Unit 05: Marine Ecology

Content Area: **Science**
Course(s):
Time Period: **Marking Period 2**
Length: **3 weeks**
Status: **Published**

Brief Summary of Unit

Students will learn about the interdependence of organisms with each other and their surroundings in the ocean. Symbiotic relationships, nutrient cycles, succession of marine ecosystems, and food webs of the sea will be explored. Students will also explore the impact of climate change on ocean food chains.

June 2024

Essential Questions

Essential Questions:

How are marine organisms interdependent on each other?

How is a food pyramid of marine organisms similar to a food pyramid of land organisms?

Why do some marine organisms migrate and how are some symbiotic relationships influenced by migration patterns?

How are some relationships influenced by physical oceanography?

Enduring Understandings:

Biological interactions are based on survival and reproduction

Survival and reproduction are dependent on the availability of resources for which organisms compete

Energy is lost as heat from on link in the food chain to the next over time

Students Will Know / Students Will Be Skilled At

Students will know the difference between marine algae and seaweed.

Students will know the importance of some seaweed products to man and nature.

Students will know the importance of plankton to the ecosystem and humans.

Students will be skilled at naming different types of marine symbiosis and giving examples of each.

Students will be skilled at the topics and concepts of marine ecology by defining the following key terms: food pyramid, mutualism, commensalism, parasitism, ecological succession, trophic levels, climax community, holoplankton, meroplankton, planktonic, benthic, nektonic.

Students will be skilled at identifying the groupings of algae.

Learning Plan

Meaningful participation in guided question/answer sessions, individual/group discussions, demonstrating an understanding of the purpose of the unit lesson(s), key terms, and concepts.

Preview the essential questions, provide answers, and connect to learning throughout the unit.

Discuss marine ecology, trophic levels, interactions, and the 5-kingdom system.

Activity: Building a marine food web.

Discuss ecological succession and symbiosis.

Calculating the available energy within each trophic level and amounts of energy transfer to successive trophic levels.

Google Slides Presentation: Marine seaweed and/or Seaweed Projects.

Optional Activity: Find the agar in household products and foods.

Differentiate between phytoplankton and zooplankton and identify meroplankton with its adult form.

Discuss various types of marine symbiosis listing examples of each.

Learn about various commercial uses of seaweed and their ecological functions.

Climate Change Lab Activity: Algae and oceanic pH - exploring the relationship between plant growth and ocean acidity

Evidence / Performance Tasks

Formative Assessments:

Worksheets

Do Nows

Exit Tickets

Class Discussions

Complete daily classwork and regular homework assignments related to the identification of concepts learned in the natural setting, vocabulary, problem solving, and critical thinking.

Quiz on the characteristics of oceanic food chains and food webs and how ecological succession occurs in marine environments.

Summative:

Unit Test on the economic importance of seaweed products as a resource & assembling trophic levels of marine organisms.

Bench Marks:

Midterm/Final Exam

Alternative:

Use a marine community of interest to create a large food web consisting of several food chains; illustrating (choice of visually or digitally) how ecological succession would occur in a particular marine community of choice

Materials

Textbook, *Essentials of Oceanography (13th Ed.), Trujillo and Thurman and ancillary materials*

Earth Science, Merrill, and ancillary resource materials

Earth Science, Prentice-Hall, and ancillary resource materials

quantitative/qualitative lab equipment for activities, experiments

related oceanography maps, ocean current charts

Informational & interactive Website: noaa.gov

Standards

MATH.9-12.S.ID.A	Summarize, represent, and interpret data on a single count or measurement variable

ELA.L.SS.11–12.1	Demonstrate command of the system and structure of the English language when writing or speaking.
ELA.L.KL.11–12.2	Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.
ELA.L.VL.11–12.3	Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11–12 reading and content, including technical meanings, choosing flexibly from a range of strategies.
MATH.9-12.S.ID.C	Interpret linear models
MATH.9-12.S.IC.A	Understand and evaluate random processes underlying statistical experiments
MATH.9-12.S.IC.B	Make inferences and justify conclusions from sample surveys, experiments, and observational studies
ELA.RL.CR.11–12.1	Accurately cite strong and thorough textual evidence and make relevant connections to strongly support a comprehensive analysis of multiple aspects of what a literary text says explicitly and inferentially, as well as interpretations of the text; this may include determining where the text leaves matters uncertain.
ELA.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.
MATH.9-12.S.CP.A	Understand independence and conditional probability and use them to interpret data
ELA.W.AW.11–12.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
MATH.9-12.S.MD.A	Calculate expected values and use them to solve problems
ELA.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.
MATH.9-12.S.MD.B	Use probability to evaluate outcomes of decisions
ELA.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.
ELA.SL.PE.11–12.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
ELA.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.
ELA.SL.AS.11–12.6	Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.
SCI.HS-PS3-3	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
SCI.HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
SCI.HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
SCI.HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

SCI.HS-LS2-3	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
SCI.HS-LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
SCI.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.
SCI.HS-LS2-6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
SCI.HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
SCI.HS-LS2-8	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
SCI.HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.
SCI.HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
SCI.HS-LS4-1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
SCI.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.
SCI.HS-LS4-3	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
SCI.HS-LS4-4	Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
SCI.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.
SCI.HS-LS4-6	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
SCI.HS-ESS1-6	Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.
SCI.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.
SCI.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.
SCI.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.
SCI.HS-ESS2-6	Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
SCI.HS-ESS2-7	Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.
SCI.HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity.

SCI.HS-ESS3-3	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
SCI.HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other natural systems.
SCI.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.
SCI.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).
SCI.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.
WRK.9.2.12.CAP.4	Evaluate different careers and develop various plans (e.g., costs of public, private, training schools) and timetables for achieving them, including educational/training requirements, costs, loans, and debt repayment.
WRK.9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.
TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.CI.2	Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8).
TECH.9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
	Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.
	Digital tools differ in features, capacities, and styles. Knowledge of different digital tools is helpful in selecting the best tool for a given task.
	Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.
	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.
	Collaborative digital tools can be used to access, record and share different viewpoints and to collect and tabulate the views of groups of people.

Suggested Strategies for Modification

https://docs.google.com/spreadsheets/d/1BoXlgGboaurkHWyNqQpnIzI77z6Lb7Dg_ExD7n7FQJw/edit?usp=sharing

Additional modifications may be made based on individual needs of students as stated in student IEP (Individualized Education Program) documentation and as observed by the teacher:

Student directed research/presentation (power point, skit, demonstration) - Recent Scientific Contributions.

Design your own lab experiment

modified tests

cooperative learning groups

one-to-one instruction and assistance

additional time on task

alternative outcome options

individualized student assessment

preferential seating

handouts of class materials

guided notes

visual aides

computer web search