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.

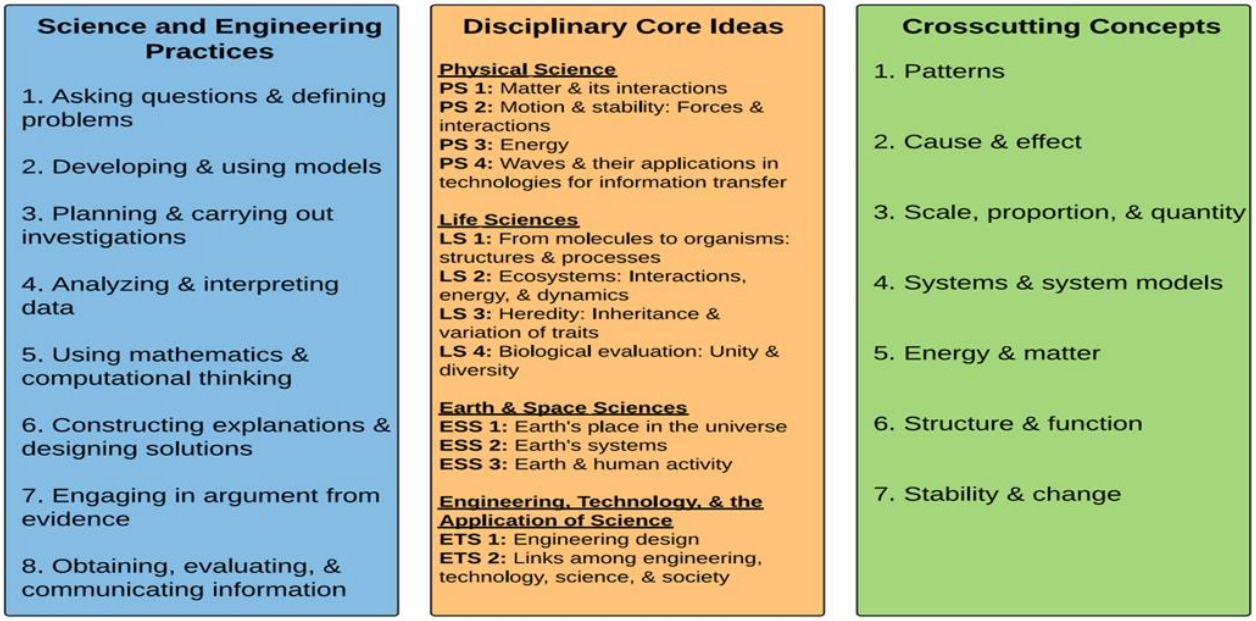
The Tennessee Academic Standards for Science were developed using the National Research Council's 2012 publication, A Framework for K-12 Science Education as their foundation. The framework presents a new model for science instruction that is a stark contrast to what has come to be the norm in science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

7th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback					
Quarter 1	Quarter 2		**Quarter 3**	Quarter 4	
Unit 1 Matter	Unit 2 Cell Structure and Function	Unit 3 Human Body Systems	**Unit 4 Reproduction, Survival, and Heredity**	Unit 5 Cycling of Matter and Energy	Unit 6 Earth's Atmosphere
9 weeks	6 weeks	3 weeks	**9 weeks**	3 weeks	6 weeks

UNIT 4: Reproduction, Survival, and Heredity (9 weeks)			
Overarching Question(s)			
How do organisms live, grow, respond to their environment, and reproduce?			
Unit 4, Lesson 1	**Lesson Length**	**Essential Question**	**Vocabulary**
Mitosis	1.5 weeks	How do cells divide?	DNA, interphase, chromosomes, mitosis, cell cycle, cytokinesis

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 7.LS1: From Molecules to Organisms: Structures and Processes **Standard(s)** 7.LS1.8 Construct an explanation demonstrating that the function of mitosis for multicellular organisms is for growth and repair through the production of genetically identical daughter cells. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 7.LS1.8 Understanding the significance of mitosis requires that students incorporate conservation of	**Learning Outcomes** • Describe the function of cell division in unicellular organisms. • Describe the function of cell division in multicellular organisms. • Explain how cell division results in two new daughter cells, each with a full set or genetic material that is identical to the parent cell's. • Define DNA. • Define chromosome. • Define cell cycle and identify its three stages. • Describe interphase. • Define mitosis. • Describe the four phases of mitosis.	**Curricular Resources** HMH Tennessee Science TE, Unit 5, Lesson 1, pp. 336-349 Engage • Engage Your Brain #s 1 and 2, SE p. 261 • Active Reading #s 3 and 4, SE p. 261 Explore Mitosis • Stages of the Cell Cycle, TE p. 339 Explain Why Cells Divide • Visualize It! #5, SE p. 262 • Out with the Old Discussion, TE p. 338 • How Do They Get So Big? Activity, TE p. 338

mass into their discussions (7.PS1.4). In order for organisms to grow, they must consume matter, and this matter must be broken down, and reassembled into the molecules that make up cellular components. Simple questions such as, "How do animals grow larger?" allow students to connect their knowledge about the hierarchy of structures in living organisms to their models for mitosis, rather than simply learning the phases of mitosis, devoid of any conceptual significance. The mechanisms by which DNA moves from parent cell to daughter cell is addressed in 7.LS3.2. Recognizing that growth requires mitosis and inputs of matter is central to 7.LS1.8. **Suggested Science and Engineering Practice(s)** Constructing Explanations and Designing Solutions 7.LS1.8 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)** Energy and Matter 7.LS1.8 Students give general descriptions of different forms and mechanisms for energy storage within a system.	• Define cytokinesis. **Suggested Phenomenon**  When the skin is broken by a cut or scrape, it is able to make more skin cells to fill in the damaged area. This "wound healing" is possible because of mitosis. The skin cells surrounding the wound undergo mitosis to make more copies of themselves. Click on the picture to view a time-lapse video of a wound healing. Students can complete a See Think Wonder Template while watching the video.	Genetic Material and Cell Division • Active Reading #6, SE p. 263 • Visualize It! #7, SE p. 263 • Active Reading #8, SE p. 264 • Active Reading #9, SE p. 264 • Visualize It! #10, SE p. 265 Mitosis • Active Reading #11, SE p. 266 • Think Outside the Book #12, SE p. 267 • Apply #13, SE p. 267 • Mitosis Experts Activity, TE p. 338 Extend Reinforce and Review • Process Chart Graphic Organizer, TE p. 342 • Visual Summary, SE p. 268 Going Further • Language Arts Connection, SE p. 342 • Math Connection, SE p. 342 Evaluate Formative Assessment • Reteach, TE p. 343 • Throughout TE • Lesson Review, SE p. 269 Summative Assessment • Mitosis Alternative Assessment, TE p. 343 • Lesson Quiz

		Additional Resources • 7.LS1.8 Student Activity and Teacher Guide • Phases of Mitosis Khan Academy Article and Questions • Modeling Mitosis CPALMS Activity • Mitosis Mover! Bioman Interactive Game • Mitosis: The Amazing Cell Process that Uses Division to Multiply! Amoeba Sisters Video • Cancer: From A Healthy Cell to A Cancer Cell 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 describe the function of cell division in unicellular organisms using a graphic organizer. Pre-teach vocabulary: (Consider teaching this vocabulary in addition to vocabulary addressed in the standard to support Entering Level ELs) daughter cells, division

		Use graphic organizers or concept maps to support students in their descriptions of how cells divide. Provide sentence stems and signal words: for example, for instance, in support of this, in fact, as evidence. 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 …..

7th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback					
Quarter 1	Quarter 2		**Quarter 3**	Quarter 4	
Unit 1 Matter	Unit 2 Cell Structure and Function	Unit 3 Human Body Systems	**Unit 4 Reproduction, Survival, and Heredity**	Unit 5 Cycling of Matter and Energy	Unit 6 Earth's Atmosphere
9 weeks	6 weeks	3 weeks	**9 weeks**	3 weeks	6 weeks

UNIT 4: Reproduction, Survival, and Heredity (9 weeks)			
Overarching Question(s)			
How are characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics?			
Unit 4, Lesson 2	**Lesson Length**	**Essential Question**	**Vocabulary**
Meiosis	1.5 weeks	How do cells divide for sexual reproduction?	homologous chromosomes, meiosis

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 7.LS3: Heredity **Standard(s)** 7.LS3.2 Distinguish between mitosis and meiosis and compare the resulting daughter cells. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 7.LS3.2 Daughter cells produced through mitosis are identical to the parent cells. With the exception of mutations that will occur at random, the chromosomes in the daughter cells will be identical to the chromosomes in the parent cell. This process is	**Learning Outcomes** • Define sex cells • Explain how sex cells differ from body cells. • Define homologous chromosome. • Define meiosis. • Identify the relationship between meiosis and sexual reproduction. • Describe the steps of meiosis. • Identify the results of meiosis I and meiosis II. • Compare meiosis and mitosis. **Suggested Phenomenon** Not all cells in the human body can simply divide to create more cells for growth and repair.	**Curricular Resources** HMH Tennessee Science TE, Unit 5, Lesson 2, pp. 350-363 Engage • Engage Your Brain #s 1 and 2, SE p. 271 • Active Reading #s 3 and 4, SE p. 271 Explore Meiosis • Crossover and Meiosis Quick Lab, TE p. 353 • Comparing Cell Division Virtual Lab, TE p. 353 Explain Sex Cells • Active Reading #5, SE p. 272 • Visualize It! #6, SE p. 272

vital to processes such as the growth of organisms or repair to tissues (7.LS1.8). Meiosis occurs in organisms that undergo sexual reproduction and the daughter cells are gametes (eggs or sperm). The sex cells created in meiosis are not complete. Most cells contain two copies of each chromosome, and therefore two copies of each gene to make a protein. Meiosis creates daughter cells that have only one copy of the gene to make a particular protein. It is not until a pair of sex cells combine during fertilization that a complete set of DNA is accumulated. This halving of genetic information means that the organisms that are conceived through sexual reproduction will contain a combination of traits, half of which originates from each parent. **Suggested Science and Engineering Practice(s)** <u>Developing and Using Models</u> 7.LS3.2 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.		• Visualize It! #7, SE p. 273 • Modeling Chromosomes Activity, TE p. 352 Meiosis • Active Reading #8, SE p. 274 • Visualize It! #9, SE p. 275 • Think Outside the Book #10, SE p. 275 • Identify #11, SE p. 275 • Summarize #12, SE p. 276 • Modeling Meiosis Daily Demo, TE p. 353 • Meiosis Skit Activity, TE p. 352 Steps of Meiosis • Active Reading #8, SE p. 274 • Visualize It! #9, SE p. 275 • Think Outside the Book #10, SE p. 275 • Identify #11, SE p. 275 • Summarize #12, SE p. 276 • Meiosis Posters Activity, TE p. 352 • Meiosis Flipbooks Quick Lab, TE p. 353 Meiosis vs. Mitosis • Active Reading #8, SE p. 274 • Visualize It! #9, SE p. 275 • Think Outside the Book #10, SE p. 275 • Identify #11, SE p. 275 • Summarize #12, SE p. 276 • Tracking Sequence Activity, TE p. 352 <u>Extend</u> Reinforce and Review • Modeling Meiosis Activity, TE p. 356 • Venn Diagram Graphic Organizer, TE p. 356

Suggested Crosscutting Concept(s) Cause and Effect 7.LS3.2 Students use cause and effect relationships to make predictions.		• Visual Summary, SE p. 278 Going Further • Life Science Connection, TE p. 356 • Music Connection, TE p. 356 • Why It Matters, TE p. 277 Evaluate Formative Assessment • Reteach, TE p. 357 • Throughout TE • Lesson Review, SE p. 279 Summative Assessment • Meiosis Alternative Assessment, TE p. 357 • Lesson Quiz **Additional Resources** • Meiosis Amoeba Sisters Video • Mitosis vs. Meiosis: Side by Side Comparison Amoeba Sisters Video • Chromosomes Numbers During Division: Demystified! Amoeba Sisters Video • Mitosis vs. Meiosis cK-12 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 use a text to identify the relationship between meiosis and sexual reproduction using a T-chart and word bank. Pre-teach vocabulary: (Consider teaching this vocabulary in addition to vocabulary addressed in the standard to support Entering Level ELs) daughter cells; division; random Use graphic organizers or concept maps to support students in their explanations of how cells divide for sexual reproduction. Provide/explain signal words: again, first, moreover, also, further, next, and furthermore, nor, and then, in addition, secondly, besides, last, thirdly, equally important, lastly, too, finally, likewise, after a few days, immediately, meanwhile, afterward, in the meantime, soon, at length 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….? <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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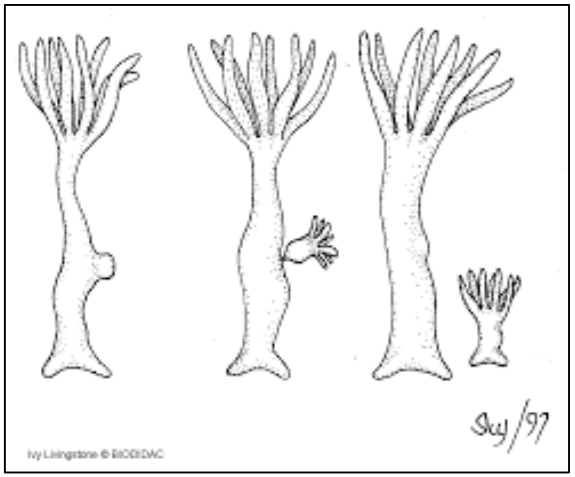
Unit 1 Matter	Unit 2 Cell Structure and Function	Unit 3 Human Body Systems	**Unit 4 Reproduction, Survival, and Heredity**	Unit 5 Cycling of Matter and Energy	Unit 6 Earth's Atmosphere
9 weeks	6 weeks	3 weeks	**9 weeks**	3 weeks	6 weeks

UNIT 4: Reproduction, Survival, and Heredity (9 weeks)			
Overarching Question(s)			
How do organisms live, grow, respond to their environment, and reproduce?			
Unit 4, Lesson 3	**Lesson Length**	**Essential Question**	**Vocabulary**
Sexual and Asexual Reproduction	1 week	How do organisms reproduce?	asexual reproduction, sexual reproduction, fertilization

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 7.LS1: From Molecules to Organisms: Structures and Processes **Standard(s)** 7.LS1.7 Evaluate and communicate evidence that compares and contrasts the advantages and disadvantages of sexual and asexual reproduction. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 7.LS1.7 In the context of *Growth and Development of Organisms* students should become aware that there are different strategies that organisms use for	**Learning Outcomes** • Define asexual reproduction. • Describe four ways by which organisms reproduce asexually. • Define sexual reproduction. • Describe the process of fertilization. • Compare asexual and sexual reproduction. • Identify the advantages of both forms. • Relate why some organisms reproduce both ways.	**Curricular Resources** HMH Tennessee Science TE, Unit 5, Lesson 3, pp. 366-379 Engage • Engage Your Brain #s 1 and 2, SE p. 283 • Active Reading #s 3 and 4, SE p. 283 Explore Comparing Asexual and Sexual Reproduction • Reproduction and Diversity Quick Lab, TE p. 369 Explain Asexual Reproduction • Active Reading #5, SE p. 284 • Think Outside the Book #6, SE p. 284

reproduction. The 7.LS3 standards address cellular processes associated with reproduction. Sexual reproduction includes genetic variation, while asexual reproduction results in far less genetic variation. By bundling this standard with discussions of cellular processes, students can compile evidence to explain why genetic variation occurs in sexual reproduction. Students should consider the origin of the genetic information in the offspring. **Suggested Science and Engineering Practice(s)** Obtaining, Evaluating, and Communicating Information 7.LS1.7 (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. **Suggested Crosscutting Concept(s)** Patterns 7.LS1.7 Students infer and identify cause and effect relationships from patterns.	**Suggested Phenomena**  Hydra are small freshwater that reproduce asexually by budding. Click on the picture to view an animation of a new hydra forming from budding. Students can complete a See Think Wonder Template while viewing the movie. Possible Guiding Questions: How does the offspring look in comparison to the parent? How many parents were involved in creating the new organism?	• Visualize It! #7, SE p. 285 Sexual Reproduction • Active Reading #8, SE p. 286 • Compare #9, SE p. 286 Comparing Asexual and Sexual Reproduction • Compare #13, SE p. 288 • Visualize It! #14, SE p. 288 • List #15, SE p. 288 • Explain #16, SE p. 289 • Compare #17, SE p. 289 Extend Reinforce and Review • Asexual Reproduction Game Activity, TE p. 372 • Comparing Asexual and Sexual Reproduction Graphic Organizer, TE p. 372 • Visual Summary, SE p. 290 Going Further • Technology Connection, TE p. 372 • Social Studies Connection, TE p. 372 • Why It Matters, SE p. 287 Evaluate Formative Assessment • Reteach, p. 373 • Throughout TE • Lesson Review, SE p. 291 Summative Assessment • Sexual and Asexual Reproduction Alternative Assessment, TE p. 373

	 Sexual reproduction in dogs results in puppies that look similar to the parents but not exactly alike. Students can complete a See Think Wonder Template after viewing the picture. Possible Guiding Questions: How do the offspring look in comparison to the parents? How many parents were involved in creating the litter of puppies? How does the hydra offspring compare to the litter of puppies?	• Lesson Quiz **Additional Resources** • Reproduction PBS Learning Media Lesson • Asexual and Sexual Reproduction Amoeba Sisters Video • Investigating Reproductive Strategies Activity • Reproduction cK-12 Content **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 define sexual reproduction using 2-3 sentences and a word box with pre-taught vocabulary. Use graphic organizers or concept maps to support students in their explanations of sexual reproduction. Provide/explain signal words: again, first, moreover, also, further, next, and furthermore, nor, and then, in addition, secondly, besides, last, thirdly, equally important, lastly, too, finally, likewise,

		after a few days, immediately, meanwhile, afterward, in the meantime, soon, at length 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 …..

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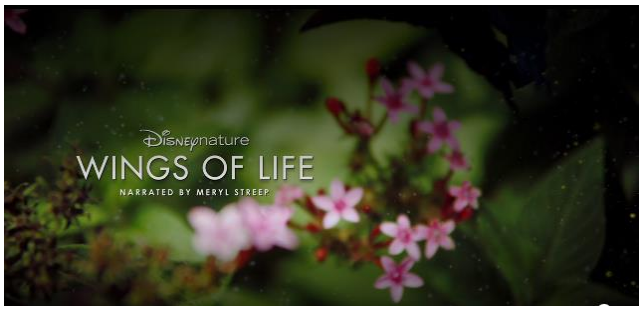
9 weeks	6 weeks	3 weeks	**9 weeks**	3 weeks	6 weeks

UNIT 4: Reproduction, Survival, and Heredity (9 weeks)			
Overarching Question(s)			
How do organisms live, grow, respond to their environment, and reproduce?			
Unit 4, Lesson 4	**Lesson Length**	**Essential Question**	**Vocabulary**
Adaptations and Survival	1 week	How do organisms adapt to their environment?	adaptation, variation, mutation, evolution, natural selection, structural adaptation, behavioral adaptation, exaptation, vestigial adaptation

Standards and Related Background Information	**Instructional Focus**	**Instructional Resources**
DCI(s) 7.LS1: From Molecules to Organisms: Structures and Processes **Standard(s)** 7.LS1.6 Develop an argument based on empirical evidence and scientific reasoning to explain how behavioral and structural adaptations in animals and plants affect the probability of survival and reproductive success.	**Learning Outcomes** • Define adaptation, and explain its role in a species' survival. • Describe how mutations and genetic variations improve survival. • Explain natural selection, and describe how helpful traits are passed down to offspring. • Define structural adaptation. • Define behavioral adaptation. • Explain exaptation, vestigial adaptations, coadaptation, and co-extinction. • Identify different types of structural adaptation.	**Curricular Resources** HMH Tennessee Science TE, Unit 5, Lesson, pp. 380-393 Engage • Engage Your Brain #s 1 and 2, SE p. 293 • Active Reading #s 3 and 4, SE p. 293 Explore Types of Adaptations • Explaining Camouflage Daily Demo, TE p. 383 • Modeling Predator-Prey Scenarios Quick Lab, TE p. 383

Explanation(s) and Support of Standard(s) from TN Science Reference Guide 7.LS1.6 The focus of this standard is reproductive strategies in plants and animals, with a secondary connection to the way that these strategies have been cemented over time. Discussions of the adaptations support the main focus on reproductive success. Structural adaptations in animals could be things such as coloration, or patterns, along with behaviors that increase success in attracting a mate such as vocalization. Plants have structures that attract pollinators or foster interactions with specific pollinators, or seeds with features that aid in dispersion by wind or interactions with animals. Instructionally, it is not necessary to focus on presenting students with as many interactions/structures as possible. Instead, time should be taken to allow students to observe patterns in interactions (between same species, or different species) and allow students to present arguments with how these interactions increase reproductive success. Students should closely examine the interactions searching for a cause-effect relationship between the behavior and reproductive success. Internal and external structures that help an organism survive in their environments (e.g. swim	• Identify different types of behavioral adaptations. **Suggested Phenomenon**  Pollination is necessary for plants to reproduce. Flowers are structural adaptations of plants that attract pollinators to aid in reproduction. Click on the picture to view Disneynature WINGS OF LIFE to see how pollinators interact with flowers to ensure that reproduction occurs. Students can complete a See Think Wonder Template while viewing the movie. Possible Guiding Questions: What do you notice about the flowers' appearance? Why do you think the pollinators are attracted to the flowers? What would happen if the pollinators were not attracted to the flowers?	Explain Adaptations and Evolution • Visualize It! #5, SE p. 294 • Active Reading #6, SE p. 295 • Think Outside the Book #7, SE p. 295 Structural and Behavioral Adaptations • Visualize It! #8, SE p. 296 • Visualize It! #9, SE p. 296 • Visualize It! #10, SE p. 297 • Active Reading #11, SE p. 297 • Do Plants Have Behavioral Adaptations? Discussion, TE p. 382 • Adaptations Brainstorm Activity, TE p. 382 Types of Adaptations • Active Reading #12, SE p. 297 • Visualize It! #13, SE p. 298 • Visualize It! #14, SE p. 299 • Visualize It! #15, SE p. 299 • Identifying Habitats Activity, TE p. 382 Extend Reinforce and Review • Mind Map Graphic Organizer, TE p. 386 • Visual Summary, SE p. 300 Going Further • Art Connection, TE p. 386 • Environmental Science Connection, TE p. 386 Evaluate Formative Assessment

bladder in fish), but not associated with reproduction, but have been covered in third grade. **Suggested Science and Engineering Practice(s)** Engaging in Argument from Evidence 7.LS1.6 Students present an argument based on empirical evidence, models, and invoke scientific reasoning. **Suggested Crosscutting Concept(s)** Cause and Effect 7.LS1.6 Students begin to connect their explanations for cause and effect relationships to specific scientific theory.		• Reteach, TE p. 387 • Throughout TE • Lesson Review, SE p. 301 Summative Assessment • Adaptations and Survival Alternative Assessment, TE p. 387 • Lesson Quiz **Additional Resources** • Animal Adaptations STUDY JAMS! Video and Quiz • Plant Adaptations STUDY JAMS! Video and Quiz • Cities Drive Animals and Plants to Evolve • Mates or Survival: Which Explains a Bird's Color? Article • On Separate Island, Crickets Go Silent 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 define structural adaptation using 2-3 sentences and a word box with pre-taught vocabulary. Use graphic organizers or concept maps to support students in their explanations of how organisms adapt to their environment. Provide/explain signal words: again, first, moreover, also, further, next, and furthermore, nor, and then, in addition, secondly, besides, last, thirdly, equally important, lastly, too, finally, likewise, after a few days, immediately, meanwhile, afterward, in the meantime, soon, at length 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….? <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 …..

7th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback					
Quarter 1	Quarter 2		**Quarter 3**	Quarter 4	
Unit 1 Matter	Unit 2 Cell Structure and Function	Unit 3 Human Body Systems	**Unit 4 Reproduction, Survival, and Heredity**	Unit 5 Cycling of Matter and Energy	Unit 6 Earth's Atmosphere
9 weeks	6 weeks	3 weeks	**9 weeks**	3 weeks	6 weeks

UNIT 4: Reproduction, Survival, and Heredity (9 weeks)			
Overarching Question(s)			
How are characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics?			
Unit 4, Lesson 5	**Lesson Length**	**Essential Question**	**Vocabulary**
Heredity	1 week	How are traits inherited?	heredity, gene, allele, genotype, phenotype, incomplete dominance, dominant, recessive, codominance

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 7.LS3: Heredity **Standard(s)** 7.LS3.3 Predict the probability of individual dominant and recessive alleles to be transmitted from each parent to offspring during sexual reproduction and represent the genotypic and phenotypic patterns using ratios.	**Learning Outcomes** • Summarize Mendel's findings. • Explain how dominant and recessive traits differ. • Describe DNA's role in determining traits. • Identify the relationship between genes and alleles. • Identify the relationship between genotype and phenotype. • Describe the relationship among genes, traits, and characteristics. • Discuss complete and incomplete dominance.	**Curricular Resources** HMH Tennessee Science TE, Unit 5, Lesson 5, pp. 394-407 Engage • Engage Your Brain #s 1 and 2, SE p. 303 • Active Reading #4, SE p. 303 Explore DNA's Role in Inheritance • What's the Difference Between a Dominant Trait and a Recessive Trait? Quick Lab, TE p. 397 Explain Mendel's Work

Explanation(s) and Support of Standard(s) from TN Science Reference Guide 7.LS3.3 Meiosis produces sex cells that must be combined during fertilization to result in an offspring. Models such as Punnett squares are tools that can be used to make sense of the possible genetic combinations that could arise for a single trait (at this level). Meiosis produces eggs and sperm, whose chromosomal content is represented symbolically (often letters). Students could project forward from a set of parent genes, prior to meiosis, into the sex cells represented symbolically on the Punnett square. Each square within the predictive field of the Punnett square represents a possible outcome of fertilization. The cells created during fertilization will have a certain combination of genes (genotype) that will encode for certain proteins. The production of these proteins from genes will control the observable characteristics (structural, functional, behavioral) in the offspring. These observable characteristics are referred to as the organism's phenotype.	• Distinguish between inherited and acquired characteristics. • Provide examples of environmental factors that may affect phenotype. **Suggested Phenomenon**  These young ladies are twins, click on the picture to view suggested classroom use of this phenomena. Click here for additional suggestions. Students can complete a See Think Wonder Template after viewing the picture.	• Apply #5, SE p. 304 • Active Reading #6, SE p. 305 • Visualize It! #7, SE p. 305 • Sonnem Farming, Part 1 Activity, TE p. 396 DNA's Role in Inheritance • Visualize It! #8, SE p. • Apply #9, SE p. 307 • Think Outside the Book 310, SE p. 307 • Active Reading #11, SE p. 307 • Mnemonic Discussion, TE p. 396 • Visualize It! #12, SE p. 306 • Active Reading #13, SE p. 309 • Predict #14, SE p. 309 Genes, Traits, and Characteristics • Active Reading #15, SE p. 310 • Visualize It! #16, SE p. 310 • Think Outside the Book #17, SE p. 311 • Active Reading #18, SE p. 311 • Visualize It! #19, SE p. 311 • Sonnem Farming, Part 2 Activity, TE p. 396 Extend Reinforce and Review • Heredity Game Activity, TE p. 400 • Combination Notes Graphic Organizer, TE p. 400 • Visual Summary, SE p. 312 Going Further • Life Science Connection, TE p. 400 • Language Arts Connection, TE p. 400

Suggested Science and Engineering Practice(s) Using Mathematics and Computational Thinking 7.LS3.3 Students can use computing to process large amounts of data in order to develop mathematical representations (ratios, percentages, rates) that will help evaluate a scientific explanation. **Suggested Crosscutting Concept(s)** Scale, Proportion, and Quantity 7.LS3.3 Students make and evaluate derived/proportional measurements.		Evaluate Formative Assessment • Reteach, TE p. 401 • Throughout TE • Lesson Review, SE p. 313 Summative Assessment • Heredity Alternative Assessment, TE p. 401 • Lesson Quiz **Additional Resources** • Heredity STUDY JAMS! Video and Quiz • Generations of Traits Activity • Learn.Genetics Website • The Gene Scene Interactive Website • DNA, Chromosomes, Genes, and Traits: An Intro to Heredity Amoeba Sisters Video • Alleles and Genes Amoeba Sisters Video • New York Post Article and YouTube Video • Pasta Genetics Activity **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 describe the relationship among genes, traits, and characteristics using a 3 column chart and pre-taught vocabulary. Use graphic organizers or concept maps to support students in their explanations of how traits are inherited. Provide/explain signal words: again, first, moreover, also, further, next, and furthermore, nor, and then, in addition, secondly, besides, last, thirdly, equally important, lastly, too, finally, likewise, after a few days, immediately, meanwhile, afterward, in the meantime, soon, at length 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….? <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 …..

7th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback					
Quarter 1	Quarter 2		**Quarter 3**	Quarter 4	
Unit 1 Matter	Unit 2 Cell Structure and Function	Unit 3 Human Body Systems	**Unit 4 Reproduction, Survival, and Heredity**	Unit 5 Cycling of Matter and Energy	Unit 6 Earth's Atmosphere
9 weeks	6 weeks	3 weeks	**9 weeks**	3 weeks	6 weeks

UNIT 4: Reproduction, Survival, and Heredity (9 weeks)			
Overarching Question(s)			
How are characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics?			
Unit 4, Lesson 6	**Lesson Length**	**Essential Question**	**Vocabulary**
Punnett Squares and Pedigrees	2 weeks	How are patterns of inheritance studied?	Punnett square, probability, ratio, pedigree

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 7.LS3: Heredity **Standard(s)** 7.LS3.3 Predict the probability of individual dominant and recessive alleles to be transmitted from each parent to offspring during sexual reproduction and represent the genotypic and phenotypic patterns using ratios. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 7.LS3.3 Meiosis produces sex cells that must be combined during fertilization to result in an offspring.	**Learning Outcomes** • Define Punnett square. • Use a Punnett square to find combinations of alleles in potential offspring. • Define ratio. • Define probability. • Define pedigree. • Explain what a sex-linked disorder is. • Give examples of sex-linked disorders. • Use a pedigree to trace a genetic trait.	**Curricular Resources** HMH Tennessee Science TE, Unit 5, Lesson 6, pp. 410-423 Engage • Engage Your Brain #s 1 and 2, SE p. 317 • Active Reading #s 3 and 4, SE p. 317 • What's the Probability? Activity, TE p. 412 Explore Punnett Squares • Completing a Punnett Square Quick Lab, TE p. 413 • Matching Punnett Square Predictions S.T.E.M. Lab, TE p. 413

Models such as Punnett squares are tools that can be used to make sense of the possible genetic combinations that could arise for a single trait (at this level). Meiosis produces eggs and sperm, whose chromosomal content is represented symbolically (often letters). Students could project forward from a set of parent genes, prior to meiosis, into the sex cells represented symbolically on the Punnett square. Each square within the predictive field of the Punnett square represents a possible outcome of fertilization. The cells created during fertilization will have a certain combination of genes (genotype) that will encode for certain proteins. The production of these proteins from genes will control the observable characteristics (structural, functional, behavioral) in the offspring. These observable characteristics are referred to as the organism's phenotype. **Suggested Science and Engineering Practice(s)** Using Mathematics and Computational Thinking 7.LS3.3 Students can use computing to process large amounts of data in order to develop mathematical representations (ratios, percentages, rates) that will help evaluate a scientific explanation.	**Suggested Phenomenon**  These young ladies are twins, click on the picture to view suggested classroom use of this phenomena. Click here for additional suggestions. Students can complete a See Think Wonder Template after viewing the picture.	• Crossing pea Plants Virtual Lab, TE p. 413 Explain Punnett Squares • Active Reading #5, SE p. 318 • Visualize It! #6, SE p. 319 • Visualize It! #7, SE p. 320 • Do the Math #8, SE p. 320 • Graph #9, SE p. 321 • Sonnem Farming, Part 3 Activity, TE p. 412 • Coding for Traits Daily Demo, TE p. 412 Pedigrees • Visualize It! #11, SE p. 322 • Visualize It! #12, SE p. 322 Extend Reinforce and Review • Description Wheel Graphic Organizer. TE p. 416 • Visual Summary, SE p. 324 Going Further • Math Connection, TE p. 416 • Why It Matters, SE p. 323 Evaluate Formative Assessment • Reteach, TE p. 417 • Throughout TE • Lesson Review, SE p. 325 Summative Assessment • Punnett Squares and Pedigrees Alternative Assessment, TE p. 417

Suggested Crosscutting Concept(s) Scale, Proportion, and Quantity 7.LS3.3 Students make and evaluate derived/proportional measurements.		• Lesson Quiz **Additional Resources** • Learn.Genetics Website • Monohybrids and the Punnett Square Guinea Pigs • Pasta Genetics Activity **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 define Punnett square using complete sentences. Use graphic organizers or concept maps to support students in their explanations of how patterns of inheritance are studied. Provide/ explain signal words: again, first, moreover, also, further, next, and furthermore, nor, and then, in addition, secondly, besides, last, thirdly, equally important, lastly, too, finally, likewise,

		after a few days, immediately, meanwhile, afterward, in the meantime, soon, at length When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals Punnett Square video 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 …..

7th Grade Quarter 3 Curriculum Map Quarter 3 Curriculum Map Feedback					
Quarter 1	Quarter 2		**Quarter 3**	Quarter 4	
Unit 1 Matter	Unit 2 Cell Structure and Function	Unit 3 Human Body Systems	**Unit 4 Reproduction, Survival, and Heredity**	Unit 5 Cycling of Matter and Energy	Unit 6 Earth's Atmosphere
9 weeks	6 weeks	3 weeks	**9 weeks**	3 weeks	6 weeks

UNIT 4: Reproduction, Survival, and Heredity (9 weeks)			
Overarching Question(s)			
How can individuals of the same species and even siblings have different characteristics?			
Unit 4, Lesson 7	**Lesson Length**	**Essential Question**	**Vocabulary**
DNA Structure and Function	1 week	What is DNA?	DNA, mutation, nucleotide, RNA, replication, ribosome

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI(s) 7. LS3: Heredity **Standard(s)** 7.LS3.1 Hypothesize that the impact of structural changes to genes (i.e., mutations) located on chromosomes may result in harmful, beneficial, or neutral effects to the structure and function of the organism. **Explanation(s) and Support of Standard(s) from TN Science Reference Guide** 7.LS3.1 Proteins control the characteristics of an organism, both structurally and physiologically. A	**Learning Outcomes** • Define DNA and list the components of DNA. • Describe Chargraff's rules concerning bases. • Explain Rosalind Franklin's and Watson and Crick's contributions to knowledge about the structure of DNA. • Explain how DNA makes copies of itself. • Describe when DNA replication occurs. • Define mutation and list three different types of mutations. • Explain why mutations occur.	**Curricular Resources** HMH Tennessee Science TE, Unit 5, Lesson 7, pp. 424-437 Engage • Engage Your Brain #s 1 and 2, SE p. 327 • Active Reading #s 3 and 4, SE p. 327 Explore Mutations • Mutations Cause Diversity Quick Lab, TE p. 427 Explain DNA Structure • Active Reading #5, SE p. 328 • Analyze #6, SE p. 328

single chromosome will hold the information needed to produce many number of proteins. Each protein is produced by a gene "on" the chromosome. Metaphorically, the chromosome is a cookbook filled with recipes (genes) for many different types of meals (proteins). A change to a gene that is found on a chromosome will influence the protein formed from that gene. This change may influence the ability of the protein produced by the gene to perform its' typical role within an organism. The observable characteristics of an organism are an outcome of protein activities. Changes to the observable characteristics of an organism may be harmful, beneficial, or have no impact on an organism. Students should see that a protein's shape (e.g. hemoglobin) is essential to its ability to function properly and that the shape of the protein is derived from the structure of the gene. Student models should account for the sequence of general processes (not specific, technical mechanisms) that connect gene content to observable effects on the organism. The models can then be used to explain phenomena related to mutations to genes.	**Suggested Phenomenon**  Click on the picture to view suggestions for classroom use. Students can complete a See Think Wonder Template after viewing the picture.	• Active Reading #8, SE p. 330 • Visualize It! # 9, SE p. 330 • Apply #10, SE p. 331 • Devise #11, SE p. 331 DNA Replication • Visualize It! #12, SE p. 332 Mutations • Visualize It! #13, SE p. 333 • Explain #14, SE p. 333 • Hypothesize #15, SE p. 333 <u>Extend</u> Reinforce and Review • Standup DNA Activity, TE p. 430 • Visual Summary, SE p. 336 Going Further • Environmental Science Connection, TE p. 430 • Real World Connection, TE p. 430 <u>Evaluate</u> Formative Assessment • Reteach, TE p. 431 • Throughout TE • Lesson Review, SE p. 337 Summative Assessment • DNA Structure and Function Alternative Assessment, TE p. 431 • Lesson Quiz • Unit 5 Big Idea, SE p. 340 • Unit 5 Review, SE pp. 341-346

Suggested Science and Engineering Practice(s) Obtaining, Evaluating, and Communicating Information 7.LS3.1 (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. **Suggested Crosscutting Concept(s)** Structure and Function 7.LS3.1 Students begin to attribute atomic structure and interactions between particles to the properties of a material.		**Additional Resources** • Learn.Genetics Website • The Gene Scene Interactive Website • From Chimps to People Article • Scientists Say: Mutation • Fancy Feather Gene Article • Awake at Night Article • Mutation Telephone Activity • Mutations Webpage • Monstrous Mutations • On Separate Island, Crickets Go Silent Article • Mutations Amoeba Sisters Video • Life Without Color Article • Lab 15. Mutations in Genes: How Do Different Types of Mutations in Genes Affect the Function of an Organism? • Lab 15. Mutations in Genes: How Do Different Types of Mutations in Genes Affect the Function of an Organism? Student Handout **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 define DNA and list the components of DNA using complete sentences. Use graphic organizers or concept maps to support students in their explanations of what DNA is. Provide/explain signal words: again, first, moreover, also, further, next, and furthermore, nor, and then, in addition, secondly, besides, last, thirdly, equally important, lastly, too, finally, likewise, after a few days, immediately, meanwhile, afterward, in the meantime, soon, at length When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates Interactive Science Dictionary with visuals Video on DNA with subtitles and 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….? <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 …..