Ponds
Grade K

Synopsis and Key Concepts	CA State Standards Correlation
WATER WATER EVERYWHERE Students participate in a brainstorm about water and its importance and then rotate to three different activity stations to explore some of the interesting properties of water. In Sink or Float, students have the opportunity to first predict and then find out what happens when a variety of objects are placed in a tub of water. In Boat Building, students explore what kinds of shapes make the best boats, and how much you can load in them before they sink. In Water Drops, students use water droplets and toothpicks to discover how water is attracted to itself. The Fill'er Up activity provides students the opportunity to apply what they have learned about predictions and how scientists work, as they discover the concept of volume. • *Water is a very important and interesting liquid.* • *Scientists make careful observations using their five senses.* • *Some materials tend to float, other materials tend to sink.* • *Whether or not something sinks or floats depends on the material, not on the size of the object.* • *Water drops are attracted to one another.* • *We can make predictions and then measure the amount of water that different shapes will hold.*	**1. Physical Science:** Properties of materials can be observed, measured, and predicted. a. objects can be described in terms of the materials they are made of and their physical properties. **4.Investigation and Experimentation**: a. observe common objects by using 5 senses, b. describe the properties of common objects, c. describe the relative position of objects by using one reference, d. compare and sort common objects by one physical attribute, e. communicate observations orally and through drawings
POND HOMES Students listen to a story about ponds and participate in a whole class discussion about what they think they know about ponds and what they want to learn. The concept of habitat is introduced and the students work together in small groups to create desktop ponds. The students begin	**2. Life Sciences**: Different types of plants and animals inhabit the earth. a. observe and describe similarities and differences in the appearance and behavior of plants and animals. c. major structures of common plants and animals

to use a science journal for drawing their observations and making predictions about what they think will happen as they add worms, snails and fish to the pond over the course of a few sessions. Students are introduced to the concept of adaptations as they observe the animals' structures and behaviors and use their journals to keep track of the changes they see. • *The neighborhood where an animal lives is called a habitat and has everything an animal needs to survive.* • *An animal's habitat must provide food, water, shelter and space.* • *Our desktop ponds are models of real ponds.* • *Scientists create models of organisms and habitats so that they can learn more about them.* • *It is important to write down observations using words and drawings so we can tell others about what we have discovered.* • *Animals have special parts or ways of acting that help them to survive in their habitat. These are called adaptations.*	can be identified. **4.Investigation and Experimentation**: a. observe common objects by using 5 senses, b. describe the properties of common objects, c. describe the relative position of objects by using one reference, d. compare and sort common objects by one physical attribute, e. communicate observations orally and through drawings
BUILD A POND Children use their imaginations and what they have learned about ponds to guess the names of an assortment of animals they encounter while pretending to live in a pond. Students are then introduced to a large construction paper pond, the center stage for the upcoming Pond Drama. They help to populate the pond by creating colorful 3-d paper and clay models of the plants and animals that live there. The Pond becomes the site around which the students hear stories and learn more about the life cycles and adaptations of these plants and animals. Students then act our their own pond dramas while adding the plants and animals they created to the classroom model pond. • *A three-dimensional organism made out of paper is a kind of model.* • *Pond organisms interact with each other in their pond habitat.*	**2. Life Sciences:** Different types of plants and animals inhabit the earth. a. observe and describe similarities and differences in the appearance and behavior of plants and animals.2 b. stories sometimes give plants and animals attributes that they do not really have. c. major structures of common plants and animals can be identified. **4.Investigation and Experimentation**: a. observe common objects by using 5 senses, b. describe the properties of common objects, c. describe the relative position of objects by using one reference, d. compare and sort common objects by one physical attribute, e. communicate observations orally

	and through drawings
LIVING IN WATER HABITATS Students observe their living ponds again and are reminded of the diversity of pond organisms as they work in small groups to sort pond illustrations. If your school is participating in an Ocean Immersion, students are then told that the rest of the school is also studying water homes. But instead of studying fresh water ponds, they are studying salt water homes in the ocean. The students compare ponds and the ocean as they make a bulletin board. They then have the opportunity to visit other classrooms in the school and ask the "experts" on those habitats about the organisms that live there. The class comes back together to debrief their grade/habitat visits and discuss what the animals in one group or habitat have in common. The activity ends with a water homes bingo game to check for understanding and reinforce concepts. • *Living things are called organisms. Organisms can be animals, plants or living things that look like plants.* • *Plant-like organisms are called algae.* • *The water in ponds is fresh water* • *Many different organisms live in fresh water.* • *Some animals live in fresh water and some animals live in salt water.* • *The water in the ocean is salty.* • *There are many different habitats in the ocean.* • *Different kinds of organisms live in different ocean habitats.*	**2. Life Sciences:** Different types of plants and animals inhabit the earth. a. observe and describe similarities and differences in the appearance and behavior of plants and animals. c. major structures of common plants and animals can be identified. **3. Earth Sciences:** earth is composed of land, air, and water. a. (partly covered) characteristics of mountains rivers, oceans, valleys, deserts and local landforms. **4.Investigation and Experimentation**: d. compare and sort common objects by one physical attribute, e. communicate observations orally and through drawings
ADOPT–A–PLAYGROUND Students are taken on a "virtual tour" of their teacher's backyard as they look at a map of the teacher's yard and listen to a narrative description. Students then help make a map of their own schoolyard and are taken on a trip around the school to check if additional things should be	**3. Earth Sciences:** Earth is composed of land, air, and water. c. some resources from Earth are used in everyday life and many resources can be conserved. **4.Investigation and Experimentation**: a. observe

added, including litter. Students are also asked to think about the best place to add a pond to the schoolyard and they write a letter to the principal, suggesting why it would be a good idea. In "Litter in Our Habitat", students discover that someone has added litter to their 3-dimensional paper pond. A discussion and circle chat about litter ensues and the students try to figure out what they could do to help make sure that litter doesn't come out to play in their school and neighborhood. Students then investigate and help sort the contents of the "Teacher's Room" wastebasket into recyclable, re-usable, compostable and other. The session ends with students removing the litter from the 3-dimensional pond and discussing how throwing a piece of litter on the schoolyard or street could affect animals living in ponds. • *Litter may harm land animals or be carried by the wind to ponds where it can harm the animals living there.* • *We need to take care of our own home and schools the same way we take care of all habitats.*	common objects by using 5 senses, b. describe the properties of common objects, c. describe the relative position of objects by using one reference, d. compare and sort common objects by one physical attribute, e. communicate observations orally and through drawings

ROCKY SEASHORE
Grade 1

Synopsis and Key Concepts	CA State Standards Correlation
ACTIVITY 1: SEASHORE CHARADES Students learn about the rocky seashore as they enter the habitat through a simulated field trip using slides illustrating how organisms living there are adapted to survive among crashing waves and changing tides and how to escape being someone's lunch. Students take turns acting out the adaptations of creatures living there as the teacher directs the action. • *The place where animals find the shelter, food and water that they need is called a habitat.* • *The rocky seashore is a habitat with very special animals and seaweeds.* • *There are high tides and low tides and crashing waves at the rocky seashore.* • *The special things animals have or the way they act that help them to survive the crashing waves and changing tides are called adaptations.*	**2. Life Sciences:** Plants and animals meet their needs in different ways. a. different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places. b. both plants and animals need water, animals need food and plants need light. c. animals eat plants or other animals for food and may also use plants or even other animals for shelter. **Reinforces K Earth Science Standards:** The earth is composed of land, air and water. 3a. characteristics of mountains, rivers, oceans, valleys, deserts and local landforms
ACTIVITY 2: SEASHORE SLEUTHING Students observe the properties of rocks and sand and make candy "sand" to investigate the forces of erosion. Students cycle through three hands-on activity stations looking closely at sand, gravel and beach drift that will eventually become sand and participate in a guided investigation to find out how the rising and falling tides "behave" differently in sand versus gravel. Students hide plastic seashore animals under sand, gravel and rocks and observe which substrate is safest when hit by thundering waves (buckets of water). • *Rocks, shells and other beach drift become sand as they are broken into smaller pieces by the crashing waves.* • *There are different kinds of seashores–some are sand, some are gravel and some are rocky.* • *Different types of animals, seaweed and plants are adapted*	**2. Life Sciences:** Plants and animals meet their needs in different ways. a. different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places. **4. Invest. & Experiment.:** Scientific progress is made by asking meaningful questions and conducting careful investigations. a. draw pictures, b. record observations in various ways, d. make new observations

to live at different types of seashores. • *Sand, gravel and larger rocks provide very different places for organisms to live. Sand holds water better than gravel and is a safer place to survive crashing waves.*	when discrepancies arise. **Introduction to Grade 2 Earth Science Standards:** Earth is made of materials that have distinct properties 3a. how to compare the physical properties of different kinds of rocks. b. smaller rocks come from the breakage and weathering of larger rocks, c. soil (sand) is made partly from weathered rock and partly from organic materials, and that soils (sands) differ in their color, texture, capacity to retain water, and ability to support the growth of many kinds of plants.
ACTIVITY 3: CRAYFISH CAPERS Students work in small groups to create a habitat for crayfish. They carefully observe and draw the crayfish's external anatomy and describe their behavior to discover the ways a crayfish is adapted to live in a water home. • Crayfish are living creatures that must be treated with respect. • Crayfish have special adaptations to survive in their freshwater habitat. • Crayfish have many special parts and behaviors that are the same as other crustaceans, but they also very different	**2. Life Sciences:** Plants and animals meet their needs in different ways. a. different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places. **4. Invest. & Experiment.:** Scientific progress is made by asking meaningful questions and conducting careful investigations. a. draw pictures, b. record observations in various ways, d. make new observations when discrepancies arise.
ACTIVITY 4: WHO AM I? In this jigsaw activity, students work in small groups to teach each other about some important traits and adaptations of rocky seashore creatures. They participate in a game show and a 20-question guessing game to check for understanding. • *The rocky seashore is a habitat with many, very different*	**2. Life Sciences:** Plants and animals meet their needs in different ways. a. different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places.

creatures. • *Each rocky seashore animal has special adaptations for living there.* • *Encouraging others helps everyone to be a winner!*	b. both plants and animals need water, animals need food and plants need light. c. animals eat plants or other animals for food and may also use plants or even other animals for shelter.
ACTIVITY 5: TIDEPOOL BOOGIE Tidepool Boogie focuses on eight different organisms representative of the diversity in this unique and rigorous habitat. Students listen to and talk about the song "Tidepool Boogie" and then work together in small groups to act out the organisms in the song. The class then stages a performance, complete with costumes. • *There are many, very different types of animals and seaweeds that make their home at the rocky seashore.*	**2. Life Sciences:** Plants and animals meet their needs in different ways. a. different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places. b. both plants and animals need water, animals need food and plants need light. c. animals eat plants or other animals for food and may also use plants or even other animals for shelter.
ACTIVITY 6: BUILD A ROCKY SEASHORE Students widen the focus of their study of the rocky seashore habitat as they play Seashore Bingo and sort animal and seaweed pictures into the zones where the animals actually live on the shore. They then build a 3-d rocky seashore and place organisms in the correct tidal zones. Students work as individuals and in groups to create a Field Trip Guide for other classes to use when visiting their rocky seashore classroom. • *The rocky seashore is a neighborhood that is home to many kinds of seaweeds and animals.* • *Seaweeds and animals of the rocky seashore live in a special spot or zone within the habitat.* • *Rules help to protect rocky seashore organisms and people visiting them*	**2. Life Sciences:** Plants and animals meet their needs in different ways. a. different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places. b. both plants and animals need water, animals need food and plants need light. c. animals eat plants or other animals for food and may also use plants or even other animals for shelter.

Overview
Life Science 2a, b, c [*Activities: 1, 2 (2a), 3 (2a), 4, 5, 6]*
Investigation 4a, b, d [*Activities 2, 3]*
Reinforces K Earth Science 3a [*Activity 1]*
Introduction to Grade 2 Earth Science 3a, b, c [*Activity 2]*

Sandy Beach
Grade 2

Synopsis and Key Concepts	CA State Standards Correlation:
ACTIVITY 1: BEACH BUCKET SCAVENGER HUNT In this activity students are introduced to the vastness of our planet's ocean and to the characteristics of one type of shoreline we call a beach. They work in small cooperative groups to explore a simulated sandy beach in a plastic tub that is littered with beach drift and debris. Through a sorting activity, they discover that biotic objects found on the sandy beach can be grouped into those that represent evidence of plant live, evidence of animal life and evidence of humans. They discover the differences between abiotic and biotic objects. • *Objects found on the sandy beach can be grouped into: evidence of plant life, evidence of animal life, evidence of humans, and non-living material.* • *Sand is made up of tiny bits of everything that is found on the beach.*	**4. Investigation and Experimentation:** a. make predictions based on observed patterns and not random guessing, b. measure length with appropriate tools and express those measurements in standard metric system units, c. compare and sort common objects according to two or more physical attributes, d. write or draw descriptions of a sequence of steps, events, and observations, f. use magnifiers or microscopes to observe and draw descriptions of small objects or small features of objects, g. follow oral instructions for a scientific investigation.
ACTIVITY 2: SAND ON STAGE Students use hand lenses or microscopes to compare the color, size and shape of several sand samples. They then use rock and mineral kits and magnets and perform tests to guess about the origin and composition of "their" sample. They record their findings on a student sheet and then draw a sequence of pictures of how the sand they examined might have been formed and what the beach looked like where it was collected. • *Sand grains can be made of animals, plants, rocks or minerals.* • *Sand grains come in many different shapes, sizes, and colors.* • *Differences between sand grains can be clues about where the sand came from and how it got to the beach.*	**3. Earth Sciences:** Earth is made of materials that have distinct properties a. how to compare the physical properties of different kinds of rocks and that rock is composed of different types of minerals. b. smaller rocks come from the breakage and weathering of larger rocks, c. soil (sand) is made partly from weathered rock and partly from organic materials, and that soils (sands) differ in their color, texture, capacity to retain water, and ability to support the growth of many kinds of plants, e. rock, water, plants and soil provide many resources, including food, fuel, and building materials, that humans use.

	4. Investigation and Experimentation: a. make predictions based on observed patterns and not random guessing, b. measure length with appropriate tools and express those measurements in standard metric system units, c. compare and sort common objects according to two or more physical attributes, d. write or draw descriptions of a sequence of steps, events, and observations, f. use magnifiers or microscopes to observe and draw descriptions of small objects or small features of objects, g. follow oral instructions for a scientific investigation. **1. Physical Sciences:** f. magnets can be used to make some objects move without being touched.
ACTIVITY 3: HERMIT CRABS IN THE CLASSROOM Students construct temporary homes for visiting hermit crabs. They become student scientists while making guided observations, and biological illustrators while sketching their crabs. Students then help create a permanent home for the hermit crabs and learn about the care of these animals. • A habitat is a home and has everything an animal needs to survive. • Each kind of animal has its own very special needs for food, water, air and shelter. • If we want to keep a hermit crab happy and healthy in the classroom, we need to learn about how it lives in its real sandy beach habitat.	**4. Investigation and Experimentation:** a. make predictions based on observed patterns and not random guessing, b. measure length with appropriate tools and express those measurements in standard metric system units, c. compare and sort common objects according to two or more physical attributes, d. write or draw descriptions of a sequence of steps, events, and observations, f. use magnifiers or microscopes to observe and draw descriptions of small objects or small features of objects, g. follow oral instructions for a scientific investigation.

ACTIVITY 4: SHELL SORTING Students explore shell collections and shell reference books and then work with a partner to answer a series of guided questions about shelled animals including what they want to know about shells and the animals that make them. They then work in cooperative groups to creatively decide how to sort a basket of shells into categories related to each other in some way. Each student in the group then picks one of the categories to illustrate and name. Students from each group have the opportunity to visit each other's shell museum and guess what criteria the groups based their categories on. This session ends with more specific information about the shelled organisms, including how scientists classify them. • *Shells come in many different shapes because each is made by a different kind of animal.* • *Scientists sort animals into groups based on features of the animal they can observe.* • *Related organisms may not look exactly alike, but they have many features in common.*	**2. Life Sciences: Plants and animals have predictable life cycles** a. organisms reproduce offspring of their own kind and the offspring resemble their parents and one another, c. many characteristics of an organism are inherited from the parents, and some characteristics are caused or influenced by the environment, d. there is variation among individuals of one kind within a population. **4. Investigation and Experimentation:** a. make predictions based on observed patterns and not random guessing, b. measure length with appropriate tools and express those measurements in standard metric system units, c. compare and sort common objects according to two or more physical attributes, d. write or draw descriptions of a sequence of steps, events, and observations, f. use magnifiers or microscopes to observe and draw descriptions of small objects or small features of objects, g. follow oral instructions for a scientific investigation.
ACTIVITY 5: EARS TO YOU Students work cooperatively to teach each other about the adaptations that seals and sea lions have for living in the ocean, and about the differences between seals and sea lions. Then students participate in a game show to check for understanding. • *Seals and sea lions are mammals that have special ways of surviving in the ocean.* • *Seals and sea lions have many things in common, but they are not exactly the same.*	**Reinforces Grade 1 Life Sciences:** 2. Plants and animals meet their needs in different ways. a. different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places. b. both plants and animals

	need water, animals need food and plants need light. c. animals eat plants or other animals for food.
ACTIVITY 6: BUILD A SANDY BEACH This activity transforms your classroom into a sandy beach habitat as the students construct three-dimensional, magnified models of organisms that live below the sand as well as models of the living and dead organisms that make up the beach wrack washed ashore by the waves. Student presentations and two games Who am I? and Twenty Questions reinforce growing student knowledge about sandy beach organisms, their interactions and their habitat. • *Sandy beaches- and the beach wrack that washes ashore on them-provide homes to many kinds of organisms.* • *Most of the animals living at the sandy beach are hidden from view under the sand to escape the pounding surf and hungry birds.*	**Reinforces Grade 1 Life Science Standards:** 2. Plants and animals meet their needs in different ways. a. different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places. b. both plants and animals need water, animals need food and plants need light. c. animals eat plants or other animals for food and may also use plants or even other animals for shelter. **Introduction to Grade 3 Life Science Standards:** 3. Adaptations in physical structure or behavior may improve an organism's chance for survival. a. plants and animals have structures that serve different functions in growth, survival, and reproduction. b. diverse life forms exist in different environments, such as oceans, deserts, tundra, forests, grasslands and wetlands.

Overview
Physical Science 1f *[Activity 2]*
Life Science 2a, c, d *[Activity 4]*
Earth Science 3a, b, c, e *[Activity 2]*
Invest. & Exper. 4a, b, c, d, f, g *[Activities 1, 2, 3, 4]*
Reinforces Grade 1 Life Science 2a, b, c *[Activities 5, 6]*
Introduction to Grade 3 Life Science 3a, b *[Activity 6]*

Wetlands
Grade 3

Synopsis and Key Concepts	CA State Standards Correlation:
BUILD A WETLAND ESTUARY Students take field notes during a virtual field trip and then transform the classroom into a wetland estuary as pairs of students make three-dimensional organisms based on a Wetland Information Card they are assigned. They become expert naturalists for their organism, find additional information about it and add a sketch to the class bingo boards. Students then present their "field talk" on their organism as the rest of the class uses goldfish crackers to play bingo as each organism is mentioned. They then write a paragraph in pictures and words about their classroom field trip. • Estuaries are special wetlands where salt and fresh water mix. • Estuaries include open water, mud flats and salt marshes. • Many different kinds of organisms live in an estuary. Each organism lives in a particular part of the estuary.	**3. Life Sciences: Adaptations in physical structure or behavior may improve an organism's chance for survival.** a. plants and animals have structures that serve different functions in growth, survival, and reproduction, b. examples of diverse life forms in different environments, such as oceans, and wetlands, d. when the environment changes, some plants and animals survive and reproduce; others die or move to new locations.
ESTUARY LIFE Students learn about wetlands and estuaries as they listen and delve into the lyrics of the song *Estuary Life* by the Banana Slug String Band. They participate in a jigsaw activity using Estuary Life Content Cards containing additional information about the lyrics, relating especially to new vocabulary or content. Students then participate as contestants in a Game Show to check for understanding. • *Estuaries are formed where fresh water from a river mixes with salty ocean water.* • *Estuaries provide habitat for many different types of living things.* • *Human impact may harm estuary communities.*	**3. Life Sciences: Adaptations in physical structure or behavior may improve an organism's chance for survival.** a. plants and animals have structures that serve different functions in growth, survival, and reproduction, b. examples of diverse life forms in different environments, such as oceans, and wetlands, c. living things cause changes in the environment in which they live: some of these changes are detrimental to the organism or other organisms, and some are beneficial, d. when the

	environment changes, some plants and animals survive and reproduce; others die or move to new locations. **Reinforces Grade 2 Life Science** **2. Plants and animals have predictable life cycles.** a. organisms reproduce offspring of their own kind and the offspring resemble their parents and one another. b. the sequential stages of life cycles are different for different animals, such as butterflies, frogs, and mice. **Introduces Grade 4 Life Science** **2. All organisms need energy and matter to live and grow.** a. plants are the primary source of matter and energy entering most food chains. b.producers and consumers (herbivores, carnivores, omnivores, and decomposers) are related in food chains and food webs and may compete with each other for resources in an ecosystem. **3. Living organisms depend on one another and on their environment for survival.** a. ecosystems can be characterized by their living and nonliving components. b. in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at

	all.
OYSTER BEDS This activity uses a content-rich approach to increasing literacy skills. Students in small groups make observations about oyster shells and communicate their observations to other students with words or drawings. They then find the "match" to their shell and with their partner hypothesize about the living animal, which made it. The activity concludes with students writing collaborative and individual poetry using the word walls filled with new and descriptive vocabulary gleaned from throughout the entire activity. • *Scientists need to make careful observations and communicate them clearly in order to learn about the natural world.* • *Poetry offers a way for people to communicate their thoughts and feeling s about the special qualities and values of the ocean and ocean habitats.*	**3. Life Sciences: Adaptations in physical structure or behavior may improve an organism's chance for survival.** a. plants and animals have structures that serve different functions in growth, survival, and reproduction, b. examples of diverse life forms in different environments, such as oceans, and wetlands. **5. Invest. And Expt.: Scientific progress is made by asking meaninful questions and conducting careful investigations.** b. students differentiate evidence from opinion and know that scientists do not rely on claims or conclusions unless they are backed by observations that can be confirmed, c. students use numerical data in describing and comparing objects, events, and measurements.
CLAMS INSIDE AND OUT Students rotate through interdisciplinary stations about shells to give them more experience with mollusks. They then learn about the structure, biology, and natural history of clams by coloring, cutting out, and constructing a 6-page clam "Bivalve Booklet". Students then dissect a real clam to find the parts they learned about with their Bivalve Booklet. • *Each animal has special body parts and ways of behaving, which are adaptations to survive and be successful in their habitat.* • *Scientists use dissection as a way of learning more about an animal's body parts and how the parts work together. These body parts are called structures.*	**3. Life Sciences: Adaptations in physical structure or behavior may improve an organism's chance for survival.** a. plants and animals have structures that serve different functions in growth, survival, and reproduction, b. examples of diverse life forms in different environments, such as oceans, and wetlands.

CRAYFISH INVESTIGATIONS Students are guided through a full open-ended inquiry in five sessions. (An alternate route provides students with a partial inquiry in three sessions.) Students are first introduced to an Inquiry Journal and focus on making observations, sketching and asking questions about crayfish and categorize them as investigable or not . They are then provided with more background information about crayfish on which to base their investigations. Small groups of students choose their question and plan their investigation. In Session 3 students actually do their investigation, in Session 4 they make a poster presentation of their results and Session 5 provides an opportunity for content synthesis of the class results. • *Crayfish have many adaptations to survive and thrive in a wetland habitat.* • *Scientists learn about the world through an inquiry process.* • *Inquiry science consists of making observations about the world, asking questions about the observations, doing investigations to discover answers to questions and making new observations leading to new explanations and questions.* • *Scientists communicate about their own and their peers' investigations and explanations.*	**3. Life Sciences: Adaptations in physical structure or behavior may improve an organism's chance for survival.** a. plants and animals have structures that serve different functions in growth, survival, and reproduction, b. examples of diverse life forms in different environments, such as oceans, and wetlands. **5. Invest. And Expt.: Scientific progress is made by asking meaninful questions and conducting careful investigations. Students should develop their own questions and perform investigations.** a. students repeat observations to improve accuracy and know that the results of similar scientific investigations seldom turn out exactly the same because of differences in the things being investigated, methods being used, or uncertainty in the observation b. students differentiate evidence from opinion and know that scientists do not rely on claims or conclusions unless they are backed by observations that can be confirmed, c. students use numerical data in describing and comparing objects, events, and measurements, d. students predict the outcome of a simple investigation and compare the result with the prediction, e.

	students collect data in an investigation and analyze those data to develop a logical conclusion.
SALINITY CURRENTS Students, in small cooperative groups, make observations and participate in discussions about two unknown liquids. Their observations and discussions are facilitated by questions leading to further observations. Students then design an investigation to make currents, using only the limited materials given to them on a tray. Students then make their own currents and use data sheets, make predictions, answer questions designed to facilitate their discoveries, and compare their results with other groups. A teacher demonstration then helps students understand the concept of salinity currents and apply their results to the real world. • *Salinity is a measure of the amount of salt dissolved in a liquid.* • *Fresh water will float on top of saltier water.* • *Fresh water is less dense than salt water.* • *Salinity currents can form when fresh water from the land and salt water from the ocean meet in an estuary.*	**5. Invest. And Expt.: Scientific progress is made by asking meaninful questions and conducting careful investigations.** b. students differentiate evidence from opinion and know that scientists do not rely on claims or conclusions unless they are backed by observations that can be confirmed, d. students predict the outcome of a simple investigation and compare the result with the prediction, e. students collect data in an investigation and analyze those data to develop a logical conclusion. **1. Physical Sciences: Energy and matter have multiple forms and can be changed from one form to another.** g. when two or more substances are combined, a new substance may be formed with properties that are different from those of the original materials.
BIRD BEAK BUFFET Students go on a video journey to the wetlands as if they were scientists studying the habitat. Students then role-play species of birds with beaks of different shapes and sizes. They gather different food items with their beaks, graph the results and compare their feeding success. • *Different types of shorebirds can feed together in one area*	**3. Life Sciences: Adaptations in physical structure or behavior may improve an organism's chance for survival.** a. plants and animals have structures that serve different functions in growth, survival, and reproduction, b. examples of diverse life forms in

because each type is adapted to feed on different types of prey. (This is called resource partitioning.) *• Adaptations are features or behaviors that improve an organisms chance for survival.*	different environments, such as oceans, and wetlands, c. living things cause changes in the environment in which they live: some of these changes are detrimental to the organism or other organisms, and some are beneficial, d. when the environment changes, some plants and animals survive and reproduce; others die or move to new locations. **5. Invest. And Expt.: Scientific progress is made by asking meaninful questions and conducting careful investigations.** a. students repeat observations to improve accuracy and know that the results of similar scientific investigations seldom turn out exactly the same because of differences in the things being investigated, methods being used, or uncertainty in the observation b. students differentiate evidence from opinion and know that scientists do not rely on claims or conclusions unless they are backed by observations that can be confirmed, c. students use numerical data in describing and comparing objects, events, and measurements, d. students predict the outcome of a simple investigation and compare the result with the prediction, e. students collect data in an investigation and analyze those data to develop a logical conclusion.

Kelp Forest
Grade 4

Synopsis and Key Concepts	CA State Standards Correlation:
Activity 1: Red Fish Roundup • Some fish hide from, predators at depth by using camouflage color. • The white light that comes from the sun is actually a mixture of the seven different colors seen in a rainbow. • A rainbow forms when white light passes through water droplets in the sky or through a glass prism or is bent when entering or leaving water. • Each color of light travels at a slightly different speed and contains a different amount of energy. • The ocean acts as a filter and allows only certain colors to pass through to the deep, while it absorbs other colors in the top few meters. • Different kinds of seaweeds (red, brown or green) grow at different depths in the ocean because they use specific colors of light for photosynthesis.	**Reinforces Grade Three Physical Science Standards** **Energy and matter have multiple forms and can be changed form one form to another,** 1a. energy comes form the Sun to earth in the form of light, d. energy can be carried from one place to another by waves, such as water waves and sound waves. **Light has a source and travels in a direction,** 2a. sunlight can be blocked to create shadows, b. light is reflected from mirrors and other surfaces, c. the color of light striking an object affects the way the object is seen.
Activity 2: Fish Formation • Different kinds of fishes have many similarities since all are adapted to be survivors in a water habitat.	**Reinforces Grade Three Life Science Standards** **Adaptations in physical structure or behavior may improve an organism's chance for survival** 3a. plants and animals have structures that serve different functions in growth, survival, and reproduction.
Activity 3: It Takes All Kinds • Fish come in a great variety of forms, colors, and shapes and these adaptations can be used to predict their habitat and lifestyle. • Adaptations are features or behaviors that can improve an organisms chance for survival.	**3. Life Sciences: Living organisms depend on one another and on their environment for survival,** b. in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all. **Reinforces Grade Three Life Science Standards**

	Adaptations in physical structure or behavior may improve an organism's chance for survival 3a. plants and animals have structures that serve different functions in growth, survival, and reproduction. **6. Invest. And Expert.: Scientific progress is made by asking meaningful questions and conducting careful investigations**. a. differentiate observation from inference and know scientists' explanations come partly from what they observe and partly from how they interpret their observations, c. formulate and justify predictions based on cause-and–effect relationships
Activity 4: Sea Otter Jeopardy • Adaptations are features or behaviors that can improve an organisms chance for survival. • Sea otters have many adaptations that help them be successful in their kelp forest habitat. • Cooperation, encouraging others, taking careful notes and using other available information posted around the room helps to insure that everyone is successful in learning new information.	**2. Life Sciences: All organisms need energy and matter to live and grow,** a. plants [and plant-like organisms] are the primary source of matter and energy entering most food chains, b. producers and consumers are related in food chains and food webs and may compete with each other for resources in a ecosystem. **Reinforces Grade Three Life Science Standards Adaptations in physical structure or behavior may improve an organism's chance for survival** 3a. plants and animals have structures that serve different functions in growth, survival, and reproduction.

Activity 5: Seaweed Smorgasbord • Seaweeds are plant-like organisms that have no roots, stems, leaves, flowers or adaptations necessary for living on land. • Adaptations are features or behaviors that can improve an organisms chance for survival. • Seaweeds have many adaptations to live in a watery environment including strong holdfasts, rubbery stipes, blades and spores. • People around the world depend on seaweed for many important everyday uses.	**2. Life Sciences: All organisms need energy and matter to live and grow,** a. plants [and plant-like organisms] are the primary source of matter and energy entering most food chains, b. producers and consumers are related in food chains and food webs and may compete with each other for resources in a ecosystem. **3. Living organisms depend on one another and on their environment for survival,** b. in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all, c. many plants depend on animals for pollination and seed dispersal, [seaweeds depend on water dispersal] and animals depend on plants [and seaweeds] for food and shelter.
Activity 6: Build a Kelp Forest • Kelp Forests are home to many different kinds of organisms that interact with one another as predators, prey or competitors. • Kelp forests are habitats that change over time as they are affected by weather, predators and human impact.	**2. Life Sciences: All organisms need energy and matter to live and grow,** a. plants [and plant-like organisms] are the primary source of matter and energy entering most food chains, b. producers and consumers are related in food chains and food webs and may compete with each other for resources in a ecosystem, c. decomposers, including fungi, insects, and microorganisms, recycle matter from dead plants and animals. **3. Living organisms depend**

	on one another and on their environment for survival, a. ecosystems can be characterized by their living and nonliving components, b. in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all, c. many plants depend on animals for pollination and seed dispersal, [seaweeds depend on water dispersal] and animals depend on plants [and seaweeds] for food and shelter. **6. Invest. And Expert.: Scientific progress is made by asking meaningful questions and conducting careful investigations.** a. differentiate observation from inference and know scientists' explanations come partly from what they observe and partly from how they interpret their observations, b. measure and estimate the weight, length, or volume of objects, c. formulate and justify predictions based on cause-and–effect relationships

Reinforces Grade 3 Physical 1a,d and 2a-c [Act 1]
Reinforces Grade 3 Life Sciences 3a [Act. 2, 3, 4]
Life Sciences 3b [Act 3], 2a,b [Act 4 and 5], 2a-c [Act 6], 3b,c {Act 5], 3a-c [Act 6]
I and E 6a,c [Act 3], 6a,b [Act 6]

MARE Open Ocean Curricula
Grade 5

Activity Synopsis & Concepts Correlated
To the California State Science Standards

Synopsis and Key Concepts	CA State 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.*	**Grade 5** **3. Earth Sciences** Water on earth moves between the oceans and land through the processes of evaporation and condensation. a. Most of Earth's water is present as salt water in the oceans, which cover most of earth's surface, d. the amount of fresh water located in rivers, lakes, underground sources and glaciers is limited and its availability can be extended by recycling and decreasing the use of water. **4. Earth Sciences** Energy from the Sun heats Earth unevenly, causing air movements that result in changing weather patterns. a. uneven heating of Earth causes air (and water) movements, b. the ocean influences the weather **Reinforces Grade 4 Life Sciences 2**: All organisms need energy and matter to live and grow. a. plants are the primary source of matter and energy entering most food chains., b. producers and consumers are related in food chains and food webs and may compete with each other for resources in an ecosystem. **3**: Living organisms depend on one another and on their environment for survival. a. ecosystems can be characterized by their living and nonliving components. **Introduces Grade 6 Life Science** **5. Ecology:** Organisms in ecosystems exchange energy and nutrients among themselves and with the

	environment. a. energy entering ecosystems as sunlight is transferred by produces into chemical energy through photosynthesis and then from organisms to organisms through food webs. b. matter is transferred over time from one organism to others in the food web and between organisms and the physical environment. c. the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water and a range of temperatures. **Introduces Grade 6 Earth Science** **2. Shaping Earth's Surface:** Topography is reshaped by the weathering of rock and soil and by the transportation and deposition of sediment. b. rivers, streams (and oceans) are dynamic systems that erode, transport, change course and flood in natural and recurring patterns. c. beaches are dynamic systems in which the sand is supplied by rivers and moved along the coast by the action of waves (and currents.) **4. Energy in the Earth System:** Many phenomena on Earth's surface are affected by the transfer of energy through radiation and convection currents. a. the sun is the major source of energy for phenomena on earth's surface; it powers winds, ocean currents, and the water cycle. **6. Resources:** Sources of energy and materials differ in amounts, distribution, usefulness, and the time required for their formation. a. the utility of energy sources is determined by factors that are involved in converting these sources to useful forms and the consequences of the conversion process. b. there are different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wild life, and forests; they can be classified as renewable or nonrenewable.
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-	**Grade 5** **2.Life Sciences:** Plants and animals have structures for respiration, digestion, waste disposal, and transport of materials a. many multicellular organisms have specialized structures to support the transport of materials. b. blood circulates through the heart chambers, lungs, and body and carbon dioxide and oxygen are exchanged.

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.*	**6. Investigation and Experimentation** g. record data by using appropriate graphic representations and make inferences based on the data **Reinforces Grade 4 Life Sciences** 3. Living organisms depend on one another and on their environment for survival. b. in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all. **Introduces Grade 6 Life Science** **5. Ecology:** Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. a. energy entering ecosystems as sunlight is transferred by produces into chemical energy through photosynthesis and then from organisms to organisms through food webs. b. matter is transferred over time from one organism to others in the food web and between organisms and the physical environment. c. the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water and a range of temperatures. **Introduces Grade 6 Earth Science** **6. Resources:** Sources of energy and materials differ in amounts, distribution, usefulness, and the time required for their formation. a. the utility of energy sources is determined by factors that are involved in converting these sources to useful forms and the consequences of the conversion process. b. there are different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wild life, and forests; they can be classified as renewable or nonrenewable. **Introduces Grade 7 Structure and Function in Living Systems 5.** The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function
WHAT'S THE CATCH Students sample various seafoods and discuss what they know about	**Grade 5** **2.Life Sciences:** Plants and animals have structures for respiration, digestion, waste disposal, and transport of materials a.

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.*	many multicellular organisms have specialized structures to support the transport of materials. b. blood circulates through the heart chambers, lungs, and body and carbon dioxide and oxygen are exchanged. **6. Investigation and Experimentation** g. record data by using appropriate graphic representations and make inferences based on the data **Reinforces Grade 4 Life Sciences** 3. Living organisms depend on one another and on their environment for survival. b. in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all. **Introduces Grade 6 Life Science** **5. Ecology**: Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. a. energy entering ecosystems as sunlight is transferred by produces into chemical energy through photosynthesis and then from organisms to organisms through food webs. b. matter is transferred over time from one organism to others in the food web and between organisms and the physical environment. c. the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water and a range of temperatures. **Introduces Grade 6 Earth Science** **6. Resources:** Sources of energy and materials differ in amounts, distribution, usefulness, and the time required for their formation. a. the utility of energy sources is determined by factors that are involved in converting these sources to useful forms and the consequences of the conversion process. b. there are different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wild life, and forests; they can be classified as renewable or nonrenewable. **Introduces Grade 7 Structure and Function in Living Systems 5.** The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function.

Activities from MARE/GEMS *Ocean Currents* guide	
PLANET OCEAN Students are introduced to the vastnes 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 is covered by one interconnected world ocean that circulates around all the continents.*	**Introduces Grade 6 Earth Science** **2. Shaping Earth's Surface:** Topography is reshaped by the weathering of rock and soil and by the transportation and deposition of sediment. b. rivers, streams (and oceans) are dynamic systems that erode, transport, change course and flood in natural and recurring patterns. c. beaches are dynamic systems in which the sand is supplied by rivers and moved along the coast by the action of waves (and currents.) **4. Energy in the Earth System:** Many phenomena on Earth's surface are affected by the transfer of energy through radiation and convection currents. a. the sun is the major source of energy for phenomena on earth's surface; it powers winds, ocean currents, and the water cycle. **6. Resources:** Sources of energy and materials differ in amounts, distribution, usefulness, and the time required for their formation. a. the utility of energy sources is determined by factors that are involved in converting these sources to useful forms and the consequences of the conversion process. b. there are different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wild life, and forests; they can be classified as renewable or nonrenewable **Introduces Grade 6 Life Science** **5. Ecology:** Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. a. energy entering ecosystems as sunlight is transferred by produces into chemical energy through photosynthesis and then from organisms to organisms through food webs. b. matter is transferred over time from one organism to others in the food web and between organisms and the physical environment. c. the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water and a range of temperatures.

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 are two factors that cause currents.* • *Winds blowing across the surface of the ocean–combined with other factors–cause major circulating currents, or gyres.*	**Grade 5 Investigation and Experimentation** 6g. record data by using appropriate graphic representations and make inferences based on the data **Introduces Grade 6 Earth Science** **4. Energy in the Earth System:** Many phenomena on Earth's surface are affected by the transfer of energy through radiation and convection currents. a. the sun is the major source of energy for phenomena on earth's surface; it powers winds, ocean currents, and the water cycle. **Introduces Grade 6 Physical Science–Heat:** Heat moves in a predictable flow from warmer objects to cooler objects until all the objects are at the same temperature. a. energy can be carried from one place to another by heat flow or by waves, including water, … or by moving objects. **Introduces Grade 7: Investigation and Experimentation.** c. communicate the logical connection among hypotheses, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence. d. construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge
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	**Grade 5** **4. Earth Sciences** Energy from the Sun heats Earth unevenly, causing air movements that result in changing weather patterns. a. uneven heating of Earth causes air (and water) movements, b. the ocean influences the weather **6. Investigation and Experimentation** 6g. record data

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 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.*	by using appropriate graphic representations and make inferences based on the data **Introduces Grade 6 Physical Science–Heat:** Heat moves in a predictable flow from warmer objects to cooler objects until all the objects are at the same temperature. a. energy can be carried from one place to another by heat flow or by waves, including water, … or by moving objects. **Introduces Grade 6 Earth Science** **4. Energy in the Earth System:** Many phenomena on Earth's surface are affected by the transfer of energy through radiation and convection currents. a. the sun is the major source of energy for phenomena on earth's surface; it powers winds, ocean currents, and the water cycle. c. currents distribute heat in the atmosphere and oceans. **Introduces Grade 7: Investigation and Experimentation.** c. communicate the logical connection among hypotheses, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence. d. construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge. e. communicate the steps and results from an investigation in written reports and oral presentations. **Introduces Grade 8 Density and Buoyancy** All objects experience a buoyant force when immersed in a fluid. a. density is mass per unit volume. b. the density of substances can be measured using mass and volume c. predictions can be made about whether an object (or substance) will sink or float.
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	**Grade 5** **6. Investigation and Experimentation** 6g. record data by using appropriate graphic representations and make inferences based on the data **Introduces Grade 8 Physical Science: Structure of Matter 3** d. the states of matter depend on molecular motion e. in solids the atoms are closely locked in

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.*	position and can only vibrate; in liquids the atoms and molecules are more loosely connected and can collide with and move past one another **Introduces Grade 8 Density and Buoyancy** All objects experience a buoyant force when immersed in a fluid. a. density is mass per unit volume. b. the density of substances can be measured using mass and volume d. predictions can be made about whether an object (or substance) will sink or float. **Introduces Grade 8 Investigation and Experimentation 9** Plan and conduct a scientific investigation to test a hypothesis
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.)*	**Grade 5** **4. Earth Sciences** Energy from the Sun heats Earth unevenly, causing air movements that result in changing weather patterns. a. uneven heating of Earth causes air (and water) movements, b. the ocean influences the weather **6. Investigation and Experimentation** 6g. record data by using appropriate graphic representations and make inferences based on the data **Introduces Grade 6 Physical Science–Heat:** Heat moves in a predictable flow from warmer objects to cooler objects until all the objects are at the same temperature. a. energy can be carried from one place to another by heat flow or by waves, including water, … or by moving objects. **Introduces Grade 6 Earth Science** **4. Energy in the Earth System:** Many phenomena on Earth's surface are affected by the transfer of energy through radiation and convection currents. a. the sun is the major source of energy for phenomena on earth's

	surface; it powers winds, ocean currents, and the water cycle. c. currents distribute heat in the atmosphere and oceans. **Introduces Grade 8 Density and Buoyancy** All objects experience a buoyant force when immersed in a fluid. a. density is mass per unit volume. b. the density of substances can be measured using mass and volume d. predictions can be made about whether an object (or substance) will sink or float. **Introduces Grade 8 Investigation and Experimentation 9** Plan and conduct a scientific investigation to test a hypothesis
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.	**California History and Social Science Standards for Grade 5** Students trace the routes of early explorers and describe the early explorations of the Americans. 1. Describe the entrepreneurial characteristics of early explorers and the technological developments that made sea exploration by latitude and longitude possible 3. Trace the routes of the major land (and sea) explorers… the distances traveled by explorers, and the trade routes.
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	**California Language Arts Standards** **Grade 5-8 1.0 Writing Strategies and 2.0 Writing Applications**

wind, density, temperature and salinity.	
SUPPLEMENTAL ACTIVITIES	
THE GREAT PLANKTON RACE 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 observation 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.*	**Grade 5** **6. Investigation and Experimentation:** a. classify objects in accordance with appropriate criteria. c. plan and conduct a simple investigation, g. record data. **Reinforces Grade 4 Life Sciences** 3. Living organisms depend on one another and on their environment for survival. b. in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.
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 the role of a specific body part of a whale and put all the parts together in a choreographed production	**Grade 5** **2. Life Sciences:** Plants and animals have structures for respiration, digestion, waste disposal, and transport of materials a. many multicellular organisms have specialized structures to support the transport of materials. b. blood circulates through the heart chambers, lungs, and body and carbon dioxide and oxygen are exchanged **Reinforces Grade 4 Life Sciences** 3. Living organisms depend on one another and on their environment for survival. b. in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.

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 50 million years, whales have evolved from land mammals into ocean mammals.*	**Introduces Grade 7 Evolution** Biological evolution accounts for the diversity of species developed through gradual processes over many generations.3e. extinction of a species occurs when the environment changes, and the adaptive characteristics of a species are insufficient for its survival.
BUILDAN OPEN OCEAN Students review what they have 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.*	**Grade 5** **6. Investigation and Experimentation** a. classify objects in accordance with appropriate criteria. g. record data by using appropriate graphic representations and make inferences based on those data. i. write a report that includes conducting tests, collecting data or examining evidence, and drawing conclusions **Introduces Grade 6 Life Science** **5. Ecology** Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. a. energy entering ecosystems as sunlight is transferred by produces into chemical energy through photosynthesis and then from organisms to organisms through food webs. b. matter is transferred over time from one organism to others in the food web and between organisms and the physical environment. c. the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water and a range of temperatures. **Introduces Grade 7 Investigation and Experimentation** 7. b. use a variety of print and or resources to collect information and evidence as part of a research project. d. construct scale models, maps and

	labeled diagrams to communicate scientific knowledge **Reinforces Grade 4 Life Sciences** 3. Living organisms depend on one another and on their environment for survival.

Overview

- **Life Science 2a, b** [*Squid, What's the Catch, Whale with Class*]
- **Earth Science 3a,d; 4a, b** *[Apples and Oceans];* 4a,b *[Current Trends, Ice Cubes]*
- **Invest, & Exper. 6a, c, g** *[Great Plankton Race];* **6g** *[What's the Catch, Waste Disposal, Current Trends, Layering Liquids, Ice Cubes]*; **6a, g, i** *[Build an Open Ocean]*
- **Reinforces Grade 4 Life Science 2a,b, 3a** [*Apples and Oceans*]; **3b** [*Squid, What's the Catch, Great Plankton Race, Whale with Class, Build an Open Ocean*]
- **Introduction to Grade 6 Physical Science – Heat** *[Waste Disposal, Current Trends, Ice Cubes]*
- **Introduction to Grade 6 Earth Science**
  Shaping Earth's Surface 2b,c *[Apples and Oceans, Planet Ocean]*
  Energy in Earth System 4a, c *[Apples and Oceans, Planet ocean, Current Trends, Waste Disposal, Ice Cubes]*
  Resources 6a,b *[Apples and Oceans, Planet Ocean, What's the Catch]*
- **Introduction to Grade 6 Life Science**
  Ecology 5a, b, c *[Apples and Oceans, Planet Ocean, What's the Catch, Build an Open Ocean]*

- **Introduction to Grade 7 Structure and Function** *[Squid, What's the Catch]*
- **Introduction to Grade 7 Evolution 3e** *[Whale With Class]*
- **Introduction to Grade 7 Invest. & Exper. 7c, d** *[Waste Disposal];* **7c, d, e** *[Current Trends]*; **7b,d** *[Build an Open Ocean]*

Introduction to Grade 8 Physical Science

- **Structure of Matter 3d,e** *[Layering Liquids]*
- **Density and Buoyancy 8a,b,c,d** *[Current Trends, Layering Liquids, Ice Cubes]*

Introduction to Grade 8 Invest. & Exper. 9 *[Layering Liquids, Ice Cubes]*

History and Social Studies Standards for Grade 5 # 1, 3

Language Arts Standards Grade 5 #1, 2