Seymour Public Schools Curriculum

Grade Five Science Curriculum

The Seymour School District believes that every student needs and deserves a rich and challenging education in science. Quality education in science is an integral part of the core curriculum for our students. Students should be enabled to achieve the learning goals and standards outlined in Connecticut's science framework.

Such an education will promote essential understandings of the natural world and nurture student's abilities to apply scientific knowledge to make informed and logical judgments about personal and societal issues. Such an education requires that the fundamental approach to science is a creative process for investigating, reasoning, critiquing and communicating about ideas, not as a static body of facts to be memorized.

We believe that learning science is important for all students in order to prepare them to be informed individuals and citizens and to participate in a wide range of scientific and technological careers. Understanding the interconnections between science and technology, and their shared impact on environmental and societal issues, is essential in order to preserve and improve life on Earth.

Learning experiences in science should lead all students to:

- Understand and apply basic concepts, principles and theories of biology, chemistry, physics, earth and space sciences and their interrelationships;
- Recognize and participate in scientific endeavors which are evidence based and use inquiry skills that lead to a greater understanding of the world;
- Identify and solve problems through scientific exploration, including the formulation of hypotheses, design of experiments, use of technology, analysis of data and drawing of conclusions;
- Select and use properly appropriate laboratory technology, equipment and material, including measuring and sensing devices;
- Understand and use existing and emerging technologies which have an effect on society and the quality of life, including personal academic and work environments;
- Analyze the possibilities and limits of science and technology in order to make and defend decisions about societal issues; and
- Understand that the way in which scientific knowledge is formulated is crucial to the validity of that knowledge.

Teachers plan units and lessons that contain current, accurate and meaningful content that is aligned with the district curriculum. Through professional development, teachers keep up-to-date with the latest scientific advances in their discipline. They set a context for scientific learning that is relevant to students in class. Engaging students in extended, where developmentally appropriate scientific investigations that motivate student effort and interest in scientific learning are planned. Students are provided with a safe environment in which to participate in scientific investigations an have the resources needed to support their learning;

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Students are assessed regularly to build an understanding instruction is adjusted to accommodate students with diverse needs, abilities and interests. Students are encouraged to pursue the study of advanced science and science-related careers.

Parents play an essential role in ensuring a quality educational program in science by encouraging their children to participate in high-level science courses and activities, both in and out of school and to talk to their children about science they learn at school and showing interest in scientific content, processes and ideas, and by providing their children with access to science resources, such as museums, libraries and the Internet.

CMT
The science portion of the test is administered to students in Grades 5 and 8. The CMT science assessments measure what students have learned over several years about core science concepts and about how scientific inquiry is done. The assessments include questions related to concepts in life science, physical science and earth science and how those concepts apply to real world issues and technologies.

EMBEDDED TASKS
To assess students' understanding of inquiry and the nature of science, the CMT science assessment includes some questions framed within the CONTEXT of the curriculum-embedded performance tasks developed by the Connecticut State Department of Education. The embedded tasks engage students in focused explorations of science concepts using all the inquiry practices described in the science framework. Each embedded task is designed to be part of a larger learning unit described in the science framework, and teachers decide when and how to incorporate them into the curriculum. These inquiry investigations demonstrate how students use science inquiry practices to deepen understanding of a science concept.

CSDE 2008

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5.1 Energy Transfer and Transformations

Concept 1 - Sound

August/September 22 Days

SUBTOPIC	DAYS	LESSON/ASSESSMENT	CT STANDARD	SOURCE
Sound	1 Day/ ongoing	• Listen for various sounds around you. • KWL of sounds they have heard, ways sounds are made, and questions they have about sound.	5.1.1	KWL Chart
	ongoing	Students research the ways animals hear and communicate.	5.1.1	Various research materials
Investigation 1 - Dropping In	1 Day	Part 1-Drop Challenge	5.1.1	FOSS Sound Kit
	2 Days	Part 2-Drop Codes/ Response Sheet Dropping In	5.1.1	FOSS Sound Kit
	1 Day	Part 3-Sounds and Vibrations	5.1.1	FOSS Sound Kit
Investigation 2 – Good Vibrations	1 Day	Part 1-Vibration and Pitch	5.1.2; 5.1.3; 5.1.4; 5.1.5; 5.1.6	FOSS Sound Kit
	1 Day	Part 2-Length and Pitch/Student Sheets	5.1.2; 5.1.3; 5.1.4; 5.1.5; 5.1.6	FOSS Sound Kit
	2 Days	Part 3-Tension and Pitch/Response Sheet Good Vibrations	5.1.2; 5.1.3; 5.1.4; 5.1.5;	FOSS Sound Kit

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			5.1.6	
Investigation 3 – How Sounds Travel	2 Days	Part 1-Sounds Through Air and Water/ Response Sheet How Sounds Travel/Creative Writing-Students pretend to be a sound wave	5.1.7; 5.1.8	FOSS Sound Kit
	1 Day	Part 2-Sounds Through Solids	5.1.7; 5.1.8	FOSS Sound Kit
Investigation 4 – Sound Challenges	2 Days	Part 1-Sound Challenges/Student Sheets	5.1.7; 5.1.8	FOSS Sound Kit
	6 Days	Part 2-Choosing Your Own Investigation/Presentation	5.1.7; 5.1.8	FOSS Sound Kit
	1-2 Days	Sound End of Unit Assessment	5.1.1; 5.1.2; 5.1.3; 5.1.4; 5.1.5; 5.1.6; 5.1.7; 5.1.8	FOSS Sound Kit

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5.1 Energy Transfer and Transformations

Concept 2 - Light

October __ Days

SUBTOPIC	DAYS	LESSON/ASSESSMENT	CT STANDARD	SOURCE
Light	1 Day/ ongoing	KWL of what they know about light sources and where light is reflected and absorbed.	5.1.1 & 5.1.2	KWL Chart
			5.1.1 – 5.1.7	RESOURCES NEEDED (Aries Exploring Light and Color: Filters, Lenses, and Cameras)

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5.2 Structure and Function

November/December 16 Days

SUBTOPIC	DAYS	LESSON/ASSESSMENT	CT STANDARD	SOURCE
Stimulus and Response - "Catch It"	1 Day	"Catch It" Investigation 1-Record observations and wonderings.	5.2.3	CSDE Embedded Task
	1 Day	Investigation 1-Time mini-lesson and discuss results.	5.2.3	CSDE Embedded Task
	2 Days	Research	5.2.3	CSDE Embedded Task
	1 Day	Select investigation questions and design procedure.	5.2.3	CSDE Embedded Task
	1 Day	Conduct investigation	5.2.3	CSDE Embedded Task
	1 Day	Prepare to share results	5.2.3	CSDE Embedded Task
	2 Days	Share and discuss results	5.2.3	CSDE Embedded Task
Response to	1 Day	Senses Box	5.2.3	Box filled

Stimuli				with variety of objects that have different textures and scents
Sense Organs	6 Days	Research the human senses and how they work.	5.2.1 & 5.2.2	Various Research Materials
			5.2.1; 5.2.2; 5.2.4 – 5.2.12	RESOURCES NEEDED

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5.3 Earth in the Solar System

January-February __ Days

SUBTOPIC	DAYS	LESSON/ASSESSMENT	CT STANDARD	SOURCE
Solar System			5.3.1 – 5.3.8	RESOURCES NEEDED (Aries Exploring the Moon and Stars)

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5.4 Science and Technology in Society

February/March 15 Days

SUBTOPIC	DAYS	LESSON/ASSESSMENT	CT STANDARD	SOURCE
Camera	1 Day	Explore and discuss what students know about a camera and how it works.	5.4.8	Camera
Compare eye to camera	2 Days	Research the components of the eye and compare to those of a camera./ Write similarities in science journals.	5.4.1; 5.4.2; 5.4.3; 5.4.4; 5.4.5; 5.4.6; 5.4.7	Various Research Materials
Optical Tools	1-2 Days	Brainstorm instruments used to help people see better. Chart questions students have about these instruments. Show various optical tools. Student groups choose a tool to research.	5.4.1; 5.4.2; 5.4.3; 5.4.4; 5.4.5; 5.4.6; 5.4.7	Various Research Materials
	1-2 Days	Groups research selected optical tool.	5.4.1; 5.4.2; 5.4.3; 5.4.4; 5.4.5; 5.4.6; 5.4.7	Various Research Materials
	2 Days	Groups share information. Complete class comparison matrix of all tools presented.	5.4.1; 5.4.2; 5.4.3; 5.4.4; 5.4.5; 5.4.6; 5.4.7	
Telescope	1-2 Days	Build telescopes.	5.4.4 & 5.4.6	RESOURCES NEEDED (Aries Exploring the Moon and

				Stars)
Periscope	1-2 Days	Build periscopes.	5.4.3 & 5.4.6	RESOURCES NEEDED (Aries Exploring the Moon and Stars)
Microscope	1-2 Days	Observe and use a microscope.	5.4.5	RESOURCES NEEDED (Aries Exploring the Moon and Stars)

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Grade 5 Food and Nutrition

OPTIONAL – Not a Grade 5 Science Standard/See Health Standards

April/May

SUBTOPIC	DAYS	LESSON/ASSESSMENT	CT STANDARD	SOURCE
				FOSS Kit - Food and Nutrition

ELEMENTARY SCIENCE CMT
INQUIRY PRACTICES AND SCIENCE KNOWLEDGE ASSESSED*

THE STANDARDS FOR SCIENTIFIC INQUIRY, LITERACY AND NUMERACY ARE INTEGRAL PARTS OF THE CONTENT STANDARDS FOR EACH GRADE LEVEL IN THIS CLUSTER.

Grades 3-5 Core Scientific Inquiry, Literacy and Numeracy *How is scientific knowledge created and communicated?*	
Content Standards	**Expected Performances**
SCIENTIFIC INQUIRY ♦ Scientific inquiry is a thoughtful and coordinated attempt to search out, describe, explain and predict natural phenomena. **SCIENTIFIC LITERACY** ♦ Scientific literacy includes speaking, listening, presenting, interpreting, reading and writing about science. **SCIENTIFIC NUMERACY** ♦ Mathematics provides useful tools for the description, analysis and presentation of scientific data and ideas.	Make observations and ask questions about objects, organisms and the environment. Seek relevant information in books, magazines and electronic media. Design and conduct simple investigations. Employ simple equipment and measuring tools to gather data and extend the senses. Use data to construct reasonable explanations. Analyze, critique and communicate investigations using words, graphs and drawings. Read and write a variety of science-related fiction and nonfiction texts. Search the Web and locate relevant science information. Use measurement tools and standard units (e.g., centimeters, meters, grams, kilograms) to describe objects and materials. Use mathematics to analyze, interpret and present data.

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Grade 5 **Core Themes, Content Standards and Expected Performances**	
Content Standards	**Expected Performances**
Energy Transfer and Transformations – What is the role of energy in our world? **5.1 - Sound and light are forms of energy.** ♦ Sound is a form of energy that is produced by the vibration of objects and is transmitted by the vibration of air and objects. ♦ Light is a form of energy that travels in a straight line and can be reflected by a mirror, refracted by a lens, or absorbed by objects.	Describe the factors that affect the pitch and loudness of sound produced by vibrating objects. Describe how sound is transmitted, reflected and/or absorbed by different materials. Describe how light is absorbed and/or reflected by different surfaces.
Structure and Function – How are organisms structured to ensure efficiency and survival? **5.2 - Perceiving and responding to information about the environment is critical to the survival of organisms.** ♦ The sense organs perceive stimuli from the environment and send signals to the brain through the nervous system.	Describe how light absorption and reflection allow one to see the shapes and colors of objects. Describe the structure and function of the human senses and the signals they perceive.
Earth in the Solar System – How does the position of Earth in the solar system affect conditions on our planet? **5.3 - Most objects in the solar system are in a regular and predictable motion.** ♦ The positions of the Earth and moon relative to the sun explain the cycles of day and night, and the monthly moon phases.	Explain the cause of day and night based on the rotation of Earth on its axis. Describe the monthly changes in the appearance of the moon, based on the moon's orbit around the Earth.

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Science and Technology in Society – How do science and technology affect the quality of our lives? **5.4 - Humans have the capacity to build and use tools to advance the quality of their lives.** ♦ Advances in technology allow individuals to acquire new information about the world.	Compare and contrast the structures of the human eye with those of the camera. Describe the uses of different instruments, such as eye glasses, magnifiers, periscopes and telescopes, to enhance our vision.

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Grade: five	**Subject: Science**
CSDE Standard	**Energy Transfer and Transformations**
Enduring Understanding	**Sound is a form of energy that is produced by the vibration of objects and is transmitted by the vibration of air and objects.**
Essential Question	***What is the role of energy in our world?***
Content Standard:	**5.1 – Sound and light are forms of energy.**
Performance Expectations (Student outcomes)	**GRADE-LEVEL CONCEPT 1:** ◆ Sound is a form of energy that is produced by the vibration of objects and is transmitted by the vibration of air and objects. **GRADE-LEVEL EXPECTATIONS:** **1. There are a variety of sounds in our environment. Sounds have characteristics, such as loudness, pitch and quality (or "timbre"), that allow them to be identified.** **2. For sound to occur, there must be a vibrating object, a material through which the vibrations are transferred (for example, air or water), and a receiver (for example, an ear) to perceive the sound.** **3. Objects can be caused to vibrate by actions such as striking, strumming, bowing, plucking or blowing.** **4. Sounds can vary in loudness ("volume"). Volume is affected by the strength of the force causing the vibration. For example, striking a drum forcefully or gently produces sounds with different volumes.** **5. Sounds can have a high or low tone ("pitch"). The pitch of a sound depends on the speed of the vibration. Objects that vibrate quickly have a high pitch, while those that vibrate slowly have a low pitch.**

	6. **Pitch is affected by characteristics such as the shape, length, tension or thickness of the vibrating material (for example, the vibrating material may be a string, a glass, a wire or a drum).** 7. **Sound travels (is "transmitted") through materials by causing them to vibrate. Sound is not transmitted if there are no materials to vibrate. Solids, liquids and gases (air) transmit sound differently.** 8. **Sounds can be reflected or absorbed, depending on the properties of the material it hits. Sound tends to bounce off smooth, hard surfaces, producing an echo; sound tends to be absorbed by soft, porous surfaces, producing a muffled sound.**

Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
	KEY SCIENCE VOCABULARY: vibration, transfer, volume, pitch, transmit, reflect, absorb	**CMT Expected Performances** **B 17. Describe the factors that affect the pitch and loudness of sound produced by vibrating objects.** **B 18. Describe how sound is transmitted, reflected and/or absorbed by different materials.**
5.1.1 ❖ **Have students sit quietly in the room or take a quiet walk around the school or the school building. Ask the students to talk about the different sounds that they have heard and what they think made the sounds (B INQ. 1)** ❖ **Create a KWL chart of sounds they have heard, ways sounds are made, and questions they have about sounds. Incorporate/refer students to words that they have learned about in music class such as**	Changing Sounds http://www.bbc.co.uk/schools/ks2bitesize/science/activities/changing_sounds.shtml Animal Communication example sites: http://www.bbc.co.uk/schools/ks2bitesize/science/activities/changing_sounds.shtml http://www.factmonster.com/ipka/A0768578.html http://www.factmonster.com/ipka/A0768549.html Slap, Squeak, and Scatter : How Animals Communicate by Steve Jenkins	

pitch, volume, etc. (B INQ. 1, 4, 5, 6, 9)		
5.1.1 **Discuss the way animals hear and communicate. Using books and electronic resources, have students research the ways other animals hear and communicate. (B INQ. 2, 6, 7, 8)**	Musical Instrument example sites: http://www.smm.org/sound/nocss/activity/resources.htm Musical Instruments Around the World by Meryl Doney	Teacher assessment of student research using a rubric. (B INQ. 1, 4, 5)
5.1.1 FOSS Investigation 1: Dropping In-Students explore their ability to discriminate between sounds, by dropping objects into a drop chamber and identifying each object by the property of its sound. They develop a code by assigning letters to objects and send messages to one another by using their drop code. **Students will:** ❖ **Observe sounds made by objects when dropped.** ❖ **Compare sounds to develop sound discrimination.** ❖ **Create a code.** ❖ **Communicate with others using a drop code.** ❖ **Identify a variety of sound sources and receivers.** ❖ **Observe the vibrations made by various objects that**	**FOSS Science Kit: Physics of Sound**	

produce sound. ❖ **Use scientific thinking processes to conduct investigations and build explanations: observing, communicating, comparing, and organizing.** **Foss Part 1: Drop Challenge (30-40 minutes)** **What are the properties of sounds that make them identifiable?** **Students explore their ability to discriminate sounds. They listen to sounds made by objects dropped into a drop chamber and attempt to identify each object from its sound.** **Foss Part 2: Drop Codes (50 minutes or two shorter sessions)** **Can you use the discrimination of sounds to make a code for sending messages?** **Students develop a code by assigning letters of the alphabet to a selection of objects. Using this sound code, the students send messages to one another by dropping a series of objects into the drop chamber.** **Foss Part 3: Sounds and Vibrations (50 minutes or two shorter sessions)** **How are sounds made?** **Students explore the production of sound with a door fiddle, an electronic tone generator, and two other sound instruments. Through these explorations, students look for vibrations at the sound source,**	**FOSS Science Kit: Physics of Sound**	**Teacher Observation: Check for careful observational sound discrimination.** **Response Sheet:** **Students respond to a disagreement between two students who are developing a new code. FOSS Science Response Sheet-Dropping In** **Teacher Observation: Check to see if students understand that sound is caused by vibrations. *Assessment Chart for Investigations 1***

identify sound receivers, and compare sound volume to vibration intensity. **5.1.2; 5.1.3; 5.1.4; 5.1.5; 5.1.6 FOSS <u>Investigation 2: Good Vibrations</u>- Students explore sound generators and musical instruments in mini-activities to find out what causes sound and what changes the pitch. They investigate variables that affect changes in pitch; the length of vibrating objects and the tension on vibrating strings.** **Students will:** ❖ **Observe that sound originates from vibrating sources.** ❖ **Compare high, low, and medium pitched sounds.** ❖ **Compare the frequency of vibrations made by various sound sources producing different pitches.** ❖ **Compare the pitch of a sound to the physical properties of the sound source.** ❖ **Record observations and comparisons of sounds.**	**FOSS Science Kit: Physics of Sound**	
FOSS Part 1: Vibration and Pitch How are high and low sounds made? (30-40 minutes) ❖ **Sound originates from vibrating sources.** ❖ **Pitch is how high or low a sound is.**	**FOSS Science Kit: Physics of Sound**	**Teacher Observation** **Informal Observation** ***Assessment Chart for Investigation 2***

❖ **Differences in pitch are caused by differences in the rate at which objects vibrate.** **Using their voices and tongue depressors, students look for evidence that different vibrations produce different pitches of sounds. They revisit the door fiddle and tone generator to look more closely at the vibrations that make high and low pitches.**		
Foss Part 2: Length and Pitch **How does length affect the rate of vibration, and there the pitch?** **(30-40 minutes)** ❖ **Long objects vibrate slowly and have a low pitch.** ❖ **Short objects vibrate quickly and have a high pitch.** **Students use a waterphone, xylophone, kalimba, and string beam to look at how length affects pitch. They study what happens when the length of the vibrating sound source changes.**	**FOSS Science Kit: Physics of Sound**	**Student Sheets** **Students demonstrate their understanding of the role length plays in the modification of pitch.** ***The Waterphone*** ***The Xylophone*** ***The Kalimba*** ***The String Beam***
Foss Part 3: Tension and Pitch **How does tension affect the rate of vibration, and therefore the pitch?** **(30-40 minutes)** ❖ **With more tension, vibrations are faster and the pitch is higher.** ❖ **With less tension, vibrations are slower and the pitch is**	**FOSS Science Kit: Physics of Sound**	**Response Sheet** **Students respond to another student's thoughts about pitch and how pitch can be changed.** **Response sheet-*Good Vibrations***

lower. **Students use a minigutbucket and a FOSS-ulele to look at how tension affects the pitch of a sound. They study what happens when the tension applied to a sound source changes.**		
5.1.7; 5.1.8 **<u>Investigation 3: How Sound Travels</u>-Students work in collaborative groups on mini-activities that introduce a sound source and a medium of sound travel. They observe and compare how sound travels through solids, water, and air.** **Foss Part 1: Sounds Through Air and Water** **(30-40 minutes)** ❖ **Can sounds travel through liquids?** ❖ **Can sounds travel through air?** ❖ **How is sound different when heard through air or water?** **Students use listening tubes and tuning forks to compare how sound travels through air in two ways-simply by playing the tuning fork in the air, and then using a tube to direct the sound. They use stethoscopes placed in water to determine whether sound can travel through liquid. They compare the shape of a megaphone to that of their outer ears for directing**	**FOSS Science Kit: Physics of Sound** **FOSS Science Kit: Physics of Sound**	**Response Sheet** **Students debate whether sounds can be heard in space.** **Response Sheet-How Sounds Travel** **Creative Writing: Have students pretend to be a sound wave. Describe the way that they travel from one place to another. Include the different materials that they encounter and how it affected their travels. Teacher assess student writing using a rubric (B INQ.6 and 7).**

sound through air. **Foss Part 2: Sounds Through Solids** **Can sound travel through solids?** **How is sound different when heard through solids?** **(40-50 minutes)** **Students listen through string telephones and wood dowels to determine how well sound travels through solids. They compare the results to the sounds they observed when sound travels through air and water.**	**FOSS Science Kit: Physics of Sound**	**Teacher Observation** **Check students' ability to describe how sound travels from source to a receiver through several different mediums.** ***Assessment Chart for Investigations 3***
5.1.7; 5.1.8 **<u>FOSS Investigation 4: Sound Challenges</u>-Students investigate the nature of our sound receivers, ears. They are challenged to put their knowledge of sound sources, sound travel, and sound receivers to work. They take one of the instruments they used earlier and change its pitch, make its sound travel further, or make it louder.** **FOSS Part 1: Sound Challenges** **How can pitch, volume, and the distance a sound can travel be modified or enhanced?** **(Two 50-minute sessions)** **Each group gets a specific problem in the area of sound generation, transmission, or modification to solve using familiar materials and their**	**FOSS Science Kit: Physics of Sound**	**Student Sheets**

knowledge of vibrations, pitch, and how sound travels. Students present their solutions to the rest of the class. **FOSS Part 2: Choosing Your Own Investigations** **Students ask their own questions (or select from the pool of class questions) about how sound is generated, transmitted, or modified. (4-6 sessions-interdisciplinary-library media specialist/classroom teacher)** **Students use what they have learned about sound as a starting point for further inquiry into sound. They may choose to conduct investigations or demonstrations using materials, or they may choose to do library research. They present projects to the rest of the class.**	**FOSS Science Kit: Physics of Sound**	**Review the sound-challenge sheets to see if students can use information to find and express solutions to the challenges.** **The FOSS-ulele Challenge, The Kalimba Challenge, The Long-Gong Challenge, The Minigutbucket Challenge, The String-Beam Challenge, The Tuning Fork Challenge, The Waterphone and Xylophone Challenge, The Whisperer Challenge** **Performance Assessment** **Students can be assessed on the process they use to conduct investigations and to research information for the presentation and on the development of their presentation skills.** ***Project Proposal***

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Grade: five	**Subject: Science**
CSDE Standard	**Energy Transfer and Transformations**
Enduring Understanding	**Light is a form of energy that travels in a straight line and can be reflected by a mirror, refracted by a lens, or absorbed by objects.**
Essential Question	***What is the role of energy in our world?***
Content Standard:	**5.1 – Sound and light are forms of energy.**
Performance Expectations (Student outcomes)	**GRADE-LEVEL CONCEPT 2:** ◆ Light is a form of energy that travels in a straight line and can be reflected by a mirror, refracted by a lens, or absorbed by objects. **GRADE-LEVEL EXPECTATIONS:** **1. Light travels in straight paths away from a source of illumination in all directions until it hits an object. Some sources of illumination produce their own light (for example, the sun, fire, light bulb); other sources of illumination reflect light produced by something else (for example, the moon or a mirror).** **2. Light interacts with objects in various ways; it can be reflected off the object, absorbed by the object, or refracted through the object.** **3. Materials can be classified based on how much light passes through them. Transparent materials allow most light to pass through them. Translucent materials allow some light to pass through them. Opaque materials do not allow any light to pass through them.** **4. Objects that have flat, smooth surfaces reflect light and produce a mirror-like image. Objects that have curved or uneven surfaces scatter the reflected light and produce distorted or blurry images.**

	5. **Light always reflects away from a mirror at the same angle that it hits the mirror. The angle of incoming light equals the angle of reflected light.** 6. **Objects that block light traveling from a source produce shadows. The shape, length, direction and clarity of a shadow depend on the shape and position of the object.** 7. **Light changes direction ("refracts") as it passes from one transparent material to another (for example, as it passes from air to water or through lenses.**

Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
5.1.1; 5.1.2 **KWL Chart-Have students tell what they already know about light and light sources. Have students discuss/identify different surfaces that they think light is reflected off of or absorbed into (for example: mirrors, humans, etc.) (B. INQ. 1)**	**KEY SCIENCE VOCABULARY:** reflect, absorb, refract, transparent, translucent, opaque, angle **Resources needed for 5.1.1 through 5.1.7** **Additional Resources needed (see ARIES Exploring Light and Color: Filters, Lenses, and Cameras)**	**CMT Expected Performances** **B 19. Describe how light is absorbed and/or reflected by different surfaces.**

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Grade: five	**Subject: Science**
CSDE Standard	**Structure and Function**
Enduring Understanding	**The sense organs perceive stimuli from the environment and send signals to the brain through the nervous system.**
Essential Question	***How are organisms structured to ensure efficiency and survival?***
Content Standard:	**5.2 – Perceiving and responding to information about the environment is critical to the survival of organisms.**
Performance Expectations (Student outcomes)	**GRADE-LEVEL EXPECTATIONS:** **1. Animals have sense organs that are structured to gather information about their environment. Information perceived by the senses allows animals to find food, water, mates and protection.** **2. Each sense organ perceives specific kinds of stimuli. Some human senses are more or less developed than the senses of other animals.** **3. Sense organs transfer information through a network of nerves to the brain where it is interpreted and responded to. The brain responds by sending messages to all parts of the body. The type of response and the amount of time it takes for the response to occur vary depending on the stimulus.** **4. The human ear is structured to collect sound vibrations from the environment and pass them through the middle ear (eardrum and small bones) and inner ear (hair-lined tubes) to the auditory nerve where they are transformed into electrical signals that are sent to different parts of the brain.** **5. The human eye is structured to collect light through the cornea and the pupil. The amount of light that enters the eye is controlled by the iris. The cornea and the lens refract the light and focus it onto the retina and the optic nerve where it is**

transformed into electrical signals that are sent to different parts of the brain.

6. For anything to be visible, light must be present. For a person to see an object, the light it reflects or produces must have a straight, unobstructed path to the eye.
7. Human eyes have receptors for perceiving shades of red, orange, yellow, green, blue, indigo and violet.
8. Sunlight (or "white light") is a combination of colors. White light passed through prisms, water droplets or diffraction gratings can be refracted to show its component colors: red, orange, yellow, green, blue, indigo and violet.
9. The perceived color of an object depends on the color of the light illuminating it and the way the light interacts with the object. The color humans see is the color that is reflected by the object. For example, an object that appears green is absorbing all colors except green, which is reflected to the eye.
10. Human skin is structured to detect information related to texture, temperature, pressure and vibration. Each sensation has different receptors distributed around the body; some areas of the body have greater concentrations of receptors for certain sensations, making those areas more sensitive than others to texture, temperature, or pressure.
11. Human noses are structured to collect and detect chemicals floating in the air (odors). Tiny hairs behind the nose have special receptors that respond to airborne chemicals and produce electrical signals that are transmitted to different parts of the brain by the olfactory nerve.
12. Human tongues are sense organs that are structured for detecting chemicals dissolved in saliva (flavors). Taste buds respond to 4 basic tastes: salty, sweet, sour and bitter. Special receptors in taste buds respond to tastes and produce electrical signals that transmit information through nerves to different parts of the brain.

Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
	KEY SCIENCE VOCABULARY: sense organ, receptor, stimulus, response, nervous system, vibration, reflect, refract, cornea, pupil, iris, lens, retina, white light, absorb **Need additional resources for 5.2.1, 5.2.2. and 5.2.4 through 5.2.12.**	**CMT Expected Performances** **B 20. Describe how light absorption and reflection allow one to see the shapes and colors of objects.** **B 21. Describe the structure and function of the human senses and the signals they perceive.**

5.2.3 **Students do curriculum embedded task-"Catch It" – an investigation of factors affecting human reaction time. (B INQ. 1,3,4,5,6,8,10)** **Differentiation:** Performance tasks should be *differentiated* to accommodate students' learning needs and prior experiences. The main goal is to give all students opportunities to become curious, pose questions, collect and analyze data, and communicate conclusions. For different learners, these same actions will require different levels of "scaffolding" as they move toward greater levels of independence. For example, if students have had experiences creating their own data tables, the teacher may decide to delete part or all of the data table included in the performance task. Other possible adjustments include (but are not limited to): • Text readability; • Allowing students to control all or some of the variables; • Whether the experimental procedure is provided or student-created; • Graph labels and scales provided or student-created; • Expectations for	CSDE Embedded Task: **http://www.sde.ct.gov/sde/lib/sde/word_docs/curriculum/science/cmtgr5taskstudent.doc** **Materials needed** 1. A 30-cm metric ruler. Using different types of rulers (different colors, materials, transparent vs. opaque) provides another opportunity for students to investigate factors that may affect reaction time. 2. Calculators (optional) 3. Resources for recording and presenting observations (science notebooks, paper, posters, etc.) 4. Nonfiction reading materials – see "Resources" section	Investigation #1 (with task directions) record observations and wonderings Investigation #1 time mini-lesson/ discussion of results/ questions for further investigations Research Students select investigation questions and design procedure Conduct Investigation #2 Preparing to share results Share and discuss results

communication of results; or • Opportunities for student-initiated follow-up investigations. **5.2.3** **Provide students with a "senses box" filled with a variety of objects that have different textures and scents (or odors). Students feel or smell objects without looking at them and they name them. They can describe the texture or scent to other students to challenge them to name the object. (B INQ. 1, 3, 4).**	**Senses box- a variety of objects with a variety of scents and textures**	

5.2.1; 5.2.2 **Students research the human senses and how they work. They can find information in books and magazines and/or searching the internet. (B INQ. 1, 2, 5, 6, 7, 8)**	**Student's websites;** **http://www.hunkinsexperiments.com** **http://42explore.com/brain.htm** **http://freda.auyeng.net/5senses/**	

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Grade: five	**Subject: Science**
CSDE Standard	***Earth in the Solar System***
Enduring Understanding	**The positions of the earth and moon relative to the sun explain the cycles of day and night, and the monthly moon phases.**
Essential Question	***How does the position of Earth in the solar system affect conditions on our planet?***
Content Standard:	**5.3 – Most objects in the solar system are in a regular and predictable motion.**
Performance Expectations (Student outcomes)	**GRADE-LEVEL EXPECTATIONS:** 1. **The sun, Earth and its moon are spherical objects that move in two ways: they spin (rotate) and they change positions relative to each other (revolve).** 2. **The sun is a star that produces light that travels in straight lines away from the sun in all directions. Light from the sun illuminates objects that reflect light, including Earth and its moon. The side of the earth that is facing the sun experiences daylight; the side of the earth facing away from the sun experiences night. All parts of the earth experience a cycle that includes both day and night, providing evidence that the earth is rotating on its axis.** 3. **The amount of time it takes for the earth to rotate once on its axis is regular and predictable (24 hours), and is called "a day." Earth's rotation makes it appear as if the sun is moving across the sky from east to west.** 4. **The moon is a rocky object that revolves around the earth in a circular path called an orbit. The amount of time it takes for the moon to revolve once around the earth is about 29 days and is called a "lunar month."** 5. **Half of the moon is always illuminated by the sun. Phases of the moon occur because a different portion of the lit half of the moon is visible from Earth each day as the moon revolves around the earth.** 6. **The changes in the moon's phases occur in a regular and predictable sequence. At predictable periods during the lunar**

	cycle, the moon is visible in either the daytime or the nighttime sky. 7. **At the beginning of a lunar month, no lit part of the moon is visible from Earth (new moon). As the moon progresses through the first two quarters of its complete trip around the earth, larger portions of the right side of the moon are illuminated each day. When the moon has completed half its trip around the earth, the full moon is illuminated. During the third and fourth quarters of the moon's trip around the earth, the illuminated portion gradually decreases so only the left side is illuminated and finally no lit portion of the moon is visible from Earth again.** 8. **Like the sun, the moon appears to rise at the eastern horizon and set at the western horizon due to the earth's rotation. From one day to the next, when observed at the same time from the same location, the moon's position in the sky varies in predictable ways.**

Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
	KEY SCIENCE VOCABULARY: sphere, illuminate, reflect, rotate, day/night cycle (24-hour rotation period), horizon, orbit, revolve, month (one lunar cycle), moon phase, new moon **Additional Resources needed for 5.3.1 through 5.3.8 (see ARIES Exploring the Moon and Stars)** **http://www.charlesbridge.com/school/pdf/Aries.MoonStars.pdf**	**CMT Expected Performances** **B 22. Explain the cause of day and night based on the rotation of Earth on its axis.** **B 23. Describe the monthly changes in the appearance of the moon, based on the moon's orbit around the Earth.**

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Grade: five	**Subject: Science**
CSDE Standard	***Science and Technology in Society***
Enduring Understanding	**Advances in technology allow individuals to acquire new information about the world.**
Essential Question	***How do science and technology affect the quality of our lives?***
Content Standard:	**5.4 – Humans have the capacity to build and use tools to advance the quality of their lives.**
Performance Expectations (Student outcomes)	**GRADE-LEVEL EXPECTATIONS:** **1. People design optical tools (for example, binoculars, telescopes, eyeglasses or periscopes) that enable them to see things better or to see what cannot be seen by human eyes alone. Optical tools change the path of light by reflecting or refracting it.** **2. Throughout history new optical technologies have led to new discoveries and understandings that change people's lives.** **3. Periscopes allow people to see things that are not within their line of sight (for example, around corners, over walls, under a table, or above the ocean's surface from a submerged submarine).** **4. Telescopes make distant objects appear larger (and therefore closer).** **5. Magnifiers, such as hand lenses, microscopes or make-up mirrors, make objects appear larger.** **6. The shape of a lens or mirror (concave, convex or flat) affects the direction in which light travels:** **a. Telescopes focus light using a lens that refracts the light (refracting telescope) or a curved mirror that reflects the light (reflecting telescope).** **b. Periscopes use flat mirrors to reflect light to change its path.** **c. Magnifying glasses use convex lenses to refract light so that objects appear larger.**

7. **Some human eyes do not focus light properly onto the retina. Eyeglasses are lenses that improve vision by changing the path of light (refracting it) so it forms an image on the retina.**
8. **Cameras have parts that function similarly to the human eye:**

HUMAN EYE	CAMERA	FUNCTION
Eyelid	**Lens cap**	**Protect interior parts**
Pupil	**Lens opening (aperture)**	**Control amount of light entering**
Cornea, lens	**Lens**	**Focus light rays on a point**
Retina	**Film (or digital medium)**	**Respond to light resulting in an**

Strategies/Modes (examples)	Materials/Resources (examples)	Assessments (examples)
5.4.8 **Show students a 35mm camera and take a model picture. Students brainstorm and record what they know about a camera. Guide them to discuss a camera's purpose, components of a camera and how they think that a camera would work. Have students label the parts of the camera that they know. Review the**	**KEY SCIENCE VOCABULARY:** optical tool, hand lens, magnifying glass, telescope, periscope, lens, mirror, concave, convex, reflect, refract, focus, camera and eye parts (see chart above) **Need additional resources for 5.4.1 through 5.4.8** Resources needed to support these activities: **Camera, eyeglasses, glasses, microscopes, telescopes, periscopes** http://science.howstuffworks.com/camera.htm (informational sight for a teacher resource to explain how a camera works)	**CMT Expected Performances** **B 24. Compare and contrast the structures of the human eye with those of the camera.** **B 25. Describe the uses of different instruments, such as eye glasses, magnifiers, periscopes, and telescopes to enhance our vision.** **Teacher observation of prior knowledge and questions.**

importance of the lens and discuss the camera's aperture (the opening behind the lens) and the ability for the photographer to control light. Students formulate questions that they would like answered about a camera. (B INQ. 1)		
5.4.7 ; 5.4.8 **Students research information about the pupil, cornea, retina, and lens. Students present their researched information to the class. Students will then relate the components of the human eye to the components of a camera to note similarities between the two in their science journals (B IN. 2 and 8)**		**Student report of the human eye.** **Student responses to similarities between human eye and camera (Journal response)**
5.4.1 through 5.4.7 **Brainstorm different instruments that help us to see things better (ex. eyeglasses, glasses, microscopes, telescopes, periscopes, etc.) Have students state the tool and what it would help to see and why someone would need to use it. Guide students to see the similarities with all of the tools. (They all have lenses to help us see.) Have students ask and chart any questions that they have about this tool. (B INQ. 1)**	The Microscope Book (paperback) by Shar Levine, Leslie Johnstone Hidden Worlds: Looking Through a Scientist's Microscope (Scientists in the Field Series) (paperback) by Stephen Kramer, Dennis Kunkel	**Teacher observation of prior knowledge and questions.**
If possible have a microscope, telescope, periscope, etc. available for students to observe and investigate. Student groups choose one corrective tool and research the following: What is it and what are some of its uses? How does it work? Who would use this tool and why? Students describe a real world application for this	**Aries Exploring the Moon and Stars** **http://www.charlesbridge.com/school/pdf/Aries.MoonStars.pdf**	**Teacher assessment of student reports and comparison matrices.**

too and when it could be used (B INQ. 2 and 8). Students also investigate answers to their questions about the tool. Students will use books, magazines, electronic media or the web to investigate answers and to learn about their chosen too. Students regroup to include a representative from each research group. The new groups report to one another in order to complete a comparison matrix. (B INQ. 6)		
After students give their reports on telescopes, students build a telescope. (B INQ. 4)	**Aries Exploring the Moon and Stars Lesson Exploration 12**	
After students give their reports on periscopes, they build a periscope and continue to explore the effect of light on prisms. (B INQ. 4)	**Aries Exploring the Moon and Stars Lesson 12 Part 2**	
After students give their reports on microscopes, teacher or students bring in a microscope for students to use, observe, and learn about. (B INQ. 4)		

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APPENDIX

Science CMT Handbook ..\Science\science_cmt_handbook.pdf

Format of the Elementary Science CMT Administered at Grade 5

SCIENTIFIC LITERACY TERMINOLOGY: ELEMENTARY

Format of the Elementary Science CMT Administered at Grade 5

Item Distribution

Content Knowledge			Scientific Inquiry, Literacy and Numeracy	
Selected Response*	Constructed Response*	Selected Response*	Total Points	
Life Science	6	1	6	14
Physical Science	6	1	6	14
Earth Science	6	1	6	14
Total Points	24		18	42

The Elementary Science CMT is a cumulative test administered at Grade 5. It includes science knowledge and inquiry skills described in the Core Science Curriculum Framework for Grades 3, 4 and 5. There are 39 test questions: 36 selected response items and three constructed response items. Of the 36 selected response items, 18 assess Content Knowledge and 18 assess processes of Scientific Inquiry, Literacy and Numeracy. The three constructed response items assess Content Knowledge.

Test Scoring

The selected response items are scored electronically as correct or incorrect. Constructed response items are hand-scored by trained readers using a three-point scale (0-2).

Curriculum-Embedded Performance Tasks

CSDE has developed curriculum-embedded performance tasks related to content standards in Grades 3, 4 and 5. These instructional materials are posted at www.ct.gov/sde at the science link from Curriculum and Instruction. Teachers are encouraged to incorporate these inquiry investigations into a learning unit that addresses the content standard related to each task. The Elementary Science CMT will include two to three multiple-choice items that assess expected performances in Scientific Inquiry, Literacy and Numeracy within the context of each embedded performance task.

Reporting

A total science score will be reported based on all 42 points. In addition, the following subscores will be reported:

Life Science 14 points (33⅓ %)

Physical Science 14 points (33⅓ %)
Earth Science 14 points (33⅓ %)

Content Knowledge 24 points (57%)
Scientific Inquiry, Literacy and Numeracy 18 points (43%)

Testing Time - 65 minutes

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SCIENTIFIC LITERACY TERMINOLOGY: ELEMENTARY

This list, while not exhaustive, includes vocabulary that should be used by teachers and students during classroom discourse.

absorb
adaptation (adapt)
aluminum
amphibian
analyze
atmosphere
attract
average
balance
battery
beaker
binoculars
boulder
breathe
butterfly
cactus
camouflage
Celsius
centimeter
characteristic
circuit
classify
clay
climate
collect data
compare
conclusion
conclusion based on data
condense
condensation
conduct (an experiment)
conduct (electricity)
conserve
cork
critique
crystal
cycle
data
decrease
describe
determine
diagram
dissolve
draw a conclusion
droplets
drought
ecosystem
environment
erode, erosion
evaluate
evaporate
evaporation
evidence
experiment
explain your reasoning
explain, explanation
explore
extinct
Fahrenheit
fair test
findings
flexible
float
force
freeze
gas
germinate
gills
graduated cylinder
gram
gravity
guitar string
habitat
hand lens
hibernate, hibernation
humid, humidity
hypothesis
identify
increase
insect
insulate, insulator
investigate
kilogram
layer
length
lens
life cycle
liquid
liter
lungs
magnet, magnetic
magnifier
magnifying glass
mammal
mass
materials
melt
metal
metamorphosis
meter, meter stick
migrate
migration
milliliters
mineral
mirror
mixture
motion
natural resources
nutrients
object
observe, observation
offspring
opinion
orbit
organism
oxygen
particles
pattern
pebble
perform an experiment
periscope
photosynthesis
pitch (sound)
planet
pluck (a string)
position
precipitation
predict, prediction
pressure
procedure
process
property
range
record (data)
recycle
reflect
repel
reproduce
reptile
result
reuse
revolve, revolution
rotate, rotation
sand
scale
scientific
observation
season
seed dispersal
separate
sequence
shadow
silt
sink (float)
soil
solid
sort
speed
state of matter
stopwatch
strum (a string)
surface
survive
telescope
temperature
tension
testable
texture
thermometer
thorns
transparent
vibrate, vibration
water cycle
weigh, weight

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