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 provides 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.

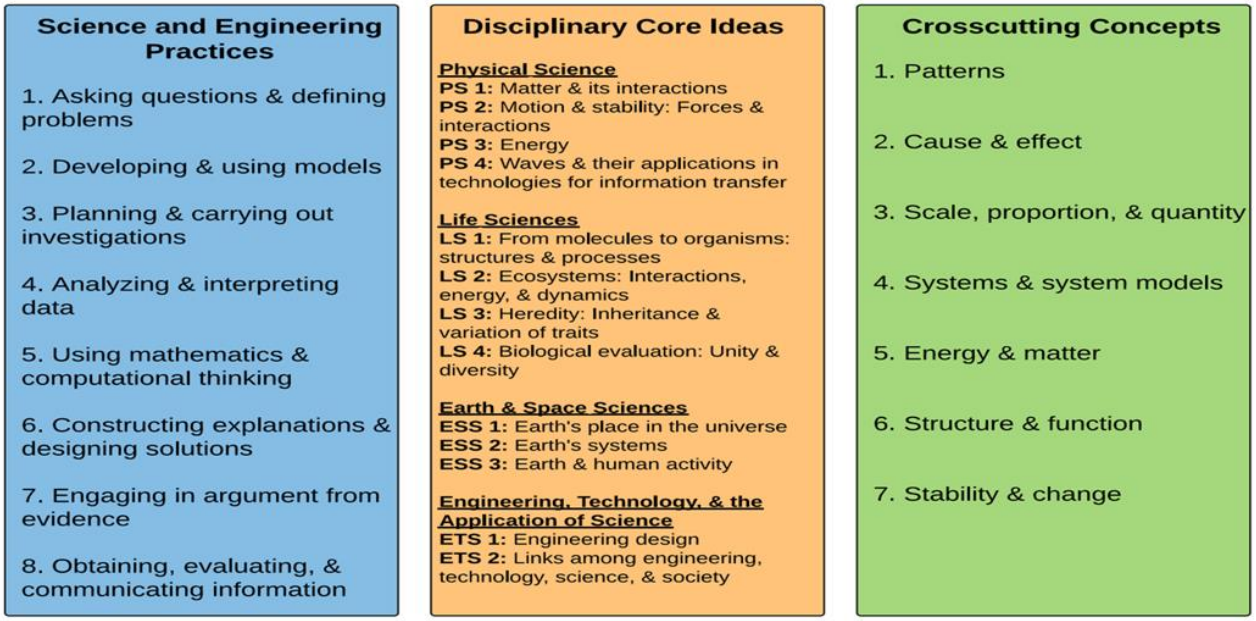
The Tennessee Academic Standards for Science were developed using the National Research Council's 2012 publication, A Framework for K-12 Science Education as their foundation. The framework presents a new model for science instruction that is a stark contrast to what has come to be the norm in science 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.

6th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback							
Quarter 1	Quarter 2		**Quarter 3**				Quarter 4
Unit 1 Energy	Unit 2 Relationships Among Organisms	Unit 3 Earth's Biomes and Ecosystems	**Unit 4 Earth's Resources**	Unit 5 Human Impact on the Environment	Unit 6 Earth's Water	Unit 7 Earth's Systems	Unit 8 Weather and Climate
9 weeks	4 weeks	5 weeks	**3 weeks**	2 weeks	1 week	3 weeks	9 weeks

UNIT 4: Earth's Resources and Human Impact on the Environment (3 weeks)			
Overarching Question(s)			
How is energy transferred and conserved?			
Unit 4, Lesson 1	**Lesson Length**	**Essential Question**	**Vocabulary**
Earth's Support of Life	3 days	How can Earth support life?	photosynthesis, atmosphere, ultraviolet radiation, ozone

Standards and Related Background Information	**Instructional Focus**	**Instructional Resources**
DCI(s) 6.PS3: Energy **Standard(s)** 6.PS3.4 Conduct an investigation to demonstrate the way that heat (thermal energy) moves among objects through radiation, conduction, or convection. **Explanation(s)and Support of Standard(s) from TN Science Reference Guide** 6.PS3.4 In everyday language, "heat" is used to refer to thermal energy (the motion of particles) and	**Learning Outcomes** • Describe what is required by all living things on Earth. • Describe how Earth's proximity to the sun produces a unique surface temperature range. • Explain how Earth's rotation allows efficient energy use. • Describe how plants on Earth use solar energy to make food. • Compare the supply of water on Earth to the supply of water on other planets in our solar system.	**Curricular Materials** HMH Tennessee Science TE, Unit 4, Lesson 1 pp. 236-239 Engage • Engage Your Brain #s 1 and 2, SE p. 213 • Active Reading #s 3 and 4, SE p. 213 Explore The Sun • Measuring the Sun's Heat Activity, TE p. 238 • Temperature Variations on Earth Quick Lab, TE p. 239

energy transfer. Students should comprehend the difference between these two uses, and understand that scientist only use the term heat when referencing energy transfer from one object to another. The colloquial use of "heat" to describe the amount of warmth an object possesses should be abandoned, in favor of the use of "thermal energy." Thermal energy is the total energy due to the movement of particles in a substance. Thermal energy is related to temperature which can be measured using a thermometer, however thermal energy must also account for mass of the sample. There are three specific means of heating: conduction, convection, and radiation. Radiation (infrared or visible light) can be seen as a form of heating, but is unique from conduction and convection, because it can transfer energy across empty space. Students can observe changes in thermal energy (by recording temperature) or changes in state (by observing pure substances) using any of the above methods of heating. **Suggested Science and Engineering Practice(s)** Planning and Carrying out Controlled Investigations 6.PS3.4 Students begin to investigate independently, select appropriate independent variables to explore	• Explain how water accumulated on Earth's surface. • Explain how water supports the existence of life on Earth. • Compare the composition of Earth's atmosphere to those of other planets in the solar system. • Describe both the composition of and the formation of the atmosphere. • Explain how the atmosphere supports life. **Suggested Phenomenon**  Earth has many features that make it "special" or different from the other planets within our solar system. The existence of liquid water at Earth's surface is neither too much nor too little. Its proximity to the sun provide just the right amount of heat to support life. Earth is large enough to hang on to its atmosphere, but not so large to hold on to too much atmosphere and consequently too	Earth's Water • How Water Forms on Earth's Surface Quick Lab, TE p. 239 Earth's Atmosphere • Modeling the Atmosphere Activity, TE p. 238 • Whip It Up! Daily Demo, TE p. 239 • Modeling the Greenhouse Effect Exploration Lab, TE p. 239 Explain The Sun • Visualize It! #5, SE p. 214 • Identify #6, SE p. 214 • Visualize It! #8, SE p. 215 Earth's Water • Why We Need Water Activity, TE p. 238 • Active Reading #9, SE p. 216 • Visualize It! #10, SE p. 216 Earth's Atmosphere • Infer #s 14 and 15, SE p. 218 • Visualize It! #16, SE p. 219 Extend Reinforce and Review • Tri-Fold Fold Note, TE p. 242 • Visual Summary, SE p. 220 Going Further • Music Connection, TE p. 242 • Real-World Connection, TE p. 242 • Why It Matters, SE p. 217 • TED Talks on water

a dependent variable and recognize the value of failure and revision in the experimental process. **Suggested Crosscutting Concept(s)** System and System Models 6.PS3.4 Students develop models for systems which include both visible and invisible inputs and outputs for that system.	much heat. Students can complete a See Think Wonder Template after examining the picture. Possible Guiding Question(s): What makes Earth so special?	Evaluate Formative Assessment • Reteach, TE p. 243 • Throughout TE • Lesson Review, SE p. 221 Summative Assessment • Earth's Support of Life Alternative Assessment, TE p. 243 Lesson Quiz **Additional Resources** • Why Is There Life on Earth? YouTube Video **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) • Students will talk with a partner to name what is required by all living things on Earth by using visuals and a text to support their answers. Pre-teach vocabulary: (Consider teaching this vocabulary in addition to vocabulary addressed in the standard to support Entering Level ELs):

		support, rotate, efficient, energy, composition Provide compare/contrast sentence stems: This is the same as because... This is different than because… All these are because…, and all have/are…. When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals to support students with the scientific explanation: Question Starters What's the connection between….? What link do you see between… Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows…? Response Starters I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about …..

6th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback							
Quarter 1	Quarter 2		**Quarter 3**				Quarter 4
Unit 1 Energy	Unit 2 Relationships Among Organisms	Unit 3 Earth's Biomes and Ecosystems	**Unit 4 Earth's Resources**	Unit 5 Human Impact on the Environment	Unit 6 Earth's Water	Unit 7 Earth's Systems	Unit 8 Weather and Climate
9 weeks	4 weeks	5 weeks	**3 weeks**	2 weeks	1 week	3 weeks	9 weeks

UNIT 4: Earth's Resources and Human Impact on the Environment (3 weeks)

Overarching Question(s)

How do the Earth's surface processes and human activities affect each other?

Unit 4, Lesson 2	Lesson Length	Essential Question	Vocabulary
Natural Resources	3 days	What are Earth's natural resources?	natural resource, fossil fuel, renewable resource, material resource, nonrenewable resource, energy resource

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 6.ESS3: Earth and Human Activity **Standard(s)** 6.ESS3.1 Differentiate between renewable and nonrenewable resources by asking questions about their availability and sustainability. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 6.ESS3.1 Renewable resources are resources that can be regenerated within a human lifetime. While	**Learning Outcomes** • Identify a natural resource. • Describe examples of natural resources. • Compare renewable resources and nonrenewable resources. • Explain how some resources can be considered both renewable and nonrenewable. • Explain how energy resources are used. • Explain how energy can be converted from one form to another.	**Curricular Materials** HMH Tennessee Science TE, Unit 4, Lesson 2 pp. 250-267 Engage • Engage Your Brain #s 1 and 2, SE p. 225 • Active Reading #s 3 and 4, SE p. 225 Explore Renewable or Nonrenewable Resources • Can Renewable Resources Become Nonrenewable? Daily Demo, TE p. 235 • Renewable or Not? Quick Lab, TE p. 253

this then infers that non-renewable resources must develop over longer periods of time. Beyond mere memorization of those parameters, students should recognize that the processes that create mineral, groundwater, and energy (fuels) happen at geologic rates as a result of geologic processes. Because geologic processes do not occur uniformly, there is not a uniform distribution of resources. (e.g., oil deposits in the middle east, coal deposits in the western United States, gold deposits in California, the use of Tennessee waterways for hydroelectric power generation.) As humans use nonrenewable resources, they are restored, but in amounts of time that greatly exceed those of near generations. Thus, these resources are considered limited. It is not intended that students memorize the processes for the formation of all non-renewables, but rather to understand that they are in some way connected to geologic processes. A limited number of examples can be used to establish this idea. **Suggested Science and Engineering Practice(s)** <u>Constructing Explanations and Designing Solutions</u> 6.ESS3.1 Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion.	• Describe how the conversion between potential and kinetic energy provides energy that is useful to people. **Suggested Phenomenon**  The Earth has many natural resources that can be renewed in our lifetime, however, many cannot. Discuss this idea with students, giving them time to generate and record ideas.	Material Resources • Natural Resources Used at Lunch Field Lab, TE p. 253 • Production Impacts Quick Lab, TE p. 253 <u>Explain</u> Natural Resources • Active Reading #5, SE p. 226 • A Resourceful List Activity, TE p. 252 • Using Resources Activity, TE p. 252 • Visualize It! #6, SE p. 226 • Natural Resources Take It Home, TE p. 252 Renewable or Nonrenewable Resources • Think Outside the Book #7, SE p. 227 • Compare #8, SE p. 227 Material Resources • Active Reading #9, SE p. 228 • Visualize It! #10, SE p. 228 • Visualize It! #11, SE p. 229 Energy Resources • Active Reading #12, SE p. 230 • List #13, SE p. 230 • Visualize It! #s 14-16, SE p. 231 • Active Reading #17, SE p. 232 • Visualize It! #18, SE p. 232 <u>Extend</u> Reinforce and Review • Visualizing Natural Resources Activity, TE p. 256 • Four-Corner Fold Note, TE p. 256

Suggested Crosscutting Concept(s) Cause and Effect 6.ESS3.1 Students begin to connect their explanations for cause and effect relationships to specific scientific theory.		• Cluster Diagram Graphic Organizer, TE p. 256 • Visual Summary, SE p. 234 Going Further • Earth Science Connection, TE p. 256 • Real World Connection, TE p. 256 • Why It Matters, SE p. 257 Evaluate Formative Assessment • Reteach, TE p. 257 • Throughout TE • Lesson Review, SE p. 235 Summative Assessment • Natural Resources Alternative Assessment, TE p. 257 • Lesson Quiz Analyzing the Life of a Paper Cup S.T.E.M., TE pp. 264-267 **Additional Resources** • 6.ESS3.1 Card Sort Images, Student Notes, Student Activity, and Teacher Guide • Natural Resources STUDY JAMS! Video and Quiz • Legend of Learning-Natural Resources **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource:

		WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) • Students will talk with a partner to compare renewable resources and nonrenewable resources using a t-chart and word bank. Short videos with visuals for renewable and non-renewable resources. Use graphic organizers or concept maps to support students in their explanations of human's impact on the environment. Provide compare/contrast sentence stems: This is the same as because... This is different than because… All these are because…, and all have/are…. This resource is renewable, but this is not because… When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals To support students with the scientific explanation:

		<u>Question Starters</u> What's the connection between….? What link do you see between… Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows…? But does your claim account for…(evidence) <u>Response Starters</u> I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about …..

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9 weeks	4 weeks	5 weeks	**3 weeks**	2 weeks	1 week	3 weeks	9 weeks

UNIT 4: Earth's Resources and Human Impact on the Environment (3 weeks)			
Overarching Question(s)			
How do the Earth's surface processes and human activities affect each other?			
Unit 4, Lesson 3	**Lesson Length**	**Essential Question**	**Vocabulary**
Nonrenewable Resources	3 days	How do we use nonrenewable energy resources?	energy resource, nuclear energy, fossil fuel, fission

Standards and Related Background Information	**Instructional Focus**	**Instructional Resources**
DCI(s) 6.ESS3: Earth and Human Activity **Standard(s)** 6.ESS3.1 Differentiate between renewable and nonrenewable resources by asking questions about their availability and sustainability. 6.ESS3.2 Investigate and compare existing and developing technologies that will utilize renewable and alternate energy sources.	**Learning Outcomes** • Describe how humans use energy resources. • Differentiate between renewable and nonrenewable resources. • Identify the two main types of nonrenewable resources. • Describe the characteristics of fossil fuels. • Explain how fossil fuels are used. • Describe the advantages and disadvantages of using fossil fuels. • Explain how nuclear energy is generated. • Describe how nuclear energy is used to generate electricity.	**Curricular Materials** HMH Tennessee Science TE, Unit 4, Lesson 3 pp. 268-281 Engage • Engage Your Brain #s 1 and 2, SE p. 243 • Active Reading #s 3 and 4, SE p. 243 • Energy, Energy, Everywhere Activity, TE p. 270 • Looking Ahead Probing Questions, TE p. 270 • Acid Rain Daily Demo, TE p. 271 • Chain Reaction Activity, TE p. 270

Explanation(s) **from TN Science Reference Guide**

6.ESS3.1 Renewable resources are resources that can be regenerated within a human lifetime. While this then infers that non-renewable resources must develop over longer periods of time. Beyond mere memorization of those parameters, students should recognize that the processes that create mineral, groundwater, and energy (fuels) happen at geologic rates as a result of geologic processes. Because geologic processes do not occur uniformly, there is not a uniform distribution of resources. (e.g., oil deposits in the middle east, coal deposits in the western United States, gold deposits in California, the use of Tennessee waterways for hydroelectric power generation.) As humans use nonrenewable resources, they are restored, but in amounts of time that greatly exceed those of near generations. Thus, these resources are considered limited.

It is not intended that students memorize the processes for the formation of all non-renewables, but rather to understand that they are in some way connected to geologic processes. A limited number of examples can be used to establish this idea.

6.ESS3.2 Utilization of natural resources involves weighing environmental, economic, and oftentimes political conversations. Environmental discussions should include models which help to predict effects

- Explain the advantages and disadvantages of using nuclear energy.

Suggested Phenomenon

The Earth has many natural resources that can be renewed in our lifetime, however, many cannot. Discuss this idea with students, giving them time to generate and record ideas.

Explore

Energy Resources

- Modeling Nonrenewable Resources Quick Lab, TE p. 271
- How Can We Measure the Impact of Nonrenewable Energy? Virtual Lab, TE p. 271

Explain

Energy Resources

- Do the Math #5, SE p. 244
- Compare #6, SE p. 244

Fossil Fuels

- Active Reading #7, SE p. 245
- Think Outside the Book #8, SE p. 246
- Active Reading #9, SE p. 247
- Visualize It! #10, SE p. 247
- Active Reading #11, SE p. 248

Nuclear Energy

- Compare #12, SE p. 249
- Active Reading #13, SE p. 250
- Visualize It! #14, SE p. 250
- Evaluate #15, SE p. 251
- Is It Safe? Discussion, TE p. 270

Extend

Reinforce and Review

- Process Chart Graphic Organizer, TE p. 274
- Visual Summary, SE p. 252

Going Further

- Health Connection, TE p. 274
- Physical Science Connection, TE p. 274

and gains of using a natural resource on the environment. Economic considerations include the amount of energy which can be harvested for the cost. For example, the economy of installing residential photovoltaic systems depends on the availability of sunlight in a person's location or on their property. Political conversations are impacted by considering global distributions of energy sources. As technologies progress, energy harvesting becomes less expensive and more efficient such that conversations regarding the utilization of renewable and alternate energy sources may shift over time. **Suggested Science and Engineering Practice(s)** Constructing Explanations and Designing Solutions 6.ESS3.1 Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion. Obtaining, Evaluating, and Communicating Information 6.ESS3.2 (O/E) Students can evaluate text, media, and visual displays of information with the intent of clarifying claims and reconciling explanations. (C) Students can communicate scientific information in writing utilizing embedded tables, charts, figures, graphs.		Evaluate Formative Assessment • Reteach, TE p. 275 • Throughout TE • Lesson Review, SE p. 253 Summative Assessment • Nonrenewable Energy Resources Alternative Assessment, TE p. 275 • Lesson Quiz **Additional Resources** • 6.ESS3.1 Card Sort Images, Student Notes, Student Activity, and Teacher Guide • Fossil Fuels STUDY JAMS! Slide Show and Quiz • Non-Renewable Energy National Geographic Article **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) • Students will talk with a partner to compare renewable resources and nonrenewable resources using a t-chart and word bank.

Suggested Crosscutting Concept(s) Energy ad Matter 6.ESS3.2 Students give general descriptions of different forms and mechanisms for energy storage within a system. Cause and Effect 6.ESS3.1 Students use cause and effect relationships to make predictions.		Use graphic organizers or concept maps to support students in their explanations of human's impact on the environment. Short videos with visuals for renewable and non-renewable resources. When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals To support students with the scientific explanation: Question Starters What's the connection between….? What link do you see between… Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows.? But does your claim account for…(evidence) Response Starters I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning)

		This evidence shows that… Your explanation makes me think about …..

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UNIT 4: Earth's Resources and Human Impact on the Environment (3 weeks)

Overarching Question(s)

How do the Earth's surface processes and human activities affect each other?

Unit 4, Lesson 4	Lesson Length	Essential Question	Vocabulary
Renewable Energy Resources	3 days	How do humans use renewable energy resources?	energy resources, hydroelectric energy, wind energy, biomass, solar energy, geothermal energy

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 6.ESS3: Earth and Human Activity **Standard(s)** 6.ESS3.1 Differentiate between renewable and nonrenewable resources by asking questions about their availability and sustainability. 6.ESS3.2 Investigate and compare existing and developing technologies that will utilize renewable and alternate energy sources.	**Learning Outcomes** • Describe how humans use energy resources. • Explain the difference between renewable and nonrenewable energy resources. • Identify the two main kinds of renewable energy resources. • Describe solar energy and how it is harnessed and used. • Explain why wind and flowing water occur and how their energy is harnessed and used. • Describe how biomass and alcohol form and how their energy is harnessed and used.	**Curricular Materials** HMH Tennessee Science TE, Unit 4, Lesson 4 pp. 282-295 Engage • New Again Activity, TE p. 284 • Engage Your Brain #s 1 and 2, SE p. 257 • Active Reading #s 3 and 4, SE p. 257 • Pick Your Resources Daily Demo, TE p. 285 Explore Energy Resources • How Can We Use Renewable Energy Resources Virtual Lab, TE p. 285

Explanation(s)and Support of Standard(s) from TN Science Reference Guide 6.ESS3.1 Renewable resources are resources that can be regenerated within a human lifetime. While this then infers that non-renewable resources must develop over longer periods of time. Beyond mere memorization of those parameters, students should recognize that the processes that create mineral, groundwater, and energy (fuels) happen at geologic rates as a result of geologic processes. Because geologic processes do not occur uniformly, there is not a uniform distribution of resources. (e.g., oil deposits in the middle east, coal deposits in the western United States, gold deposits in California, the use of Tennessee waterways for hydroelectric power generation.) As humans use nonrenewable resources, they are restored, but in amounts of time that greatly exceed those of near generations. Thus, these resources are considered limited. It is not intended that students memorize the processes for the formation of all non-renewables, but rather to understand that they are in some way connected to geologic processes. A limited number of examples can be used to establish this idea. 6.ESS3.2 Utilization of natural resources involves weighing environmental, economic, and oftentimes political conversations. Environmental discussions should include models which help to predict effects	• Describe what geothermal energy is and how it is used. **Suggested Phenomenon**  The Earth has many natural resources that can be renewed in our lifetime, however, many cannot. Discuss this idea with students, giving them time to generate and record ideas.	Energy from the Sun • Design a Turbine Quick Lab, TE p. 284 • Understanding Solar Panels Quick Lab, TE p. 285 • Modeling Geothermal Power S.T.E.M. Lab, TE p. 284 Explain Energy Resources • Contrast #5, SE p. 258 • Apply #6, SE p. 259 • Distinguish #7, SE p. 259 • Think Outside the Book #8, SE p. 259 Energy from the Sun • Infer #9, SE p. 260 • Active Reading #10, SE p. 261 • Visualize It! #11, SE p. 261 • Infer #12, SE p. 262 • Active Reading #13, SE p. 263 • Visualize It! #14, SE p. 263 • Active Reading #15, SE p. 264 • List #16, SE p. 264 • How It Works Activity, TE p. 284 Energy from Earth • List #17, SE p. 265 • The Future of Renewables Activity, TE p. 284 Extend Reinforce and Review • Pyramid Fold Note, TE p. 288

and gains of using a natural resource on the environment. Economic considerations include the amount of energy which can be harvested for the cost. For example, the economy of installing residential photovoltaic systems depends on the availability of sunlight in a person's location or on their property. Political conversations are impacted by considering global distributions of energy sources. As technologies progress, energy harvesting becomes less expensive and more efficient such that conversations regarding the utilization of renewable and alternate energy sources may shift over time. **Suggested Science and Engineering Practice(s)** Obtaining, Evaluating, and Communicating Information 6.ESS3.2 (O/E) Students can evaluate text, media, and visual displays of information with the intent of clarifying claims and reconciling explanations. (C) Students can communicate scientific information in writing utilizing embedded tables, charts, figures, graphs. Constructing Explanations and Designing Solutions 6.ESS3.1 Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion.		• Visual Summary, SE p. 266 Going Further • Life Science Connection, TE p. 288 • Social Studies Connection, TE p. 288 Evaluate Formative Assessment • Throughout TE • Lesson Review, SE p. 267 Summative Assessment • Renewable Energy Resources Alternative Assessment, TE p. 289 • Lesson Quiz • Alternate Thinking: Different Forms of Energy S.T.E.M., TE pp. 296-299 **Additional Resources** • 6.ESS3.1 Card Sort Images, Student Notes, Student Activity, and Teacher Guide • Gone with the Wind Energy: Design-Build - Test Mini Sail Cars! • Environmental Impacts of Renewable Energy Technologies Article • Alternative Energy for Transportation Article • Renewable Fuels STUDY JAMS! Slide Show and Quiz • The Power of Wind Read Works Article • Drawing Energy Out of Wastewater Science News for Students Article • Renewables Are Ready Guide

Suggested Crosscutting Concept(s) Energy ad Matter 6.ESS3.2 Students give general descriptions of different forms and mechanisms for energy storage within a system. Cause and Effect 6.ESS3.1 Students begin to connect their explanations for cause and effect relationships to specific scientific theory.		• Renewable Energy Living Lab: Energy Priorities **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) • Students will talk with a partner to compare renewable resources and nonrenewable resources using a t-chart and word bank. Short videos with visuals for renewable and non-renewable resources. When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals To support students with the scientific explanation: Question Starters What's the connection between….? What link do you see between…

		Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows.? But does your claim account for…(evidence) <u>Response Starters</u> I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about …..

6th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback							
Quarter 1	Quarter 2		**Quarter 3**				Quarter 4
Unit 1 Energy	Unit 2 Relationships Among Organisms	Unit 3 Earth's Biomes and Ecosystems	**Unit 4 Earth's Resources**	Unit 5 Human Impact on the Environment	Unit 6 Earth's Water	Unit 7 Earth's Systems	Unit 8 Weather and Climate
9 weeks	4 weeks	5 weeks	**3 weeks**	2 weeks	1 week	3 weeks	9 weeks

UNIT 4: Earth's Resources and Human Impact on the Environment (3 weeks)			
Overarching Question(s)			
How do the Earth's surface processes and human activities affect each other?			
Unit 4, Lesson 5	**Lesson Length**	**Essential Question**	**Vocabulary**
Managing Resources	3 days	Why should natural resources be managed?	natural resource, nonrenewable resource, renewable resource, conservation, stewardship

Standards and Related Background Information	**Instructional Focus**	**Instructional Resources**
DCI(s) 6.ESS3: Earth and Human Activity **Standard(s)** 6.ESS3.1 Differentiate between renewable and nonrenewable resources by asking questions about their availability and sustainability. 6.ESS3.2 Investigate and compare existing and developing technologies that will utilize renewable and alternate energy sources.	**Learning Outcomes** • Describe what a natural resource is. • Describe the two main kinds of resources. • Describe the impacts of resource extraction, resource use, and resource disposal. • Explain the need for managing resources. • Explain how stewardship and conservation are related to resource management. • Describe the management practices for renewable and nonrenewable resources. • Describe ways to manage resources globally, nationally, and individually.	**Curricular Materials** HMH Tennessee Science TE, Unit 4, Lesson 5 pp. 300-313 Engage • Engage Your Brain #s 1 and 2, SE p. 275 • Active Reading #s 3 and 4, SE p. 275 • Non-Biodegradable Peanuts? Daily Demo, TE p. 303 Explore Resources • The Impact of Resource Extraction Quick Lab, TE p. 303

6.ESS3.3 Assess the impacts of human activities on the biosphere including conservation, habitat management, species endangerment, and extinction. **Explanation(s)and Support of standard(s) from TN Science Reference Guide** 6.ESS3.1 Renewable resources are resources that can be regenerated within a human lifetime. While this then infers that non-renewable resources must develop over longer periods of time. Beyond mere memorization of those parameters, students should recognize that the processes that create mineral, groundwater, and energy (fuels) happen at geologic rates as a result of geologic processes. Because geologic processes do not occur uniformly, there is not a uniform distribution of resources. (e.g., oil deposits in the middle east, coal deposits in the western United States, gold deposits in California, the use of Tennessee waterways for hydroelectric power generation.) As humans use nonrenewable resources, they are restored, but in amounts of time that greatly exceed those of near generations. Thus, these resources are considered limited. It is not intended that students memorize the processes for the formation of all non-renewables, but rather to understand that they are in some way connected to geologic processes. A limited number of examples can be used to establish this idea.	• Discuss the advantages and disadvantages of managing resources. **Suggested Phenomenon**  The Earth has many natural resources that can be renewed in our lifetime, however, many cannot. Discuss this idea with students, giving them time to generate and record ideas.	Explain Resources • Compare #5, SE p. 276 • Visualize It! #6, SE p. 277 • Active Reading #7 SE p. 277 • Visualize It! #s 8-10, SE p. 277 • Renewable or Not? Probing Questions, TE p. 302 Managing Resources • How Resourceful Are You? Activity, TE p. 302 • Active Reading #11, SE p. 278 • Visualize It! #12, SE p. 278 • Apply #13, SE p. 279 • Changing Habits Take It Home, TE p. 302 • Managing a Resource Quick Lab, TE p. 303 Advantages and Disadvantages of Managing Resources • Active Reading #14, SE p. 280 • Visualize It! #15, SE p. 280 • Making Changes Discussion, TE p. 302 • Think Outside the Book #16, SE p. 281 • Visualize It! #17, SE p. 281 Extend Reinforce and Review • Magnet Word Graphic Organizer, TE p. 306 • Visual Summary, SE p. 282 Going Further • Math Connection, TE p. 306

6.ESS3.2 Utilization of natural resources involves weighing environmental, economic, and oftentimes political conversations. Environmental discussions should include models which help to predict effects and gains of using a natural resource on the environment. Economic considerations include the amount of energy which can be harvested for the cost. For example, the economy of installing residential photovoltaic systems depends on the availability of sunlight in a person's location or on their property. Political conversations are impacted by considering global distributions of energy sources. As technologies progress, energy harvesting becomes less expensive and more efficient such that conversations regarding the utilization of renewable and alternate energy sources may shift over time. 6.ESS3.3 Beyond creating explanations for observations of changes to the environment, this standard can also be interpreted treated as a design task where students are developing a device to monitor human impacts, similar to 6.ESS2.4. Part of the design process should involve recognizing that many human activities are necessary, but analyzing the impacts of the activities can help to development responsible constraints. Human activities have greatly altered rates of change to Earth's surface. As humans develop land		• Earth Science Connection, TE p. 306 Evaluate Formative Assessment • Reteach, TE p. 307 • Throughout TE • Lesson Review, SE p. 283 Summative Assessment • Managing Resources Alternative Assessment, TE p. 307 • Lesson Quiz • Unit 4 Big Idea, SE p. 286 Unit 4 Review, SE pp. 287-290 **Additional Resources** • Watch Your Step **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) • Students will work with a partner to identify how stewardship and conservation are related to resource management by using visuals, a graphic organizer, and text.

and build roads, large amounts of natural habitat are lost, affecting the species indigenous to that habitat. Students can obtain and evaluate evidence that increases in human populations or increases in the amount of energy consumed per person also increase negative effects, but engineered solutions can mitigate some of these negative effects. For example, development of low energy consumption lightbulbs (such as LED) can reduce the amount of energy used in a home. Assessments of human activities should include models which can assist in making predictions for the efficacy of conservation efforts with competing interests. **Suggested Science and Engineering Practice(s)** <u>Obtaining, Evaluating, and Communicating Information</u> 6.ESS3.2 (O/E) Students can evaluate text, media, and visual displays of information with the intent of clarifying claims and reconciling explanations. (C) Students can communicate scientific information in writing utilizing embedded tables, charts, figures, graphs. <u>Constructing Explanations and Designing Solutions</u> 6.ESS3.1 Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion.		Pre-teach vocabulary: (Consider teaching this vocabulary in addition to vocabulary addressed in the standard to support Entering Level ELs) manage, stewardship, kinds of Use graphic organizers or concept maps to support students in their explanations of why good stewardship is important to managing natural resources. Academic vocabulary for “identify”: since, caused by, in effect, because of, this results in, brought about, due to, consequently, made possible, for this reason, accordingly, as might be expected, therefore, as a result of, give rise to, If…then, leads to, was responsible for How to care for the environment video When applicable - use Home Language to build vocabulary in concepts. <u>Spanish Cognates</u> <u>Interactive Science Dictionary with visuals</u> To support students with the scientific explanation:

Suggested Crosscutting Concept(s) Energy ad Matter 6.ESS3.2 Students give general descriptions of different forms and mechanisms for energy storage within a system. Cause and Effect 6.ESS3.1 Students begin to connect their explanations for cause and effect relationships to specific scientific theory. 6.ESS3.3 Students begin to connect their explanations for cause and effect relationships to specific scientific theory.		Question Starters What's the connection between….? What link do you see between… Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows.? But does your claim account for…(evidence) Response Starters I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about …..

6th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback							
Quarter 1	Quarter 2		Quarter 3				Quarter 4
Unit 1 Energy	Unit 2 Relationships Among Organisms	Unit 3 Earth's Biomes and Ecosystems	Unit 4 Earth's Resources	**Unit 5 Human Impact on the Environment**	Unit 6 Earth's Water	Unit 7 Earth's Systems	Unit 8 Weather and Climate
9 weeks	4 weeks	5 weeks	3 weeks	**2 weeks**	1 week	3 weeks	9 weeks

UNIT 5: Human Impact on the Environment (2 weeks)			
Overarching Question(s)			
How and why is Earth constantly changing?			
Unit 5, Lesson 1	**Lesson Length**	**Essential Question**	**Vocabulary**
Human Impact on Water	3 days	What impact can human activities have on water resources?	urbanization, desertification, land degradation, deforestation

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 6.ESS2: Earth Systems **Standard(s)** 6.ESS2.4 Apply scientific principles to design a method to analyze and interpret the impact of humans and other organisms on the hydrologic cycle. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 6.ESS2.4 In 4.ESS2.3, students consider the ways that living organisms impact the land. This standard	**Learning Outcomes** • Explain why humans need water. • Explain why fresh water is a limited resource. • Explain the importance of water quality. • Compare supply and quality. • Define water pollution, point- source pollution, and non-point source pollution. • Define eutrophication and acid rain. • Describe water quality measures and monitoring. • Explain how water quality is maintained in the U.S.	**Curricular Materials** HMH Tennessee Science TE, Unit 5, Lesson 1 pp. 326-341 Engage • Engage Your Brain #s 1 and 2, SE p. 295 • Active Reading #s 3 and 4, SE p. 295 Explore • Ocean Pollution from Land Quick Lab, TE p. 329 Explain Water as a Resource • Visualize It! #5, SE p. 296

advances that idea, noting that the increase in the number of organisms present on the planet means that changes to the Earth will occur at a faster rate. Some effects on the land are inevitable as humans attempt to meet their needs, however analysis of impacts can inform sustainable use of resources. Impacts on the hydrologic cycle might include impacts on runoff, use or contamination of aquifers, etc.

Students designs might focus on how to minimize impacts as a consequence of what their monitoring suggests, however emphasis should be on types of data to be collected and how students might collect data on factors such as location, frequency, purpose for data, in order to begin to define or resolve a design task.

Suggested Science and Engineering Practice(s)

Using Mathematical and Computational Thinking

6.ESS2.4 Students can create ordered series of steps to evaluate the function of a device or understand a process.

Suggested Crosscutting Concept(s)

Scale, Proportion, and Quantity 6.ESS2.4 Students make and evaluate derived/proportional measurements.

- Describe how urbanization can affect water quality.
- Define reservoir and urbanization.
- Explain how humans affect the fresh water flow and supply.

Suggested Phenomena

The Earth has a certain amount of water that is continuously moving over and under the Earth's surface. Humans affect the water cycle by polluting and taking water out of the system. Students can complete a See Think Wonder Template after examining the picture.

- Active Reading #6, SE p. 297
- Think Outside the Book #7, SE p. 297

Water Pollution

- Active Reading #8, SE p. 298
- Visualize It! #s 9-10, SE p. 299

Water Quality

- Predict #11, SE p. 300
- Active Reading #12, SE p. 301
- Active Reading #13, SE p. 301
- Water in the Community Probing Question, TE p. 328

Water Supply and Flow

- Active Reading #14, SE p. 303
- Infer #15, SE p. 303
- Visualize It! #16, SE p. 303
- Active Reading #17, SE p. 304

Extend

Reinforce and Review

- Process Chart Graphic Organizer, TE p. 332
- Visual Summary, SE p. 306

Going Further

- Health Connection, TE p. 332
- Real World Connection, TE p. 332
- Why It Matters, SE p. 305

Evaluate

Formative Assessment

- Reteach, TE p. 333
- Throughout TE
- Lesson Review, SE p. 307

	Possible Guiding Question(s): Based on the picture, give specific examples of how humans are affecting the water cycle?  How can this be prevented or minimized? Statues made of organic rocks, like limestone or marble, have changed over time. The change usually occurs over decades and affects things only in locations exposed to outside elements. Also, the problem is worsened in highly populated urban areas where pollution may be an issue. Students can complete a See Think Wonder Template after examining the picture. Possible Question(s): What caused the statues appearance to change?	Summative Assessment • Human Impact on Earth Alternative Assessment, TE p. 333 Lesson Quiz **Additional Resources** • Effects of Deforestation on the Water Cycle • Humans and the Water Cycle Article • A Dire Shortage of Water Science News for Students Article • Earth Science: The Human Impact on Earth's Systems Newsela Text Set • Legends of Learning-Human Impacts on Earth Systems • The Memphis Sand Aquifer: A Buried Treasure Article • Introduction to the Wolf River: Why Protect the Wolf River? **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold)

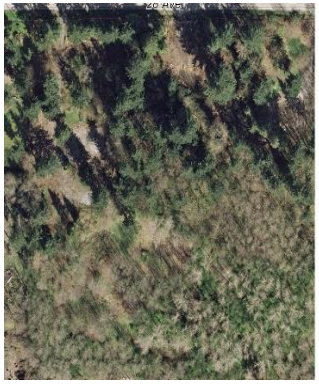
		Students will use a text and word box to explain in writing the importance of water quality. Pre-teach vocabulary (Consider teaching this vocabulary in addition to vocabulary addressed in the standard to support Entering Level ELs): limited, impact, activity, alter, quality Use graphic organizers or concept maps to support students in their explanations of why good stewardship is important to managing natural resources. Academic vocabulary for "Telling Why": since, caused by, in effect, because of, this results in, brought about, due to, consequently, made possible, for this reason, accordingly, as might be expected, therefore, as a result of, give rise to, If…then, leads to, was responsible for When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals To support students with the scientific explanation: Question Starters What's the connection between….?

		What link do you see between… Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows.? But does your claim account for…(evidence) <u>Response Starters</u> I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about …..

6th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback							
Quarter 1	Quarter 2		Quarter 3				Quarter 4
Unit 1 Energy	Unit 2 Relationships Among Organisms	Unit 3 Earth's Biomes and Ecosystems	Unit 4 Earth's Resources	**Unit 5 Human Impact on the Environment**	Unit 6 Earth's Water	Unit 7 Earth's Systems	Unit 8 Weather and Climate
9 weeks	4 weeks	5 weeks	3 weeks	**2 weeks**	1 week	3 weeks	9 weeks

UNIT 5: Human Impact on the Environment (2 weeks)			
Overarching Question(s)			
How do the Earth's surface processes and human activities affect each other?			
Unit 5, Lesson 2	**Lesson Length**	**Essential Question**	**Vocabulary**
Human Impact on Land	3 days	What impact can human activities have on land resources?	urbanization, desertification, land degradation, deforestation

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 6.ESS3: Earth and Human Activity **Standard(s)** 6.ESS3.3 Assess the impacts of human activities on the biosphere including conservation, habitat management, species endangerment, and extinction. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 6.ESS3.3 Beyond creating explanations for observations of changes to the environment, this	**Learning Outcomes** • Describe five ways in which humans use land. • Compare and contrast natural, rural, and urban land uses. • Define urbanization and urban sprawl. • Define degradation. • Describe three factors that lead to land degradation. • Describe the effects of urbanization on land.	**Curricular Materials** HMH Tennessee Science TE, Unit 5, Lesson 2 pp. 344-357 Engage • Engage Your Brain #s 1 and 2, SE p. 313 • Active Reading #s 3 and 4, SE p. 313 • Is Soil a Renewable Resource? Probing Question, TE p. 346 Explore Land Degradation • Roots and Erosion Quick Lab, TE p. 347

standard can also be interpreted treated as a design task where students are developing a device to monitor human impacts, similar to 6.ESS2.4. Part of the design process should involve recognizing that many human activities are necessary, but analyzing the impacts of the activities can help to development responsible constraints. Human activities have greatly altered rates of change to Earth's surface. As humans develop land and build roads, large amounts of natural habitat are lost, affecting the species indigenous to that habitat. Students can obtain and evaluate evidence that increases in human populations or increases in the amount of energy consumed per person also increase negative effects, but engineered solutions can mitigate some of these negative effects. For example, development of low energy consumption lightbulbs (such as LED) can reduce the amount of energy used in a home. Assessments of human activities should include models which can assist in making predictions for the efficacy of conservation efforts with competing interests.	**Suggested Phenomenon**   Urbanization has replaced the forest area with a new neighborhood to support a growing community. Students can complete a See Think Wonder Template after examining the picture. Possible Guiding Question(s): What happened to the plants and animals that once lived in the area? How is the land in the surrounding area affected by the new neighborhood? What can be done to minimize the impact?	<u>Explain</u> How Humans Use Land • Visualize It! #5, SE p. 314 • Active Reading #6, SE p. 315 • Active Reading #7, SE p. 315 • Active Reading #8, SE p. 316 • Visualize It! #9, SE p. 316 Land Degradation • Think Outside the Book #13, SE p. 318 • Active Reading #14, SE p. 318 • Visualize It! #15, SE p. 319 • Land Degradation Posters Activity, TE p. 346 • Investigating Human Impact on the Land Quick Lab, TE p. 347 <u>Extend</u> Reinforce and Review • How Humans Use Land Graphic Organizer, TE p. 350 • Visual Summary, SE p. 320 Going Further • Geography Connection, TE p. 350 • Social Studies Connection, TE p. 350 • Why It Matters, SE p. 317 <u>Evaluate</u> Formative Assessment • Reteach, TE p. 351 • Throughout TE • Lesson Review, SE p. 321

Suggested Science and Engineering Practice(s) Constructing Explanations and Designing Solutions 6.ESS3.3 Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion. **Suggested Crosscutting Concept(s)** Cause and Effect 6.ESS3.3 Students begin to connect their explanations for cause and effect relationships to specific scientific theory		Summative Assessment • Human Impact on Land Alternative Assessment, TE p. 351 • Lesson Quiz **Additional Resources** • Effects of Deforestation on Soil • Saving Wetlands Science News for Students Article • Earth Science: The Human Impact on Earth's Systems Newsela Text Set • Legends of Learning-Human Impacts on Earth Systems • UN Report: Humans Accelerating Extinction of Species • Natural and Human Impacts on Wildlife • Deforestation Explained **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) • Students will use sentence frames and a word bank to define, in writing, urbanization and urban sprawl.

		Pre-teach vocabulary: (Consider teaching this vocabulary in addition to vocabulary addressed in the standard to support Entering Level ELs) factors, sprawl Use graphic organizers or concept maps to support students in their explanations of how humans use land. When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals To support students with the scientific explanation: Question Starters What's the connection between….? What link do you see between… Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows.? But does your claim account for…(evidence) Response Starters

		I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about …..

6th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback							
Quarter 1	Quarter 2		Quarter 3				Quarter 4
Unit 1 Energy	Unit 2 Relationships Among Organisms	Unit 3 Earth's Biomes and Ecosystems	Unit 4 Earth's Resources	**Unit 5 Human Impact on the Environment**	Unit 6 Earth's Water	Unit 7 Earth's Systems	Unit 8 Weather and Climate
9 weeks	4 weeks	5 weeks	3 weeks	**2 weeks**	1 week	3 weeks	9 weeks

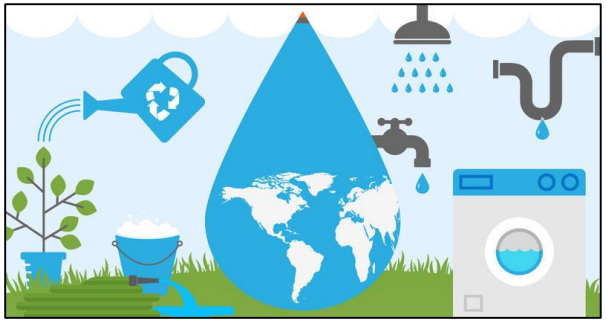
UNIT 5: Human Impact on the Environment (2 weeks)

Overarching Question(s)

How and why is Earth constantly changing? How do Earth's surface processes and human activities affect each other?

Unit 5, Lesson 3	Lesson Length	Essential Question	Vocabulary
Protecting Earth's Water, Land, and Air	4 days	How can Earth's resources be used wisely?	conservation, stewardship

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 6.ESS2: Earth Systems 6.ESS3: Earth and Human Activity **Standard(s)** 6.ESS2.4 Apply scientific principles to design a method to analyze and interpret the impact of humans and other organisms on the hydrologic cycle. 6.ESS3.3 Assess the impacts of human activities on the biosphere including conservation, habitat	**Learning Outcomes** • Define conservation. • Explain the importance of wise stewardship of Earth's resources. • Explain the importance of maintaining water quality and sustainable water use. • Describe ways to prevent water pollution. • Describe benefits of sustainable land management and conservation. • Describe ways to prevent or repair land degradation.	**Curricular Materials** HMH Tennessee Science TE, Unit 5, Lesson 3 pp. 358-373 Engage • Engage Your Brain #s 1 and 2, SE p. 325 • Active Reading #s 3 and 4, SE p. 325 • Conservation at School Activity, TE p. 360 • Packaging Daily Demo, TE p. 361 Explore Conservation and Stewardship • Investigate the Value of Recycling Quick Lab, TE p. 361

management, species endangerment, and extinction. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 6.ESS2.4 In 4.ESS2.3, students consider the ways that living organisms impact the land. This standard advances that idea, noting that the increase in the number of organisms present on the planet means that changes to the Earth will occur at a faster rate. Some effects on the land are inevitable as humans attempt to meet their needs, however analysis of impacts can inform sustainable use of resources. Impacts on the hydrologic cycle might include impacts on runoff, use or contamination of aquifers, etc. Students designs might focus on how to minimize impacts as a consequence of what their monitoring suggests, however emphasis should be on types of data to be collected and how students might collect data on factors such as location, frequency, purpose for data, in order to begin to define or resolve a design task. 6.ESS3.3 Beyond creating explanations for observations of changes to the environment, this standard can also be interpreted treated as a design task where students are developing a device to monitor human impacts, similar to 6.ESS2.4. Part of the design process should involve recognizing that	• Explain four ways people are working to reduce air pollution. **Suggested Phenomenon**  Water conservation begins with you! Students can complete a See Think Wonder Template after examining the picture. Possible Guiding Question(s): What can you do to help conserve water? What can you do to lessen the impact of our activities on the biosphere?	Preservation and Conservation of Water • Filtering Water Exploration Lab, TE p. 361 Land Management and Conservation • Soil Erosion Quick Lab, SE p. 361 Explain Conservation and Stewardship • Active Reading #5, SE p. 326 • Visualize It! #6, SE p. 326 • Compare #7, SE p. 327 • Visualize It! #8, SE p. 327 Preservation and Conservation of Water • Do the Math #9, SE p. 328 • Identify #10, SE p. 328 • Visualize It! #11, SE p. 329 Land Management and Conservation • Active Reading #12, SE p. 330 • Think Outside the Book #13, SE p. 330 • Visualize It! #14, SE p. 331 • Apply #15, SE p. 332 • Active Reading #16, SE p. 333 • Visualize It! #s 17-18, SE p. 333 • Human Impact Virtual Lab, TE p. 359 Reducing Air Pollution • Active Reading #19, SE p. 334 • Visualize It! #20, SE p. 335 • Summarize #21, SE p. 335 • The Cost of Energy Discussion, TE p. 360

many human activities are necessary, but analyzing the impacts of the activities can help to development responsible constraints. Human activities have greatly altered rates of change to Earth's surface. As humans develop land and build roads, large amounts of natural habitat are lost, affecting the species indigenous to that habitat. Students can obtain and evaluate evidence that increases in human populations or increases in the amount of energy consumed per person also increase negative effects, but engineered solutions can mitigate some of these negative effects. For example, development of low energy consumption lightbulbs (such as LED) can reduce the amount of energy used in a home. Assessments of human activities should include models which can assist in making predictions for the efficacy of conservation efforts with competing interests. **Suggested Science and Engineering Practice(s)** Using Mathematical and Computational Thinking 6.ESS2.4 Students can create ordered series of steps to evaluate the function of a device or understand a process. Constructing Explanations and Designing Solutions 6.ESS3.3 Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize		Extend Reinforce and Review • Venn Diagram Graphic Organizer, TE p. 364 • Visual Summary, SE p. 336 Evaluate Formative Assessment • Reteach, TE p. 365 • Throughout TE • Lesson Review, SE p. 337 Summative Assessment • Protecting Earth's Water, Land, and Air Alternative Assessment, TE p. 365 • Lesson Quiz • Unit 5 Big Idea, SE p. 340 Unit 5 Review, SE pp. 341-344 **Additional Resources** • Teen converts Water Pollutant into a Plant Fertilizer Science News for Students Article • Air Pollution Takes a Toll on Solar Energy Science News for Students Article • Pollution Patrol • Cleaning the Air • Legends of Learning-Human Impacts on Earth Systems

quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion. **Suggested Crosscutting Concept(s)** Scale, Proportion, and Quantity 6.ESS2.4 Students make and evaluate derived/proportional measurements. Cause and Effect 6.ESS3.3 Students begin to connect their explanations for cause and effect relationships to specific scientific theory.		**ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) Students will explain the importance of maintaining water quality and sustainable water use to a partner by using examples from a text and graphic organizer. Pre-teach vocabulary: (Consider teaching this vocabulary in addition to vocabulary addressed in the standard to support Entering Level ELs) maintain, quality, wisely Use graphic organizers or concept maps to support students in their explanations of how humans use land. Academic vocabulary for "Explain": since, caused by, in effect, because of, this results in, brought about, due to, consequently, made possible, for this reason, accordingly, as might be expected, therefore, as a result of, give rise to, If…then, leads to, was responsible for

		When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals To support students with the scientific explanation: Question Starters What's the connection between….? What link do you see between… Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows.? But does your claim account for…(evidence) Response Starters I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about …..

6th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback							
Quarter 1	Quarter 2		Quarter 3				Quarter 4
Unit 1 Energy	Unit 2 Relationships Among Organisms	Unit 3 Earth's Biomes and Ecosystems	Unit 4 Earth's Resources	Unit 5 Human Impact on the Environment	**Unit 6 Earth's Water**	Unit 7 Earth's Systems	Unit 8 Weather and Climate
9 weeks	4 weeks	5 weeks	3 weeks	2 weeks	**1 week**	3 weeks	9 weeks

UNIT 6: Earth's Water (1 week)			
Overarching Question(s)			
How and why is Earth constantly changing?			
Unit 6, Lesson 1	**Lesson Length**	**Essential Question**	**Vocabulary**
Water and Its Properties	2 days	What makes water so important?	polarity, specific heat, cohesion, solvent, adhesion

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 6.ESS2: Earth's Systems **Standard(s)** 6.ESS2.4 Apply scientific principles to design a method to analyze and interpret the impact of humans and other organisms on the hydrologic cycle. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide**	**Learning Outcomes** • Explain water's importance to Earth's surface and weather, and to living organisms, including humans. • Describe the distribution of water on Earth. • Describe the structure of water. • Explain why water is a polar molecule. • Describe the three states of water on Earth. • Describe the properties of water in each of these three states.	**Curricular Materials** HMH Tennessee Science TE, Unit 6, Lesson 1 pp. 386-399 Engage and Explore • Engage Your Brain #s 1 and 2, SE p. 349 • Active Reading #s 3 and 4, SE p. 349 • Toss the Blue Planet Explain Importance and Distribution of Water • Do the Math #5, SE p. 350 • Active Reading #6, SE p. 350 • Visualize It! #7, SE p. 351

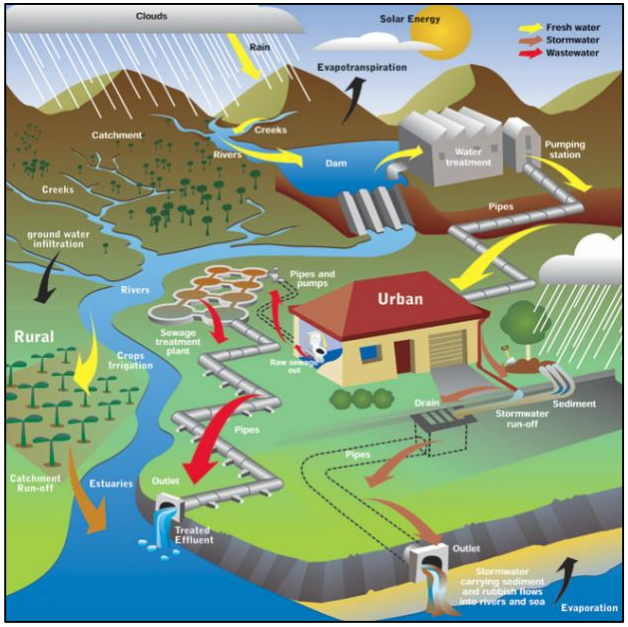
6.ESS2.4 In 4.ESS2.3, student consider the ways that living organisms impact the land. This standard advances that idea, noting that the increase in the number of organisms present on the planet means that changes to the Earth will occur at a faster rate. Some effects on the land are inevitable as humans attempt to meet their needs, however analysis of impacts can inform sustainable use of resources. Impacts on the hydrologic cycle might include impacts on runoff, use or contamination of aquifers, etc.

Students designs might focus on how to minimize impacts as a consequence of what their monitoring suggests, however emphasis should be on types of data to be collected and how students might collect data on factors such as location, frequency, purpose for data, in order to begin to define or resolve a design task.

Suggested Science and Engineering Practice(s)
Using Mathematical and Computational Thinking
6.ESS2.4 Students can create ordered series of steps to evaluate the function of a device or understand a process.

Suggested Crosscutting Concept(s)
Scale, Proportion, and Quantity 6.ESS2.4 Students make and evaluate derived/proportional measurements.

Suggested Phenomenon



The Earth has a certain amount of water that is continuously moving over and under the Earth's surface. Humans affect the water cycle by polluting and taking water out of the system. Students can complete a See Think Wonder Template after examining the picture.

Possible Guiding Question(s):
Based on the picture, give specific examples of how humans are affecting the water cycle?
How can this be prevented or minimized?

Structure of Water
- Visualize It! #8, SE p. 352

States of Water
- Active Reading #9, SE p. 353
- Visualize It! #10, SE p. 353

Properties of Water
- Visualize It! #11, SE p. 354
- Summarize #12, SE p. 355
- Think Outside the Book #13, SE p. 355

Extend

Reinforce and Review
- Water Sport Activity, TE p. 392
- Layered Book Fold Note, TE p. 392
- Visual Summary, SE p. 356

Evaluate

Formative Assessment
- Reteach, TE p. 393
- Throughout TE
- Lesson Review, SE p. 357

Summative Assessment
- Water and Its Properties Alternative Assessment, TE p. 393
- Lesson Quiz

ESL Supports and Scaffolds
WIDA Standard 4 - The Language of Science

To support students in speaking refer to this resource:

		WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) Students will use a graphic organizer and visuals to describe to a partner the distribution of water on Earth. Pre-teach vocabulary: (Consider teaching this vocabulary in addition to vocabulary addressed in the standard to support Entering Level ELs) distribution, states Use graphic organizers or concept maps to support students in their descriptions of water distribution on earth. Academic vocabulary for "Explain": since, caused by, in effect, because of, this results in, brought about, due to, consequently, made possible, for this reason, accordingly, as might be expected, therefore, as a result of, give rise to, If…then, leads to, was responsible for When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals

		To support students with the scientific explanation: <u>Question Starters</u> What's the connection between….? What link do you see between… Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows.? But does your claim account for…(evidence) <u>Response Starters</u> I agree with you because of (evidence or reasoning) I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about …..

6th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback							
Quarter 1	Quarter 2		Quarter 3				Quarter 4
Unit 1 Energy	Unit 2 Relationships Among Organisms	Unit 3 Earth's Biomes and Ecosystems	Unit 4 Earth's Resources	Unit 5 Human Impact on the Environment	**Unit 6 Earth's Water**	Unit 7 Earth's Systems	Unit 8 Weather and Climate
9 weeks	4 weeks	5 weeks	3 weeks	2 weeks	**1 week**	3 weeks	9 weeks

UNIT 6: Earth's Water (1 week)			
Overarching Question(s)			
How and why is Earth constantly changing?			
Unit 6, Lesson 2	**Lesson Length**	**Essential Question**	**Vocabulary**
The Water Cycle	2 days	How does water change state and move around on Earth?	water cycle, sublimation, evaporation, condensation, transpiration, precipitation

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 6.ESS2: Earth Systems **Standard(s)** 6.ESS2.4 Apply scientific principles to design a method to analyze and interpret the impact of humans and other organisms on the hydrologic cycle. **Explanation(s) and Support of Standard(s)** from TN Science Reference Guide	**Learning Outcomes** • Define the water cycle. • Describe the states of matter and how changes of state occur. • Define and describe three ways that water reaches the atmosphere. • Define and describe condensation and precipitation. • Describe what happens to water after it falls to Earth. • Describe examples of two things that the water cycle transports.	**Curricular Materials** HMH Tennessee Science TE, Unit 6, Lesson 2 pp. 400-413 Engage • Engage Your Brain #s 1 and 2, SE p. 361 • Active Reading #s 3 and 4, SE p. 361 Explore • How Does Water Move Through the Water Cycle? Virtual Lab, TE p. 403 Explain Water Cycle and Change of State • Visualize It! #5, SE p. 362

6.ESS2.4 In 4.ESS2.3, student consider the ways that living organisms impact the land. This standard advances that idea, noting that the increase in the number of organisms present on the planet means that changes to the Earth will occur at a faster rate. Some effects on the land are inevitable as humans attempt to meet their needs, however analysis of impacts can inform sustainable use of resources. Impacts on the hydrologic cycle might include impacts on runoff, use or contamination of aquifers, etc.

Students designs might focus on how to minimize impacts as a consequence of what their monitoring suggests, however emphasis should be on types of data to be collected and how students might collect data on factors such as location, frequency, purpose for data, in order to begin to define or resolve a design task.

Suggested Science and Engineering Practice(s)
Using Mathematical and Computational Thinking
6.ESS2.4
Students can create ordered series of steps to evaluate the function of a device or understand a process.

Suggested Crosscutting Concept(s)

Suggested Phenomenon

The Earth has a certain amount of water that is continuously moving over and under the Earth's surface. Humans affect the water cycle by polluting and taking water out of the system. Students can complete a See Think Wonder Template after examining the picture.

Possible Guiding Question(s):
Based on the picture, give specific examples of how humans are affecting the water cycle?
How can this be prevented or minimized?

- Active Reading #6, SE p. 363
- Visualize It! #7, SE p. 363

Water in the Atmosphere
- Do the Math #8, SE p. 364
- Visualize It! #9, SE p. 364
- Visualize It! #10, SE p. 365
- Summarize #11, SE p. 365

Water in the Oceans and on Land
- Active Reading #12, SE p. 366
- Visualize It! #13, SE p. 366

Transport of Matter and Energy
- Think Outside the Book #14, SE p. 367
- Visualize It! #s 16-17, SE p. 368
- Think Outside the Book #18, SE p. 369

Extend

Reinforce and Review
- Water Moves Activity, TE p. 406
- Mind Map Graphic Organizer, TE p. 406
- Visual Summary, SE p. 370

Evaluate

Formative Assessment
- Reteach, TE p. 407
- Throughout TE
- Lesson Review, SE p. 371

Summative Assessment
- The Water Cycle Alternative Assessment, TE p. 407
- Lesson Quiz

Scale, Proportion, and Quantity 6.ESS2.4 Students make and evaluate derived/proportional measurements.		• Altering the Water Cycle S.T.E.M., TE pp. 414-417 **Additional Resources** • The Water Cycle STUDY JAMS! Video and Quiz • Legend of Learning-The Water Cycle **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) Students will use a graphic organizer and visuals to describe to a partner the distribution of water on Earth. Pre-teach vocabulary: (Consider teaching this vocabulary in addition to vocabulary addressed in the standard to support Entering Level ELs) distribution, states Use graphic organizers or concept maps to support students in their descriptions of water distribution on earth.

		Academic vocabulary for "Explain": since, caused by, in effect, because of, this results in, brought about, due to, consequently, made possible, for this reason, accordingly, as might be expected, therefore, as a result of, give rise to, If…then, leads to, was responsible for When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals To support students with the scientific explanation: Question Starters What's the connection between….? What link do you see between… Why do you think…? What is our evidence that…. Do we have enough evidence to make that claim? But what about this other evidence that shows.? But does your claim account for…(evidence) Response Starters I agree with you because of (evidence or reasoning)

		I don't agree with your claim because of (evidence or reasoning) This evidence shows that… Your explanation makes me think about …..

6th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback							
Quarter 1	Quarter 2		Quarter 3				Quarter 4
Unit 1 Energy	Unit 2 Relationships Among Organisms	Unit 3 Earth's Biomes and Ecosystems	Unit 4 Earth's Resources	Unit 5 Human Impact on the Environment	**Unit 6 Earth's Water**	Unit 7 Earth's Systems	Unit 8 Weather and Climate
9 weeks	4 weeks	5 weeks	3 weeks	2 weeks	**1 week**	3 weeks	9 weeks

UNIT 6: Earth's Water (1 week)			
Overarching Question(s)			
How and why is Earth constantly changing? How do Earth's surface processes and human activities affect each other?			
Unit 6, Lesson 3	**Lesson Length**	**Essential Question**	**Vocabulary**
Surface Water and Groundwater	2 days	How does fresh water flow on Earth?	surface water, channel, divide, groundwater, tributary, aquifer, water table, watershed

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 6.ESS2: Earth Systems 6.ESS3: Earth and Human Activity **Standard(s)** 6.ESS2.4 Apply scientific principles to design a method to analyze and interpret the impact of humans and other organisms on the hydrologic cycle. 6.ESS3.3 Assess the impacts of human activities on the biosphere including conservation, habitat	**Learning Outcomes** • Explain where surface water comes from and why living things depend on it. • Explain the relationship between rivers and the tributaries. • Explain how stream load, gradient, and flow describe river processes. • Explain the various processes carried on within river systems. • Describe watersheds and their structure, and explain how water flow is affected.	**Curricular Materials** HMH Tennessee Science TE, Unit 6, Lesson 3 pp. 418-431 Engage • Engage Your Brain #s 1 and 2, SE p. 379 • Active Reading #s 3 and 4, SE p. 379 Explore • Aquifers and Development Exploration Lab, TE p. 421 Explain Surface Water • Active Reading #5, SE p. 380

management, species endangerment, and extinction.

Explanation(s) and Support of Standard(s) from TN Science Reference Guide

6.ESS2.4 In 4.ESS2.3, students consider the ways that living organisms impact the land. This standard advances that idea, noting that the increase in the number of organisms present on the planet means that changes to the Earth will occur at a faster rate. Some effects on the land are inevitable as humans attempt to meet their needs, however analysis of impacts can inform sustainable use of resources. Impacts on the hydrologic cycle might include impacts on runoff, use or contamination of aquifers, etc.

Students designs might focus on how to minimize impacts as a consequence of what their monitoring suggests, however emphasis should be on types of data to be collected and how students might collect data on factors such as location, frequency, purpose for data, in order to begin to define or resolve a design task.

6.ESS3.3 Beyond creating explanations for observations of changes to the environment, this standard can also be interpreted treated as a design task where students are developing a device to monitor human impacts, similar to 6.ESS2.4. Part of

- Describe how humans use the water in watersheds.
- Explain how groundwater is and how it forms.
- Define water table and aquifer.
- Describe the effects of porosity and permeability.
- Explain how humans use groundwater.
- Determine how aquifers are discharged and recharged.

Suggested Phenomenon

- Active Reading #6, SE p. 380
- Visualize It! #7, SE p. 381
- Visualize It! #8, SE p. 382
- Active Reading #9, SE p. 383
- Active Reading #10, SE p. 383

Groundwater

- Visualize It! #11, SE p. 384
- Visualize It! #12, SE p. 385
- Think Outside the Book #13, SE p. 385
- Active Reading #14, SE p. 386
- Not a Drop to Drink Probing Questions, TE p. 420

Extend

Reinforce and Review

- Cause and Effect Chain Graphic Organizer, TE p. 424
- Visual Summary, SE p. 388

Evaluate

Formative Assessment

- Reteach, TE p. 425
- Throughout TE
- Lesson Review, SE p. 389

Summative Assessment

- Surface Water and Groundwater Alternative Assessment, TE p. 425

Lesson Quiz

Additional Resources

the design process should involve recognizing that many human activities are necessary, but analyzing the impacts of the activities can help to development responsible constraints. Human activities have greatly altered rates of change to Earth's surface. As humans develop land and build roads, large amounts of natural habitat are lost, affecting the species indigenous to that habitat. Students can obtain and evaluate evidence that increases in human populations or increases in the amount of energy consumed per person also increase negative effects, but engineered solutions can mitigate some of these negative effects. For example, development of low energy consumption lightbulbs (such as LED) can reduce the amount of energy used in a home. Assessments of human activities should include models which can assist in making predictions for the efficacy of conservation efforts with competing interests. **Suggested Science and Engineering Practice(s)** Using Mathematical and Computational Thinking 6.ESS2.4 Students can create ordered series of steps to evaluate the function of a device or understand a process. Constructing Explanations and Designing Solutions 6.ESS3.3 Students form explanations using source (including student developed investigations) which	The Earth has a certain amount of water that is continuously moving over and under the Earth's surface. Humans affect the water cycle by polluting and taking water out of the system. Students can complete a See Think Wonder Template after examining the picture. Possible Guiding Question(s): Based on the picture, give specific examples of how humans are affecting the water cycle? How can this be prevented or minimized?	The Memphis Sand Aquifer: A Buried Treasure Article **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) Students will use a graphic organizer and visuals to explain the relationship between rivers and tributaries. Use graphic organizers or concept maps to support students in their explanations of how fresh water flows on earth. Academic vocabulary for "Explain": since, caused by, in effect, because of, this results in, brought about, due to, consequently, made possible, for this reason, accordingly, as might be expected, therefore, as a result of, give rise to, If…then, leads to, was responsible for When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates

show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion. **Suggested Crosscutting Concept(s)** Scale, Proportion, and Quantity 6.ESS2.4 Students make and evaluate derived/proportional measurements. Cause and Effect 6.ESS3.3 Students begin to connect their explanations for cause and effect relationships to specific scientific theory		Interactive Science Dictionary with visuals

6th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback							
Quarter 1	Quarter 2		**Quarter 3**				Quarter 4
Unit 1 Energy	Unit 2 Relationships Among Organisms	Unit 3 Earth's Biomes and Ecosystems	Unit 4 Earth's Resources	Unit 5 Human Impact on the Environment	Unit 6 Earth's Water	**Unit 7 Earth's Systems**	Unit 8 Weather and Climate
9 weeks	4 weeks	5 weeks	3 weeks	2 weeks	1 week	**3 weeks**	9 weeks

UNIT 7: Earth's Systems (3 weeks)

Overarching Question(s)

How and why is Earth constantly changing?

Unit 7, Lesson 1	Lesson Length	Essential Question	Vocabulary
Energy Transfer	1 week	How does energy move through Earth's system?	temperature, heat, conduction, thermal energy, radiation, atmosphere, thermal expansion, convection

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 6.ESS2: Earth Systems **Standard(s)** 6.ESS2.1 Gather evidence to justify that oceanic convection currents are caused by the sun's transfer of heat energy and differences in salt concentration leading to global water movement. 6.ESS2.2 Diagram convection patterns that flow due to uneven heating of the earth.	**Learning Outcomes** • Define temperature, heat, thermal energy, and thermal expansion. • Describe what happens when objects at different temperatures come into contact. • Summarize the process of radiation. • Describe the main source of energy on Earth's surface. • Identify examples of radiation on Earth. • Summarize the process of convection. • Identify examples of convection on Earth.	**Curricular Materials** HMH Tennessee Science TE, Unit 7, Lesson 1 pp. 444-458 Engage • Engage Your Brain #s 1 and 2, SE p. 401 • Active Reading #s 3 and 4, SE p. 401 • Transfer Energy Daily Demo, TE p. 447 • Modeling Convection Quick Lab, TE p. 447 Explore Radiation • Heat from the Sun S.T.E.M. Lab, TE p. 446

6.ESS2.3 Construct explanation for how atmospheric flow, geographic features, and ocean currents affect the climate of a region through heat transfer. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 6.ESS2.1 Students should be able to use evidence to create models for how oceanic convection currents originate. Such a model should include not only the sun's warming of equatorial waters, but also the impact ice at the poles causing water to descend. The primary factors influencing ocean currents are unequal heating of the earth's surface, differences in energy transfer to land vs ocean, and density-related behaviors of heated or cooled water. Demonstrations of the temperature-based behavior can be performed by heating one side of a water-filled baking dish and cooling the opposite side. If the water is initially allowed to settle, drops of food coloring will trace out the convection patterns which develop. Pipets can be used to insert the food coloring into the lower currents. Demonstration of the effect of salt on creating a sinking mass of water can be accomplished by partially filling a large container with water then covering the surface of the water with plastic wrap and pouring an additional volume of salt containing, colored water onto the wrap. With the gentle removal of the plastic wrap, the mixing will be visible. Reversing the	• Summarize conduction. • Identify examples of conduction on Earth. **Suggested Phenomenon**  Possible Guiding Question(s): How is energy being transferred?	• The Sun's Angle and Temperature Quick Lab, TE p. 447 Explain Temperature, Heat, Thermal Energy, Thermal Expansion • Visualize It! #5, SE p. 402 • Predict #6, SE p. 403 • Inquiry #7, SE p. 403 • Active Reading #8, SE p. 404 • Visualize It! #9, SE p. 404 • Predict #10, SE p. 405 Radiation • Visualize It! #11, SE p. 406 • Summarize #12, SE p. 407 • Think Outside the Book #13, SE p. 407 Convection • Visualize It! #14, SE p. 408 • Active Reading #15, SE p. 409 • Visualize It! #16, SE p. 409 Conduction • Active Reading #17, SE p. 410 • Visualize It! #18, SE p. 410 • Summarize #19, SE p. 411 Extend Reinforce and Review • Energy Transfer Game, TE p. 450 • Pyramid Fold Note Graphic Organizer, TE p. 450 • Visual Summary, SE p. 412

order that the waters are added will provide the opposite effect. (From third grade, students will have developed understandings of mass and volume; however, the topic of density will need to be explored to fully support 6.ESS2.1 and 6.ESS2.2. Calculations of density are beyond the scope of this standard.) 6.ESS2.2 Models for which demonstrate convection patterns should incorporate the Sun, Earth (rotating), ocean, and land. The relationships between these components also make it possible to explain patterns in the distribution of climate types and resulting biomes (6.LS2.4). A model for heating of the Earth shows more direct heating of the earth's equator relative to the poles creating two large convection cells which move ascend at the equator and descend at the poles north and south poles. The Coriolis force, due to the Earth's spin breaks the two convection cells into a total of six cells, three in the southern hemisphere and three in the norther hemisphere. This breakup (Coriolis effect) can be modeled by a pair of students using a marker and a large sphere. If the sphere is stationary, a student can use a marker to draw a straight line from the equator to the poles. If the ball is rotated while drawing this same		Going Further • Real World Connection, TE p. 450 Evaluate Formative Assessment • Reteach, TE p. 451 • Throughout TE • Lesson Review, SE p. 413 Summative Assessment • Transfer of Energy Alternative Assessment, TE p. 451 • Lesson Quiz **Additional Resources** • Modeling Ocean Currents **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) Students will describe what happens when objects at different temperatures come into contact using visuals, a graphic organizer, and word box.

straight line, the resulting line drawn on the sphere will curve. Rate of rotation determines the severity of the curvature, Earth's rate of spin results in three cells, with deserts focused at latitudes near 30 degrees and 60 degrees north and south, and predictable surface winds. (Memorization of the names of specific global winds and layers of the atmosphere are beyond the scope of this standard.) 6.ESS2.3 A number of interacting parts contribute to the distribution of similar climates across the globe. Such components include factors addressed in 6.ESS2.2, as well as the ocean, land masses, different land surfaces, and impacts of living organisms. Student explanations can include the impact of solar energy on relative changes in temperature occurring in land/ocean (e.g., land warms more quickly), high altitudes/low altitudes (e.g., high altitudes have lower temperatures), and earth surfaces (e.g., ice reflects sunlight). Living things alter the surface types in an area, thus impacting energy transfer to affected areas. On land, surface features such as mountains can direct the flow of air masses upwards, inducing temperature related effects such as rain. While the Coriolis effect creates general patterns for distribution of similar climates, it is possible for the climate in a region to vary from the climate seen at		Use graphic organizers or concept maps to support students in their explanations of how energy moves through Earth's system. Academic vocabulary for "Explain": since, caused by, in effect, because of, tis results in, brought about, due to, consequently, made possible, for this reason, accordingly, as might be expected, therefore, as a result of, give rise to, If…then, leads to, was responsible for When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals

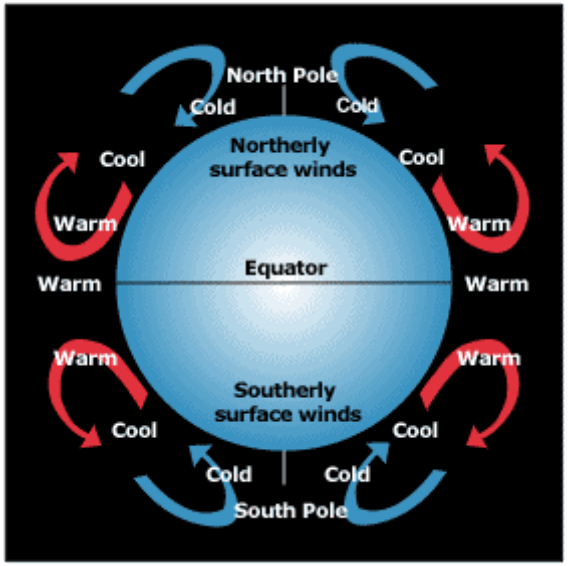
similar latitudes due to the presence of geographic features such as mountains or lakes. Coastal air rising over mountains will be depleted of its moisture and create deserts on the back side of the mountain. Likewise, large bodies of water can influence the temperature and humidity of a region due to the ability of water to store large amounts of thermal energy. **Suggested Science and Engineering Practice(s)** Engaging in Argument from Evidence 6.ESS2.1 Students present an argument based on empirical evidence, models, and invoke scientific reasoning. Developing and Using Models 6.ESS2.2 Students create models which are responsive and incorporate features that are not visible in the natural world, but have implications on the behavior of the modeled systems and can identify limitations of their models. Constructing Explanations and Designing Solutions 6.ESS2.3 Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion.		

Suggested Crosscutting Concept(s) Cause and Effect 6.ESS2.1 Students begin to connect their explanations for cause and effect relationships to specific scientific theory. Systems and System Models 6.ESS2.2 Students develop models for systems which include both visible and invisible inputs and outputs for that system. 6.ESS2.3 Students evaluate the sub-systems that may make up a larger system.		

6th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback							
Quarter 1	Quarter 2		Quarter 3				Quarter 4
Unit 1 Energy	Unit 2 Relationships Among Organisms	Unit 3 Earth's Biomes and Ecosystems	Unit 4 Earth's Resources	Unit 5 Human Impact on the Environment	Unit 6 Earth's Water	**Unit 7 Earth's Systems**	Unit 8 Weather and Climate
9 weeks	4 weeks	5 weeks	3 weeks	2 weeks	1 week	**3 weeks**	9 weeks

UNIT 7: Earth's Systems (3 weeks)			
Overarching Question(s)			
How and why is Earth constantly changing?			
Unit 7, Lesson 2	**Lesson Length**	**Essential Question**	**Vocabulary**
Wind in the Atmosphere	1 week	What is wind?	wind, jet stream, Coriolis effect, local wind, global wind

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 6.ESS2: Earth Systems **Standard(s)** 6.ESS2.2 Diagram convection patterns that flow due to uneven heating of the earth. 6.ESS2.3 Construct explanation for how atmospheric flow, geographic features, and ocean currents affect the climate of a region through heat transfer.	**Learning Outcomes** • Explain why air moves and identify the source of energy that causes air movement. • Illustrate how convection cells in Earth's atmosphere cause high- and low pressure belts at Earth's surface. • Summarize the Coriolis effect. • Describe two factors that produce global winds. • Identify and locate the three major global wind systems. Describe winds where global pressure belts meet. • Define jet streams.	**Curricular Materials** HMH Tennessee Science TE, Unit 7, Lesson 2 pp. 464-477 Engage • Engage Your Brain #s 1 and 2, SE p. 421 • Active Reading #s 3 and 4, SE p. 421 Explore The Movement of Air • Rising Heat Quick Lab, TE p. 467 Explain The Movement of Air • Visualize It! #5, SE p. 422

Explanation(s) and Support of Standard(s) from TN Science Reference Guide 6.ESS2.2 Models for which demonstrate convection patterns should incorporate the Sun, Earth (rotating), ocean, and land. The relationships between these components also make it possible to explain patterns in the distribution of climate types and resulting biomes (6.LS2.4). A model for heating of the Earth shows more direct heating of the earth's equator relative to the poles creating two large convection cells which move ascend at the equator and descend at the poles north and south poles. The Coriolis force, due to the Earth's spin breaks the two convection cells into a total of six cells, three in the southern hemisphere and three in the norther hemisphere. This breakup (Coriolis effect) can be modeled by a pair of students using a marker and a large sphere. If the sphere is stationary, a student can use a marker to draw a straight line from the equator to the poles. If the ball is rotated while drawing this same straight line, the resulting line drawn on the sphere will curve. Rate of rotation determines the severity of the curvature, Earth's rate of spin results in three cells, with deserts focused at latitudes near 30 degrees and 60 degrees north and south, and predictable surface winds.	• Explain differences in the way land and water absorb and release energy cause local winds, such as sea, land, valley, and, mountain breezes. **Suggested Phenomenon**  In the absence of the Coriolis effect in the fixed model of the Earth, you can see the cold air from the poles and the warm air from the equator create 4 distinct convection cells. Since Earth rotates on its axis these large cells do not actually form. Descending air is deflected on the right breaking the large convection current into 3 distinct cells.	• Active Reading #6, SE p. 423 • Visualize It! #7, SE p. 423 • Modeling Air Movement by Convection Quick Lab, TE p. 467 Global Winds • Active Reading #8, SE p. 424 • Think Outside the Book #9, SE p. 424 • Visualize It! #10, SE p. 425 • Active Reading #11, SE p. 426 • Visualize It! #12, SE p. 426 • Jet Streams and Weather Discussion, TE p. 466 • Journey of a Trade Wind Activity, TE p. 466 Local Winds • Active Reading #16, SE p. 428 • Visualize It! #17, SE p. 428 • Visualize It! #18, SE p. 429 Extend Reinforce and Review • Cluster Diagram Graphic Organizer, TE p. 470 • Visual Summary, SE p. 430 Going Further • Astronomy Connection, TE p. 470 • Environmental Science Connection, TE 470 • Why It Matters, TE p. 471 Evaluate Formative Assessment • Reteach, TE p. 471 • Throughout TE

(Memorization of the names of specific global winds and layers of the atmosphere are beyond the scope of this standard.) 6.ESS2.3 A number of interacting parts contribute to the distribution of similar climates across the globe. Such components include factors addressed in 6.ESS2.2, as well as the ocean, land masses, different land surfaces, and impacts of living organisms. Student explanations can include the impact of solar energy on relative changes in temperature occurring in land/ocean (e.g., land warms more quickly), high altitudes/low altitudes (e.g., high altitudes have lower temperatures), and earth surfaces (e.g., ice reflects sunlight). Living things alter the surface types in an area, thus impacting energy transfer to affected areas. On land, surface features such as mountains can direct the flow of air masses upwards, inducing temperature related effects such as rain. While the Coriolis effect creates general patterns for distribution of similar climates, it is possible for the climate in a region to vary from the climate seen at similar latitudes due to the presence of geographic features such as mountains or lakes. Coastal air rising over mountains will be depleted of its moisture and create deserts on the back side of the mountain. Likewise, large bodies of water can influence the temperature and humidity of a region	The wind cells are created as alternating high and lows. Students can complete a See Think Wonder Template after examining the picture.	• Lesson Review, SE p. 431 Summative Assessment • Wind in the Atmosphere Alternative Assessment, TE p. 471 • Lesson Quiz **Additional Resources** • Air Pressure & Wind STUDY JAMS! Video and Quiz • Land and Sea Breezes Article • Why Does the Wind Blow? YouTube Video **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science Sample Language Objectives: (language domain along with a scaffold) Students will explain why air moves and identify the source of energy that causes air movement using visuals, a graphic organizer, and word box. Use graphic organizers or concept maps to support students in their explanations of what regulates weather and climate.

due to the ability of water to store large amounts of thermal energy. **Suggested Science and Engineering Practice(s)** Developing and Using Models 6.ESS2.2 Students create models which are responsive and incorporate features that are not visible in the natural world, but have implications on the behavior of the modeled systems and can identify limitations of their models. Constructing Explanations and Designing Solutions 6.ESS2.3 Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion. **Suggested Crosscutting Concept(s)** Systems and System Models 6.ESS2.2 Students develop models for systems which include both visible and invisible inputs and outputs for that system. 6.ESS2.3 Students evaluate the sub-systems that may make up a larger system.		Academic vocabulary for "Explain": since, caused by, in effect, because of, this results in, brought about, due to, consequently, made possible, for this reason, accordingly, as might be expected, therefore, as a result of, give rise to, If…then, leads to, was responsible for When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals

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UNIT 7: Earth's Systems (3 weeks)			
Overarching Question(s)			
How and why is Earth constantly changing?			
Unit 7, Lesson 3	**Lesson Length**	**Essential Question**	**Vocabulary**
Ocean Currents	1 week	How does water move in the ocean?	ocean current, deep current, surface current, convection current, Coriolis effect, upwelling

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 6.ESS2: Earth Systems **Standard(s)** 6.ESS2.1 Gather evidence to justify that oceanic convection currents are caused by the sun's transfer of heat energy and differences in salt concentration leading to global water movement. 6.ESS2.2 Diagram convection patterns that flow due to uneven heating of the earth.	**Learning Outcomes** • Define ocean currents and surface currents. • List and describe three things that affect surface currents. • Define deep currents and explain how they form. • Define convection current and explain how they transfer energy. • Define upwelling and explain its importance to ocean life. • Describe ocean circulation.	**Curricular Materials** HMH Tennessee Science TE, Unit 7, Lesson 3 pp.478-492 Engage • Engage Your Brain #s 1 and 2, SE p. 435 • Active Reading #s 3 and 4, SE p. 435 Explore Surface Currents in the Ocean • Can Messages Travel on Ocean Water? Quick Lab, TE p. 481 • Modeling the Coriolis Effect Quick Lab, TE p. 481

6.ESS2.3 Construct explanation for how atmospheric flow, geographic features, and ocean currents affect the climate of a region through heat transfer.

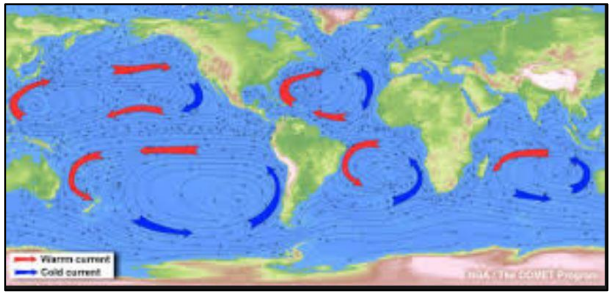
Explanation(s) and Support of Standard(s) from TN Science Reference Guide

6.ESS2.1 Students should be able to use evidence to create models for how oceanic convection currents originate. Such a model should include not only the sun's warming of equatorial waters, but also the impact ice at the poles causing water to descend.

The primary factors influencing ocean currents are unequal heating of the earth's surface, differences in energy transfer to land vs ocean, and density-related behaviors of heated or cooled water. Demonstrations of the temperature-based behavior can be performed by heating one side of a water-filled baking dish and cooling the opposite side. If the water is initially allowed to settle, drops of food coloring will trace out the convection patterns which develop. Pipets can be used to insert the food coloring into the lower currents. Demonstration of the effect of salt on creating a sinking mass of water can be accomplished by partially filling a large container with water then covering the surface of the water with plastic wrap and pouring an additional volume of salt containing, colored water onto the wrap. With the gentle removal of the plastic wrap, the mixing will be visible. Reversing the

- Give examples of how ocean currents transport matter and energy.

Suggested Phenomenon



One special property of water is that it is able to absorb large amounts of heat. Because the oceans make up 70% of Earth, there is a lot of heat in the oceans (even though they feel cool). Ocean waters closer to the equator receive more of the Sun's heat than ocean waters near the poles. Like the atmosphere, this temperature difference creates convection currents in the ocean. Warmer water rises up, and cooler water flows in to take its place, creating ocean currents. Students can complete a See Think Wonder Template after examining the picture.

Possible Guiding Question(s):
What is causes the arrows to move in a circular pattern?
Why are some arrows red and others are blue?

- Ocean Currents Virtual Lab, TE p. 481

Explain

Surface Currents in the Ocean

- Active Reading #5, SE p. 436
- Visualize #6, SE p. 436
- Identify #7, SE p. 437
- Analyze #8, SE p. 438
- Visualize It! #9, SE p. 439

Deep Currents in the Ocean

- Active Reading #10, SE p.
- Visualize It! #11, SE p. 440
- Think Outside the Book #12, SE p. 441
- Inquiry #13, SE p. 441
- The Formation of Deep Currents Quick Lab, TE p. 481

Upwelling

- Active Reading #14, SE p. 442
- Predict #15, SE p. 442

Ocean Circulation

- Active Reading #19, SE p. 444
- Describe #20, SE p. 444
- List #21, SE p. 445

Extend

Reinforce and Review

- Idea Wheel Activity, TE p. 484
- Two-Panel Flipchart Fold Note, TE p. 484
- Visual Summary, SE p. 446

Going Further

- Ecology Connection, TE p. 484

order that the waters are added will provide the opposite effect. (From third grade, students will have developed understandings of mass and volume; however, the topic of density will need to be explored to fully support 6.ESS2.1 and 6.ESS2.2. Calculations of density are beyond the scope of this standard.) 6.ESS2.2 Models for which demonstrate convection patterns should incorporate the Sun, Earth (rotating), ocean, and land. The relationships between these components also make it possible to explain patterns in the distribution of climate types and resulting biomes (6.LS2.4). A model for heating of the Earth shows more direct heating of the earth's equator relative to the poles creating two large convection cells which move ascend at the equator and descend at the poles north and south poles. The Coriolis force, due to the Earth's spin breaks the two convection cells into a total of six cells, three in the southern hemisphere and three in the norther hemisphere. This breakup (Coriolis effect) can be modeled by a pair of students using a marker and a large sphere. If the sphere is stationary, a student can use a marker to draw a straight line from the equator to the poles. If the ball is rotated while drawing this same		• Health Connection, TE p. 484 • Why It Matters, SE p. 443 Evaluate Formative Assessment • Reteach, TE p. 485 • Throughout TE • Lesson Review, SE p. 447 Summative Assessment • Ocean Currents Alternative Assessment, TE p. 485 • Lesson Quiz **Additional Resources** • 6.ESSE2.2 Student Activity and Teacher Guide • Convection Currents Article • Waves & Currents STUDY JAMS! Video and Quiz • Ocean Currents Comparison to Roller Coaster Video • Modeling Ocean Currents • NOAA Information on Ocean Currents **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science To support students in speaking refer to this resource: WIDA Doing and Talking Science

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climate in a region to vary from the climate seen at similar latitudes due to the presence of geographic features such as mountains or lakes. Coastal air rising over mountains will be depleted of its moisture and create deserts on the back side of the mountain. Likewise, large bodies of water can influence the temperature and humidity of a region due to the ability of water to store large amounts of thermal energy. **Suggested Science and Engineering Practice(s)** Engaging in Argument From Evidence 6.ESS2.1 Students present an argument based on empirical evidence, models, and invoke scientific reasoning. Developing and Using Models 6.ESS2.2 Students create models which are responsive and incorporate features that are not visible in the natural world, but have implications on the behavior of the modeled systems and can identify limitations of their models. Constructing Explanations and Designing Solutions 6.ESS2.3 Students form explanations using source (including student developed investigations) which show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion.		

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