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.

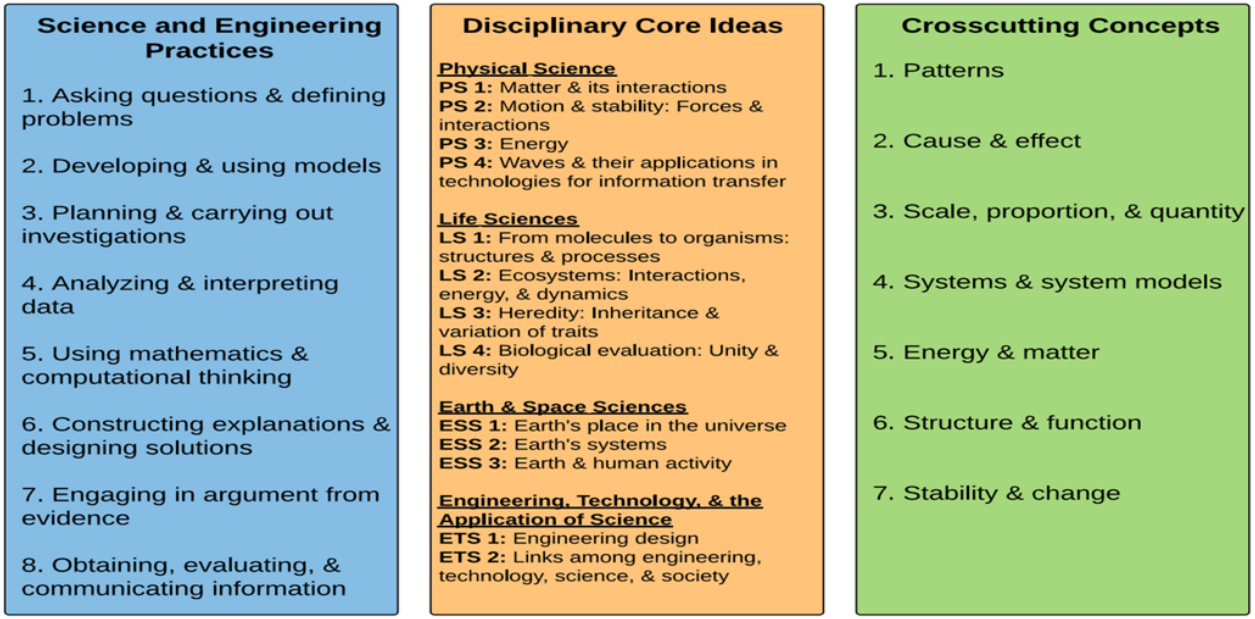
The Tennessee Academic Standards for Science were developed using the National Research Council's 2012 publication, A Framework for K-12 Science Education as their foundation. The framework presents a new model for science instruction that is a stark contrast to what has come to be the norm in science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

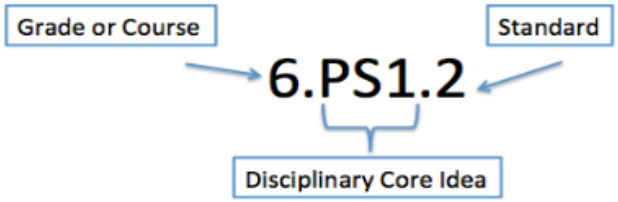
At the end of the elementary science experience, students can observe and measure phenomena using appropriate tools. They are able to organize objects and ideas into broad concepts first by single properties and later by multiple properties. They can create and interpret graphs and models that explain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

Human Anatomy Physiology
Quarter 2 Curriculum Map
Curriculum Map Feedback Survey

Quarter 1		Quarter 2		Quarter 3		Quarter 4	
Unit 1 Anatomical Orientation	Unit 2 Protection, Support, and Movement	**Unit 3 Nervous System**	Unit 4 Endocrine System	Unit 5 Transport of Nutrients and Gases	Unit 6 Lymphatic System	Unit 7 Absorption and Excretion	Unit 8 Reproduction, Growth, and Development
3 Weeks	6 Weeks	**6 Weeks**	3 Weeks	7 Weeks	2 Weeks	5 Weeks	4 Weeks

Unit 3: Nervous System [6 Weeks]

Overarching Question(s)

How do the structures of organisms enable life's functions?

Unit, Lesson	Lesson Length	Essential Question	Vocabulary
Unit 3 Nervous System	**3 weeks**	• What are the two main functions of the nervous system? • How does the body maintain control over all of its internal systems? • How does the nervous system act as a feedback mechanism for maintaining homeostasis?	External stimuli, internal stimuli, mesenchymal stem cell, neural tube, bidirectional communication, neural crest cells, axon, dendrites, interneurons, nerve cell body, neurotransmitter receptor, presynaptic neuron, postsynaptic neuron, synapse, synaptic cleft, terminus, unipolar neurons, cerebrospinal fluid, nodes of Ranvier, radial glia, Schwann cells, action potential, resting potential, neural threshold, recovery phase, refractory period, affector, dopamine, inhibitory, neural pathways, excitatory postsynaptic potential (ESPS), inhibitory postsynaptic potential (ISPS), reflex, reflex arc, transduction, demyelination, encephalitis, endotoxins, meningitis, multiple sclerosis, rabies, neurotrophic, traumatic

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI LS1: From Molecules to Organisms: Structures and Processes HAP.ETS2: Links Among Engineering, Technology, Science, and Society	**Learning Outcomes** • Create a visual representation of complex nervous systems to describe how nervous systems detect external and internal signals, transmit and integrate	**Curricular Resources** **Engage** Neurotransmission Model **Videos:** The Nervous System, Part 1: Crash Course A&P The Nervous System, Part 2: Action! Potential!: Crash Course

Standard(s)

HAP.LS1.34 Model the cellular and subcellular structures of neurons and explain the molecular neurophysiology of membrane potentials and the conduction of information through synaptic transmission.

Explanation

The neuron is the basic structure of the nervous system that reflects function. A typical neuron has a cell body, axon, and dendrites. The structure of the neuron allows for the detection, generation, transmission and integration of signal information. Transmission of information between neurons occurs across synapses. Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.

Misconceptions

- Many students imagine a massive influx and efflux of ions across the neuron's plasma membrane during the conduction of the action potential. These students do not realize the small number of ions that are involved, and they assume that Na^+ entry into the axon during depolarization reverses the Na^+ gradient across the membrane.
- Students may think that the Na^+/K^+ pumps in neuron and muscle membranes "turn off" during the action potential.
- Some students use the imagery of electricity moving down a wire in considering the conduction of an action potential. This

information, and produce responses.

- Distinguish between the types of nervous system cells.
- Explain the process of nervous system development.
- Describe the structure and components of a nerve cell.
- Explain the function of nerve cells.
- Describe the sequence of events involved in nerve cell excitation.
- Understand the biological basis of aging and the pathology of nerve cell function.

Phenomenon

There are more nerve cells in the human brain than there are stars in the Milky Way. Babies have more neurons than adults, but their neurons have fewer synapses compared to an adult brain. They undergo synaptic pruning. Inside the womb, neurons grow at the rate of 250,000 neurons a minute in the brain of a child. The brain of a newborn grows over three times its size in the first year of growth. In adults, every year a gram of the brain's weight is lost. The brain uses more than 20% of the body's total energy production. Most of this energy is channeled through the brain towards the transmission of electrical impulses whether we are awake or asleep. It is a well-known fact that the brain works tirelessly even during sleep.

The Nervous System, Part 3: Synapses!: Crash Course

Explore

EMC AA&P Workbook & Laboratory Manual:

- Ch. 8 Function of the Nervous System Workbook pgs. 130-144
- Laboratory Activity 1, pgs.137-138: Pupil Reflex
- Laboratory Activity 2, pgs. 139: Knee-Jerk Reflex
- Laboratory Activity 3, pgs. 140-141: Catch Reflex

Makes Me Sweat Activity

Dendrites Spine Lab

Explain

- Case Study Investigation #8, pgs. 272-273

Elaborate

- Case Study: Chemtrials: A Real Public Health Concern? Pgs. 302-303

Evaluate

Ch. 8 Function of the Nervous System-Concept Check pgs. 275, 278, 280, 284, 288, 289, 294, 296

Ch. 8 Function of the Nervous System-Study Guide pgs. 300-301

Textbook:

Applied Anatomy & Physiology 2nd Ed.: A Case Study Approach; Brian R, Shmaefsky

Ch. 8 Function of the Nervous System; pgs. 272 – 303

comparison may have some uses, but it can also confuse students. Ions rather than electrons are responsible for the conduction of an action potential; an action potential is conducted at speeds far slower than those of electricity; and electrons are carried along a wire, whereas ions move across the neuron membrane. • Many students do not realize that resting membrane potentials characterize all living cells. **<u>Science & Engineering Practice</u>** **Developing and Using Models** *Students can test the predictive abilities of their models in a real-world setting and make comparisons of two models of the same process or system.* **<u>Cross Cutting Concept</u>** **Cause and Effect** *Students use cause an effect models at one scale to make predictions about the behavior of systems at different scales*	Your nervous system cannot function properly in the absence of potassium and sodium ions. Multiple sclerosis and Tay-Sachs disease are degenerative disorders of the myelin sheath. In multiple sclerosis (MS), the oligodendrocytes and myelin sheaths of the CNS deteriorate and are replaced by hard-ended scar tissue, especially between the ages of 20 and 40. Nerve conduction is disrupted, with effects that depend on what part of the CNS is involved – double vision, blindness, speech defects, neurosis, tremors, or numbness, for example. Patients experience variable cycles of milder and worse symptoms until they eventually become bedridden. The cause of MS remains uncertain; most hypotheses suggest that it is an autoimmune disorder triggered by a virus in genetically susceptible individuals. There is no cure. There is conflicting evidence of how much it shortens a person's life expectancy, if at all. A few die within 1 year of diagnosis, but many people live with MS for 25 or 30 years.	

Human Anatomy Physiology
Quarter 2 Curriculum Map
Curriculum Map Feedback Survey

Quarter 1		**Quarter 2**		Quarter 3		Quarter 4	
Unit 1 Anatomical Orientation	Unit 2 Protection, Support, and Movement	**Unit 3 Nervous System**	Unit 4 Endocrine System	Unit 5 Transport of Nutrients and Gases	Unit 6 Lymphatic System	Unit 7 Absorption and Excretion	Unit 8 Reproduction, Growth, and Development
3 Weeks	6 Weeks	**6 Weeks**	3 Weeks	7 Weeks	2 Weeks	5 Weeks	4 Weeks

Unit 3: Nervous System [6 Weeks]

Overarching Question(s)

How do the structures of organisms enable life's functions?

Unit, Lesson	Lesson Length	Essential Question	Vocabulary
Unit 3 Nervous System	**3 weeks**	• What are the basic steps that occur during the formation of the nervous system? • How does the structure of a nerve relate to is function? • Distinguish between the functions of the cranial and spinal nerves. • Describe the structure and function of the eyes and ears. • Compare and contrast metabolic and toxic nervous system diseases with infectious nervous system diseases.	Central nervous system (CNS), peripheral nervous system (PNS), afferent nerve, efferent nerve, ganglia, myelinated axon, nerve tracts, brain stem, central canal, cerebellum, cerebral cortex, cerebral hemispheres, cerebrum, corpus callosum, forebrain, frontal lobe, gray matter, gyri, hindbrain, limbic system, medulla oblongata, meninges, midbrain, motor cortex, occipital lobe, parietal lobe, pia mater, pons, sensory cortex, temporal lobe, white matter, cranial nerves, autonomic nervous system, dorsal root, parasympathetic nerves, somatic nervous system, spinal nerves, sympathetic nerves, ventral root, chemoreceptor, bitter, papillae, saliva, salt, sour, sweet, taste bud, olfactory bulb, olfactory nerve, choroid, cone, conjunctiva, cornea, fovea, iris, lacrimal duct, lacrimal gland, lens, optic cup, optic nerve, retina, rod, sclera, eardrum, cochlea, eustachian tube, external auditory meatus, external ear, incus, inner ear, malleus, middle ear, ossicle, semicircular canals, stapes, vestibule, aneurysm, neuroblastoma, stroke, shaken-baby syndrome, tremor, whiplash
Standards and Related Background Information		**Instructional Focus**	**Instructional Resources**

DCI LS1: From Molecules to Organisms: Structures and Processes HAP.ETS2: Links Among Engineering, Technology, Science, and Society **Standard** **HAP.LS1.37** Model the major parts of the brain and spinal cord, relating each part to its source of sensory information and/or its primary target of regulation. **HAP.LS1.36** Compare and contrast the structures and functions of the somatic nervous system and the autonomic nervous system. **HAP.LS1.33** Anatomically distinguish between the central nervous system and the peripheral nervous system. Explain how their structures and locations are related to their physiological roles. **HAP.LS1.38** Explain the structures, functions, and limitations of the human sensory systems (senses): hearing, balance/proprioception, sight, touch, smell, and taste. the movement of body parts and/or substances **Explanation** Different regions of the brain have different functions. Examples include vision, hearing, muscle movement, abstract thought and emotions, neuro-	**Learning Outcomes** • Create a visual representation to describe how nervous systems transmit information. • Describe how the senses act as a link from the nervous system to the outside world. • Create a visual representation to describe how the brain integrates information to produce a response. • Explain and visually represent how nerve signals travel from spinal nerves to the spinal cord and then to the brain. • Describe how feedback from body systems is interpreted by the brain to maintain homeostasis. **Phenomenon** Breaching the Blood-Brain barrier. Because it is so effective, the blood-brain barrier prevents the passage of helpful substances as well as those that are potentially harmful. Researches are exploring ways to move drugs that could be therapeutic for brain cancer or other CNS disorders past the BBB. In one method, the drug is injected in a concentrated sugar solution. The high osmotic pressure of the sugar solution causes the endothelial cells of the capillaries to shrink, which opens gaps between their tight junctions, making the BBB leakier and allowing the drug to enter the brain tissue. Phantom limb Sensation. Patients who have had a limb amputated may still experience sensations such as itching, pressure, tingling,	**Curricular Resources** **Engage** **Videos:** Central Nervous System: Crash Course Peripheral Nervous System: Crash Course Autonomic Nervous System: Crash Course Sympathetic Nervous System: Crash Course Parasympathetic Nervous System: Crash Course Taste & Smell: Crash Course Hearing & Balance: Crash Course Vision: Crash Course **Explore** **EMC AA&P Workbook & Laboratory Manual**: • Ch. 9 Structure of the Nervous System, pgs. 145-172 • Laboratory Activity 1: The Stroop Effect and Brain Function, pgs. 166-167 • Laboratory Activity 2: Brain Pathology Interpretation, pgs. 167-169 Case Study: Phineas Gage Neurological Disorders Project Altered Reality **Explain** • Case Study Investigation #8, pgs. 304-305 **Elaborate** • Case Study: Aluminum: More Harmful Than Helpful? Pgs. 344-345 **Evaluate** • Ch. 9 Structure of the Nervous System-Concept Check pgs. 306, 309, 312, 317, 322, 330, 336, 338 • Ch. 9 Structure of the Nervous System-Study Guide pgs. 342-343

hormone production, forebrain, midbrain and hindbrain, right and left cerebral hemispheres in humans. Spinal nerves and spinal cord organize and transmit signals from the peripheral nervous system to and from the brain. The brain processes both autonomic and somatic signals. Sympathetic nervous system promotes a fight or flight response. The parasympathetic nervous system promotes normal function. **Misconceptions** • Students may not fully realize that the autonomic nervous system, including the sympathetic, parasympathetic, and enteric divisions, is not truly autonomous within an integrated body. **Science & Engineering Practice** **Engaging in Argument from Evidence** *Students critically evaluate evidence supporting and argument and create written or oral arguments which invoke empirical evidence, scientific reasoning, and scientific explanations.* **Cross Cutting Concept** **Systems and System Models** *Students can use models to simulate systems and their interactions.*	or pain as if the limb were still there. This phenomenon is called phantom limb sensation. Although the limb has been removed, severed endings of sensory axons are still present in the remaining stump. If these severed endings are activated, the cerebral cortex interprets the sensation as coming from the sensory receptors in the nonexistent (phantom) limb. Another explanation for the phantom limb sensation is that the area of the cerebral cortex that previously received sensory input from the missing limb undergoes extensive functional reorganization that allows it to respond to stimuli from another body part. The remodeling of this cortical area is thought to give rise to false sensory perceptions from the missing limb. Phantom limb pain can be very distressing to an amputee. Many report that the pain is severe or extremely intense, and that it often does not respond to traditional pain medication therapy. In such cases, alternative treatments may include electrical nerve stimulation, acupuncture, and biofeedback. Taste receptors play an important role in regulating metabolism and nutrient homeostasis You have taste receptors in your stomach, intestines, lungs, pancreas and the brain. The brain itself does not have any pain receptors. Therefore, it is possible for surgeons to perform brain surgeries while patients are conscious. Brain plasticity allows the brain to make new connections, so brain damage is not always permanent. New brain connections are made every time a new	**Textbook:** *Applied Anatomy & Physiology 2nd Ed.: A Case Study Approach; Brian R, Shmaefsky* Ch. 9 Structure of the Nervous System; pgs. 305-345

	memory is created. And the created connections (synapses) strengthen with more practice or repetition.	

Human Anatomy Physiology Quarter 2 Curriculum Map Curriculum Map Feedback Survey							
Quarter 1		Quarter 2		Quarter 3		Quarter 4	
Unit 1 Anatomical Orientation	Unit 2 Protection, Support, and Movement	Unit 3 Nervous System	**Unit 4 Endocrine System**	Unit 5 Transport of Nutrients and Gases	Unit 6 Lymphatic System	Unit 7 Absorption and Excretion	Unit 8 Reproduction, Growth, and Development
3 Weeks	6 Weeks	6 Weeks	**3 Weeks**	7 Weeks	2 Weeks	5 Weeks	4 Weeks

Unit 4: Endocrine System [3 Weeks]

Overarching Question(s)

How do the structures of organisms enable life's functions?

Unit, Lesson	Lesson Length	Essential Question	Vocabulary
Unit 4 Endocrine System	**3 Weeks**	• How does the Endocrine system use feedback systems to control the body? • How can one gland impact another in the Endocrine system? • How do steroid and peptide hormones compare? • How are the functions of male and female reproductive systems differ? • How does the endocrine help regulate growth?	Ductless glands, endocrine glands, endocrine secretions, environmental signals, exocrine glands, exocrine secretions, hormones, receptors, target cells, effector, internal receptor, ligand, surface receptor, negative feedback, paracrine secretions, thyroxine, antagonist, lipid hormones, peptide hormones, anterior pituitary gland, hypophysis, hypothalamus, pituitary gland, posterior pituitary gland, releasers, releasing hormones, melatonin, pineal gland, serotonin, adrenal glands, adrenal medulla, adrenaline, aldosterone, cortisol, epinephrine, noradrenaline, norepinephrine, calcitonin, parathyroid gland, parathyroid hormone, thyroid gland, glucagon, insulin, islets, islets of Langerhans, pancreas, T cells,

			thymus gland, estrogen, gonads, ovaries, progesterone, testes, testosterone, hormone replacement therapy (HRT)

Standards and Related Background Information	Instructional Focus	Instructional Resources
DCI LS1. From Molecules to Organisms: Structures and Processes HAP.ETS2: Links Among Engineering, Technology, Science, and Society **Standard** **HAP.LS1.31** Describe the relationship between receptors and ligands and differentiate between steroid and nonsteroidal hormones as ligands. **HAP.LS1.32** Explain, using examples, the mechanism of negative feedback in hormonal production and control. **HAP.LS1.30** Using a model, name and locate the major endocrine glands and identify additional organ tissues in the human body that produce hormones. Describe the hormones produced and their physiological effects on other body targets **Explanation** The endocrine system, made up of all the body's different hormones, regulates all biological processes in the body from conception through adulthood and into old age, including the development of the brain and nervous system, the growth and function of the reproductive system, as well as the metabolism and blood sugar levels. The female ovaries, male testes, and pituitary, thyroid, and adrenal glands are major constituents of the endocrine system. Hormones control or	**Learning Outcomes** • Describe the chemical classes of hormones and explain how hormones control their targets. • Describe the relationships between the anterior and posterior pituitary and the hypothalamus. • Locate and discuss functions of major endocrine glands. • Discuss the impacts of some endocrine diseased on the normal function of this system. • Identify the impacts of the aging process on the endocrine system. • Analyze symptoms of endocrine diseases to hypothesize the target gland. **Phenomenon** Though osteoporosis is often thought of as strictly a bone disorder, it often falls under the treatment of endocrinologists because of its underlying causes. Particularly, postmenopausal women sometimes develop the disease because of their low levels of the hormone estrogen, which helps to maintain bone mass. In such cases, osteoporosis may be treated with hormone replacement therapy. The eight hormone-secreting glands of the endocrine system are the adrenal gland, hypothalamus, pancreas, parathyroid gland, pineal gland, pituitary gland, reproductive glands	**Curricular Resources** **Engage** Adventures of Endo-Man! (comic strip): https://classroom.kidshealth.org/classroom/9to12/body/systems/endocrine.pdf Endocrine System Concept Map: https://www.biologycorner.com/anatomy/endocrine/endocrine_system_concept_map.html **Videos:** Endocrine System, Part 1: Gland & Hormones: Crash Course Endocrine System, Part 2: Hormone Cascades: Crash Course **Explore** **EMC AA&P Workbook & Laboratory Manual**: • Ch. 7 The Endocrine Glands and Hormones, pgs. 107-129 • Laboratory Activity 1: Microscopic Identification of Normal Endocrine Glands; pgs.123-124 • Laboratory Activity 2: Effects of Adrenaline and Caffeine on Daphnia; pgs. 125-126 Laboratory Exercise Using Virtual Rats **Explain** ▪ Case Study Investigation #7, pg. 242-243 **Elaborate** ▪ Case Study: Environmental Hormones, pg. 270-271 Article: Corticosteroids

regulate many biological processes and are often produced in exceptionally low amounts within the body. **Misconceptions** ▪ Some students think of endocrine and nervous regulation as entirely separate control mechanisms, failing to realize the extent of their cooperation in the regulation of physiological processes. ▪ Some students do not think that some molecules function both as hormones in the endocrine system and as chemical messengers in the nervous system, and that the hypothalamus and pituitary gland serve to integrate the endocrine and nervous systems of vertebrates **Science Engineering Practices** **Developing and Using Models** *Students can test the predictive abilities of their models in a real-world setting and make comparisons of two models of the same process or system.* **Cross Cutting Concept** **Cause and Effect** *Students use cause an effect models at one scale to make predictions about the behavior of systems at different scales*	(ovaries and testes) and thyroid gland. But some other organs and tissues that are not generally considered part of the endocrine system also produce and secrete hormones. For instance, the placenta of a pregnant woman secretes a few hormones, including estrogen and progesterone. And the stomach releases the hunger-inducing hormone ghrelin and the hormone gastrin, which stimulates the secretion of gastric acid. Plants do not possess an endocrine system like humans and other animals do. But they still produce hormones, which are responsible for processes such as plant growth, metabolism and cell division. Oxytocin and Childbirth: Years before oxytocin was discovered, it was common practice in midwifery to let a first-born twin nurse at the mother's breast to speed the birth of the second child. Now we know why this practice is helpful-it stimulates the release of oxytocin. Even after a single birth, nursing promotes expulsion of the placenta (afterbirth) and helps the uterus regain its smaller size. Synthetic oxytocin (Pitocin) often is given to induce labor or to increase uterine tone and control hemorrhage just after giving birth.	Case Study: What's wrong with Timothy? Case Study: Hunger Pains Case Study: Chemical Eric **Evaluate** ▪ Ch. 7 The Endocrine Glands and Hormones- Concept Check pgs. 246, 248, 249, 253, 254, 255, 256, 259, 260, 261, 263, 264 ▪ Ch. 7 The Endocrine Glands and Hormones- Study Guide pgs. 267-269 **Textbook:** *Applied Anatomy & Physiology 2nd Ed.: A Case Study Approach; Brian R, Shmaefsky* Ch. 7 The Endocrine Glands and Hormones; pgs. 242-271

Curriculum and Instruction- Science			
RESOURCE TOOLKIT			
Quarter 2 Human Anatomy and Physiology			
Textbook Resources Applied Anatomy & Physiology 2nd Ed.: A Case Study Approach; Brian R, Shmaefsky EMC AA&P Workbook & Laboratory Manual	**DCIs and Standards** **DCI(s)** LS1: From Molecules to Organisms: Structures and Processes HAP.ETS2: Links Among Engineering, Technology, Science, and Society **Standard(s)** HAP.LS1.34 HAP.LS1.37 HAP.LS1.36 HAP.LS1.33 HAP.LS1.38 HAP.LS1.31 HAP.LS1.32 HAP.LS1.30	**Websites** EMC Bookshelf Glossary CSI Worksheets Crossword Puzzles Human Anatomy Online Biology Corner Explore Health Careers Visible Body	**Additional Resources** **ACT & SAT** TN ACT Information & Resources ACT College & Career Readiness Mathematics Standards SAT Connections SAT Practice from Khan Academy Khan Academy Illuminations (NCTM) Discovery Education The Futures Channel The Teaching Channel Teachertube.com