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.

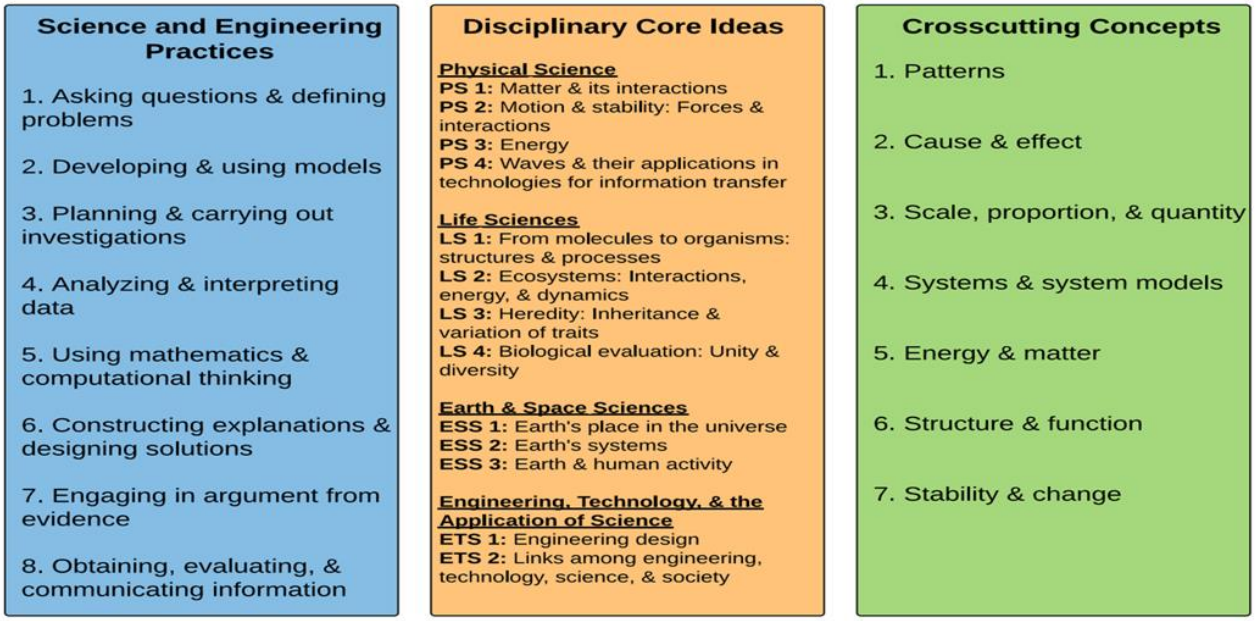
The Tennessee Academic Standards for Science were developed using the National Research Council's 2012 publication, A Framework for K-12 Science Education as their foundation. The framework presents a new model for science instruction that is a stark contrast to what has come to be the norm in science 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 4 Curriculum Map Quarter 4 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 8: Weather and Climate (9 weeks)			
Overarching Question(s)			
How and why is Earth constantly changing?			
Unit 8, Lesson 1	**Lesson Length**	**Essential Question**	**Vocabulary**
Elements of Weather	1.5 weeks	What is weather and how can we describe different types of weather conditions?	weather, dew point, wind, humidity, precipitation, visibility, relative humidity, air pressure

Standards and Related Background Information	**Instructional Focus**	**Instructional Resources**

DCI(s)
ESS2: Earth's Systems
 	
Standard(s)
6.ESS2.5 Analyze and interpret data from weather conditions, weather maps, satellites, and radar to predict probable local weather patterns and conditions.
 	
Explanation(s)and Support of Standard(s) from TN Science Reference Guide
	Learning Outcomes
	• Define weather.
	• Explain how each of the following relates to weather:
	  ○ Temperature
	  ○ Humidity
	  ○ Precipitation
	  ○ Air pressure
	  ○ Wind direction and speed
	  ○ Visibility
	• Describe how each of these is measured:
	  ○ Temperature
		Curricular Materials
		HMH Tennessee Science TE, Unit 8, Lesson 1 pp. 510-522
		Engage
		• Engage Your Brain #s 1 and 2, SE p. 459
		• Active Reading #s 3 and 4, SE p. 459
		Explore
		Measuring Elements of Weather
		• Tracking Weather Activity, TE p. 512
		Explain
		Elements of Weather
		• Visualize It! #7, SE p. 461

6.ESS2.5 Weather predictions are based on models of probability, not of certainty. As the tools used by weather scientists have become more capable, the quantity of data being captured increases, and the volume of data builds over time, predictions become increasingly accurate. Students math skills in the statistics and probability domain are just beginning to explore basic elements of statistics that are appropriate for use when compiling large amounts of data. Data might include changes in conditions (e.g., temperature, pressure, humidity, wind speed) or accumulations of weather data organized in a variety of formats including tables and transposed onto maps. **Suggested Science and Engineering Practice(s)** Analyzing and Interpreting Data 6.ESS2.5 Students should create and analyze graphical presentations of data to, consider statistical features within data and evaluate multiple data sets for a single phenomenon. **Suggested Crosscutting Concept(s)** Energy and Matter 6.ESS2.5 Students give general descriptions of different forms and mechanisms for energy storage within a system.	○ Humidity ○ Precipitation ○ Air pressure ○ Wind direction and speed • Describe technology that is used in weather data collection. **Suggested Phenomenon** Suddenly on a warm day, a cool wind begins to blow, clouds form, and the temperature drops by ten degrees. Click on the picture to view a time lapse video of weather changing. Students can complete a See Think Wonder Template while watching the video.  Possible Guiding Question(s): How do you think other elements of weather might be changing at this location? What you think causes these changes? How would you measure these changes?	• Explain #8, SE p. 461 • Visualize It! #9, SE p.462 Measuring Elements of Weather • Visualize It! #5, SE p. 460 • Active Reading #6, SE p. 461 • Measure #10, SE p. 462 • Visualize It! #13, SE p. 464 • Active Reading #14, SE p. 465 • Visualize It! #15, SE p. 465 Extend Reinforce and Review • Cluster Diagram Graphic Organizer, TE p. 516 • Visual Summary, SE p. 466 Going Further • Technology Connection, TE p. 516 • Why It Matters, SE p. 463 Evaluate Formative Assessment • Reteach, TE p. 517 • Throughout TE • Lesson Review, SE p. 467 Summative Assessment • Weather Basics Alternative Assessment, TE p. 517 • Lesson Quiz **Additional Resources** • 6.ESS2.5 Student Activity, Teacher Guide, and US Map with Regions

		• National Weather Service • Weather Basics TeachEngineering Lesson • Building a Barometer TeachEngineering Lesson • Weather & Climate STUDYJAMS! 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 Weather Flashcards What kind of weather are you? (video support) When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals Sample Language Objectives: (language domain along with a scaffold) • Students will talk with a partner to explain how each concept relates to weather by using visuals and a text to support their answers. Provide claims and evidence: write assertions

		about what was learned from the investigation, use the data as evidence to support those claims. Use inferential logical connectors such as *although*, *while*, *thus*, *therefore*. Sentence stems I claim that _____ . I know this because _____. 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….? <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 4 Curriculum Map Quarter 4 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 8: Weather and Climate (9 weeks)

Overarching Question(s)

How and why is Earth constantly changing?

Unit 8, Lesson 2	Lesson Length	Essential Question	Vocabulary
Clouds and Cloud Formation	3 days	How do clouds form, and how are clouds classified?	cloud, cumulus cloud, dew point, cirrus cloud, stratus cloud, fog

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) ESS2: Earth's Systems **Standard(s)** 6.ESS2.5 Analyze and interpret data from weather conditions, weather maps, satellites, and radar to predict probable local weather patterns and conditions. **Explanation(s)and Support of Standard(s) from TN Science Reference Guide** 6.ESS2.5 Weather predictions are based on models of probability, not of certainty. As the tools used by	**Learning Outcomes** • Briefly state what a cloud is. • Explain why clouds are important to climate. • Explain why clouds are important to weather. • Explain how a cloud forms. • Describe dew point. • Describe how water droplets form. • Describe cooling processes. • Describe solar energy's role in cloud formation. • Briefly describe what fog is and how fog forms. • Describe two ways in which air can cool to form fog.	**Curricular Materials** HMH Tennessee Science TE, Unit 8, Lesson 2 pp. 524-537 Engage • Engage Your Brain #s 1 and 2, SE p. 471 • Active Reading #s 3 and 4, SE p. 471 Explore Explain Introduction to Clouds • Active Reading #5, SE p.472 • Apply #6, SE p. 472 Cloud Formation • Conclude #7, SE p. 473

weather scientists have become more capable, the quantity of data being captured increases, and the volume of data builds over time, predictions become increasingly accurate.

Students math skills in the statistics and probability domain are just beginning to explore basic elements of statistics that are appropriate for use when compiling large amounts of data. Data might include changes in conditions (e.g., temperature, pressure, humidity, wind speed) or accumulations of weather data organized in a variety of formats including tables and transposed onto maps.

Suggested Science and Engineering Practice(s)
Analyzing and Interpreting Data 6.ESS2.5
Students should create and analyze graphical presentations of data to, consider statistical features within data and evaluate multiple data sets for a single phenomenon

Suggested Crosscutting Concept(s)
Energy and Matter 6.ESS2.5
Students give general descriptions of different forms and mechanisms for energy storage within a system.

Suggested Phenomenon
Suddenly on a warm day, a cool wind begins to blow, clouds form, and the temperature drops by ten degrees. Click on the picture to view a time lapse video of weather changing. Students can complete a See Think Wonder Template while watching the video.

Possible Guiding Question(s):
How do you think other elements of weather might be changing at this location?
What you think causes these changes?
How would you measure these changes?

- Active Reading #8, SE p. 474
- Visualize It! #9, SE p. 474
- Visualize It! #10, SE p. 475

Cloud Classification
- Active Reading #11, SE p. 476
- Visualize It! #13, SE p. 477

Fog
- Active Reading #14, SE p. 478
- Visualize It! #15, SE p. 478

Extend
Reinforce and Review
- Visual Summary, SE p. 480

Evaluate
Formative Assessment
- Reteach, TE p. 531
- Throughout TE
- Lesson Review, SE p. 481

Summative Assessment
- Clouds Alternative Assessment, TE p. 531
- Lesson Quiz

Additional Resources
- Plane Politics cK-12 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

		Types of clouds video Types of clouds: Getepic book (this text has a very low lexile but will support non-speakers with visuals and basic sentences about clouds.) When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals Sample Language Objectives: (language domain along with a scaffold) Students will write 4-5 sentences to explain why clouds are important to climate by using pre-taught vocabulary and evidence from a text. Provide support for explain: Provide claims and evidence: write assertions about what was learned from the investigation, use the data as evidence to support those claims. Use inferential logical connectors such as *although*, *while*, *thus*, *therefore*. Sentence stems I claim that _____ . I know this because _____. The reason _____ clouds are important to climate is because _____.

6th Grade Quarter 4 Curriculum Map Quarter 4 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 8: Weather and Climate (9 weeks)			
Overarching Question(s)			
How and why is Earth constantly changing?			
Unit 8, Lesson 3	**Lesson Length**	**Essential Question**	**Vocabulary**
What Influences Weather?	2 weeks	How do the water cycle and other global patterns affect local weather?	air mass, jet stream, front

Standards and Related Background Information	**Instructional Focus**	**Instructional Resources**
DCI(s) ESS2: Earth's Systems **Standard(s)** 6.ESS2.6 Explain how relationships between the movement and interactions of air masses, high and low pressure systems, and frontal boundaries result in weather conditions and severe storms. **Explanation(s)and Support of Standard(s) from TN Science Reference Guide** 6.ESS2.6 Student explanations should focus on the interactions of air masses and the patterns	**Learning Outcomes** • Explain ways in which the water cycle influences weather. • Define air mass and front; explain how weather is affected by air masses. • Describe a cold front and a warm front. • Describe a high-pressure and a low -pressure system. • Define jet stream, and explain how the polar jet stream influences weather. • Describe how ocean currents influence weather.	**Curricular Materials** HMH Tennessee Science TE, Unit 8, Lesson 3 pp. 542-557 Engage • Engage Your Brain #s 1 and 2, SE p. 489 • Active Reading #s 3 and 4, SE p. 489 Explore How Patterns in the Atmosphere Affect Weather • Blowing Around Daily Demo, TE p. 544 • Analyze Weather Patterns Quick Lab, TE p. 544 How Patterns in the Ocean Influence Weather • Coastal Climate Model Quick Lab, TE p. 545

connecting the different types of interactions with the resulting weather conditions, including severe storm. The underlying principle is that high-pressure areas will push into or fill low-pressure areas. Low-pressure areas are columns of the atmosphere with a lower-pressure than surrounding air. As the surrounding higher pressure air pushes in to fill this area, the air in this low pressure column is displaced upward where condensation and precipitation occur as the elevation of this air increases. This air mass spins due again to Earth's rotation (Coriolis Effect). The opposite phenomenon occurs for high pressure areas, with a resulting spin in the opposite direction. The convergence of opposing pressure fronts creates severe weather phenomena due to the inverse nature of the air masses. Seasonal patterns can be observed with connections to landforms as well as oceans. For example, students in Tennessee might observe typical boundaries for high and low pressure fronts in summer vs winter. This standard includes both occluded and stationary fronts, but not the memorization of specific air masses (e.g., continental polar or maritime tropical).	**Suggested Phenomenon**  Click on the picture above to view the time lapse passage of an intense cold front in Marissa, IL on October 25, 2012. This passage was most noticeable in the abrupt shift in the wind, as seen in the change of the direction of the steam emitted from a local power plant. This cold front and accompanying Artic air mass replaced the humid, tropical one that proceeded it. In fact, this same system transformed Hurricane Sandy into post-tropical Superstorm Sandy just a few days later. Students can complete a See Think Wonder Template while watching the video. Possible Guiding Question(s): What happened to the steam coming from the power plant? Why?	• Modeling El Nin o Exploration Lab, TE p. 545 <u>Explain</u> How the Water Cycle Influences Weather • Active Reading #5, SE p. 490 • Visualize It! #6, SE p. 491 • Visualize It! #7, SE p. 491 How Patterns in the Atmosphere Affect Weather • Active Reading #8, SE p. 492 • Apply #9, SE p. 493 • Identify #10, SE p. 493 • Infer #11, SE p. 493 • Visualize It! #12, SE p. 494 • Visualize It! #13, SE p. 495 • Visualize It! #14, SE p. 496 • Active Reading #15, SE p. 497 • Visualize It! #16, SE p. 497 • Air Mass Matters Activity, TE p. 544 How Patterns in the Ocean Influence Weather • Visualize It! #17, SE p. 498 • Visualize It! #18, SE p. 499 • Visualize It! #19, SE p. 499 <u>Extend</u> Reinforce and Review • Main Idea Web Graphic Organizer, TE p. 548 • Visual Summary, SE p. Going Further • Social Studies Connection, TE p. 458 • Language Arts Connection, TE p. 458

Suggested Science and Engineering Practice(s) Developing and Using Models 6.ESS2.6 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. **Suggested Crosscutting Concept(s)** Systems and System Models 6.ESS2.6 Students include relevant and exclude irrelevant factors when defining a system.		Evaluate Formative Assessment • Reteach, TE p. 549 • Throughout TE • Lesson Review, SE p. 501 Summative Assessment • Weather's Influences Alternative Assessment, TE p. 549 • Lesson Quiz **Additional Resources** • 6.ESS2.2 Student Activity and Teacher Guide • National Weather Service • Air Under Pressure TeachEngineering Lesson • Stormy Skies TeachEngineering Lesson • High and Low Pressure • Air Masses and Fronts STUDYJAMS! Video • Explainer: Winds and Where They Come From • Wacky Winter Dumps Snow on Every Single U.S. State Article • When Air Masses Collide!, Investigation 5 Data Sheet, and Student Handouts and Rubrics **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 When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals Cold and Warm front video Weather front video Sample Language Objectives: (language domain along with a scaffold) Students will talk with a partner to describe a cold front and a warm front using visuals and sentence stems. Describe sentence stems: I observed ……. . The ……. has ……. I noticed . Support students with sensory vocabulary to be able to describe cold and warm fronts.

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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 8: Weather and Climate (9 weeks)			
Overarching Question(s)			
How and why is Earth constantly changing?			
Unit 8, Lesson 4	**Lesson Length**	**Essential Question**	**Vocabulary**
Severe Weather and Weather Safety	3 days	How can humans protect themselves from hazardous weather?	thunderstorm, hurricane, lightning, storm surge, thunder, tornado

Standards and Related Background Information	**Instructional Focus**	**Instructional Resources**
DCI(s) ESS2: Earth's Systems **Standard(s)** 6.ESS2.6 Explain how relationships between the movement and interactions of air masses, high and low pressure systems, and frontal boundaries result in weather conditions and severe storms. **Explanation(s)and Support of Standard(s) from TN Science Reference Guide** 6.ESS2.6 Student explanations should focus on the interactions of air masses and the patterns	**Learning Outcomes** • Define thunderstorm, hurricane, and tornado and describe how each is formed. • Describe the dangers and damaging effects of thunderstorms, tornadoes, and hurricanes. • Explain how to prepare for hazardous weather such as high winds or heavy rains. • Describe how to be safe during a thunderstorm, hurricane, and tornado. • Describe how to protect against overexposure to the sun and to stay safe from summer heat.	**Curricular Materials** HMH Tennessee Science TE, Unit 8, Lesson 4 pp. 558-573 Engage • Engage Your Brain #s 1 and 2, SE p. 505 • Active Reading #s 3 and 4, SE p. 505 Explore Explain Hazardous Weather • Visualize It! #5, SE p. 506 • Visualize It! #6, SE p. 507 • Active Reading #7, SE p. 507 • Active Reading #8, SE p. 508

connecting the different types of interactions with the resulting weather conditions, including severe storm. The underlying principle is that high-pressure areas will push into or fill low-pressure areas. Low-pressure areas are columns of the atmosphere with a lower-pressure than surrounding air. As the surrounding higher pressure air pushes in to fill this area, the air in this low pressure column is displaced upward where condensation and precipitation occur as the elevation of this air increases. This air mass spins due again to Earth's rotation (Coriolis Effect). The opposite phenomenon occurs for high pressure areas, with a resulting spin in the opposite direction. The convergence of opposing pressure fronts creates severe weather phenomena due to the inverse nature of the air masses. Seasonal patterns can be observed with connections to landforms as well as oceans. For example, students in Tennessee might observe typical boundaries for high and low pressure fronts in summer vs winter. This standard includes both occluded and stationary fronts, but not the memorization of specific air masses (e.g., continental polar or maritime tropical).	**Suggested Phenomenon**  A tornado is a violently rotating column of air that forms when a thunderstorm meets horizontal winds at a high altitude. The high speed winds produced are a result of the collision of high and low pressure air. Click on the picture to view a tornado forming. Students can complete a See Think Wonder Template while watching the video.	• Active Reading #9, SE p. 509 • Think Outside the Book #10, SE p. 509 • Think Outside the Book #11, SE p. 510 • Active Reading #12, SE p. 511 • Graphic Organizer #s 13-14, SE p. 511 Safety and Weather • Apply #16, SE p. 513 • Active Reading #17, SE p. 514 • Visualize It! #18, SE p. 515 • Active Reading #19, SE p. 515 Extend Reinforce and Review • Visual Summary, SE p. 516 Evaluate Formative Assessment • Throughout TE • Lesson Review, SE p. 517 Summative Assessment • Severe Weather Expert Alternative Assessment, TE p. 565 • Lesson Quiz **Additional Resources** • National Weather Service • Weather Alert TeachEngineering Lesson **ESL Supports and Scaffolds** WIDA Standard 4 - The Language of Science

Suggested Science and Engineering Practice(s) Developing and Using Models 6.ESS2.6 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. **Suggested Crosscutting Concept(s)** Systems and System Models 6.ESS2.6 Students include relevant and exclude irrelevant factors when defining a system.		To support students in speaking, refer to this resource: WIDA Doing and Talking Science When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals Severe Weather Severe weather lesson plan (click on attachments for PowerPoint with severe weather visuals) Sample Language Objectives: (language domain along with a scaffold) Students will write a paragraph that describes the dangers and damaging effects of thunderstorms, tornadoes, and hurricanes using pre-taught vocabulary and sentence stems for support. Describe sentence stems: I observed ……. . The …. has ……. I noticed . Support students with sensory vocabulary to be able to describe cold and warm fronts.

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

UNIT 8: Weather and Climate (9 weeks)

Overarching Question(s)

How and why is Earth constantly changing?

Unit 8, Lesson 5	Lesson Length	Essential Question	Vocabulary
Weather Maps and Weather Prediction	2.5 weeks	What tools do we use to predict weather?	weather forecasting, meteorology, station model

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) ESS2: Earth's Systems **Standard(s)** 6.ESS2.5 Analyze and interpret data from weather conditions, weather maps, satellites, and radar to predict probable local weather patterns and conditions. **Explanation(s)and Support of Standard(s) from TN Science Reference Guide** 6.ESS2.5 Weather predictions are based on models of probability, not of certainty. As the tools used by weather scientists have become more capable, the	**Learning Outcomes** • Describe weather forecasting. • Explain how different forms of weather data are obtained. • Describe the observation of surface weather, and how to get upper air data. • Describe data from satellites. • Explain what kind of weather data radar provides. • Describe types of weather maps. • Describe surface weather maps and what they show. • Explain station models and upper air charts. • Describe the eight weather elements.	**Curricular Materials** HMH Tennessee Science TE, Unit 8, Lesson 5 pp. 574-589 Engage • Engage Your Brain #s 1 and 2, SE p. 521 • Active Reading #s 3 and 4, SE p. 521 Explore Weather Forecasts • Watching the Weather Quick Lab, TE p. 577 • Forecasting the Weather Virtual Lab, TE p. 577 Explain Introduction to Weather Forecasting

quantity of data being captured increases, and the volume of data builds over time, predictions become increasingly accurate. Students math skills in the statistics and probability domain are just beginning to explore basic elements of statistics that are appropriate for use when compiling large amounts of data. Data might include changes in conditions (e.g., temperature, pressure, humidity, wind speed) or accumulations of weather data organized in a variety of formats including tables and transposed onto maps. **Suggested Science and Engineering Practice(s)** Analyzing and Interpreting Data 6.ESS2.5 Students should create and analyze graphical presentations of data to, consider statistical features within data and evaluate multiple data sets for a single phenomenon. **Suggested Crosscutting Concept(s)** Energy and Matter 6.ESS2.5 Students give general descriptions of different forms and mechanisms for energy storage within a system.	• Compare and contrast the types of forecasts. **Suggested Phenomenon** Suddenly on a warm day, a cool wind begins to blow, clouds form, and the temperature drops by ten degrees. Click on the picture to view a time lapse video of weather changing. Students can complete a See Think Wonder Template while watching the video.  Possible Guiding Question(s): How do you think other elements of weather might be changing at this location? What you think causes these changes? How would you measure these changes?	• Predicting Weather Probing Questions, TE 576 • Infer #5, SE p. 522 • Visualize It! #6, SE p. 522 Weather Forecasting Data • Visualize It! #10, SE p. 524 • Visualize It! #11, SE p. 524 • Active Reading #12, SE p. 525 • Think Outside the Book #13, SE p. 525 Weather Maps • Barometer Prediction Daily Demo, TE p. 577 • Active Reading #14, SE p. 526 • Visualize It! #15, SE p. 526 • Visualize It! #16, SE p. 526 • Visualize It! #17, SE p. 527 • Visualize It! #18, SE p. 527 • Visualize It! #19, SE pp. 528-529 Weather Forecasts • Infer #20, SE p. 530 • Tomorrow's Weather in My Neighborhood Take It Home, TE p. 576 • Active Reading #21, SE p. 531 Extend Reinforce and Review • Visual Summary, SE p. 532 Going Further • Music Connection, TE p. 580 • Why It Matters, TE p. 581

		Evaluate Formative Assessment • Reteach, TE p. 581 • Throughout TE • Lesson Review, SE p. 533 Summative Assessment • Weather Trackers Alternative Assessment, TE p. 581 • Lesson Quiz • Evaluating Technological Systems S.T.E.M., TE p. 538-54 **Additional Resources** • 6.ESS2.5 Student Activity, Teacher Guide, and US Map with Regions • National Weather Service • Weather Forecasting TeachEngineering Lesson • Backyard Weather Station TeachEngineering Lesson • Explainer: Weather and Weather Prediction • Legends of Learning -Weather Predictions Games • The Challenges and Complexities of Weather Forecasting **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 When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals Sample Language Objectives: (language domain along with a scaffold) Students will use a chart and graphic organizer to describe their observations of surface weather and how to get upper air data. Pre-teach any of the following vocabulary as needed: (consider teaching additional vocabulary to beginning level ELs) plot, graph, function, variable, direction, quadrant, coordinate, plane, slope Recording data sentence stems: We need ….. and to . I observed…..when

6th Grade Quarter 4 Curriculum Map Quarter 4 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 8: Weather and Climate (9 weeks)			
Overarching Question(s)			
How and why is Earth constantly changing? How do Earth's surface processes and human activities affect each other?			
Unit 8, Lesson 6	**Lesson Length**	**Essential Question**	**Vocabulary**
Climate	2 weeks	How is climate affected by energy from the sun and variations on Earth's surface?	weather, climate, latitude, topography, elevation, surface current

Standards and Related Background Information	**Instructional Focus**	**Instructional Resources**
DCI(s) ESS2: Earth's Systems **Standard(s)** 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.ESS2.3 A number of interacting parts contribute to the distribution of similar climates across the globe. Such components include factors addressed in	**Learning Outcomes** • Describe the difference between climate and weather. • Identify the two main factors that determine climate. • Define latitude and state why latitude affects climate. • Explain the effect of sun's energy on precipitation, winds. • Describe how winds can affect climate. • Explain the effects of topography and elevation on climate. • Explain how mountains affect precipitation.	**Curricular Materials** HMH Tennessee Science TE, Unit 8, Lesson 6 pp.592-607 Engage • Engage Your Brain #s 1 and 2, SE p. 539 • Active Reading #s 3 and 4, SE p. 539 Explore Solar Energy and Climate • The Angles of the Sun's Rays Quick Lab, TE p. 594 Other Factors That Affect Climate • Factors That Affect Climate Quick Lab, TE p. 595

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 due to the ability of water to store large amounts of thermal energy. **Suggested Science and Engineering Practice(s)** <u>Constructing Explanations and Designing Solutions</u> 6.ESS2.3 Students form explanations using source (including student developed investigations) which	• Explain the effect of large bodies of water and surface currents on climate. • Explain how latitude is related to air temperature. • Locate and describe the polar, temperate and tropical climate zones.	<u>Explain</u> Climate vs. Weather • Active Reading #5, SE p. 540 • Visualize It! #6, SE p. 540 • Visualize It! #7, SE p. 541 • Think Outside the Book #8, SE p. 541 Solar Energy and Climate • Active Reading #9, SE p. 542 • Visualize It! #10, SE p. 542 • Visualize It! #11, SE p. 543 Other Factors That Affect Climate • Active Reading #12, SE p. 544 • Visualize It! #13, SE p. 544 • Visualize It! #14, SE p. 545 • Infer #15, SE p. 545 • Visualize It! #16, SE p. 546 • Summarize #17, SE p. 547 • Visualize It! #18, SE p. 547 Climate Zones • Active Reading #19, SE p. 548 • Visualize It! #20, SE p. 548 • Two-Column Chart #21, SE p. 549 • Visualize It! #22, SE p. 549 <u>Extend</u> Reinforce and Review • Layered Book Fold Notes, TE p. 598 • Visual Summary, SE p. 550 Going Further • Social Studies Connection, TE p. 598

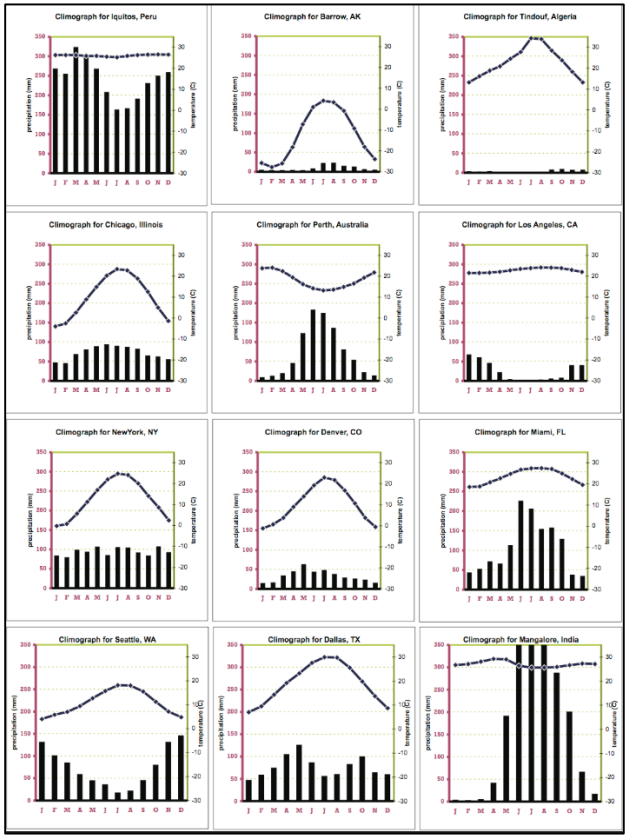
show comprehension of parsimony, utilize quantitative and qualitative models to make predictions, and can support or cause revisions of a particular conclusion.

Suggested Crosscutting Concept(s)

Systems and System Models 6.ESS2.3

Students evaluate the sub-systems that may make up a larger system.

Suggested Phenomena



Climographs show the average temperature and precipitation in an area over the course of a year. Climographs for several locations around the world are displayed in the graphic below. The data will prompt students to ask causation questions related

- Life Science Connection, TE p. 598

Evaluate

Formative Assessment

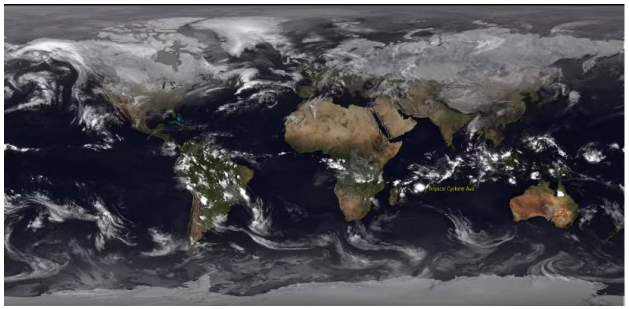
- Reteach, TE p. 599
- Throughout TE
- Lesson Review, SE p. 551

Summative Assessment

- Climate Alternative Assessment, TE p. 599
- Lesson Quiz

Additional Resources

- 6.ESS2.5 Student Activity, Teacher Guide, and US Map with Regions
- Climate Data
- National Weather Service
- Trash to Treasure! TeachEngineering Activity
- Effect of Latitude on Climate cK-12 Article
- Oceans and Climate Zones
- Can Climate Change affect Ocean Currents?
- Waves and Currents STUDYJAMS! Video and Quiz
- Ocean Currents and Climate Article and Video
- Weather & Climate STUDYJAMS! Video
- Adopt a Drifter: Do Ocean Surface Currents Influence Climate? Activity
- Engaging in Argumentation with a Science Seminar: Regional Climate in the Atacama Desert
- Geographical Influences on Climate Lesson

	to the climate differences (e.g. How do mountains and wind patterns affect the climate in an area?, How do large bodies of water affect the climate in an area?)  Click on the picture to view a daily time lapse of compiled images from global weather satellites over the course of 2018. The narration provides excellent background for teachers, but mute the narration for students. Students can complete a See Think Wonder Template while watching the video. Possible Guiding Question(s): What patterns do you see? What causes those patterns?	• Legends of Learning: Weather and Climate Factors • Weather Versus Climate Integrating Technology Lesson **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 When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals Sample Language Objectives: (language domain along with a scaffold) Student will talk with a partner to distinguish between climate and weather by using compare and contrast sentence stems and a graphic organizer. To support students in distinguishing: Use graphic organizers and narratives to express similarities and differences, to assign an object or action to the category or type to which it belongs, and to show sequencing and order.

		Sentence stems: This is the same as …. because . This is different ….. than because …… 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…? <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…