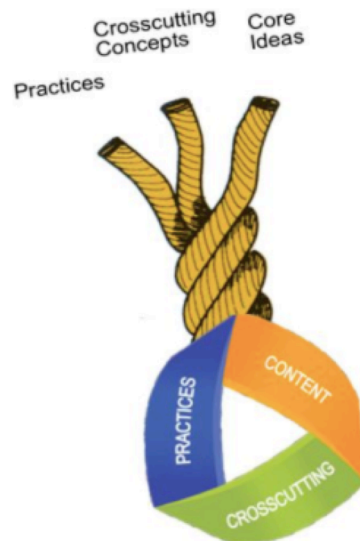


Arizona K-2 Crosscutting Concept Elements

and

Science and Engineering Practices Elements



K-2 Crosscutting Elements

Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

- Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

- Events have causes that generate observable patterns.
- Simple tests can be designed to gather evidence to support or refute student ideas about causes.

K-2 Crosscutting Elements

Scale, Proportion, and Quantity – In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

- Relative scales allow objects and events to be compared and described (e.g., bigger and smaller; hotter and colder; faster and slower).
- Standard units are used to measure length.

Systems and System Models – A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

- Objects and organisms can be described in terms of their parts.
- Systems in the natural and designed world have parts that work together.

K-2 Crosscutting Elements

Energy and Matter: Flows, Cycles, and Conservation – Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.

- Objects may break into smaller pieces, be put together into larger pieces, or change shapes.

Structure and Function – The way an object is shaped or structured determines many of its properties and functions.

- The shape and stability of structures of natural and designed objects are related to their function(s).

Stability and Change – For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

- Some things stay the same while other things change.
- Things may change slowly or rapidly.

K-2 Science & Engineering Practices Elements

Asking Questions and Defining Problems

- Ask questions based on observations of the natural and/or designed world.
- Define a simple problem that can be solved through the development of a new or improved object or tool.

Developing and Using Models

- Distinguish between a model and the actual object, process, and/or events the model represents.
- Compare models to identify common features and differences.
- Develop and/or use models (i.e., diagrams, drawings, physical replicas, dioramas, dramatizations, or storyboards) that represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed worlds.
- Develop a simple model that represents a proposed object or tool.

K-2 Science & Engineering Practices Elements

Planning and Carrying Out Investigations

- With guidance, design and conduct investigations in collaboration with peers.
- Design and conduct investigations collaboratively.
- Evaluate different ways of observing and/or measuring an attribute of interest.
- Make direct or indirect observations and/or measurements to collect data, which can be used to make comparisons.
- Identify questions and make predictions based on prior experiences.
- Make direct or indirect observations and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal.

K-2 Science & Engineering Practices Elements

Analyzing and Interpreting Data

- Use and share pictures, drawings, and/or writings of observations.
- Use observations to describe patterns and/or relationships in the natural and designed worlds in order to answer scientific questions and solve problems.
- Make measurements of length to quantify data.
- Analyze data from tests of an object or tool to determine if a proposed object or tool functions as intended.

K-2 Science & Engineering Practices Elements

Using Mathematical and Computational Thinking

- Decide when to use qualitative vs. quantitative data.
- Use counting and numbers to identify and describe patterns in the natural and designed worlds.
- Describe, measure, and compare quantitative attributes of different objects and display the data using simple graphs.
- Use quantitative data to compare two alternative solutions to a problem.

K-2 Science & Engineering Practices Elements

Constructing Explanations and Designing Solutions

- Use information from direct or indirect observations to construct explanations.
- Use tools and materials provided to design a device or solution to a specific problem.
- Distinguish between opinions and evidence in one's own explanations.
- Generate and compare multiple solutions to a problem.

Engaging in Argument from Evidence

- Identify arguments that are supported by evidence.
- Listen actively to others' explanations and arguments and ask questions for clarification.
- Make a claim about the effectiveness of an object, tool, or solution that is based on relevant evidence.

K-2 Science & Engineering Practices Elements

Obtaining, Evaluating, and Communicating Information

- Read and comprehend grade-appropriate texts and media to acquire scientific and/or technical information.
- Critique and/or communicate information or design ideas and/or solutions with others in oral and/or written forms using models, drawings, writing, or numbers.
- Record observations, thoughts, and ideas.
- Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.
- Obtain information by using various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons).