MARE Open Ocean Curricula
Grade 5

Activity Synopsis & Concepts Correlated to the National Science Standards

Synopsis and Key Concepts	National Science Standards Correlation
Activities from MARE/GEMS *Only One Ocean* guide	
APPLES AND OCEANS In this activity, students first brainstorm what they know and value about the ocean and discover where most of life is found in the ocean. Students then work in pairs, using an apple and a circle graph to represent the planet. They carefully section the apple and the graph into wedges representing various critical resources on the planet. These visuals give students an immediate sense of the small proportion of the Earth that provides resources from the land and the ocean. Students then design a mini-book or other creative writing to demonstrate what they've learned. • *Most of our planet is covered in ocean, but only a small fraction of the ocean supports large concentrations of life.*	**Earth and Space Science** **Structure of the Earth System:** • Water, which covers the majority of the earth's surface, circulates through the crust, oceans and atmosphere in what is known as the "water cycle." Water evaporates from the earth's surface, rises and cools as it moves to higher elevations, condenses as rain or snow, and falls to the surface where it collects in lakes, oceans, soil and in rocks underground. • Water is a solvent. As it passes through the water cycle it dissolves minerals and gases and carries them to the oceans. • Global patterns of atmospheric movement influence local weather. Oceans have a major effect on climate, because water in the oceans holds a large amount of heat. **Earth in the Solar System:** • The sun is the major source of energy for phenomena on the earth's surface such as growth of plants, winds, ocean currents, and the water cycle. **Science in Personal and Social Perspectives** **Populations, Resources, and Environments:** • When an area becomes overpopulated, the environment will become degraded due to the increased use of resources. • Causes of environmental degradation and resource depletion vary from region to region and from country to country **Natural Hazards:** • Human activities also can induce hazards through resource acquisition, urban growth, land-use decisions, and waste disposal. Such activities can accelerate many natural changes.

	• Natural hazards can present personal and societal challenges because misidentifying the change or incorrectly estimating the rate and scale of change may result in either too little attention and significant human costs or too much cost for unneeded preventive measures.
SQUIDS—OUTSIDE AND INSIDE Students work in pairs to dissect a squid and investigate its adaptations: its structure and how all the parts function together to allow the squid to survive and thrive in its open-ocean environment. The squid is then honored as the students participate in a Calamari Festival. In the last session, the class explores the issues surrounding the squid fishery by role-playing and discussing the problem from different points of view. • *Pelagic creatures are organisms living in the open ocean.* • *Looking closely at an animal like the squid can tell us a lot about the adaptations needed to survive and thrive as a pelagic creature.* • *Many people depend on squids for food or for their livelihood. More discussion among these people will help create solutions to the problem of diminishing squid populations.*	**Life Science** **Structure and Function in Living Systems:** • Living systems at all levels of organization demonstrate the complementary nature of structure and function. Important levels of organization for structure and function include cells, organs, tissues, organ systems, whole organisms, and ecosystems. • Specialized cells perform specialized functions in multicellular organisms. Groups of specialized cells cooperate to form a tissue, such as muscle. Different tissues are in turn grouped together to form larger functional units, called organs. Each type of cell, tissue, organ has a distinct structure and set of functions that serve the organism as a whole. **Reproduction and Heredity:** • Reproduction is a characteristic of all living systems; because no individual organism lives forever, reproduction is essential to the continuation of every species. • In many species, including humans, females produce eggs and males produce sperm. **Regulation and Behavior:** • All organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment. • Behavior is one kind of response an organism can make to an internal or environmental stimulus. A behavioral response requires coordination and communication at many levels, including cells, organ systems, and whole organisms. Behavioral response is a set of actions determined in part by heredity and in part from experience. • An organism's behavior evolves through adaptation to its environment. How a species moves, obtains food, reproduces, and responds to danger are based in the species' evolutionary history. **Populations and Ecosystems:** • A population consists of all individuals of a species

	that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem. • Populations of organisms can be categorized by the function they serve in an ecosystem. Food webs identify the relationships among producers, consumers and decomposers in an ecosystem. • The number of organisms an ecosystem can support depends on the resources available and abiotic factors… Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem. **Diversity and Adaptations of Organisms:** • Millions of species of animals…are alive today. Although different species might look dissimilar, the unity among organisms becomes apparent from an analysis of internal structures, the similarity of their chemical process, and the evidence of common ancestry. • Biological adaptations include changes in structures, behaviors, or physiology that enhance survival and reproductive success in a particular environment. • Extinction of species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival **Science in Personal and Social Perspectives** **Populations, Resources, and Environments:** • When an area becomes overpopulated, the environment will become degraded due to the increased use of resources. • Causes of environmental degradation and resource depletion vary from region to region and from country to country. **Natural Hazards:** • Human activities also can induce hazards through resource acquisition, urban growth, land-use decisions, and waste disposal. Such activities can accelerate many natural changes. • Natural hazards can present personal and societal challenges because misidentifying the change or incorrectly estimating the rate and scale of change may result in either too little attention and significant human costs or too much cost for unneeded preventive measures.

	Science as Inquiry **Understandings about Scientific Inquiry:** • Different kinds of questions suggest different kinds of scientific investigations. Some investigations involve observing and describing objects, organisms, or events… • Current scientific knowledge and understanding guide scientific investigations.
WHAT'S THE CATCH Students sample various seafoods and discuss what they know about fishing and fisheries. They read about and discuss how real people have made a difference in improving one fishery. Students then work in small groups to become the "panel of experts" on one of five fisheries that are among the most overexploited ocean resources on the planet. Each student completes a poster for a group presentation at the "World Fishery Conference" and the class makes recommendations to help manage fisheries in sustainable ways. The students are also given the opportunity to clarify their own personal decisions and choices. • *Most large commercial ocean fisheries flourish where the interaction of currents and sunlight provide a productive environment.* • *Most of the ocean fisheries in the world are severely threatened due to overfishing or habitat loss, and most commercial fishing results in significant "bycatch."* • *Personal choices about what we eat can influence public policy and the sustainability of fisheries. Scientific information should be used to help make wise choices.*	**Life Science** **Structure and Function in Living Systems:** • Living systems at all levels of organization demonstrate the complementary nature of structure and function. Important levels of organization for structure and function include cells, organs, tissues, organ systems, whole organisms, and ecosystems. **Reproduction and Heredity:** • Reproduction is a characteristic of all living systems; because no individual organism lives forever, reproduction is essential to the continuation of every species. **Regulation and Behavior:** • An organism's behavior evolves through adaptation to its environment. How a species moves, obtains food, reproduces, and responds to danger are based in the species' evolutionary history. **Populations and Ecosystems:** • A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem. • Populations of organisms can be categorized by the function they serve in an ecosystem. Food webs identify the relationships among producers, consumers and decomposers in an ecosystem. • The number of organisms an ecosystem can support depends on the resources available and abiotic factors… Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem. **Diversity and Adaptations of Organisms:** • Extinction of species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival. **Science in Personal and Social Perspectives**

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	Science as Inquiry **Abilities Necessary to do Scientific Inquiry:** • Develop Descriptions, Explanations, Predictions, and Models Using Evidence • Think Critically And Logically To Make The Relationships Between Evidence And Explanations. • Recognize And Analyze Alternative Explanations And Predictions • Communicate Scientific Procedures And Explanations • Use Mathematics In All Aspects Of Scientific Inquiry **Understandings about Scientific Inquiry:** • Different kinds of questions suggest different kinds of scientific investigations. Some investigations involve observing and describing objects, organisms, or events… • Current scientific knowledge and understanding guide scientific investigations. • Mathematics is important in all aspects of scientific inquiry. • Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories. **National Geography Standards** **8. The Characteristics and Spatial Distribution of Ecosystems on Earth's Surface**
Activities from MARE/GEMS *Ocean Currents* guide	
PLANET OCEAN Students are introduced to the vastness of our planet's one, interconnected ocean and the importance of the ocean to all life on Earth. Students participate in a wide-ranging brainstorm about what they already know, value, and enjoy about the ocean. They work in teams to explore a globe using a global exploration worksheet as a guide. • *There is only one ocean! Our*	**Earth and Space Science** **Structure of the Earth System:** • Water, which covers the majority of the earth's surface, circulates through the crust, oceans and atmosphere in what is known as the "water cycle." Water evaporates from the earth's surface, rises and cools as it moves to higher elevations, condenses as rain or snow, and falls to the surface where it collects in lakes, oceans, soil and in rocks underground. • Global patterns of atmospheric movement influence local weather. Oceans have a major effect on climate, because water in the oceans holds a large amount of heat. **Earth in the Solar System:** • The sun is the major source of energy for phenomena

Earth is covered by one interconnected world ocean that circulates around all the continents.	on the earth's surface such as growth of plants, winds, ocean currents, and the water cycle. **Science in Personal and Social Perspectives** **Populations, Resources, and Environments:** • When an area becomes overpopulated, the environment will become degraded due to the increased use of resources. • Causes of environmental degradation and resource depletion vary from region to region and from country to country **National Geography Standards** **7. The Physical Processes that Shape the Patterns of Earth's Surface**
WASTE DISPOSAL Students discuss their personal experiences with currents and then make predictions about the best and worst locations in the ocean to dispose of waste from imaginary countries. They test their ideas with a simple model of an ocean and continents. Food coloring models the waste, and ice cubes are used to model temperature differences between water masses in the ocean. The students record the movement of the "waste" and then interpret and present their findings. Finally, the teacher uses the model ocean set on an overhead projector to show how wind sets water in motion. These wind-driven currents are projected onto a map of the Pacific Ocean Rim , modeling the major circulating patterns in the ocean. • *Things dumped into the ocean may be distributed by currents throughout the ocean.* • *Wind and the temperature differences between masses of water*	**Physical Science** **Transfer of Energy:** • Heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature. **Earth and Space Science** **Structure of the Earth System:** • Water which covers the majority of the earth's surface, circulates through the crust, oceans and atmosphere in what is known as the "water cycle." • Global patterns of atmospheric movement influence local weather. Oceans have a major effect on climate, because water in the oceans holds a large amount of heat. **Earth in the Solar System:** • The sun is the major source of energy for phenomena on the earth's surface, such as growth of plants, winds, ocean currents, and the water cycle. **Science in Personal and Social Perspectives** **Populations, Resources, and Environments:** When an area becomes overpopulated, the environment will become degraded due to the increased use of resources. Causes of environmental degradation and resource depletion vary from region to region and from country to country **Natural Hazards:**

are two factors that cause currents. • *Winds blowing across the surface of the ocean–combined with other factors–cause major circulating currents, or gyres.*	Human activities also can induce hazards through resource acquisition, urban growth, land-use decisions, and waste disposal. Such activities can accelerate many natural changes. **Science as Inquiry** **Abilities Necessary to do Scientific Inquiry:** • Develop Descriptions, Explanations, Predictions, and Models Using Evidence • Think Critically And Logically To Make The Relationships Between Evidence And Explanations. • Recognize And Analyze Alternative Explanations And Predictions • Communicate Scientific Procedures And Explanations **Understandings about Scientific Inquiry:** • Different kinds of questions suggest different kinds of scientific investigations. Some investigations involve observing and describing objects, organisms, or events… • Current scientific knowledge and understanding guide scientific investigations. • Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories.
CURRENT TRENDS This activity provides students with a range of experiences relating to salinity and temperature and model how these factors and their interactions affect density and the creation of real currents. Cooperative student groups examine the relationship between temperature, salinity, and density as rotate through three different activities and experiments set up as stations. The students create currents by combining water of different temperature and salinity, and discover how the force of the wind and differences in density affect motion at all levels. Students apply their knowledge as they make a poster describing how the station	**Physical Science** **Properties and Changes of Properties in Matter:** • A substance has characteristic properties, such as density…all of which are independent of the amount of the sample. A mixture of substances often can be separated into the original substances using one or more of the characteristic properties. **Motions and Forces:** • The motion of an object can be described by its position, direction of motion, and speed. **Transfer of Energy:** • Heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature. **Earth and Space Science** **Structure of the Earth System:** • Water which covers the majority of the earth's surface, circulates through the crust, oceans and atmosphere in what is known as the "water cycle." Water evaporates from the earth's surface, rises and cools as it moves to

activities relate to actual currents. • *Salinity and temperature differences create masses of water with different densities.* • *Gravity causes more dense water to sink below less dense water. As a result, the less dense water rises.*	higher elevations, condenses as rain or snow, and falls to the surface where it collects in lakes, oceans, soil and in rocks underground. • Global patterns of atmospheric movement influence local weather. Oceans have a major effect on climate, because water in the oceans holds a large amount of heat. **Earth in the Solar System:** The sun is the major source of energy for phenomena on the earth's surface such as growth of plants, winds, ocean currents, and the water cycle. **Nature of Science** • Scientists formulate and test their explanations of nature using observations, experiments, and theoretical and mathematical models. Although all scientific ideas are tentative and subject to change and improvement in principle, for most major ideas in science, there is much experimental and observational confirmation. • It is part of scientific inquiry to evaluate the results of scientific investigations, experiments, observations, theoretical models, and the explanations proposed by other scientists. Evaluation includes reviewing the experimental procedures, examining the evidence, identifying faulty reasoning, pointing out statements that go beyond the evidence, and suggesting alternative explanations for the same observations. Although scientists may disagree about explanations of phenomena, about interpretations of data, or about the value of rival theories, they do agree that questioning, response to criticism, and open communication are integral to the process of science. As scientific knowledge evolves, major disagreements are eventually resolved through such interactions between scientists. **Science as Inquiry** **Abilities Necessary to do Scientific Inquiry:** • Develop Descriptions, Explanations, Predictions, and Models Using Evidence • Think Critically And Logically To Make The Relationships Between Evidence And Explanations. • Recognize And Analyze Alternative Explanations And Predictions • Communicate Scientific Procedures And Explanations **Understandings about Scientific Inquiry:** • Different kinds of questions suggest different kinds of

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LAYERING LIQUIDS Students are challenged to apply information they have learned about different liquids to create four distinct layers in straw cylinders using only colored water and salt. In a followup discussion and demonstration, the concept of density is introduced at a molecular level, and students are guided to an understanding that explains the concrete phenomena they have witnessed. • *The ocean is made up of layers of water of different densities.* • *Cold water is denser than warm water.* • *Water with salt is denser than fresh water.* • *The more closely packed the molecules in a substance, the denser the substance.*	**Physical Science** **Properties and Changes of Properties in Matter:** • A substance has characteristic properties, such as density…all of which are independent of the amount of the sample. A mixture of substances often can be separated into the original substances using one or more of the characteristic properties. **Motions and Forces:** • The motion of an object can be described by its position, direction of motion, and speed. **Transfer of Energy:** • Heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature. **Nature of Science** • Scientists formulate and test their explanations of nature using observations, experiments, and theoretical and mathematical models. Although all scientific ideas are tentative and subject to change and improvement in principle, for most major ideas in science, there is much experimental and observational confirmation. • It is part of scientific inquiry to evaluate the results of scientific investigations, experiments, observations, theoretical models, and the explanations proposed by other scientists. Evaluation includes reviewing the experimental procedures, examining the evidence, identifying faulty reasoning, pointing out statements that go beyond the evidence, and suggesting alternative explanations for the same observations. Although scientists may disagree about explanations of phenomena, about interpretations of data, or about the value of rival theories, they do agree that questioning, response to criticism, and open communication are integral to the process of science. As scientific knowledge evolves, major disagreements are eventually resolved through such interactions between scientists.

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ICE CUBES This demonstration synthesizes what students have learned about density-related currents. Temperature and salinity are combined to look at the interactions that create ocean currents. Students make predictions about whether ice cubes will melt faster in fresh water or salt water and explain their reasoning. They watch an experiment and hypothesize about the results. *(Students write their own key concepts for this activity.)*	**Physical Science** **Properties and Changes of Properties in Matter:** • A substance has characteristic properties, such as density…all of which are independent of the amount of the sample. A mixture of substances often can be separated into the original substances using one or more of the characteristic properties. **Motions and Forces:** • The motion of an object can be described by its position, direction of motion, and speed. **Transfer of Energy:** • Heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature. **Nature of Science** • Scientists formulate and test their explanations of nature using observations, experiments, and theoretical and mathematical models. Although all scientific ideas are tentative and subject to change and improvement in principle, for most major ideas in science, there is much experimental and observational confirmation. • It is part of scientific inquiry to evaluate the results of scientific investigations, experiments, observations, theoretical models, and the explanations proposed by

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OCEAN ROUTES Students apply what they have learned about ocean currents to find the best routes for traveling across the ocean. They use information on wind-driven surface currents, density-driven deep currents, upwelling zones, and downwelling zones. Pairs of students go to different stations around the room at their own pace, drawing routes on their data sheet maps with colored pens. Students then share their ideas and routes and the actual routes are then discussed.	**Nature of Science** • **Science as a Human Endeavor:** Science requires different abilities, depending on such factors as the field of study and type of inquiry. Science is very much a human endeavor, and the work of science relies on basic human qualities, such as reasoning, insight, energy, skill, and creativity—as well as on scientific habits of mind, such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. **History of Science** • Many individuals have contributed to the traditions of science. Studying some of these individuals provides further understanding of scientific inquiry, science as a human endeavor, the nature of science, and the relationships between science and society. • In historical perspective, science has been practiced by different individuals in different cultures. In looking at the history of many peoples, one finds that scientists and engineers of high achievement are considered to be among the most valued contributors to their culture. **Science as Inquiry** **Abilities Necessary to do Scientific Inquiry:** • Develop Descriptions, Explanations, Predictions, and Models Using Evidence • Think Critically And Logically To Make The Relationships Between Evidence And Explanations. • Recognize And Analyze Alternative Explanations And Predictions • Communicate Scientific Procedures And Explanations **Understandings about Scientific Inquiry:** • Different kinds of questions suggest different kinds of

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MESSAGE IN A BOTTLE In this embedded assessment activity, students use world currents maps and the knowledge they have gained to make up their own fictional stories involving ocean currents. Students use their stories to express the main things they have learned about the ocean including information on ocean currents, their causes and effects; as well as discussing information relating to wind, density, temperature and salinity.	**Science as Inquiry** **Abilities Necessary to do Scientific Inquiry:** • Develop Descriptions, Explanations, Predictions, and Models Using Evidence • Think Critically And Logically To Make The Relationships Between Evidence And Explanations. • Recognize And Analyze Alternative Explanations And Predictions • Communicate Scientific Procedures And Explanations **Understandings about Scientific Inquiry:** • Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories. **National Language Arts Standards** **• Communication Skills** **• Evaluating Data** **• Applying Language Skills** **National Geography Standards** **7. The Physical Processes that Shape the Patterns of Earth's Surface**
SUPPLEMENTAL ACTIVITIES	
THE GREAT PLANKTON RACE	**Life Science** **Structure and Function in Living Systems:**

Students observe, sketch and categorize a diversity of plankton from video footage and transparency cutouts and focus on the adaptations to slow down how fast they sink. Students then construct plankton models from materials of various shapes and densities to simulate adaptations, which slow sinking. They then "race" their models and calculate and graph sinking rates. The students then make increasingly detailed observations of live plankton and relate what they have learned about plankton adaptations to the living organism. • *Plankton have adaptations which help them avoid sinking below the sunlit photic zone.*	• Living systems at all levels of organization demonstrate the complementary nature of structure and function. Important levels of organization for structure and function include cells, organs, tissues, organ systems, whole organisms, and ecosystems. • All organisms are composed of cells—the fundamental unit of life. Most organisms are single cells; other organisms, including humans are multicellular. **Reproduction and Heredity:** • Reproduction is a characteristic of all living systems; because no individual organism lives forever, reproduction is essential to the continuation of every species. • In many species, including humans, females produce eggs and males produce sperm. **Regulation and Behavior:** • All organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment. • An organism's behavior evolves through adaptation to its environment. How a species moves, obtains food, reproduces, and responds to danger are based in the species' evolutionary history. **Populations and Ecosystems:** • A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem. • Populations of organisms can be categorized by the function they serve in an ecosystem. Food webs identify the relationships among producers, consumers and decomposers in an ecosystem. • The number of organisms an ecosystem can support depends on the resources available and abiotic factors… Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem. **Diversity and Adaptations of Organisms:** • Millions of species of animals…are alive today. Although different species might look dissimilar, the unity among organisms becomes apparent from an analysis of internal structures, the similarity of their chemical process, and the evidence of common ancestry. • Biological adaptations include changes in structures,

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WHALE WITH CLASS In this activity, students first discuss what they already know about mammals and then work with a partner to change a terrestrial mammal so that it is adapted to a completely aquatic environment. The general categories of changes the students suggest are then used to describe marine mammal adaptations to the ocean. Students then take on	**Life Science** **Structure and Function in Living Systems:** • Living systems at all levels of organization demonstrate the complementary nature of structure and function. Important levels of organization for structure and function include cells, organs, tissues, organ systems, whole organisms, and ecosystems. • Specialized cells perform specialized functions in multicellular organisms. Groups of specialized cells cooperate to form a tissue, such as muscle. Different tissues are in turn grouped together to form larger functional units, called organs. Each type of cell, tissue,

the role of a specific body part of a whale and put all the parts together in a choreographed production demonstrating several behaviors and adaptations in a "movable whale" with the entire class. Finally, students work with a partner and choose a terrestrial mammal for which they make several drawings with written descriptions, each one 10 million years apart, until their animal is a highly specialized marine mammal. • *Evolution is change in an organism over time.* • *Over the last 50 million years, whales have evolved from land mammals into ocean mammals.*	organ has a distinct structure and set of functions that serve the organism as a whole. **Reproduction and Heredity:** • Reproduction is a characteristic of all living systems; because no individual organism lives forever, reproduction is essential to the continuation of every species. • In many species, including humans, females produce eggs and males produce sperm. **Regulation and Behavior:** • All organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment. • Behavior is one kind of response an organism can make to an internal or environmental stimulus. A behavioral response requires coordination and communication at many levels, including cells, organ systems, and whole organisms. Behavioral response is a set of actions determined in part by heredity and in part from experience. • An organism's behavior evolves through adaptation to its environment. How a species moves, obtains food, reproduces, and responds to danger are based in the species' evolutionary history. **Populations and Ecosystems:** • A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem. • Populations of organisms can be categorized by the function they serve in an ecosystem. Food webs identify the relationships among producers, consumers and decomposers in an ecosystem. **Diversity and Adaptations of Organisms:** • Millions of species of animals…are alive today. Although different species might look dissimilar, the unity among organisms becomes apparent from an analysis of internal structures, the similarity of their chemical process, and the evidence of common ancestry. • Biological evolution accounts for the diversity of species developed through gradual processes over many generations. Species acquire many of their unique characteristics through biological adaptation, which involves the selection of naturally occurring variations

	in population. Biological adaptations include changes in structures, behaviors, or physiology that enhance survival and reproductive success in a particular environment. Biological adaptations include changes in structures, behaviors, or physiology that enhance survival and reproductive success in a particular environment. • Extinction of species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival **History and Nature of Science** • **Science as a Human Endeavor:** Science requires different abilities, depending on such factors as the field of study and type of inquiry. Science is very much a human endeavor, and the work of science relies on basic human qualities, such as reasoning, insight, energy, skill, and creativity—as well as on scientific habits of mind, such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas. **Nature of Science** • Scientists formulate and test their explanations of nature using observations, experiments, and theoretical and mathematical models. Although all scientific ideas are tentative and subject to change and improvement in principle, for most major ideas in science, there is much experimental and observational confirmation. • It is part of scientific inquiry to evaluate the results of scientific investigations, experiments, observations, theoretical models, and the explanations proposed by other scientists. Evaluation includes reviewing the experimental procedures, examining the evidence, identifying faulty reasoning, pointing out statements that go beyond the evidence, and suggesting alternative explanations for the same observations. Although scientists may disagree about explanations of phenomena, about interpretations of data, or about the value of rival theories, they do agree that questioning, response to criticism, and open communication are integral to the process of science. As scientific knowledge evolves, major disagreements are eventually resolved through such interactions between scientists.
BUILDAN OPEN OCEAN Students review what they have	**Life Science** **Structure and Function in Living Systems:** • Living systems at all levels of organization

learned about open ocean organisms and take a virtual field trip while keeping "field notes" with a partner. Students then research an open ocean organ ism, complete a page for the class Field Guide, and participate in presentations to the class. Students then transform the classroom into an open ocean as they create 3-dimensional organisms. • *The open ocean is home to many different organisms that interact with one another as predators, prey or competitors.*	demonstrate the complementary nature of structure and function. Important levels of organization for structure and function include cells, organs, tissues, organ systems, whole organisms, and ecosystems. • Specialized cells perform specialized functions in multicellular organisms. Groups of specialized cells cooperate to form a tissue, such as muscle. Different tissues are in turn grouped together to form larger functional units, called organs. Each type of cell, tissue, organ has a distinct structure and set of functions that serve the organism as a whole. **Reproduction and Heredity:** • Reproduction is a characteristic of all living systems; because no individual organism lives forever, reproduction is essential to the continuation of every species. **Regulation and Behavior:** • All organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment. • Behavior is one kind of response an organism can make to an internal or environmental stimulus. A behavioral response requires coordination and communication at many levels, including cells, organ systems, and whole organisms. Behavioral response is a set of actions determined in part by heredity and in part from experience. • An organism's behavior evolves through adaptation to its environment. How a species moves, obtains food, reproduces, and responds to danger are based in the species' evolutionary history. **Populations and Ecosystems:** • A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem. • Populations of organisms can be categorized by the function they serve in an ecosystem. Food webs identify the relationships among producers, consumers and decomposers in an ecosystem. **Diversity and Adaptations of Organisms:** • Millions of species of animals…are alive today. Although different species might look dissimilar, the unity among organisms becomes apparent from an analysis of internal structures, the similarity of their

	chemical process, and the evidence of common ancestry. **Science as Inquiry** **Abilities Necessary to do Scientific Inquiry:** • Develop Descriptions, Explanations, Predictions, and Models Using Evidence • Think Critically And Logically To Make The Relationships Between Evidence And Explanations. • Communicate Scientific Procedures And Explanations • Use Mathematics In All Aspects Of Scientific Inquiry **Understandings about Scientific Inquiry:** • Different kinds of questions suggest different kinds of scientific investigations. Some investigations involve observing and describing objects, organisms, or events… • Current scientific knowledge and understanding guide scientific investigations. • Mathematics is important in all aspects of scientific inquiry. • Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories. **National Language Arts Standards** **• Communication Skills** **• Evaluating Data** **• Applying Language Skills**