

Kindergarten: Focus on Patterns; Structure and Function

By the end of Kindergarten, students learn to use their senses to help them make observations and predictions about the world around them. In this grade level, students will investigate how the senses detect light and sound, observe weather patterns and their influences on plants and animals, and differentiate between systems and **structures of living** and non-living **things**. Student investigations focus on collecting and making sense of observational data and simple measurements using the **science and engineering practices**: ask questions and define problems, develop and use models, plan and carry out investigations, analyze and interpret data, use mathematics and computational thinking, construct explanations and design solutions, use evidence, and obtain, evaluate, and communicate information. While individual lessons may include connections to any of the crosscutting concepts, the standards in Kindergarten focus on helping students understand phenomena through the crosscutting concepts of **patterns** and **structure and function**.

Core Ideas for Knowing Science*	Core Ideas for Using Science*
<p>Physical Science</p> <p>P1: All matter in the Universe is made of very small particles. P2: Objects can affect other objects at a distance. P3: Changing the movement of an object requires a net force to be acting on it. P4: The total amount of energy in a closed system is always the same but can be transferred from one energy store to another during an event.</p> <p>Earth and Space Science</p> <p>E1: The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth’s surface and its climate. E2: The Earth and our solar system are a very small part of one of many galaxies within the Universe.</p> <p>Life Science</p> <p>L1: Organisms are organized on a cellular basis and have a finite life span. L2: Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms. L3: Genetic information is passed down from one generation of organisms to another. L4: The unity and diversity of organisms, living and extinct, is the result of evolution.</p>	<p>U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.</p> <p>U2: The knowledge produced by science is used in engineering and technologies to solve problems and/or create products.</p> <p>U3: Applications of science often have both positive and negative ethical, social, economic, and/or political implications.</p>

*Adapted from *Working with Big Ideas in Science Education*²

Arizona Science Standards

Physical Sciences: Students explore how their senses can detect light, sound, and vibration and how technology can be used to extend their senses.

Physical Science Standards	Learning Progressions, Key Terms, and Crosscutting Concepts
K.P2U1.1	
<p><u>Investigate</u> how senses can detect light, sound, and vibrations even when they come from far away; use the collected evidence to <u>develop and support an explanation</u>.</p>	<p>People use their senses to learn about the world around them. Their eyes detect light, their ears detect sound, and they can feel vibrations by touch. People also use a variety of devices to communicate (send and receive information) over long distances. ^{4(p. 137)}</p> <p>Objects can have an effect on other objects even when they are not in contact with them. For instance, light affects the objects it reaches, including our eyes. Objects that are seen either give out or reflect light that human eyes can detect. Sound comes from things that vibrate and can be detected at a distance from the source because the air or other material around is made to vibrate. Sounds are heard when the vibrations in the air enter our ears.^{2 (p. 21)}</p> <p>Designs can be conveyed through sketches, drawings, or physical models.^{4(p. 207)} Because there is always more than one possible solution to a problem, it is useful to compare designs, test them, and discuss their strengths and weaknesses.^{4(p. 209)}</p> <p>Crosscutting Concepts: patterns; cause and effect; structure and function⁴</p>
K.P2U2.2	
<p><u>Design and evaluate</u> a tool that helps people extend their senses.</p>	

Arizona Science Standards

Earth and Space Sciences: Students develop an understanding of patterns to understand changes in local weather, seasonal cycles, and daylight.

Earth and Space Standards	Learning Progressions, Key Terms, and Crosscutting Concepts
K.E1U1.3	
<p>Observe, record, and ask questions about temperature, precipitation, and other weather data to identify patterns or changes in local weather.</p>	<p>There is air all around the Earth’s surface, but there is less and less further away from the surface (higher in the sky). Weather is determined by the conditions and movement of the air. The temperature, pressure, direction, speed of movement and the amount of water vapor in the air combine to create the weather. Measuring these properties over time enables patterns to be found that can be used to predict the weather a short time ahead.^{2 (p. 24)}</p> <p>Crosscutting Concepts: patterns; cause and effect; stability and change⁴</p>
K.E1U1.4	
<p>Observe, describe, ask questions, and predict seasonal weather patterns; and how those patterns impact plants and animals (including humans).</p>	
K.E2U1.5	
<p>Observe and ask questions about patterns of the motion of the sun, moon, and stars in the sky.</p>	<p>Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. At night one can see the light coming from many stars with the naked eye, but telescopes make it possible to see many more and to observe them and the moon and planets in greater detail.^{4 (p. 174)}</p> <p>Crosscutting Concepts: patterns; cause and effect; structure and function; stability and change⁴</p>

Arizona Science Standards

Life Sciences: Students develop an understanding that the world is comprised of living and non-living things. They investigate the relationship between structure and function in living things; plants and animals use specialized parts to help them meet their needs and survive.

Life Science Standards	Learning Progressions, Key Terms, and Crosscutting Concepts
K.L1U1.6	
<p>Obtain, evaluate, and communicate information about how organisms use different body parts for survival.</p>	<p>All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water, and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive, grow, and produce more plants. ^{4(p. 144)} Animals have body parts that capture and convey different kinds of information needed for growth and survival—for example, eyes for light, ears for sounds, and skin for temperature or touch. Animals respond to these inputs with behaviors that help them survive (e.g., find food, run from a predator)^{4 (p. 149)}</p>
K.L1U1.7	<p>Observe, ask questions, and explain how specialized structures found on a variety of plants and animals (including humans) help them sense and respond to their environment.</p> <p>Crosscutting Concepts: patterns; cause and effect; structure and function ⁴</p>
K.L2U1.8	
<p>Observe, ask questions, and explain the differences between the characteristics of living and non-living things.</p>	<p>There is a wide variety of living things (organisms), including plants and animals. They are distinguished from non-living things by their ability to move, reproduce, and react to certain stimuli.^{2 (p. 26)}</p> <p>Crosscutting Concepts: patterns; structure and function⁴</p>