

Subject	Grade	Standard	Objective
Science	6	I: Students will understand that the appearance of the moon changes in a predictable cycle as it orbits Earth and as Earth rotates on its axis.	1: Explain patterns of changes in the appearance of the moon as it orbits Earth.
Content Big Ideas		ILO Big Ideas	Science, Technology, & Society Big Ideas
(SS) The moon changes in appearance in a predictable pattern.		(PoS) People can observe patterns of the moon and draw conclusions based on data. (CoS) People can describe the changes they observe. (NoS) Many people over time have used different means to observe and describe the moon.	(T) People use appropriate tools and models to investigate the world. (A) People working alone or in groups often invent new ways to solve problems and get work done. (S) The tools and ways of doing things that people have invented affect all aspects of life.
Content Objective Indicators Framed by ILO Big Ideas			
<p>Indicator a. Describe changes in the appearance of the moon during a month.</p> <p>Indicator b. Identify the pattern of change in the moon's appearance</p> <p>Indicator c. Use observable evidence to explain the movement of the moon around Earth in relationship to Earth turning on its axis and the position of the moon changing in the sky.</p> <p>Indicator d. Design an investigation, construct a chart, and collect data depicting the phases of the moon</p>			
Science language students should be able to use correctly: Earth's tilt, seasons, axis of rotation, orbits, phases of the moon, revolution, reflection			
Guidance for Combining Content and Process		Guidance for Combining Science, Technology & Society	
<p>Suggested Strategies</p> <p>Have students keep a moon journal to observe the moon nightly, draw what they observe, and record the date, time, degrees from the horizon (using a clinometer), and the weather conditions. (M) (PoS) (CoS)</p> <p>Make a calendar of the phases of the moon, observing and describing the pattern. (PoS) (CoS)</p>		<p>(T) Use a clinometer (created using a protractor, straw, string and small weight like a washer).</p> <p>(A) Students should view the moon themselves.</p> <p>(S) Moon phases are used to predict the tides, planting seasons, and create calendars.</p>	

Subject	Grade	Standard	Objective
Science	6	I: Students will understand that the appearance of the moon changes in a predictable cycle as it orbits Earth and as Earth rotates on its axis.	2: Demonstrate how the relative positions of Earth, the moon, and the sun create the appearance of the moon's phases.
Content Big Ideas		ILO Big Ideas	Science, Technology, & Society Big Ideas
(SS) The movement, position, and relative positions of the Earth, moon, and sun create the moon's phases.		(PoS) People can conduct experiments to recreate the appearance of the moon phases. (CoS) People can report on moon phases using models. (NoS) Evidence of things in space can be based on observation and evidence using models.	(T) People use appropriate tools and models to investigate the world. (A) People working alone or in groups often invent new ways to solve problems and get work done. (S) The tools and ways of doing things that people have invented affect all aspects of life.
Content Objective Indicators Framed by ILO Big Ideas			
<p>Indicator a. Identify the difference between the motion of an object rotating on its axis and an object revolving in orbit.</p> <p>Indicator b. Compare how objects in the sky (the moon, planets, stars) change in relative position over the course of the day or night.</p> <p>Indicator c. Model the movement and relative positions of Earth, the moon, and the sun.</p> <p>Science language students should be able to use correctly: Earth's tilt, axis of rotation, orbits, phases of the moon, revolution, reflection</p>			
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<p>Suggested Strategies</p> <p>Using a lamp in the middle of the classroom to represent the sun, have students rotate around the light holding a popsicle stick with a small Styrofoam ball on it to represent the moon and their head to represent the Earth. Observe and record the relative positions of the celestial objects and the phases of the moon. (UoS) (PoS)</p> <p>Have students stand and spin in place to demonstrate rotating, walk around a table to demonstrate revolving, and walk on the sidewalk around the school to demonstrate orbit. (CoS)</p>		<p>(T) Use popsicle sticks, Styrofoam balls, and a lamp.</p> <p>(A) Students should observe the appearance of the moon phases themselves through the use of models.</p> <p>(S) The sun, moon, stars, and planets all appear to move across the night sky.</p>	

Subject	Grade	Standard	Objective
Science	6	II. Students will understand how Earth's tilt on its axis changes the length of daylight and creates the seasons.	1. Describe the relationship between the tilt of Earth's axis and its yearly orbit around the sun.
Content Big Ideas		ILO Big Ideas	Science, Technology, & Society Big Ideas
<p>(SS) Rotation and the Earth's tilt affect the amount of daylight and Earth's temperature.</p> <p>(SS) The amount of heat absorbed by the Earth is affected by the angle of light from the sun.</p>		<p>(PoS) People can create simulations to replicate the Earth's tilt and revolution around the sun to research the effects on daylight and temperature.</p> <p>(CoS) People can use information observed by simulations to describe and explain observations and present their information in a table or graph form.</p> <p>(NoS) People will be able to use their observations as evidence to base their conclusions about the tilt of the Earth.</p>	<p>(T) People use appropriate tools and models to investigate the world.</p> <p>(A) People working alone or in groups often invent new ways to solve problems and get work done</p> <p>(S) The tools and ways of doing things that people have invented affect all aspects of life.</p>
Content Objective Indicators Framed by ILO Big Ideas			
<p>Indicator 1. Describe the yearly revolution (orbit) of Earth around the sun.</p> <p>Indicator 2. Explain that Earth's axis is tilted relative to its yearly orbit around the sun.</p> <p>Indicator 3. Investigate the relationship between the amount of heat absorbed and the angle to the light source.</p>			
<p>Science language students should be able to use correctly: Earth's tilt, seasons, axis of rotation, orbits, phases of the moon, revolution, reflection</p>			
Guidance for Combining Content and Process		Guidance for Combining Science, Technology & Society	
<p>To simulate the Earth's revolution around the sun, students will observe a globe revolving around a lamp with the shade missing. Emphasis on the tilt of the globe. Students will record observations in their science journal. (L) (PoS) (CoS)</p> <p>Students can use thermometers and touch to record heat differences at various positions on the globe as the light is reflected off the globe's surface. (NoS)</p> <p>Shine a sun lamp at different angles and measure the temperature of the surface at each. (PoS)</p>		<p>(T) Students can use age-appropriate tools to investigate a simulation of the tilt of the Earth to replicate the seasons</p> <p>(A) Students will use their observations to predict conditions found on the Earth at various positions the light source. They will then relate those predictions to the real world.</p> <p>(S) Students can relate their findings to explain why summer months are hotter than in winter.</p>	

Subject	Grade	Standard	Objective
Science	6	II. Students will understand how Earth's tilt on its axis changes the length of daylight and creates the seasons.	2. Explain how the relationship between the tilt of Earth's axis and its yearly orbit around the sun produces the seasons.
Content Big Ideas		ILO Big Ideas	Science, Technology, & Society Big Ideas
<p>(SS) Earth's revolution and the Earth's tilt create the seasons.</p> <p>(SS) Heat absorbed by the Earth is affected by the angle of light from the sun.</p> <p>(SS) The distance of the Earth from the sun does not affect the heat changes in summer, fall, winter, and spring.</p>		<p>(PoS) People can create simulations to replicate the Earth's tilt and revolution around the Sun to research the effects on daylight and temperature.</p> <p>(CoS) People can use information observed by simulations to describe and explain observations and present their information in a table or graph form.</p> <p>(NoS) People will be able to use their observations as evidence to understand what makes the seasons.</p>	<p>(T) People use appropriate tools and models to investigate the world.</p> <p>(A) People working alone or in groups often invent new ways to solve problems and get work done</p> <p>(S) The tools and ways of doing things that people have invented affect all aspects of life.</p>
Content Objective Indicators Framed by ILO Big Ideas			
<p>Indicator 1. Compare Earth's position in relationship to the sun during each season.</p> <p>Indicator 2. Compare the hours of daylight and illustrate the angle that the sun's rays strikes the surface of Earth during summer, fall, winter, and spring in the Northern Hemisphere.</p> <p>Indicator 3. Use collected data to compare patterns relating to seasonal daylight changes.</p> <p>Indicator 4. Use a drawing and/or model to explain that changes in the angle at which light from the sun strikes Earth, and the length of daylight, determine seasonal differences in the amount of energy received.</p> <p>Indicator 5. Use a model to explain why the seasons are reversed in the Northern and Southern Hemispheres.</p> <p>Science language students should be able to use correctly: Earth's tilt, seasons, axis of rotation, orbits, phases of the moon, revolution, reflection</p>			
Guidance for Combining Content and Process		Guidance for Combining Science, Technology & Society	
<p>Students will work with teams to make posters showing the relationships of the sun and Earth at various positions representing summer, winter, spring and fall. Students will research using the internet, reference books etc. (FA) (CoS) (L)</p> <p>Using a flashlight and a styrofoam ball, place pencil through center and tilt towards light source. Place tilt towards light source and observe. Place tilt away from light source and observe. Have student record observations in their journals. (L) (PoS) (NoS) (CoS)</p>		<p>(T) Students can use the computer and other resources to discover the Earth's positions for each season.</p> <p>(A) Students can use information they discover to plan vacations in various parts of the world. They would explain why they chose the place and the time of year.</p> <p>(S) Students can explain why it is winter in the Southern Hemisphere while it is summer in the Northern Hemisphere.</p>	

Subject	Grade	Standard	Objective
Science	6	III: Students will understand the relationship and attributes of objects in the solar system.	1. Describe and compare the relationship and attributes of objects in the solar system
Content Big Ideas		ILO Big Ideas	Science, Technology, & Society Big Ideas
(SS) The solar system is made up of planets, comets, asteroids, meteors, the sun, and manmade satellites. (SS) Planets in the solar system differ in terms of distance from the sun and physical properties.		(PoS) People can compare and classify objects in the solar system. (CoS) Report data found and report what was learned with pictures and sentences. (MSA) Read books and other materials about planets and other celestial objects.	(T) People use appropriate tools and models to investigate the world. (A) People working alone or in groups often invent new ways to solve problems and get work done. (S) The tools and ways of doing things that people have invented affect all aspects of life.
Content Objective Indicators Framed by ILO Big Ideas			
<p>Indicator a. Identify the planets in the solar system by name and relative location from the sun.</p> <p>Indicator b. Use references, compare the physical properties of the planets (e.g., size, solid or gaseous).</p> <p>Indicator c. Use models and graphs that accurately depict scale to compare the size and distance between objects in the solar system.</p> <p>Indicator d. Describe the characteristics of comets, asteroids, and meteors.</p> <p>Indicator e. Research and report on the use of manmade satellites orbiting Earth and various planets.</p> <p>Science language students should be able to use correctly: asteroids, celestial object, comets, galaxy, planets, satellites, star, distance, force, gravity, gravitational force, mass, scale, solar system, constellation, Milky Way galaxy, speed of light, telescope, universe, sun, light years</p>			
Guidance for Combining Content and Process		Guidance for Combining Science, Technology & Society	
<p>Suggested Strategies</p> <p>Have students create acronyms, stories, and/or songs to memorize the order of the planets by relative location from the sun and by name. (FA) (USC)</p> <p>In small groups, have students research and report on a planet and create an informational poster that includes: mass, temperature, distance from the sun, an illustration of the planet, gravitational pull, etc. and present what they've learned to the class. (CoS) (MSA) (PoS)</p> <p>Create a scale model of the planets (using clay, Styrofoam balls, or other various objects such as peas, marbles, beach balls, etc.). (PoS) (M)</p> <p>Create a venn diagram to compare and contrast the characteristics of comets, asteroids, and meteors. (USC) (CoS)</p> <p>Make a comet using dry ice, ammonia, and dirt. Form it into a ball and record your observations as it melts. (PoS)</p>		<p>(T) Students can access books, websites, and other resource materials on planets, manmade satellites, etc.</p> <p>(A) Students should compare and contrast characteristics of and distances between celestial objects using research, tables, and graphs.</p> <p>(S) Understanding more about the nature of our solar system helps people to understand the night sky and their own place in the universe.</p>	

Subject	Grade	Standard	Objective
Science	6	III: Students will understand the relationship and attributes of objects in the solar system.	2: Describe the use of technology to observe objects in the solar system and relate this to science's understanding of the solar system.
Content Big Ideas		ILO Big Ideas	Science, Technology, & Society Big Ideas
(SS) Our knowledge of the solar system is based on observations made by instruments such as telescopes, satellites and computers.		(PoS) People can use technology to observe objects in the solar system. (CoS) People can explain and describe the celestial objects they observe with technology. (MSA) Read books and other materials about technology.	(T) People use appropriate tools and models to investigate the world. (A) People working alone or in groups often invent new ways to solve problems and get work done. (S) The tools and ways of doing things that people have invented affect all aspects of life.
Content Objective Indicators Framed by ILO Big Ideas			
<p>Indicator a. Describe the use of instruments to observe and explore the moon and planets</p> <p>Indicator b. Using Describe the role of computers in understanding the solar system (e.g., collecting and interpreting data from observations, predicting motion of objects, operating space probes).</p> <p>Indicator c. Relate science's understanding of the solar system to the technology used to investigate it.</p> <p>Indicator d. Find and report on ways technology has been and is being used to investigate the solar system.</p> <p>Science language students should be able to use correctly: asteroids, celestial object, comets, galaxy, planets, satellites, star, distance, force, gravity, gravitational force, mass, scale, solar system, constellation, Milky Way galaxy, speed of light, telescope, universe, sun, light years</p>			
Guidance for Combining Content and Process		Guidance for Combining Science, Technology & Society	
<p>Suggested Strategies</p> <p>Go to the NASA website and view images retrieved from the Hubble Space Telescope and other technology. (NoS) (MSA)</p> <p>Go to the Mars Public Mapping Project (http://mp2.mars.asu.edu/) and investigate images of mars taken by cameras on the Mars Odyssey Orbiter. Learn about the Mars Rover and other space technology. (NoS) (CoS)</p> <p>In small groups, have students create their own space stations using common classroom objects. (FA) (CoS)</p> <p>Invite parents and the community to a "Star Party" or "Full Moon Fest" where students use telescopes to view celestial objects. (PoS)</p>		<p>(T) Students can access websites showing current space technology and the images and knowledge we've gained from their use.</p> <p>(A) Students should use space technology themselves as much as possible and view images from modern technology.</p> <p>(S) Understanding more about the nature of our solar system and how we observe our solar system helps people to understand the night sky and their own place in the universe.</p>	

Subject	Grade	Standard	Objective
Science	6	III: Students will understand the relationship and attributes of objects in the solar system.	3. Describe the forces that keep objects in the solar system.
Content Big Ideas		ILO Big Ideas	Science, Technology, & Society Big Ideas
(SS) Gravity holds celestial objects in orbit and plays an important role in our solar system. (SS) The mass of a celestial object is related to its gravitational force.		(PoS) People can compare the mass of an object to its gravitational pull and draw conclusions. (CoS) People can record data in a chart. (NoS) People can draw conclusions about celestial objects based on evidence used with models.	(T) People use appropriate tools and models to investigate the world. (A) People working alone or in groups often invent new ways to solve problems and get work done. (S) The tools and ways of doing things that people have invented affect all aspects of life.
Content Objective Indicators Framed by ILO Big Ideas			
<p>Indicator a. Describe the forces holding Earth in orbit around the sun, and the moon in orbit around Earth.</p> <p>Indicator b. Relate a celestial object's mass to its gravitational force on other objects.</p> <p>Indicator c. Identify the role gravity plays in the structure of the solar system.</p> <p>Science language students should be able to use correctly: asteroids, celestial object, comets, galaxy, planets, satellites, star, distance, force, gravity, gravitational force, mass, scale, solar system, constellation, Milky Way galaxy, speed of light, telescope, universe, sun, light years</p>			
Guidance for Combining Content and Process		Guidance for Combining Science, Technology & Society	
<p>Suggested Strategies</p> <p>Fill tennis balls with different amounts of steel shot pellets and attach a string to the ball. Swing the tennis balls around and observe and discuss differences between mass and gravitational pull. (PoS)</p> <p>Complete various activities with chairs and against walls to increase understanding of gravity. See http://www.csr.utexas.edu/grace/education/activities/pdf/Fun_Gravity.pdf. (PoS) (NoS)</p>		<p>(T) Tennis balls, shot pellets, and string.</p> <p>(A) Students should feel the connection between mass and gravitational pull.</p> <p>(S) Gravity affects everyday life.</p>	

Subject	Grade	Standard	Objective
Science	6	IV: Students will understand the scale of size, distance between objects, movement, and apparent motion (due to Earth's rotation) of objects in the universe and how cultures have understood, related to and used these objects in the night sky.	1. Compare the size and distance of objects in the universe.
Content Big Ideas		ILO Big Ideas	Science, Technology, & Society Big Ideas
(SS) The universe is so vast that light years are used to measure distances between objects in it.		(PoS) People use light years to measure distances in space. (CoS) Graphs can be used to compare distances between objects in the solar system. (NoS) People can use parallax to determine relative distances in space for themselves.	(T) People use appropriate tools and models to investigate the world. (A) People working alone or in groups often invent new ways to solve problems and get work done. (S) The tools and ways of doing things that people have invented affect all aspects of life.
Content Objective Indicators Framed by ILO Big Ideas			
<p>Indicator a. Use the speed of light as a measuring standard to describe the relative distances to objects in the universe (e.g., 4.4 light years to star Alpha Centauri; 0.00002 light years to the sun).</p> <p>Indicator b. Compare distances between objects in the solar system</p> <p>Indicator c. Compare the size of the Solar System to the size of the Milky Way galaxy.</p> <p>Indicator d. Compare the size of the Milky Way galaxy to the size of the known universe.</p> <p>Science language students should be able to use correctly: asteroids, celestial object, comets, galaxy, planets, satellites, star, distance, force, gravity, gravitational force, mass, scale, solar system, constellation, Milky Way galaxy, speed of light, telescope, universe, sun, light years</p>			
Guidance for Combining Content and Process		Guidance for Combining Science, Technology & Society	
<p>Suggested Strategies</p> <p>Create a model using string and beads or toilet paper to compare relative distances. (PoS)</p> <p>View the Powers of 10 video at http://www.powersof10.com/index.php?mod=watch_powersof10. (USC)</p> <p>View images at http://www.conradaskland.com/blog/2007/02/relative-size-of-planets/ to see the relative size of planets. (CoS)</p>		<p>(T) Websites and videos.</p> <p>(A) Students should see and experience as many models and pictures as possible to understand how vast the universe is.</p> <p>(S) Understanding more about the nature of the universe helps people to understand the night sky and their own place in the universe.</p>	

Subject	Grade	Standard	Objective
Science	6	IV: Students will understand the scale of size, distance between objects, movement, and apparent motion (due to Earth's rotation) of objects in the universe and how cultures have understood, related to and used these objects in the night sky.	2. Describe the appearance and apparent motion of groups of stars in the night sky relative to Earth and how various cultures have understood and used them.
Content Big Ideas		ILO Big Ideas	Science, Technology, & Society Big Ideas
<p>(SS) Groups of stars are called constellations, and the stars in constellations are different distances from Earth.</p> <p>(SS) Constellations have been used historically by various cultures for navigation and calendars.</p> <p>(SS) Stars appear to move across the night sky and change seasonally because of the rotation and revolution of the Earth.</p>		<p>(PoS) Patterns in the stars can be observed with the naked eye and with telescopes.</p> <p>(CoS) People can create models and pictures of constellations.</p> <p>(NoS) Throughout human history people have used constellations.</p>	<p>(T) People use appropriate tools and models to investigate the world.</p> <p>(A) People working alone or in groups often invent new ways to solve problems and get work done.</p> <p>(S) The tools and ways of doing things that people have invented affect all aspects of life.</p>
Content Objective Indicators Framed by ILO Big Ideas			
<p>Indicator a. Locate and identify stars that are grouped in patterns in the night sky.</p> <p>Indicator b. Identify ways people have historically grouped stars in the night sky.</p> <p>Indicator c. Recognize that stars in a constellation are not all the same distance from Earth.</p> <p>Indicator d. Relate the seasonal change in the appearance of the night sky to Earth's position.</p> <p>Indicator e. Describe ways that familiar groups of stars may be used for navigation and calendars.</p>			
<p>Science language students should be able to use correctly: asteroids, celestial object, comets, galaxy, planets, satellites, star, distance, force, gravity, gravitational force, mass, scale, solar system, constellation, Milky Way galaxy, speed of light, telescope, universe, sun, light years</p>			
Guidance for Combining Content and Process		Guidance for Combining Science, Technology & Society	
<p>Suggested Strategies</p> <p>Have students bring in a can of Pringles and create a kaleidoscope of different constellations to place in the lid. (CoS)</p> <p>Compare and contrast the constellation legends of different cultures then have students write their own legend. (L) (SS) (HaS)</p> <p>Have a few students hold Styrofoam balls to create a constellation when viewed from the front at a distance. Afterwards, have students walk around and view the created constellation from the side to demonstrate that the stars are not flat or equal distance from the Earth. (PoS) (CoS)</p> <p>Relate constellations to Greek and Roman mythology. (SS)</p> <p>Break students into groups and do a jigsaw reading activity about the cultural uses of constellations. (L) (SS) (CoS)</p>		<p>(T) Pringles cans, books about constellations, constellation legends and mythology, Styrofoam balls.</p> <p>(A) Students should view, create, and write about constellations.</p> <p>(S) People have used constellations for navigation and calendars throughout human history.</p>	
<p>Earth and Space Science</p> <p>(E) Earth science</p> <p>(SS) Space science</p>	<p>Physical Science</p> <p>(A) Atomic/molecular</p> <p>(F) Force and motion</p>	<p>Life Science</p> <p>(CT) Changes over time</p> <p>(C) Cell theory</p>	<p>Processes, Communication and Nature of Science</p> <p>(PoS) Processes of science</p> <p>(CoS) Communication of science</p>
<p>Applications: Science, Technology, and Society</p> <p>(T) Tools of science</p> <p>(A) Applications of science</p>			

Subject	Grade	Standard	Objective
Science	Sixth	V: Students will understand that microorganisms range from simple to complex, are found almost everywhere, and are both helpful and harmful.	1. Observe and summarize information about microorganisms.
Content Big Ideas		ILO Big Ideas	Science, Technology, & Society Big Ideas
(L) There are microbes everywhere. (L) Microbes have characteristics that help them survive in their environment. (L) Most microorganisms are not visible without the aid of a microscope.		(PoS) Microorganisms can be observed using a microscope that shows a range of complexity from single to multi-cellular organisms.	(T) There are different types of instruments that help us observe the microscopic world. (A) Learning about and observing microorganisms helps us to understand what their effect is upon the environment and us. (S) Microorganisms can be modified and applied to problems in the environment.
Content Objective Indicators Framed by ILO Big Ideas			
Indicator a. Examine and illustrate size, shape, and structure of organisms found in an environment such as pond water.			
Indicator b. Compare characteristics common in observed organisms (e.g., color, movement, appendages, shape) and infer their function (e.g., green color found in organisms that are producers, appendages help movement).			
Indicator c. Research and report on a microorganism's requirements (i.e., food, water, air, waste disposal, temperature of environment, reproduction).			
Science language students should be able to use correctly: organism, microorganism, single-celled, investigation, culture			
Guidance for Combining Content and Process		Guidance for Combining Science, Technology & Society	
Students read about microorganisms and create a poster on them (FA) (L) (NoS) (CoS) Students observe pond water and its contents using a microscope and draw what they have seen. (T) (FA) (PoS) Using a series of cards, students sort each microorganism by different characteristics. (N) (M) (A) Students observe and write about the changes in beef broth as microorganisms colonize it over a period of time. (L) (CT) (N) (PoS) (CoS)		(T) Students will understand that microbes can be investigated by using microscopes, magnifying glasses, and document cameras. (A) Students will understand how microbes can be used to clean up environmental problems such as oil spills. (S) Students will discover that the investigation of microbes can develop new vaccines against diseases.	

Subject	Grade	Standard	Objective
Science	Sixth	V: Students will understand that microorganisms range from simple to complex, are found almost everywhere, and are both helpful and harmful.	2. Demonstrate the skills needed to plan and conduct an experiment to determine a microorganism's requirements in a specific environment.
Content Big Ideas		ILO Big Ideas	Science, Technology, & Society Big Ideas
(L) There are microbes everywhere. (L) Microbes have characteristics that help them survive in their environment. (L) The scientific process can be used to discover microorganism's specific requirements to survive through experimentation.		(PoS) Students will be able to determine by experimentation what microorganisms need to survive, such as the need of food, water, oxygen, and ways of disposing waste.	(T) There are different types of instruments that help us observe the microscopic world. (A) Learning about and observing microorganisms helps us to understand what their effect is on the environment and us. (S) Microorganisms can be modified and applied to problems in the environment.
Content Objective Indicators Framed by ILO Big Ideas			
<p>Indicator a. Formulate a question about microorganisms that can be answered with a student experiment.</p> <p>Indicator b. Develop a hypothesis for a question about microorganisms based on observations and prior knowledge.</p> <p>Indicator c. Plan and carry out an investigation on microorganisms. {Note: Teacher must examine plans and procedures to assure the safety of students; for additional information, you may wish to read microbe safety information on Utah Science Home Page.}</p> <p>Indicator d. Display results in an appropriate format (e.g., graphs, tables, diagrams).</p> <p>Indicator e. Prepare a written summary or conclusion to describe the results in terms of the hypothesis for the investigation on microorganisms.</p> <p>Science language students should be able to use correctly: organism, microorganism, single-celled, investigation, culture, question, research, hypothesis, experiment, variables, control, data, procedure, analysis, and conclusion</p>			
Guidance for Combining Content and Process		Guidance for Combining Science, Technology & Society	
Students will propose a method of growing microorganisms on common kitchen foods, i.e. bread, fruit, or vegetables. (CT) (N) (L) (PoS) Students will conduct an experiment comparing and contrasting these different types of foods and how well microorganisms thrive them. (CT) (N) (M) Students will write their report and share it with other members in the classroom. (CoS) (N) (M) (L) (N)		(T) Students will be able to understand and use the microscope in their investigations. (A) Students use their investigation to better understand the growth of microbes and how to prevent their spread on basic foods. (S) Students will recognize the presence of microorganisms in their environment.	

Subject	Grade	Standard	Objective
Science	Sixth	V: Students will understand that microorganisms range from simple to complex, are found almost everywhere, and are both helpful and harmful.	3: Identify positive and negative effects of microorganisms and how science has developed positive uses for some microorganisms and overcome the negative effects of others.
Content Big Ideas		ILO Big Ideas	Science, Technology, & Society Big Ideas
(L) There are microbes everywhere. (L) Microbes have characteristics that help them survive in their environment.		(PoS) Microorganisms can be observed using a microscope that shows a range of complexity from single to multi-cellular organisms. (NoS) Microorganisms are found everywhere in our environment and they are both helpful and harmful types.	(T) There are different types of instruments that help us observe the microscopic world. (A) Learning about and observing microorganisms helps us to understand what their effect is on the environment and us. (S) Microorganisms can be modified and applied to problems in the environment.
Content Objective Indicators Framed by ILO Big Ideas			
<p>Indicator a. Describe in writing how microorganisms serve as decomposers in the environment.</p> <p>Indicator b. Identify how microorganisms are used as food or in the production of food (e.g., yeast helps bread rise, fungi flavor cheese, algae are used in ice cream, bacteria are used to make cheese and yogurt).</p> <p>Indicator c. Identify helpful uses of microorganisms (e.g., clean up oil spills, purify water, digest food in digestive tract, antibiotics) and the role of science in the development of understanding that led to positive uses (i.e., Pasteur established the existence, growth, and control of bacteria; Fleming isolated and developed penicillin).</p> <p>Indicator d. Relate several diseases caused by microorganisms to the organism causing the disease (e.g., athlete's foot -fungi, streptococcus throat -bacteria, giardia - protozoa).</p> <p>Indicator e. Observe and report on microorganisms' harmful effects on food (e.g., causes fruits and vegetables to rot, destroys food bearing plants, makes milk sour).</p> <p>Science language students should be able to use correctly: algae, fungi, microorganism, decomposer, single-celled, organism, bacteria, protozoan, producer, hypothesis, experiment, investigation, variable, control, culture</p>			
Guidance for Combining Content and Process		Guidance for Combining Science, Technology & Society	
Students will participate in an activity that shows disease transmission and analyze the results. Use lesson link @ http://www.uen.org/Lessonplan/preview?LPid=2518 (SS) (PoS) (M) (CT) Students will compare and contrast different diseases by creating trading cards and presenting them to the class. (L) (FA) (N) Students will demonstrate the growth of society based on the productive use of microorganisms by making cheese, yogurt, and bread just as early settlers in the Fertile Crescent did. (SS) (CT)		(T)Students will use a computer to research diseases. (A)Students will show how science can prevent diseases and preserve food. (S)Students will discover the development of society in history based on the preservation of food and the use of microorganisms.	

Subject	Grade	Standard	Objective
Science	Sixth	VI: Students will understand properties and behavior of heat, light, and sound.	1. Investigate the movement of heat between objects by conduction, convection, and radiation.
Content Big Ideas		ILO Big Ideas	Science, Technology, & Society Big Ideas
<p>(PS) Heat, light, and sound are all forms of energy and each form travels as a wave.</p> <p>(PS) Heat can be transferred by radiation, conduction and convection.</p>		<p>(PoS) Students will understand the properties and behavior of heat.</p> <p>(PoS) Students will be able to use experimentation to understand the properties of heat.</p> <p>(CoS) Students will apply these properties to solve practical problems in the real world.</p>	<p>(T) We use different tools to measure heat such as thermometers.</p> <p>(A) The electromagnetic spectrum is a tool used to analyze heat, light, and sound across many different content areas.</p> <p>(S) The different ways heat can move are observable in cooking, being outside, and etc.</p>
Content Objective Indicators Framed by ILO Big Ideas			
<p>Indicator a. Compare materials that conduct heat to materials that insulate the transfer of heat energy.</p> <p>Indicator b. Describe the movement of heat from warmer objects to cooler objects by conduction and convection.</p> <p>Indicator c. Describe the movement of heat across space from the sun to Earth by radiation.</p> <p>Indicator d. Observe and describe, with the use of models, heat energy being transferred through a fluid medium (liquid and/or gas) by convection currents.</p> <p>Indicator e. Design and conduct an investigation on the movement of heat energy.</p> <p>Science language students should be able to use correctly: angle of incidence, angle of reflection, absorption, conduction, conductor, convection, medium, pitch, prism, radiation, reflection, refraction, spectrum, vibration</p>			
Guidance for Combining Content and Process		Guidance for Combining Science, Technology & Society	
Suggested Strategies			

Subject	Grade	Standard	Objective
Science	Sixth	VI: Students will understand properties and behavior of heat, light, and sound.	2: Describe how light can be produced, reflected, refracted, and separated into visible light of various colors.
Content Big Ideas		ILO Big Ideas	Science, Technology, & Society Big Ideas
(PS) Heat, light, and sound are all forms of energy and each form travels as a wave.		(PoS) Students will understand the properties and behavior of light. (PoS) Students will be able to use experimentation to understand the properties of light. (CoS) Students will apply these properties to solve practical problems in the real world.	
Content Objective Indicators Framed by ILO Big Ideas			
<p>Indicator a. Compare light from various sources (e.g., intensity, direction, color).</p> <p>Indicator b. Compare the reflection of light from various surfaces (e.g., loss of light, angle of reflection, reflected color).</p> <p>Indicator c. Investigate and describe the refraction of light passing through various materials (e.g., prisms, water).</p> <p>Indicator d. Predict and test the behavior of light interacting with various fluids (e.g., light transmission through fluids, refraction of light).</p> <p>Indicator e. Predict and test the appearance of various materials when light of different colors is shone on the material.</p> <p>Science language students should be able to use correctly: angle of incidence, angle of reflection, absorption, conduction, conductor, convection, medium, pitch, prism, radiation, reflection, refraction, spectrum, vibration</p>			
Guidance for Combining Content and Process		Guidance for Combining Science, Technology & Society	
Suggested Strategies			

Subject	Grade	Standard	Objective
Science	6	VI: Students will understand properties and behavior of heat, light, and sound.	3. Describe the production of sound in terms of objects that create vibrations in other materials.
Content Big Ideas		ILO Big Ideas	Science, Technology, & Society Big Ideas

<p>(SS) Sound is created from vibrations and moves in all directions from its source. (SS) Vibrating objects produce pitch. (SS) Volume of a sound is affected by the energy expended.</p>	<p>(PoS) People can use observation and exploration activities to discover attributes of sound and report their findings. (CoS) People can record data in their exploration with charts, graphs, and tables. (NoS) People can use a variety of methods to investigate the properties of sound.</p>	<p>(T) People use appropriate tools and models to investigate the world. (A) People working alone or in groups often invent new ways to solve problems and get work done (S) The tools and ways of doing things that people have invented affect all aspects of life.</p>
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Content Objective Indicators Framed by ILO Big Ideas

Indicator a. Describe how sound is made from vibration and moves in all directions from the source in waves.
Indicator b. Explain the relationship of the size and shape of a vibrating object to the pitch of the sound produced.
Indicator c. Relate the volume of a sound to the amount of energy used to create the vibration of the object producing the sound.
Indicator d. Make a musical instrument and report on how it produces sound.

Science language students should be able to use correctly: angle of incidence, angle of reflection, absorption, conduction, conductor, convection, medium, pitch, prism, radiation, reflection, refraction, spectrum, vibration

Guidance for Combining Content and Process	Guidance for Combining Science, Technology & Society
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<p>Students can observe the effect of dropping a pebble into a basin of water to view the action of waves moving in all directions from the source. Using a slinky toy, students can observe the action of a single wave as it moves down the toy. Record results in a journal. (PoS) (CoS) (L)</p> <p>Students can make a fish line guitar and explore the pitch as the strings are tightened and relaxed. Describing to the class the effects on pitch as the strings are adjusted. (Cos)(L)</p> <p>To investigate the amount of energy used to create vibration of an object to create sound, students will make a reed (straw) flute. After playing the flute, Students will perform a solo for the class. Class discussion will follow about the creation of sound. (FA) (L) (PoS)</p> <p>Students make an sound instrument, create a “symphony”, and perform for another class. Students will record feeling in their Science Journal. (FA) (L) (CoS)</p>	<p>(T) Students can use a age-appropriate tools to investigate sound (A) Students can explain how sound is produced after investigations and explain how it effects their lives (S) Students can expand their thinking about their environment through investigations with sound.</p>
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