineering challenge • Investigate the effects of ocean acidification on marine organisms • Conduct a marine plastic pollution investigation • Participate in an overfishing simulation • Research marine conservation issues and threatened species • Create marine conservation posters, infographics, public service announcements, or campaigns • Analyze real-world marine science	
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case studies • Use videos, virtual field trips, and interactive digital marine science resources • Analyze authentic marine science data and draw evidence-based conclusions • Present research findings to classmates • Work collaboratively on marine science projects and problem-solving activities • Maintain a marine science journal or field notebook • Complete virtual or local field investigations of aquatic environments • Develop and use models to explain marine ecosystems and organism interactions • Construct scientific explanations using evidence from laboratory investigations • Communicate scientific information through written, visual, and oral presentations	
Unit 3 Essential Questions	
• How do different marine environments and life zones vary from the coast to the deepest parts of the ocean? • How do the physical and chemical characteristics of the ocean influence where marine organisms can live? • What geological features and landforms make up the ocean floor, and how have they formed and changed over time? • How are marine organisms adapted to survive and reproduce in different ocean environments? • How do the structures and functions of marine organisms help them obtain food, avoid predators, reproduce, and respond to changing environmental conditions? • How do marine organisms interact with one another through feeding relationships, competition, predation, and symbiosis? • How does energy move through marine food chains and food webs, and why are primary producers essential to marine ecosystems? • How are marine organisms classified, and what can their characteristics reveal about their evolutionary relationships? • How do marine ecosystems depend on the interactions between living organisms and nonliving environmental factors? • How do human activities affect marine ecosystems, biodiversity, and the availability of marine resources?	

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- How do humans depend on the ocean for food, energy, transportation, recreation, medicine, and other resources?
- How can scientific knowledge and responsible management help protect marine ecosystems and ensure that ocean resources remain available for future generations?

Unit 3 Knowledge and Skills

Enduring Understandings	Learning Targets
<i>Students will know...</i> • Marine environments are diverse and interconnected, with organisms interacting with one another and with the physical and chemical conditions of their surroundings. • The distribution and abundance of marine organisms are influenced by factors such as depth, temperature, salinity, light availability, water movement, habitat structure, and access to resources. • The ocean is a dynamic system in constant motion, and ocean currents, tides, waves, and circulation influence climate, weather, nutrient distribution, and biological activity both within the ocean and on land. • Marine organisms possess specialized structures, behaviors, and adaptations that enable them to survive and thrive in a wide range of marine environments. • The ocean provides valuable resources and ecosystem services that support human communities, economies, and global environmental systems. • Human activities can significantly alter marine ecosystems, affecting biodiversity, habitats, populations, and the availability of marine resources. • Understanding the relationships among marine organisms, environmental conditions, and human activities is essential for making informed decisions about ocean conservation and sustainable resource use.	<i>Students will be able to..</i> • Explain how human activities affect ocean ecosystems, marine organisms, habitats, biodiversity, and the availability of marine resources. • Describe the characteristics of major marine ecosystems and life zones, including the organisms, environmental conditions, and resources associated with each. • Analyze how marine plants, animals, microorganisms, and other organisms are interconnected through food webs, energy flow, competition, predation, and other ecological relationships. • Explain how ocean currents, tides, waves, and other forms of ocean movement are generated and how they influence marine ecosystems, climate, weather patterns, and terrestrial environments. • Identify and compare the physical and chemical factors that influence marine environments, including temperature, salinity, depth, light availability, pressure, nutrients, and water movement. • Describe the characteristics, adaptations, and ecological roles of marine flora and fauna and explain how these adaptations enable organisms to survive in different marine environments. • Analyze how changes to one organism, population, or environmental factor can affect other organisms and the overall health and stability of a marine ecosystem. • Explain how humans depend on marine ecosystems for food, transportation, recreation, energy, medicine, and other resources, and evaluate the importance of responsible and sustainable use of ocean resources. • Use observations, data, models, and scientific evidence to investigate marine ecosystems and

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	explain relationships among organisms, environmental conditions, and human impacts.
Unit 3 Instructional Plan	
Suggested Activities	Resources
• Work on individual and group marine science projects and laboratory investigations. • Create marine ecosystem models representing environments such as coral reefs, estuaries, wetlands, rocky shores, the open ocean, and the deep sea. • Research and compare the physical, chemical, biological, and ecological characteristics of different marine ecosystems. • Complete marine organism identification and classification activities using photographs, specimens, dichotomous keys, field guides, and online resources. • Create food chains, food webs, and energy pyramids to demonstrate the relationships among producers, consumers, and decomposers in marine ecosystems. • Conduct a marine food web simulation in which students examine how changes to one species or population can affect other organisms within the ecosystem. • Investigate marine organism adaptations through hands-on activities involving camouflage, feeding structures, movement, temperature regulation, buoyancy, and protection from predators. • Design and build a model of a marine organism that demonstrates adaptations necessary for survival in a specific ocean environment. • Create a deep-sea creature design project in which students research	• Gizmos • Textbook • Supplementary text • Internet/website articles • Video clips • Lab materials

deep-ocean conditions and develop an organism with realistic adaptations to pressure, temperature, darkness, and limited food resources.

- Investigate ocean currents, tides, waves, and circulation through demonstrations, models, simulations, and data analysis.
- Use maps, diagrams, and interactive technology to identify major ocean basins, currents, seafloor features, coastal environments, and marine life zones.
- Create a shoebox seafloor topography model showing features such as continental shelves, slopes, trenches, ridges, and abyssal plains.
- Conduct investigations involving ocean conditions such as temperature, salinity, density, pH, light availability, and water movement.
- Conduct an osmosis and salinity investigation to explore how changes in water conditions can affect marine organisms.
- Investigate photosynthesis and primary productivity by examining the importance of phytoplankton, algae, and other marine producers.
- Analyze marine ecosystem data, including population changes, temperature trends, water quality, biodiversity, and human impacts, and use evidence to draw scientific conclusions.
- Complete a marine organism research project in which students investigate an organism's habitat, adaptations, diet, ecological role, predators, prey, and interactions with other species.
- Conduct squid, fish, clam, or other appropriate marine organism dissections to examine structures and relate form to function.
- Examine shells, skeletons, teeth, beaks, fins, body shapes, and other structures to determine how marine

organisms are adapted to their environments. ● Investigate human impacts on marine ecosystems through case studies involving plastic pollution, oil spills, overfishing, habitat destruction, coastal development, ocean acidification, and climate change. ● Complete an oil spill cleanup simulation and evaluate the effectiveness, cost, and environmental consequences of different cleanup methods. ● Conduct a marine pollution investigation in which students identify sources of pollution and trace their effects through a marine food web. ● Research a marine resource, such as fisheries, offshore energy, minerals, biotechnology, or recreational resources, and evaluate its importance to humans and potential environmental impacts. ● Participate in a classroom debate or town-hall simulation addressing a marine environmental issue such as overfishing, coastal development, marine protected areas, or offshore energy. ● Develop a conservation campaign that promotes a specific action to protect marine organisms, habitats, or resources. ● Create public service announcements, posters, infographics, videos, or digital presentations communicating the importance of protecting marine ecosystems. ● Use technology and virtual field trips to explore marine environments that students may not be able to visit in person. ● Maintain a marine science journal in which students record observations, questions, diagrams, data, and reflections throughout the unit. ● Complete a local marine or coastal	
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field investigation, when possible, to observe organisms, habitats, human impacts, and environmental conditions. • Work with maps, charts, graphs, photographs, specimens, models, and digital resources to interpret evidence about marine ecosystems. • Complete a final marine ecosystem project in which students demonstrate how physical conditions, organisms, adaptations, food webs, energy flow, and human activities are interconnected within a marine environment.	
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Unit 3 Suggested Options for Differentiation: Content-specific Accommodations and Modifications for Subgroups

Multilingual Learners

- Speak slowly, distinctly, and write down key terms
- Closed Captioning
- Emphasize visual literacy
- Graphic Organizers
- Use charts, graphs and figures
- Group projects & cooperative learning
- Partner English learners with strong English speakers
- Consistent routines
- Outlines
- Language-based science games
- Picture glossary
- Root words

Students with 504 Plans

- At the beginning of a course, have a conversation about the value of understanding one's learning profile and/or let students take a learning style survey.
- Explicitly share with students your observations about their learning strengths and challenges as the course progresses.
- Build metacognitive reflection into assignments.
- Instead of relying on large unit tests or exams, build in more frequent forms of assessment.
- Use grade-keeping software and make updated grade reports accessible to students.
- Provide direct personalized feedback to students
- Provide (or assign) some form of study guide for students to review before any quiz or exam.
- Provide scoring rubrics that describe the qualities of excellent work for the various components of each assignment.
- Make a direct connection, orally and in writing, between each class task and its associated learning objective.
- Distribute all important assignment handouts in the same format and structure.
- Establish and rationalize a routine for how class operates

- Post and review daily agendas for all class activities and assignments.
- Consider making available, in the classroom or learning support center, emerging assistive technologies such as text-to-speech screen readers, which are designed to assist students with difficulties decoding or attending to written text.
- Teach students to use some form of course planner or calendar that shows assignment due dates in a clear, graphical format.

Special Education

- At the beginning of a course, have a conversation about the value of understanding one's learning profile and/or let students take a learning style survey.
- Explicitly share with students your observations about their learning strengths and challenges as the course progresses.
- Build metacognitive reflection into assignments.
- Instead of relying on large unit tests or exams, build in more frequent forms of assessment.
- Use grade-keeping software and make updated grade reports accessible to students.
- Provide direct personalized feedback to students
- Provide (or assign) some form of study guide for students to review before any quiz or exam.
- Provide scoring rubrics that describe the qualities of excellent work for the various components of each assignment.
- Make a direct connection, orally and in writing, between each class task and its associated learning objective.
- Distribute all important assignment handouts in the same format and structure.
- Establish and rationalize a routine for how class operates
- Post and review daily agendas for all class activities and assignments.
- Consider making available, in the classroom or learning support center, emerging assistive technologies such as text-to-speech screen readers, which are designed to assist students with difficulties decoding or attending to written text.
- Teach students to use some form of course planner or calendar that shows assignment due dates in a clear, graphical format.

Gifted and Talented

- Interdisciplinary and problem-based assignments with planned scope and sequence
- Advance, accelerated, or compacted content
- Abstract and advanced higher-level thinking
- Allowance for individual student interests
- Assignments geared to development in areas of affect, creativity, cognition, and research skills
- Complex, in-depth assignments
- Diverse enrichment that broadens learning
- Variety in types of resources
- Open-ended questions for higher-level thinking
- Higher-level text

Students at Risk of School Failure

- Small group instruction
- Frequent breaks
- Increased parent communication
- Daily log

Diversity and Inclusion:

- Involve families in student learning
- Respect cultural traditions
- Provided students with necessary academic resources and materials
- Allow for alternative assignments
- Provide visuals
- Assign peer tutor
- Collaborate with language professionals and ESL teachers
- Establish a positive connection with parent
- Utilize closed captioning when available
- Provide road maps or outlines for difficult concepts
- Provide sufficient wait time before calling on any student to help keep students who may need more time engaged
- Speak clearly and slowly, avoid slang and idiomatic expressions
- Create a nurturing environment with structured routines

Unit 3 Core Instructional and Supplemental Materials and Additional Resources**Instructional Materials**

- Textbook
- Textbook resources
- Laboratory manuals and equipment
- Translation apps (Google etc)

Supplemental Materials

- School databases
- Multimedia Resources
- Printers and Computers
- Online Resources and videos
- Interactive Projector
- Rubrics
- POGIL
- Science Websites:
 - ACS Chemistry for Life
 - Periodic table
 - PBS Learning Media
 - Khan Academy
 - Bozeman Science
 - Science Magazine
 - US National Science Foundation
 - Newsela
 - Next Generation Science Standards
 - Chem Spider
 - Amoeba Sisters
 - HHMI
 - Gizmos
 - Edpuzzle

Intervention Materials

- Anchor activities: Anchor activities provide meaningful options for students when they are not actively engaged in classroom activities (e.g., when they finish early, are waiting for further directions, are stumped, first enter class, or when the teacher is working with other students). Anchors should be directly related to the current learning goals.
- Choices of review activities: Different review or extension activities are made available to students during a specific section of the class (such as at the beginning or end of the period).
- Homework options: Students are provided with choices about the assignments they complete as homework. Or, students are directed to specific homework based on student needs.
- Student-teacher goal setting: The teacher and student work together to develop individual learning goals for the student.
- Flexible grouping: Students might be instructed as a whole group, in small groups of various permutations (homogeneous or heterogeneous by skill or interest), in pairs or individuals. Any small groups or pairs change over time based on assessment data.
- Varied computer programs: The computer is used as an additional center in the classroom, and students are directed to specific websites or software that allows them to work on skills at their level.
- Varying scaffolding of same organizer: Provide graphic organizers that require students to complete various amounts of information. Some will be more filled out (by the teacher) than others.
- Think-Pair-Share by readiness, interest, and/or learning profile: Students are placed in pre-determined pairs, asked to think about a question for a specific amount of time, then are asked to share their answers first with their partner and then with the whole group.
- Games to practice mastery of information and skill: Use games as a way to review and reinforce concepts. Include questions and tasks that are on a variety of cognitive levels.
- Multiple levels of questions: Teachers vary the sorts of questions posed to different students based on their ability to handle them. Varying questions is an excellent way to build the confidence (and motivation) of students who are reluctant to contribute to class discourse. Note: Most teachers would probably admit that without even thinking about it they tend to address particular types of questions to particular students. In some cases, such tendencies may need to be corrected. (For example, a teacher may be unknowingly addressing all of the more challenging questions to one student, thereby inhibiting other students' learning and fostering class resentment of that student.)
- Stations/ Learning Centers: A station (or simply a collection of materials) that students might use independently to explore topics or practice skills. Centers allow individuals or groups of students to work at their own pace. Students are constantly

reassessed to determine which centers are appropriate for students at a particular time, and to plan activities at those centers to build the most pressing skills.

Social and Emotional Learning New Jersey SEL

Competencies and Sub-Competencies Social and emotional learning (SEL) involves the process through which children and adults acquire and apply the knowledge, attitudes and skills necessary to understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions. The purpose of the SEL competencies is to provide schools with guidelines for integrating SEL across grades and subject areas.

Self-Awareness

- Recognize one's feelings and thoughts
- Recognize the impact of one's feelings and thoughts on one's own behavior
- Recognize one's personal traits, strengths and limitations
- Recognize the importance of self-confidence in handling daily tasks and challenges

Self-Management

- Understand and practice strategies for managing one's own emotions, thoughts and behaviors
- Recognize the skills needed to establish and achieve personal and educational goals
- Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals

Social Awareness

- Recognize and identify the thoughts, feelings and perspectives of others
- Demonstrate awareness of the differences among individuals, groups and others' cultural backgrounds
- Demonstrate an understanding of the need for mutual respect when viewpoints differ
- Demonstrate an awareness of the expectations for social interactions in a variety of settings

Responsible Decision-Making

- Develop, implement and model effective problem solving and critical thinking skills
- Identify the consequences associated with one's actions in order to make constructive choices
- Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills

- Establish and maintain healthy relationships
- Utilize positive communication and social skills to interact effectively with others
- Identify ways to resist inappropriate social pressure
- Demonstrate the ability to prevent and resolve interpersonal conflicts in constructive ways
- Identify who, when, where, or how to seek help for oneself or others when needed

Teacher Notes

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<u>Ocean Academy Charter High School</u> Unit 4 Overview	
Content Area: Science	Target Course/Grade Levels: 10th -12th
Unit Title: Unit 4: Ocean Life and Human Impact	Duration: 5 Days
Unit 4 Introduction/ Focus	
This unit examines the complex relationship between humans and the marine environment, with a focus on how human activities have changed ocean ecosystems and marine resources over time. Students will investigate the ways humans depend on the ocean for food, energy, transportation, recreation, and other resources while examining the environmental consequences of these activities. Students will explore the management of marine resources, including fisheries, and analyze the causes and consequences of overfishing, bycatch, and unsustainable harvesting practices. They will also examine the extraction of non-living marine resources, including oil, natural gas, sand, minerals, and other materials, and evaluate the environmental impacts associated with these activities. Students will investigate major threats to marine ecosystems, including marine pollution, climate change, ocean warming and acidification, habitat destruction, coastal development, and the introduction of non-native species. Through case studies, laboratory investigations, data analysis, and other hands-on activities, students will examine how these environmental changes affect marine organisms, biodiversity, food webs, habitats, and ecosystem health. Students will also examine how patterns of resource use and human activity have changed over the past century and consider how scientific knowledge, technology, policy, conservation, and sustainable practices can be used to reduce environmental damage and promote the long-term health of marine ecosystems. Students will evaluate potential solutions to marine environmental problems and use evidence to develop and communicate recommendations for protecting ocean resources. Throughout the unit, students will apply science and engineering practices, including asking questions, analyzing data, developing and using models, conducting investigations, evaluating evidence, constructing scientific explanations, and communicating solutions to demonstrate their understanding of marine science concepts and real-world environmental challenges. This unit is based on HS-ESS3-5, HS-ESS3-6, HS-ETS1-1 and HS-ETS1-2. Standard 9.1 Personal Financial Literacy: This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about	

personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.

Standard 9.2 Career Awareness, Exploration, Preparation and Training. This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.

Standard 9.4 Life Literacies and Key Skills. This standard outline key literacies and technical skills such as critical thinking, global and cultural awareness, and technology literacy* that are critical for students to develop to live and work in an interconnected global economy.

Standard 8.1 Computer Science

Computer Science outlines a comprehensive set of concepts and skills, such as data and analysis, algorithms and programming, and computing systems.

Standard 8.2 Design Thinking

Technology, outlines the technological design concepts and skills essential for technological and engineering literacy. The framework design includes Engineering Design, Ethics and Culture, and the Effects of Technology on the Natural world among the disciplinary concepts

Amistad Law: N.J.S.A. 18A 52:16A-88 Every board of education shall incorporate the information regarding the contributions of African-Americans to our country in an appropriate place in the curriculum of elementary and secondary school students.

Holocaust Law: N.J.S.A. 18A:35-28 Every board of education shall include instruction on the Holocaust and genocide in an appropriate place in the curriculum of all elementary and secondary school pupils. The instruction shall further emphasize the personal responsibility that each citizen bears to fight racism and hatred whenever and wherever it happens.

LGBT and Disabilities Law: N.J.S.A. 18A:35-4.35 A board of education shall include instruction on the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, in an appropriate place in the curriculum of middle school and high school students as part of the district's implementation of the New Jersey Student Learning Standards (N.J.S.A.18A:35-4.36) A board of education shall have policies and procedures in place pertaining to the selection of instructional materials to implement the requirements of N.J.S.A. 18A:35-4.35.

Diversity and Inclusion

C.18A:35-4.36a Curriculum to include instruction on diversity and inclusion.

1. The instruction shall:
 - (1) highlight and promote diversity, including economic diversity, equity, inclusion, tolerance, and belonging in connection with gender and sexual orientation, race and ethnicity, disabilities, and religious tolerance;
 - (2) examine the impact that unconscious bias and economic disparities have at both an individual level and on society as a whole; and
 - (3) encourage safe, welcoming, and inclusive environments for all students regardless of race or ethnicity, sexual and gender identities, mental and physical disabilities, and religious

beliefs.

Asian Americans and Pacific Islanders (AAPI)

Ensures that the contributions, history, and heritage of Asian Americans and Pacific Islanders (AAPI) are included in the New Jersey Student Learning Standards (NJSLS) for Social Studies in kindergarten through Grade 12 (P.L.2021, c.416).

21st Century Themes and Skills

“Twenty-first century themes and skills” means themes such as global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; learning and innovation skills, including creativity and innovation, critical thinking and problem solving, and communication and collaboration; information, media, and technology skills; and life and career skills, including flexibility. Career readiness, life literacies, and key skills education provides students with the necessary skills to make informed career and financial decisions, engage as responsible community members in a digital society, and to successfully meet the challenges and opportunities in an interconnected global economy.”

Unit 4 Focus Standards

HS-ESS3-5 Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. [Clarification Statement: Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).] [Assessment Boundary: Assessment is limited to one example of climate change and its associated impacts.]

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 (i.e., climate change). [Clarification Statement: Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. An example of the far-reaching impacts from human activity is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations.] [Assessment Boundary: Assessment does not include running computational representations but is limited to using the published results of scientific computational models.]

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.

HS-ETS1-2 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

Science and Engineering
Practices

Disciplinary Core Ideas

Crosscutting Concepts

Analyzing and Interpreting Data Analyzing data in 9-12 builds on K-8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data. - Analyze data using computational models in order to make valid and reliable scientific claims. (HS-ESS3-5) Using Mathematics and Computational Thinking Mathematical and computational thinking in 9-12 builds on K-8 experiences and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions. - Create a computational model or simulation of a phenomenon, designed device, process, or system. (HS-ESS3-3) - Use a computational representation of phenomena or design solutions to describe and/or support claims	ESS2.D: Weather and Climate - Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere. <i>(secondary to HS-ESS3-6)</i> ESS3.A: Natural Resources - Resource availability has guided the development of human society. (HS-ESS3-1) - All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. (HS-ESS3-2) ESS3.B: Natural Hazards - Natural hazards and other geologic events	Cause and Effect - Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-ESS3-1) Systems and System Models - When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models. (HS-ESS3-6) Stability and Change - Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible. (HS-ESS3-3), (HS-ESS3-5) - Feedback (negative or positive) can stabilize or destabilize a system. (HS-ESS3-4) ----- <i>Connections to Engineering, Technology, and Applications of Science</i>
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and/or explanations. (HS-ESS3-6) Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 9-12 builds on K-8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific knowledge, principles, and theories. - Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (HS-ESS3-1) - Design or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-ESS3-4) Engaging in Argument from Evidence	have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (HS-ESS3-1) ESS3.C: Human Impacts on Earth Systems - The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (HS-ESS3-3) - Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (HS-ESS3-4) ESS3.D: Global Climate Change - Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts. (HS-ESS3-5) - Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the	Influence of Science, Engineering, and Technology on Society and the Natural World - Modern civilization depends on major technological systems. (HS-ESS3-1), (HS-ESS3-3) - Engineers continuously modify these technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (HS-ESS3-2), (HS-ESS3-4) - New technologies can have deep impacts on society and the environment, including some that were not anticipated. (HS-ESS3-3) - Analysis of costs and benefits is a critical aspect of decisions about technology. (HS-ESS3-2) ----- <i>Connections to Nature of Science</i> Science is a Human Endeavor - Science is a result of human endeavors, imagination, and creativity. (HS-ESS3-3) Science Addresses Questions About the Natural and Material World
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Engaging in argument from evidence in 9-12 builds on K-8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed world(s). Arguments may also come from current scientific or historical episodes in science. - Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations). (HS-ESS3-2) ----- <i>Connections to Nature of Science</i> Scientific Investigations Use a Variety of Methods - Science investigations use diverse methods and do not always use the same set of procedures to obtain data. (HS-ESS3-5) - New technologies advance scientific knowledge. (HS-ESS3-5) Scientific Knowledge is Based on Empirical Evidence	biosphere interact and are modified in response to human activities. (HS-ESS3-6) ETS1.B: Developing Possible Solutions When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. <i>(secondary to HS-ESS3-2), (secondary HS-ESS3-4)</i>	- Science and technology may raise ethical issues for which science, by itself, does not provide answers and solutions. (HS-ESS3-2) - Science knowledge indicates what can happen in natural systems—not what should happen. The latter involves ethics, values, and human decisions about the use of knowledge. (HS-ESS3-2) - Many decisions are not made using science alone, but rely on social and cultural contexts to resolve issues. (HS-ESS3-2)
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- Science knowledge is based on empirical evidence. (HS-ESS3-5)
- Science arguments are strengthened by multiple lines of evidence supporting a single explanation. (HS-ESS3-5)

Unit 4 Supporting and Additional Standards//Interdisciplinary Connections

ELA/Literacy -

RI.CR.11-12.1. Accurately cite a range of thorough textual evidence and make relevant connections to strongly support a comprehensive analysis of multiple aspects of what an informational text says explicitly and inferentially, as well as interpretations of the text.

(HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-4),(HS-ESS3-5)

RI.CI.11-12.2. Determine two or more central ideas of an informational text and analyze how they are developed and refined over the course of a text, including how they interact and build on one another to provide a complex account or analysis; provide an objective summary of the text.

(HS-ESS3-5)

RI.MF.11-12.6. Synthesize complex information across multiple sources and formats to develop ideas, resolve conflicting information, or develop an interpretation that goes beyond explicit text information (e.g., express a personal point of view, new interpretation of the concept). (HS-ESS3-5)

RI.CT.11-12.8. Analyze and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) documents of historical and scientific significance for their purposes, including primary source documents relevant to U.S. and/or global history and texts proposing scientific or technical advancements. (HS-ESS3-2),(HS-ESS3-4)

W.IW.11-12.2. Write informative/explanatory texts (including the narration of historical events, scientific procedures/ experiments, or technical processes) to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

- A. Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
- B. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
- C. Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
- D. Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile,

and analogy to manage the complexity of the topic.

- E. Establish and maintain a style and tone appropriate to the audience and purpose (e.g., formal and objective for academic writing) while attending to the norms and conventions of the discipline in which they are writing.
- F. Provide a concluding paragraph or section that supports the argument presented (e.g., articulating implications or the significance of the topic). (HS-ESS3-1)

Mathematics-

MP.2 Reason abstractly and quantitatively.

(HS-ESS3-1), (HS-ESS3-2), (HS-ESS3-3), (HS-ESS3-4), (HS-ESS3-5), (HS-ESS3-6)

MP.4 Model with mathematics. (HS-ESS3-3), (HS-ESS3-6)

HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-ESS3-1), (HS-ESS3-4), (HS-ESS3-5), (HS-ESS3-6)

HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.
(HS-ESS3-1), (HS-ESS3-4), (HS-ESS3-5), (HS-ESS3-6)

HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-ESS3-1), (HS-ESS3-4), (HS-ESS3-5), (HS-ESS3-6)

Unit 4 New Jersey Student Learning Standards Connections:

Disciplinary Concepts

Information & Media Literacy and Technology Literacy

Core Ideas	Performance Expectations (Identified with Standard Number and Statement)
<i>Advanced search techniques can be used with digital and media resources to locate information and to check the credibility and the expertise of sources to answer questions, solve problems, and inform the decision-making.</i>	9.4.12.IML.1: Compare search browsers and recognize features that allow for filtering of information. • 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources (e.g., NJSLSA.W8, Social Studies Practice: Gathering and Evaluating Sources.
Digital tools such as artificial intelligence, image enhancement and analysis, and sophisticated computer modeling and simulation create new types of information that may have profound effects on society. These new types of information must be evaluated carefully	9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8) • 9.4.12.IML.4: Assess and critique the appropriateness and impact of existing data

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	visualizations for an intended audience (e.g., S-ID.B.6b, HS-LS2-4).
In order for members of our society to participate productively, information needs to be shared accurately and ethically.	9.4.12.IML.5: Evaluate, synthesize, and apply information on climate change from various sources appropriately (e.g., 2.1.12.CHSS.6, S.IC.B.4, S.IC.B.6, 8.1.12.DA.1, 6.1.12.GeoHE.14.a, 7.1.AL.PRSNT.2). 9.4.12.IML.6: Use various types of media to produce and store information on climate change for different purposes and audiences with sensitivity to cultural, gender, and age diversity (e.g., NJSLSA.SL5).
Accurate information may help in making valuable and ethical choices.	9.4.12.IML.7: Develop an argument to support a claim regarding a current workplace or societal/ethical issue such as climate change (e.g., NJSLSA.W1, 7.1.AL.PRSNT.4).
Media have embedded values and points of view.	9.4.12.IML.8: Evaluate media sources for point of view, bias, and motivations (e.g., NJSLSA.R6, 7.1.AL.IPRET.6). 9.4.12.IML.9: Analyze the decisions creators make to reveal explicit and implicit messages within information and media (e.g., 1.5.12acc.C2a, 7.1.IL.IPRET.4).
Digital tools differ in features, capacities, and styles. Knowledge of different digital tools is helpful in selecting the best tool for a given task.	9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.). 9.4.12.TL.2: Generate data using formula-based calculations in a spreadsheet and draw conclusions about the data.
Collaborative digital tools can be used to access, record and share different viewpoints and to collect and tabulate the views of groups of people.	9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments. 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6).
Unit 4 New Jersey Student Learning Standards:	
Disciplinary Concepts Interaction of Technology and Humans , Nature of Technology, Effects of Technology on the Natural World and Ethics & Culture	

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Core Ideas	
Decisions to develop new technology are driven by societal and cultural opinions and demands that differ from culture to culture	8.2.12.ITH.1: Analyze a product to determine the impact that economic, political, social, and/or cultural factors have had on its design, including its design constraints.
Changes caused by the introduction and use of a new technology can range from gradual to rapid and from subtle to obvious, and can change over time. These changes may vary from society to society as a result of differences in a society's economy, politics, and culture.	8.2.12.ITH.2: Propose an innovation to meet future demands supported by an analysis of the potential costs, benefits, trade-offs, and risks related to the use of the innovation. 8.2.12.ITH.3: Analyze the impact that globalization, social media, and access to open source technologies has had on innovation and on a society's economy, politics, and culture.
Engineers use science, mathematics, and other disciplines to improve technology. Increased collaboration among engineers, scientists, and mathematicians can improve their work and designs. Technology, product, or system redesign can be more difficult than the original design.	8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product. 8.2.12.NT.2: Redesign an existing product to improve form or function.
Development and modification of any technological system needs to take into account how the operation of the system will affect natural resources and ecosystems. Impacts of technological systems on the environment need to be monitored and must inform decision-making. Many technologies have been designed to have a positive impact on the environment and to monitor environmental change over time.	8.2.12.ETW.1: Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation, and maintenance of a chosen product. 8.2.12.ETW.2: Synthesize and analyze data collected to monitor the effects of a technological product or system on the environment. 8.2.12.ETW.3: Identify a complex, global environmental or climate change issue, develop a systemic plan of investigation, and propose an innovative sustainable solution.
The ability to ethically integrate new technologies requires deciding whether to introduce a technology, taking into consideration local resources and the role of culture in acceptance. Consequences of technological use may be different for different groups of people and may change over time. Since technological decisions can have ethical implications, it is essential that individuals analyze issues by gathering	8.2.12.EC.1: Analyze controversial technological issues and determine the degree to which individuals, businesses, and governments have an ethical role in decisions that are made. 8.2.12.EC.2: Assess the positive and negative impacts of emerging technologies on developing countries and evaluate how individuals, non-profit organizations, and governments have responded.

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evidence from multiple perspectives and conceiving of alternative possibilities before proposing solutions.	8.2.12.EC.3: Synthesize data, analyze trends, and draw conclusions regarding the effect of a technology on the individual, culture, society, and environment and share this information with the appropriate audience. 8.2.12.ETW.4: Research historical tensions between environmental and economic considerations as driven by human needs and wants in the development of a technological product and present the competing viewpoints.
New Jersey Student Learning Standards: Climate Change Mandate	
Core Ideas	Performance Expectations (Identified with Standard Number and Statement)
Resource availability has guided the development of human society.	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.
Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics and to consider social, cultural and environmental impacts.	HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other natural systems.
Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.	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.
When evaluating solutions, it is important to take into account a range of constraints,	HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and

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including cost, safety, reliability, and aesthetics and to consider social, cultural and environmental impacts.	trade-offs that account for a range of constraints, including cost, safety, reliability and aesthetics as well as possible social, cultural and environmental impacts.
Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs.	HS-ETS1-4: Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Unit 4 Evidence of Student Learning

Performance Tasks/Use of Technology: • Design and test different fishing-net prototypes to determine how changes in mesh size, shape, and design can reduce bycatch while maintaining the ability to harvest target species. • Conduct a fishery management simulation in which students analyze population data and develop regulations designed to maintain healthy fish populations and support sustainable fishing practices. • Complete an oil-spill cleanup investigation in which students test and compare different cleanup methods, collect data on their effectiveness, and evaluate the environmental and economic trade-offs of each approach. • Conduct an albatross bolus investigation to examine the types of materials consumed by seabirds and use evidence to investigate the impacts of marine debris and plastic pollution on marine organisms. • Analyze data from the bolus investigation to identify common types and sources of marine debris and determine how human activities contribute to the accumulation of plastics in marine food webs.	Other Assessments • Observation • Homework • Class participation • Graphic Organizers • Projects • Student Response Systems • Do-Now/Exit Cards • Laboratories/Lab Reports • Maintaining a Notebook • Writing Assignments • Graphs, Models, and Tables Summative • Chapter/Unit Test • Writing Assignments • Presentations • Laboratory Reports/Practical • Unit Projects Benchmark • Common Assessments • Final Exams • Performance Assessment • Link-it assessment Alternative • Quizz • Blooket • Kahoot
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• Use models and simulations to demonstrate how pollution, overfishing, habitat destruction, and other human activities can affect marine populations and disrupt food webs. • Research a current marine environmental issue and develop an evidence-based presentation that explains the causes, environmental consequences, and potential solutions. • Use graphs, maps, photographs, and other scientific data to investigate changes in marine populations, habitats, pollution levels, or ocean conditions over time. • Design an engineering solution to address a marine environmental problem, such as reducing plastic pollution, preventing bycatch, limiting coastal erosion, or protecting marine habitats. • Develop and communicate recommendations for reducing human impacts on the marine environment through a poster, infographic, presentation, public service announcement, or other technology-based product.	• CER (claim, evidence, reasoning)
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Unit 4 Essential Questions

- How do humans depend on the ocean for food, energy, transportation, recreation, and other natural resources?
- How have human activities changed the way marine resources are used and harvested over time?
- Why is sustainable management of marine fisheries important, and what are the ecological, economic, and social consequences of overfishing?
- How do fishing practices, including bycatch and habitat disturbance, affect marine populations and ecosystems?
- What non-living resources are extracted from the ocean, and what environmental impacts can result from their exploration and extraction?
- How do human activities contribute to marine pollution, habitat destruction, and the introduction of non-native species?
- How is climate change affecting ocean conditions and marine organisms, including through ocean warming, sea-level rise, and ocean acidification?
- How can changes to one species, habitat, or environmental condition affect the health and stability of an entire marine ecosystem?

- How can scientific research, technology, conservation, and effective resource management help reduce human impacts on the marine environment?
- What actions can individuals, communities, industries, and governments take to protect marine ecosystems and promote the sustainable use of ocean resources?
- How can we use scientific evidence and the science and engineering practices to evaluate marine environmental problems and develop realistic solutions?

Unit 4 Knowledge and Skills

Enduring Understandings	Learning Targets
<i>Students will know...</i> • Marine ecosystems contain a remarkable diversity of organisms that are interconnected through food webs, energy flow, competition, predation, symbiotic relationships, and interactions with their physical environment. • The distribution, abundance, and survival of marine organisms are influenced by environmental conditions such as temperature, salinity, depth, light availability, nutrients, water movement, and habitat structure. • Marine organisms have specialized structures, behaviors, and adaptations that allow them to survive and fulfill ecological roles within different marine environments. • The health and stability of marine ecosystems depend on the interactions among organisms and between living organisms and nonliving components of the environment; changes to one part of an ecosystem can affect many other organisms and processes. • Human activities can significantly alter marine ecosystems, affecting water quality, habitats, biodiversity, food webs, and the populations of marine organisms. • The use and extraction of marine resources can provide important benefits to human communities while also creating environmental challenges that require responsible management and sustainable practices. • Activities such as overfishing, pollution, coastal development, habitat destruction, resource extraction, and the introduction of	<i>Students will be able to..</i> • Explain how human activities affect marine ecosystems, including the impacts of pollution, overfishing, habitat destruction, resource extraction, climate change, and introduced species. • Analyze how human use of marine resources can affect the health, biodiversity, and long-term sustainability of ocean ecosystems. • Evaluate the causes and consequences of overfishing and explain the importance of effective fisheries management and sustainable harvesting practices. • Identify and describe the ways in which humans depend on the ocean for food, energy, transportation, recreation, medicine, and other resources. • Explain how marine organisms are interconnected through food webs, energy flow, predation, competition, symbiosis, and other ecological relationships. • Analyze how changes in one marine population, species, or environmental condition can affect other organisms and the overall stability of an ecosystem. • Describe how human activities can disrupt marine food webs, habitats, biodiversity, and relationships among organisms. • Examine how climate change and changing ocean conditions, including warming, acidification, and sea-level rise, affect marine organisms, habitats, and ecosystems. • Investigate strategies for conserving marine ecosystems and managing ocean resources while balancing environmental, economic, and societal needs. • Use scientific evidence, data, models, and

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non-native species can have long-lasting effects on marine ecosystems. • Climate change is altering ocean conditions, including temperature, sea level, chemistry, and circulation, creating challenges for marine organisms and ecosystems. • Scientific knowledge, conservation efforts, responsible resource management, and individual and collective actions can help reduce human impacts and protect the health and sustainability of marine ecosystems for future generations.	investigations to evaluate human impacts on the marine environment and propose realistic solutions for protecting and restoring marine ecosystems. • Develop and communicate evidence-based recommendations for individuals, communities, industries, and governments to reduce human impacts and promote the long-term health of the marine environment.
Unit 4 Instructional Plan	
Suggested Activities	Resources
• Conduct a marine resource-use timeline activity in which students examine how human use of ocean resources has changed over the past 100-150 years. • Analyze historical and current fisheries data to investigate changes in fish populations, catch sizes, fishing pressure, and sustainability. • Participate in a fishery management simulation in which students represent fishermen, scientists, conservationists, government agencies, and consumers and work together to develop sustainable fishing regulations. • Conduct an overfishing simulation using a renewable-resource model to demonstrate how populations can be depleted when organisms are harvested faster than they can reproduce. • Investigate bycatch by examining different fishing methods and designing or modifying fishing gear to reduce the accidental capture of non-target species. • Research a commercially important marine species and create a population-management plan that considers reproduction, habitat,	• Gizmos • Textbook • Supplementary text • Nonfiction articles • Internet/websites • Video clips • Lab materials

predators, food availability, fishing pressure, and human demand.

- Investigate the environmental impacts of extracting non-living marine resources, including offshore oil and natural gas, sand, gravel, and minerals.
- Conduct a case study of an offshore drilling operation and evaluate its economic benefits, environmental risks, and potential alternatives.
- Complete an oil-spill cleanup simulation in which students test different cleanup techniques and evaluate their effectiveness, cost, and environmental consequences.
- Conduct a marine pollution investigation by examining the sources, pathways, and effects of plastics, oil, chemicals, agricultural runoff, sewage, and other pollutants.
- Create a model demonstrating how pollutants can move through a marine food web and affect organisms at different trophic levels.
- Investigate microplastics by examining simulated or collected samples and determining potential sources and pathways into marine ecosystems.
- Conduct a water-quality investigation in which students test factors such as pH, temperature, salinity, turbidity, dissolved oxygen, or nutrient levels and evaluate how these conditions affect marine organisms.
- Investigate ocean acidification through a hands-on laboratory activity using safe materials to model changes in seawater chemistry and examine potential effects on organisms that build shells or skeletons.
- Analyze ocean temperature and climate data to identify trends and investigate how ocean warming can affect marine organisms, habitats, and ecosystems.
- Create a cause-and-effect model showing relationships among

greenhouse gas emissions, atmospheric changes, ocean warming, sea-level rise, ocean acidification, and marine ecosystem changes.

- Research the effects of climate change on a specific marine ecosystem, such as coral reefs, polar environments, estuaries, kelp forests, or coastal wetlands.
- Investigate coral bleaching through a model, simulation, or data-analysis activity and identify environmental factors that contribute to coral stress.
- Examine the ecological effects of introduced or invasive marine species through case studies and determine how these species can alter food webs, habitats, and native populations.
- Complete an invasive-species simulation in which students model how a newly introduced organism can spread through an ecosystem and affect native species.
- Analyze the effects of habitat destruction caused by coastal development, dredging, bottom trawling, pollution, and other human activities.
- Create before-and-after ecosystem models showing how a marine habitat changes following human disturbance and identify potential strategies for restoration.
- Conduct a coastal development planning simulation in which students balance economic development, recreation, resource use, wildlife protection, and habitat conservation.
- Research a marine environmental issue and develop an evidence-based claim about its causes, effects, and possible solutions.
- Use graphs, maps, satellite imagery, photographs, and other data representations to analyze changes in marine ecosystems over time.

- Examine real-world marine environmental case studies and evaluate the effectiveness of different conservation strategies.
- Research marine protected areas and evaluate how they can be used to conserve biodiversity, protect habitats, and manage marine resources.
- Design a marine protected area using maps and ecological data, explaining which habitats should be protected and why.
- Investigate sustainable fishing practices and compare methods based on environmental impact, economic viability, and long-term sustainability.
- Research careers related to marine conservation, fisheries management, oceanography, environmental science, marine biology, and coastal resource management.
- Work in teams to develop a solution to a marine environmental problem using the engineering design process.
- Create a prototype or model designed to reduce a specific marine environmental problem, such as plastic pollution, oil contamination, coastal erosion, or bycatch.
- Develop a conservation campaign addressing a local, regional, or global marine environmental issue.
- Create public service announcements, infographics, posters, podcasts, videos, or digital presentations designed to educate the public about marine conservation.
- Hold a classroom debate or environmental summit in which students use scientific evidence to defend different perspectives on a controversial marine resource or conservation issue.
- Conduct a local coastal or watershed investigation, when possible, to identify evidence of human impacts

and connect local activities to downstream marine ecosystems. ● Maintain a marine environmental science journal in which students record observations, analyze data, reflect on investigations, and propose solutions to environmental challenges. ● Complete a culminating project in which students select a major threat to the marine environment, investigate its causes and consequences, evaluate existing solutions, and propose an evidence-based strategy for reducing or reversing environmental damage.	
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Unit 4 Suggested Options for Differentiation: Content-specific Accommodations and Modifications for Subgroups

Multilingual Learners

- Speak slowly, distinctly, and write down key terms
- Closed Captioning
- Emphasize visual literacy
- Graphic Organizers
- Use charts, graphs and figures
- Group projects & cooperative learning
- Partner English learners with strong English speakers
- Consistent routines
- Outlines
- Language-based science games
- Picture glossary
- Root words

Students with 504 Plans

- At the beginning of a course, have a conversation about the value of understanding one's learning profile and/or let students take a learning style survey.
- Explicitly share with students your observations about their learning strengths and challenges as the course progresses.
- Build metacognitive reflection into assignments.
- Instead of relying on large unit tests or exams, build in more frequent forms of assessment.
- Use grade-keeping software and make updated grade reports accessible to students.
- Provide direct personalized feedback to students
- Provide (or assign) some form of study guide for students to review before any quiz or exam.
- Provide scoring rubrics that describe the qualities of excellent work for the various components of each assignment.
- Make a direct connection, orally and in writing, between each class task and its associated learning objective.
- Distribute all important assignment handouts in the same format and structure.

- Establish and rationalize a routine for how class operates
- Post and review daily agendas for all class activities and assignments.
- Consider making available, in the classroom or learning support center, emerging assistive technologies such as text-to-speech screen readers, which are designed to assist students with difficulties decoding or attending to written text.
- Teach students to use some form of course planner or calendar that shows assignment due dates in a clear, graphical format.

Special Education

- At the beginning of a course, have a conversation about the value of understanding one's learning profile and/or let students take a learning style survey.
- Explicitly share with students your observations about their learning strengths and challenges as the course progresses.
- Build metacognitive reflection into assignments.
- Instead of relying on large unit tests or exams, build in more frequent forms of assessment.
- Use grade-keeping software and make updated grade reports accessible to students.
- Provide direct personalized feedback to students
- Provide (or assign) some form of study guide for students to review before any quiz or exam.
- Provide scoring rubrics that describe the qualities of excellent work for the various components of each assignment.
- Make a direct connection, orally and in writing, between each class task and its associated learning objective.
- Distribute all important assignment handouts in the same format and structure.
- Establish and rationalize a routine for how class operates
- Post and review daily agendas for all class activities and assignments.
- Consider making available, in the classroom or learning support center, emerging assistive technologies such as text-to-speech screen readers, which are designed to assist students with difficulties decoding or attending to written text.
- Teach students to use some form of course planner or calendar that shows assignment due dates in a clear, graphical format.

Gifted and Talented

- Interdisciplinary and problem-based assignments with planned scope and sequence
- Advance, accelerated, or compacted content
- Abstract and advanced higher-level thinking
- Allowance for individual student interests
- Assignments geared to development in areas of affect, creativity, cognition, and research skills
- Complex, in-depth assignments
- Diverse enrichment that broadens learning
- Variety in types of resources
- Open-ended questions for higher-level thinking
- Higher-level text

Students at Risk of School Failure

- Small group instruction
- Frequent breaks
- Increased parent communication
- Daily log

Diversity and Inclusion:

- Involve families in student learning
- Respect cultural traditions
- Provide students with necessary academic resources and materials
- Allow for alternative assignments
- Provide visuals
- Assign peer tutor
- Collaborate with language professionals and ESL teachers
- Establish a positive connection with parent
- Utilize closed captioning when available
- Provide road maps or outlines for difficult concepts
- Provide sufficient wait time before calling on any student to help keep students who may need more time engaged
- Speak clearly and slowly, avoid slang and idiomatic expressions
- Create a nurturing environment with structured routines

Unit 4 Core Instructional and Supplemental Materials and Additional Resources

Instructional Materials

- Textbook
- Textbook resources
- Laboratory manuals and equipment
- Translation apps (Google etc)

Supplemental Materials

- School databases
- Multimedia Resources
- Printers and Computers
- Online Resources and videos
- Interactive Projector
- Rubrics
- POGIL
- Science Websites:
 - ACS Chemistry for Life
 - Periodic table
 - PBS Learning Media
 - Khan Academy
 - Bozeman Science
 - Science Magazine
 - US National Science Foundation
 - Newsela
 - Next Generation Science Standards
 - Chem Spider
 - Amoeba Sisters
 - HHMI
 - Gizmos

- Edpuzzle

Intervention Materials

- Anchor activities: Anchor activities provide meaningful options for students when they are not actively engaged in classroom activities (e.g., when they finish early, are waiting for further directions, are stumped, first enter class, or when the teacher is working with other students). Anchors should be directly related to the current learning goals.
- Choices of review activities: Different review or extension activities are made available to students during a specific section of the class (such as at the beginning or end of the period).
- Homework options: Students are provided with choices about the assignments they complete as homework. Or, students are directed to specific homework based on student needs.
- Student-teacher goal setting: The teacher and student work together to develop individual learning goals for the student.
- Flexible grouping: Students might be instructed as a whole group, in small groups of various permutations (homogeneous or heterogeneous by skill or interest), in pairs or individuals. Any small groups or pairs change over time based on assessment data.
- Varied computer programs: The computer is used as an additional center in the classroom, and students are directed to specific websites or software that allows them to work on skills at their level.
- Varying scaffolding of same organizer: Provide graphic organizers that require students to complete various amounts of information. Some will be more filled out (by the teacher) than others.
- Think-Pair-Share by readiness, interest, and/or learning profile: Students are placed in pre-determined pairs, asked to think about a question for a specific amount of time, then are asked to share their answers first with their partner and then with the whole group.
- Games to practice mastery of information and skill: Use games as a way to review and reinforce concepts. Include questions and tasks that are on a variety of cognitive levels.
- Multiple levels of questions: Teachers vary the sorts of questions posed to different students based on their ability to handle them. Varying questions is an excellent way to build the confidence (and motivation) of students who are reluctant to contribute to class discourse. Note: Most teachers would probably admit that without even thinking about it they tend to address particular types of questions to particular students. In some cases, such tendencies may need to be corrected. (For example, a teacher may be unknowingly addressing all of the more challenging questions to one student, thereby inhibiting other students' learning and fostering class resentment of that student.)
- Stations/ Learning Centers: A station (or simply a collection of materials) that students might use independently to explore topics or practice skills. Centers allow

individuals or groups of students to work at their own pace. Students are constantly reassessed to determine which centers are appropriate for students at a particular time, and to plan activities at those centers to build the most pressing skills.

Social and Emotional Learning New Jersey SEL

Competencies and Sub-Competencies Social and emotional learning (SEL) involves the process through which children and adults acquire and apply the knowledge, attitudes and skills necessary to understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions. The purpose of the SEL competencies is to provide schools with guidelines for integrating SEL across grades and subject areas.

Self-Awareness

- Recognize one's feelings and thoughts
- Recognize the impact of one's feelings and thoughts on one's own behavior
- Recognize one's personal traits, strengths and limitations
- Recognize the importance of self-confidence in handling daily tasks and challenges

Self-Management

- Understand and practice strategies for managing one's own emotions, thoughts and behaviors
- Recognize the skills needed to establish and achieve personal and educational goals
- Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals

Social Awareness

- Recognize and identify the thoughts, feelings and perspectives of others
- Demonstrate awareness of the differences among individuals, groups and others' cultural backgrounds
- Demonstrate an understanding of the need for mutual respect when viewpoints differ
- Demonstrate an awareness of the expectations for social interactions in a variety of settings

Responsible Decision-Making

- Develop, implement and model effective problem solving and critical thinking skills
- Identify the consequences associated with one's actions in order to make constructive choices
- Evaluate personal, ethical, safety and civic impact of decisions

Relationship Skills

- Establish and maintain healthy relationships
- Utilize positive communication and social skills to interact effectively with others
- Identify ways to resist inappropriate social pressure
- Demonstrate the ability to prevent and resolve interpersonal conflicts in constructive ways
- Identify who, when, where, or how to seek help for oneself or others when needed

Teacher Notes

Ocean Academy Charter High School
Curriculum Guide
Grade 10-12

