

First Grade: Focus on Cause and Effect; Stability and Change (cycles)

By the end of first grade, students make observations to understand the connections between earth materials and the ability for Earth to sustain a variety of organisms. Students learn how objects can impact other objects from a distance or by contact with each other, how organisms interact with earth materials for survival, and how life systems have cycles. 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 first grade focus on helping students understand phenomena through cause and effect and stability and change.

| Core Ideas for Knowing Science* | Core Ideas for Using Science* |
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| <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 develop an understanding of the effects of forces and waves, and how they can impact or be impacted by objects near and far away. They explore the relationships between sound and vibrating materials, as well as light and materials including the ability of sound and light to travel from place to place.

| Physical Science Standards | Learning Progressions, Key Terms, and Crosscutting Concepts |
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| 1.P2U1.1 | |
| <p>Plan and carry out investigations demonstrating the effect of placing objects made with different materials in the path of a beam of light and predict how objects with similar properties will affect the beam of light.</p> | <p>Some materials allow light to pass through them, others allow only some light through, and others block all the light and create a dark shadow on any surface beyond them (i.e., on the other side from the light source), where the light cannot reach. Mirrors and prisms can be used to redirect a light beam. ⁴ (p. 134-135) Light and sound are wavelike phenomena. Sound can make matter vibrate, and vibrating matter can make sound. ⁴ (p. 132)</p> |
| 1.P2U1.2 | |
| <p>Use models to provide evidence that vibrating matter creates sound and sound can make matter vibrate.</p> | <p>Crosscutting Concepts: cause and effect; systems and system models; energy and matter; stability and change ⁴</p> |
| 1.P3U1.3 | |
| <p>Plan and carry out investigations which demonstrate how equal forces can balance objects and how unequal forces can push, pull, or twist objects, making them change their speed, direction, or shape.</p> | <p>Forces can push, pull or twist objects, making them change their motion or shape. Forces act in particular directions. Equal forces acting in opposite directions in the same line cancel each other and are described as being in balance. The movement of objects is changed if the forces acting on them are not in balance. ²(p. 22)</p> <p>Crosscutting Concepts: cause and effect; systems and system models; energy and matter; stability and change ⁴</p> |
| 1.P4U2.4 | |
| <p>Design and evaluate ways to increase or reduce heat from friction between two objects.</p> | <p>When two objects rub against each other, this interaction is called friction. Friction between two surfaces can warm both of them (e.g., rubbing hands together). There are ways to reduce the friction between two objects.⁴ (p. 129) 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: cause and effect; systems and system models; energy and matter; stability and change; ⁴</p> |

Arizona Science Standards

Earth and Space Sciences: Students develop an understanding that earth materials are essential for organisms survival.

| Earth and Space Standards | Learning Progressions, Key Terms, and Crosscutting Concepts |
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| 1.E1U1.5 | |
| <p>Obtain, evaluate, and communicate information about the properties of Earth materials and investigate how humans use natural resources in everyday life.</p> | <p>Wind and water can change the shape of the land. The resulting landforms, together with the materials on the land, provide homes for living things.^{4 (p. 180)} Humans use natural resources for everything they do: for example, they use soil and water to grow food, wood to burn to provide heat or to build shelters, and materials such as iron or copper (minerals) extracted from Earth to make cooking pans.^{4 (p. 192)}</p> <p>Crosscutting Concepts: cause and effect; systems and system models; energy and matter; stability and change⁴</p> |

Life Sciences: Students develop an understanding that Earth has supported, and continues to support, a large variety of organisms. These organisms can be distinguished by their physical characteristics, life cycles, and their different resource needs for survival. Different types of organisms live where there are different earth resources such as food, air, and water.

| Life Science Standards | Learning Progressions, Key Terms, and Crosscutting Concepts |
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| 1.L1U1.6 | |
| <p>Observe, describe, and predict life cycles of animals and plants.</p> | <p>Plants and animals have predictable characteristics at different stages of development. Plants and animals grow and change. Adult plants and animals can have young.^{4(p. 146)}</p> <p>Crosscutting Concepts: cause and effect; structure and function; stability and change⁴</p> |
| 1.L2U2.7 | |
| <p>Develop and use models about how living things use resources to grow and survive; design and evaluate habitats for organisms using earth materials.</p> | <p>Animals depend on their surroundings to get what they need, including food, water, shelter, and a favorable temperature. Animals depend on plants or other animals for food. They use their senses to find food and water, and they use their body parts to gather, catch, eat, and chew the food. Plants depend on air, water, minerals (in the soil), and light to grow. Animals can move around, but plants cannot, and they often depend on animals for pollination or to move their seeds around. Different plants survive better in different settings because they have varied</p> |
| 1.L2U1.8 | |

Arizona Science Standards

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| <p>Construct an explanation describing how organisms obtain resources from the environment including materials that are used again by other organisms.</p> | <p>needs for water, minerals, and sunlight ^{4.(.151)} Animals need food that they can break down, which comes either directly by eating plants (herbivores) or by eating animals (carnivores) which have eaten plants or other animals. ^{2.(p.27)} 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: cause and effect; systems and system models; energy and matter; structure and function; stability and change⁴</p> |
| <p>1.13U1.9</p> | |
| <p>Obtain, evaluate, and communicate information to support an evidence-based explanation that plants and animals produce offspring of the same kind, but offspring are generally not identical to each other or their parents.</p> | <p>Living things produce offspring of the same kind, but offspring are not identical with each other or with their parents. Plants and animals, including humans, resemble their parents in many features because information is passed from one generation to the next.^{2.(p.22)} Organisms have characteristics that can be similar or different. Young animals are very much, but not exactly, like their parents and also resemble other animals of the same kind. Plants also are very much, but not exactly, like their parents and resemble other plants of the same kind.^{4.(p.158)}</p> <p>Crosscutting Concepts: cause and effect; structure and function; stability and change ⁴</p> |
| <p>1.14U1.10</p> | |
| <p>Develop a model to describe how animals and plants are classified into groups and subgroups according to their similarities.</p> | <p>There are many different kinds of plants and animals in the world today and many kinds that once lived but are now extinct. We know about these from fossils. Animals and plants are classified into groups and subgroups according to their similarities.^{2.(p.29)} Some kinds of plants and animals that once lived on Earth (e.g., dinosaurs) are no longer found anywhere, although others now living (e.g., lizards) resemble them in some ways.^{4.(p.162)}</p> |
| <p>1.14U3.11</p> | |
| <p>Ask questions and explain how factors can cause species to go extinct.</p> | <p>Crosscutting Concepts: cause and effect; systems and system models; energy and matter; structure and function; stability and change⁴</p> |