Shelby County Schools Science Vision

Shelby County Schools' vision of science education is to ensure that from early childhood to the end of the 12th grade, all students have heightened curiosity and an increased wonder of science; possess sufficient knowledge of science and engineering to engage in discussions; are able to learn and apply scientific and technological information in their everyday lives; and have the skills such as critical thinking, problem solving, and communication to enter careers of their choice, while having access to connections to science, engineering, and technology.

To achieve this, Shelby County Schools has employed The Tennessee Academic Standards for Science to craft meaningful curricula that is innovative and provide a myriad of learning opportunities that extend beyond mastery of basic scientific principles.

Introduction

In 2014, the Shelby County Schools Board of Education adopted a set of ambitious, yet attainable goals for school and student performance. The District is committed to these goals, as further described in our strategic plan, Destination 2025. In order to achieve these ambitious goals, we must collectively work to provide our students with high quality standards aligned instruction. The Tennessee Academic Standards for Science provide a common set of expectations for what students will know and be able to do at the end of each grade, can be located in the Tennessee Science Standards Reference. Tennessee Academic Standards for Science are rooted in the knowledge and skills that students need to succeed in post-secondary study or careers. While the academic standards establish desired learning outcomes, the curricula provide instructional planning designed to help students reach these outcomes. The curriculum maps contain components to ensure that instruction focuses students toward college and career readiness. Educators will use this guide and the standards as a roadmap for curriculum and instruction. The sequence of learning is strategically positioned so that necessary foundational skills are spiraled in order to facilitate student mastery of the standards.

Our collective goal is to ensure our students graduate ready for college and career. Being College and Career Ready entails, many aspects of teaching and learning. We want our students to apply their scientific learning in the classroom and beyond. These valuable experiences include students being facilitators of their own learning through problem solving and thinking critically. The Science and Engineering Practices are valuable tools used by students to engage in understanding how scientific knowledge develops. These practices rest on important "processes and proficiencies" with longstanding importance in science education. The science maps contain components to ensure that instruction focuses students toward understanding how science and engineering can contribute to meeting many of the major challenges that confront society today. The maps are centered around five basic components: the Tennessee Academic Standards for Science, Science and Engineering Practices, Disciplinary Core Ideas, Crosscutting Concepts, and Phenomena.

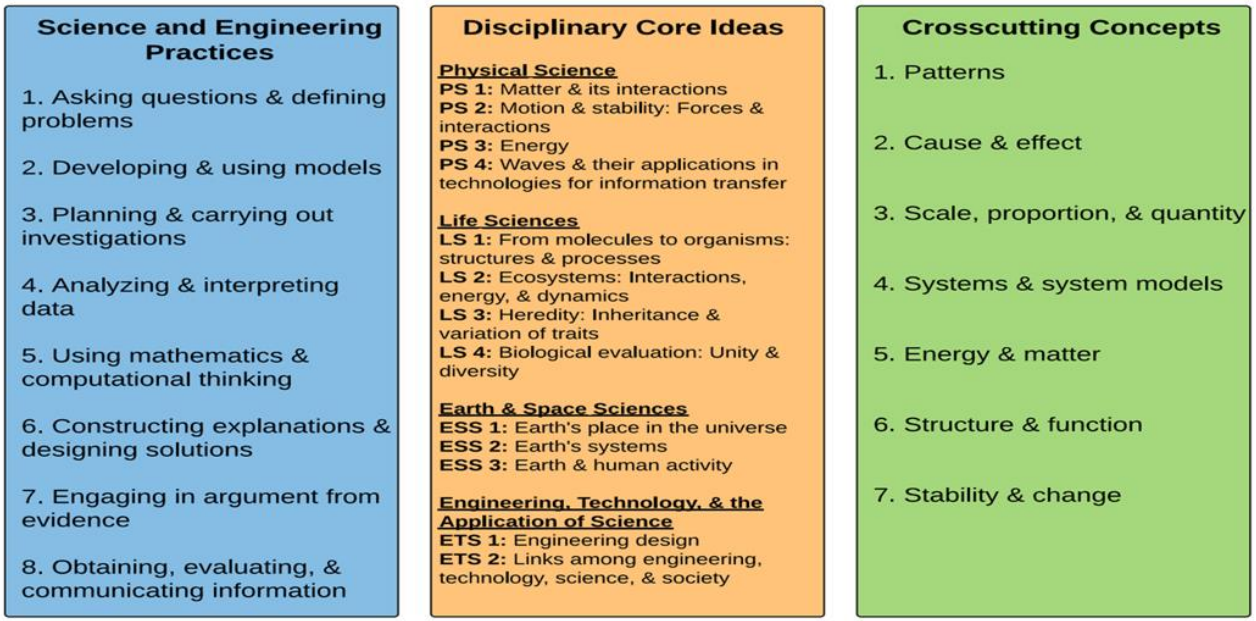
The Tennessee Academic Standards for Science were developed using the National Research Council's 2012 publication, A Framework for K-12 Science Education as their foundation. The framework presents a new model for science instruction that is a stark contrast to what has come to be the norm in science classrooms. Thinking about science had become memorizing concepts and solving mathematical formulae. Practicing science had become prescribed lab situations with predetermined outcomes. The framework proposes a three-dimensional approach to science education that capitalizes on a child's natural curiosity. The Science Framework for K-12 Science Education provides the blueprint for developing the effective science practices. The *Framework* expresses a vision in science education that requires students to operate at the nexus of three dimensions of learning: Science and Engineering Practices, Crosscutting Concepts, and Disciplinary Core Ideas. The *Framework* identified a small number of disciplinary core ideas that all students should learn with increasing depth and sophistication, from Kindergarten through grade twelve. Key to the vision expressed in the *Framework* is for students to learn these disciplinary core ideas in the context of science and engineering practices. The importance of combining Science and Engineering Practices, Crosscutting Concepts and Disciplinary Core Ideas is stated in the *Framework* as follows:

Standards and performance expectations that are aligned to the framework must take into account that students cannot fully understand scientific and engineering ideas without engaging in the practices of inquiry and the discourses by which such ideas are developed and refined. At the same time, they cannot learn or show competence in practices except in the context of specific content. (NRC Framework, 2012, p. 218)

To develop the skills and dispositions to use scientific and engineering practices needed to further their learning and to solve problems, students need to experience instruction in which they use multiple practices in developing a particular core idea and apply each practice in the context of multiple core ideas. We use the term "practices" instead of a term such as "skills" to emphasize that engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice. Students in grades K-12 should engage in all eight practices over each grade band**.** Crosscutting concepts have application across all domains of science. As such, they are a way of linking the different domains of science. Crosscutting concepts have value because they provide students with connections and intellectual tools that are related across the differing areas of disciplinary content and can enrich their application of practices and their understanding of core ideas. There are seven crosscutting concepts that bridge disciplinary boundaries, uniting core ideas throughout the fields of science and engineering. Their purpose is to help students deepen their understanding of the disciplinary core ideas and develop a coherent and scientifically based view of the world.

The map is meant to support effective planning and instruction to rigorous standards. It is *not* meant to replace teacher planning, prescribe pacing or instructional practice. In fact, our goal is not to merely "cover the curriculum," but rather to "uncover" it by developing students' deep understanding of the content and mastery of the standards. Teachers who are knowledgeable about and intentionally align the learning target (standards and objectives), topic, text(s), task, and needs (and assessment) of the learners are best-positioned to make decisions about how to support student learning toward such mastery. Teachers are therefore expected--with the support of their colleagues, coaches, leaders, and other

support providers--to exercise their professional judgment aligned to our shared vision of effective instruction, the Teacher Effectiveness Measure (TEM) and related best practices. However, while the framework allows for flexibility and encourages each teacher/teacher team to make it their own, our expectations for student learning are non-negotiable. We must ensure all of our children have access to rigor—high-quality teaching and learning to grade level specific standards, including purposeful support of literacy and language learning across the content areas.



Learning Progression

At the end of the elementary science experience, students can observe and measure phenomena using appropriate tools. They are able to organize objects and ideas into broad concepts first by single properties and later by multiple properties. They can create and interpret graphs and models that explain phenomena. Students can keep notebooks to

record sequential observations and identify simple patterns. They are able to design and conduct investigations, analyze results, and communicate the results to others. Students will carry their curiosity, interest and enjoyment of the scientific world view, scientific inquiry, and the scientific enterprise into middle school.

At the end of the middle school science experience, students can discover relationships by making observations and by the systematic gathering of data. They can identify relevant evidence and valid arguments. Their focus has shifted from the general to the specific and from the simple to the complex. They use scientific information to make wise decision related to conservation of the natural world. They recognize that there are both negative and positive implications to new technologies.

As an SCS graduate, former students should be literate in science, understand key science ideas, aware that science and technology are interdependent human enterprises with strengths and limitations, familiar with the natural world and recognizes both its diversity and unity, and able to apply scientific knowledge and ways of thinking for individual and social purposes.

Structure of the Standards

- Grade Level/Course Overview: An overview that describes that specific content and themes for each grade level or high school course.
- Disciplinary Core Idea: Scientific and foundational ideas that permeate all grades and connect common themes that bridge scientific disciplines.
- Standard: Statements of what students can do to demonstrate knowledge of the conceptual understanding. Each performance indicator includes a specific science and engineering practice paired with the content knowledge and skills that students should demonstrate to meet the grade level or high school course standards.

Purpose of Science Curriculum Maps

This map is a guide to help teachers and their support providers (e.g., coaches, leaders) on their path to effective, college and career ready (CCR) aligned instruction and our pursuit of Destination 2025. It is a resource for organizing instruction around the Tennessee Academic Standards for Science, which define what to teach and what students need to learn at each grade level. The map is designed to reinforce the grade/course-specific standards and content (scope) and provides *suggested* sequencing, pacing, time frames, and aligned resources. Our hope is that by curating and organizing a variety of standards-aligned resources, teachers will be able to spend less time wondering what to teach and searching for quality materials (though they may both select from and/or supplement those included here) and have more time to plan, teach, assess, and reflect with colleagues to continuously improve practice and best meet the needs of their students.

The map is meant to support effective planning and instruction to rigorous standards. It is *not* meant to replace teacher planning, prescribe pacing or instructional practice. In fact, our goal is not to merely "cover the curriculum," but rather to "uncover" it by developing students' deep understanding of the content and mastery of the standards. Teachers who are knowledgeable about and intentionally align the learning target (standards and objectives), topic, text(s), task, and needs (and assessment) of the learners are best-positioned to make decisions about how to support student learning toward such mastery. Teachers are therefore expected--with the support of their colleagues, coaches, leaders, and other support providers--to exercise their professional judgment aligned to our shared vision of effective instruction, the Teacher Effectiveness Measure (TEM) and related best practices. However, while the framework allows for flexibility and encourages each teacher/teacher team to make it their own, our expectations for student learning are non-negotiable. We must ensure all of our children have access to rigor—high-quality teaching and learning to grade level specific standards, including purposeful support of literacy and language learning across the content areas.

1st Grade Quarter 4 Curriculum Map Quarter 4 Curriculum Map Feedback					
Quarter 1			Quarter 2	Quarter 3	**Quarter 4**
Structure and Routine	Unit 1 Earth and Space	Unit 2 Seasons	Unit 3 Light Energy	Unit 4 Plants	**Unit 5 Plant Environment**
1 week	5 weeks	3 weeks	9 weeks	9 weeks	**9 weeks**

UNIT 5: Plants (9 weeks)			
Overarching Question(s)			
How and why do organisms interact with their environment and what are the effects of these interactions?			
Unit 5: Lesson 1	**Lesson Length**	**Essential Question**	**Vocabulary**
Prairie Plants	3 weeks	What are characteristics of some prairie plants?	characteristic, prairie

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 1.LS2: Ecosystems: Interactions, Energy, and Dynamics **Standard(s)** 1.LS2.2: Obtain and communicate information to classify plants by where they grow (water, land) and the plant's physical characteristics. **Explanation and Support of Standard** 1.LS2.2 Recognizing that plants have requirements for life, students can then explore how different availabilities of sunlight, water, and nutrients define ecosystems. Students can then relate the differences in the environments where the plants	**Learning Outcomes** Students will be able to identify and classify prairie plants. **Suggested Phenomenon** *Click on the phenomenon picture to view the video.* 	**Curricular Resources** Engage Inspire Science TE, p. 65-66 TE, p. 65, Phenomenon TE, p. 66, Essential Question TE, p. 66, Science and Engineering Practices Explore Inspire Science TE, pp. 67-68 *(LAB)* Be a Scientist Notebook, p. 62 Inquiry Activity: Observe a Prairie Plant Explain Inspire Science TE, pp. 68-70

can be found to physical characteristics of plants. Examples of plants growing in water may include phytoplankton in the ocean, algae in lakes, cattail in ponds, and river grasses. Examples of plants growing on land may include cacti in the desert, wildflowers on mountains, mosses toward mountain tops, and deciduous trees in forests. **Suggested Science and Engineering Practice(s)** Obtaining, Evaluating, and Communicating Information **Suggested Crosscutting Concept(s)** Structure and Function **Teacher Overview** A prairie is a flat, relatively dry environment with very few trees. Plants growing on the prairie need specialized adaptations to survive. Most of the plants in a prairie are tall grasses. Plants in a prairie tend to have narrow leaves to conserve water and stabilizing roots to combat prairie winds. **Misconceptions** Some students may think that plants can live in any environment, so long as they have air, water, soil, and sunshine. Explain to students that each different type of habitat has unique challenges and opportunities for different types of plants.	Phenomenon Explanation: Many grasses and a few trees grow on prairies. While tall grasses are most often associated with prairies, trees also are part of a prairie habitat.	Vocabulary, TE, pp. 68 Science File: Plants of the Prairie Digital Interactive: The Prairie <u>Elaborate</u> Inspire Science TE, pp. 71-72 Be a Scientist Notebook, p. 66, Research, Investigate, and Communicate: Prairie Research Be a Scientist Notebook, p. 64-65, Writing in Science <u>Evaluate</u> Inspire Science TE, pp. 73-75 *(LAB)* Be A Scientist Notebook, Performance, p. 68, Performance Task: Model Prairie eAssessment **Additional Resources** Lesson: Plant Needs Video: America's Grasslands: A Threatened National Treasure **ESL Supports and Scaffolds** WIDA Standard 4 To support students in speaking refer to this resource: WIDA Doing and Talking Science

Plants and animals cannot survive in a habitat that does not meet their needs. Clarify that some basic needs may be similar but that a habitat can provide evidence of what a plant or animal needs based on how it is surviving in the habitat.		When applicable- use Home Language do build vocabulary in concepts. Spanish Cognates Create a word wall with visuals to support students in using topic vocabulary in speaking and writing. Consider using sentence stems to support students in speaking and writing: Some characteristics of prairie plants are ... All _____ have _____. _____has _____. _____ is an example. All _____ are/are not _____. • All _____ have/ do not have _____. I classified these by _____.

1st Grade Quarter 2 Curriculum Map Quarter 2 Curriculum Map Feedback					
Quarter 1			Quarter 2	Quarter 3	**Quarter 4**
Structure and Routine	Unit 1 Earth and Space	Unit 2 Seasons	Unit 3 Light Energy	Unit 4 Plants	**Unit 5 Plant Environment**
1 week	5 weeks	3 weeks	9 weeks	9 weeks	**9 weeks**

UNIT 5: Plants (9 weeks)

Overarching Question(s)

How and why do organisms interact with their environment and what are the effects of these interactions?

Unit 5: Lesson 2	Lesson Length	Essential Question	Vocabulary
Forest Plants	3 weeks	What are characteristics of some forest plants?	forest

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 1.LS2: Ecosystems: Interactions, Energy, and Dynamics **Standard(s)** 1.LS2.2: Obtain and communicate information to classify plants by where they grow (water, land) and the plant's physical characteristics. **Explanation and Support of Standard** 1.LS2.2 Recognizing that plants have requirements for life, students can then explore how different availabilities of sunlight, water, and nutrients define ecosystems. Students can then relate the differences in the environments where the plants	**Learning Outcomes** Students will be able to identify and classify forest plants. **Suggested Phenomenon** *Click on the phenomenon picture to view the video.* 	**Curricular Resources** Engage Inspire Science TE, pp. 77-78 TE, p. 77, Phenomenon TE, p. 78, Essential Question TE, p.78, Science and Engineering Practices Explore Inspire Science TE, pp. 79-80 *(LAB)* Be a Scientist Notebook, p. 72 Inquiry Activity: Classify Plants Explain Inspire Science TE, pp. 80-83 Vocabulary, TE, pp. 80

can be found to physical characteristics of plants. Examples of plants growing in water may include phytoplankton in the ocean, algae in lakes, cattail in ponds, and river grasses. Examples of plants growing on land may include cacti in the desert, wildflowers on mountains, mosses toward mountain tops, and deciduous trees in forests. **Suggested Science and Engineering Practice(s)** Obtaining, Evaluating, and Communicating Information **Suggested Crosscutting Concept(s)** Structure and Function **Teacher Overview** Forests are any area that has dense tree cover. These areas are a unique ecosystem with unique challenges and resources for growing plants. New plants often have difficulty growing in a forest because the taller trees block out light and have the ability to take more nutrients from the soil than smaller plants. **Misconceptions** Some students may not know that large trees come from very small seeds. Some students may think that all trees lose their leaves in the fall and winter. As with the previous lesson, some students may think that plants can grow equally	Phenomenon Explanation: The forest contains trees that flower. Students may not understand that fruits form after a flower has been pollinated. Daisies, strawberry plants, maple trees, and sunflowers all produce flowers and live in a forest environment.	Science File: Plants of the Forest Digital Interactive: The Forest <u>Elaborate</u> Inspire Science TE, p. 84 Be a Scientist Notebook, p. 78, Research, Investigate, and Communicate: Forest Research <u>Evaluate</u> Inspire Science TE, pp. 85-87 *(LAB)* Be A Scientist Notebook, Performance, p. 80, Performance Task: Model Forest eAssessment **Additional Resources** Lesson: Habitats Throughout the World Lesson: A Forest Habitat Video: Plant Habitat and Adaptations **ESL Supports and Scaffolds** WIDA Standard 4 To support students in speaking refer to this resource: WIDA Doing and Talking Science

well in any environment. Explain that forests are a unique ecosystem with unique challenges and resources for plants, such as the lack of light on the forest floor.		When applicable- use Home Language do build vocabulary in concepts. Spanish Cognates Create a word wall with visuals to support students in using topic vocabulary in speaking and writing. Consider using sentence stems to support students in speaking and writing: Some characteristics of forest plants are ... All _____ have _____. _____has _____. _____ is an example. All _____ are/are not _____. • All _____ have/ do not have _____. I classified these by _____.

1st Grade Quarter 2 Curriculum Map Quarter 2 Curriculum Map Feedback					
Quarter 1			Quarter 2	Quarter 3	**Quarter 4**
Structure and Routine	Unit 1 Earth and Space	Unit 2 Seasons	Unit 3 Light Energy	Unit 4 Plants	**Unit 5 Plant Environment**
1 week	5 weeks	3 weeks	9 weeks	9 weeks	**9 weeks**

UNIT 5: Plants (9 weeks)			
Overarching Question(s)			
How and why do organisms interact with their environment and what are the effects of these interactions?			
Unit 5: Lesson 3	**Lesson Length**	**Essential Question**	**Vocabulary**
Marsh Plants	3 weeks	What are the characteristics of some marsh plants?	wetland, marsh

Standards and Related Background Information	**Instructional Focus**	**Instructional Resources**
DCI(s) 1.LS2: Ecosystems: Interactions, Energy, and Dynamics **Standard(s)** 1.LS2.2: Obtain and communicate information to classify plants by where they grow (water, land) and the plant's physical characteristics. **Explanation and Support of Standard** 1.LS2.2 Recognizing that plants have requirements for life, students can then explore how different availabilities of sunlight, water, and nutrients define ecosystems. Students can then relate the differences in the environments where the plants	**Learning Outcomes** Students will be able to identify and classify marsh plants. **Suggested Phenomenon** *Click on the phenomenon picture to view the video.* 	**Curricular Resources** Engage Inspire Science TE, pp. 89-90 TE, p. 89, Phenomenon TE, p. 90, Essential Question TE, p. 90, Science and Engineering Practices Explore Inspire Science TE, pp. 90-91 *(LAB)* Be a Scientist Notebook, p. 84, Inquiry Activity: Too Much Water Explain Inspire Science TE, pp. 92-95 Vocabulary, TE, pp. 92

can be found to physical characteristics of plants. Examples of plants growing in water may include phytoplankton in the ocean, algae in lakes, cattail in ponds, and river grasses. Examples of plants growing on land may include cacti in the desert, wildflowers on mountains, mosses toward mountain tops, and deciduous trees in forests. **Suggested Science and Engineering Practice(s)** Obtaining, Evaluating, and Communicating Information **Suggested Crosscutting Concept(s)** Structure and Function **Teacher Overview** Wetlands are environments that spend at least part of the year flooded. While all plants need water, too much water makes it impossible for all but specialized plants to grow. Marshes are a type of wetland in which mainly grass grows. In addition, marshes that develop where rivers meet the ocean may have a high salt content that is toxic to most plants. Only very specialized plants can live in marshes. **Misconceptions** Some students may not realize that too much water can be bad for plants. Students may believe that if a little of something, including	Phenomenon Explanation: Plants grow in many environments and require different amounts of water to survive. Many land plants will be damaged by too much water.	Science File: Saltwater Marshes Digital Interactive: Marshes <u>Elaborate</u> Inspire Science TE, p. 95-96 Be a Scientist Notebook, p. 88, Research, Investigate, and Communicate: Marsh Research <u>Evaluate</u> Inspire Science TE, pp. 97-99 *(LAB)* Be A Scientist Notebook, Performance, p. 97, Performance Task: Model Marsh eAssessment **Additional Resources** Lesson: A Marsh Wetland Habitat Lesson: A Wetland Marsh Habitat Part II Video: Types of Ecosystems-Wetlands-Marshes, Swamps, Bogs, and Fens Lesson: Marshland Plants **ESL Supports and Scaffolds** WIDA Standard 4 To support students in speaking refer to this resource: WIDA Doing and Talking Science

water, sunlight, or nutrients, is good for a living thing, then more must be better. Have them consider how unwell they feel when they eat too much as a step to helping them understand that too much of a helpful resource can be detrimental to a living thing.		When applicable- use Home Language do build vocabulary in concepts. Spanish Cognates Create a word wall with visuals to support students in using topic vocabulary in speaking and writing. Consider using sentence stems to support students in speaking and writing: Some characteristics of marsh plants are ... All _____ have _____. _____has _____. _____ is an example. All _____ are/are not _____. • All _____ have/ do not have _____. I classified these by _____.

1st Grade Quarter 2 Curriculum Map Quarter 2 Curriculum Map Feedback					
Quarter 1			Quarter 2	Quarter 3	**Quarter 4**
Structure and Routine	Unit 1 Earth and Space	Unit 2 Seasons	Unit 3 Light Energy	Unit 4 Plants	**Unit 5 Plant Environment**
1 week	5 weeks	3 weeks	9 weeks	9 weeks	**9 weeks**

UNIT 5: Plants (9 weeks)			
Overarching Question(s)			
How and why do organisms interact with their environment and what are the effects of these interactions?			
Unit 5: Lesson 4	**Lesson Length**	**Essential Question**	**Vocabulary**
Ocean Plants	3 weeks	What are characteristics of some ocean plants?	ocean

Standards and Related Background Information	**Instructional Focus**	**Instructional Resources**
DCI(s) 1.LS2: Ecosystems: Interactions, Energy, and Dynamics **Standard(s)** 1.LS2.2: Obtain and communicate information to classify plants by where they grow (water, land) and the plant's physical characteristics. **Explanation and Support of Standard** 1.LS2.2 Recognizing that plants have requirements for life, students can then explore how different availabilities of sunlight, water, and nutrients define ecosystems. Students can then relate the differences in the environments where the plants	**Learning Outcomes** Students will be able to identify and classify ocean plants. **Suggested Phenomenon** *Click on the phenomenon picture to view the video.* 	**Curricular Resources** Engage Inspire Science TE, pp. 89-90 TE, p. 89, Phenomenon TE, p. 90, Essential Question TE, p. 90, Science and Engineering Practices Explore Inspire Science TE, pp. 103-104 *(LAB)* Be a Scientist Notebook, p. 94, Inquiry Activity: Plants and Salt Explain Inspire Science TE, pp. 104-107 Vocabulary, TE, pp. 104

can be found to physical characteristics of plants. Examples of plants growing in water may include phytoplankton in the ocean, algae in lakes, cattail in ponds, and river grasses. Examples of plants growing on land may include cacti in the desert, wildflowers on mountains, mosses toward mountain tops, and deciduous trees in forests. **Suggested Science and Engineering Practice(s)** Obtaining, Evaluating, and Communicating Information **Suggested Crosscutting Concept(s)** Structure and Function. **Teacher Overview** Plants living in the ocean face unique challenges. Ocean water is very salty, which is hard for most plants to process. In addition, the water can block some sunlight, so it can be harder for plants to absorb all the light they need. The vast majority of plants in the ocean exist in the top layers of the water, where they can receive sunlight. **Misconceptions** Some students may not know that some plants live underwater. They may think that only fish and other animals live in the ocean. Students may also be confused about which relatively stationary living things underwater are plants and	Phenomenon Explanation: Plants grow in many environments including the ocean. Ocean plant life is vital to the ecosystem. Many ocean-dwelling animals depend on these plants for food and oxygen. Most ocean plants in habitats relatively shallow depths, because they, like other plants, depend on sunlight to make food for themselves.	Science File: Ocean Plants Digital Interactive: Underwater Plants Elaborate Inspire Science TE, p. 107-108 Be a Scientist Notebook, p. 98, Research, Investigate, and Communicate: Land and Water Plants Evaluate Inspire Science TE, pp. 109-111 *(LAB)* Be A Scientist Notebook, Performance, p. 100, Performance Task: Ocean Plant Model eAssessment **Additional Resources** Lesson: Over in The Ocean Unit: Ocean Video: Ocean Biome Plants Video: Can You Name 6 Ocean Plants? **ESL Supports and Scaffolds** WIDA Standard 4 To support students in speaking refer to this resource: WIDA Doing and Talking Science

which are animals. Corals and sponges, for example, are animals and not plants.		When applicable- use Home Language do build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals Pre-teach: Similarities, underwater, identify, classify Sentence Stems: All these are_____because_____. A ___ is a ___ because _____. _____,_____ , and_____ all have/are .