

Prepared Graduates:

2. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding interactions between objects and within systems of objects.

Grade Level Expectation:

1. Patterns of motion can be used to predict future motion.

Evidence Outcomes

Students Can:

- a. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. (3-PS2-1)
(Clarification Statement: Examples could include an unbalanced force on one side of a ball can make it start moving and balanced forces pushing on a box from both sides will not produce any motion at all.) (Boundary Statements: Limited to one variable at a time: number, size or direction of forces and to gravity being addressed as a force that pulls objects down. Does not include quantitative force size, only qualitative and relative.)
- b. Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. (3-PS2-2)
(Clarification Statement: Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl and two children on a see-saw.) (Boundary Statement: Does not include technical terms such as period and frequency.)

Academic Context and Connections

Colorado Essential Skills and Science and Engineering Practices:

1. Ask questions that can be investigated based on patterns such as cause and effect relationships. (Asking Questions and Defining Problems) (Entrepreneurial: Inquiry/Analysis)
2. Define a simple problem that can be solved through the development of a new or improved object or tool. (Asking Questions and Defining Problems) (Entrepreneurial: Inquiry/Analysis)
3. Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (Planning and Carrying Out Investigations) (Entrepreneurial: Inquiry/Analysis)
4. Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (Planning and Carrying Out Investigations) (Entrepreneurial: Inquiry/Analysis)



Elaboration on the GLE:

1. Students can answer the questions: How can one predict an object's continued motion, changes in motion or stability? What underlying forces explain the variety of interactions observed?
2. PS2:A Forces and Motion: Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces is used at this level). The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.)
3. PS2:B Types of Interactions: Objects in contact exert forces on each other.

Cross Cutting Concepts:

1. Cause and Effect: Cause - and - effect relationships are routinely identified.
2. Patterns: Patterns of change can be used to make predictions.

Prepared Graduates:

3. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how energy is transferred and conserved.

Grade Level Expectation:

2. Objects in contact exert forces on each other; electric and magnetic forces between a pair of objects do not require contact.

Evidence Outcomes

Students Can:

- a. Ask questions to determine cause - and - effect relationships of electric or magnetic interactions between two objects not in contact with each other. (3-PS2-3) *(Clarification Statement: Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause - and - effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.) (Boundary Statement: Limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.)*
- b. Define a simple design problem that can be solved by applying scientific ideas about magnets. (3-PS2-4) *(Clarification Statement: Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.)*

Academic Context and Connections

Colorado Essential Skills and Science and Engineering Practices:

1. Ask questions that can be investigated based on patterns such as cause - and - effect relationships. (Asking Questions and Defining Problems) (Entrepreneurial: Inquiry/Analysis).
2. Define a simple problem that can be solved through the development of a new or improved object or tool. (Asking Questions and Defining Problems) (Personal: Personal responsibility).
3. Plan and conduct an investigation that control variables and provide evidence to support explanations or design solutions. (Planning and Carrying Out Investigations) (Entrepreneurial: Inquiry/Analysis).

Elaboration on the GLE:

1. Students can answer the question: Why are some physical systems more stable than others?
2. PS2:B Types of Interactions: Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and for forces between two magnets on their orientation relative to each other.

Cross Cutting Concepts:

1. Cause and Effect: Cause and effect relationships are routinely identified, tested and used to explain change.
2. Connections to Engineering, Technology and Applications of Science: Interdependence of Science, Engineering and Technology-Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the engineering design process.



Prepared Graduates:

5. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how individual organisms are configured and how these structures function to support life, growth, behavior and reproduction.

Grade Level Expectation:

1. Organisms have unique and diverse life cycles.

Evidence Outcomes

Students Can:

- a. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction and death. (3-LS1-1) (*Clarification Statement: Changes organisms go through during their life form a pattern.*) (*Boundary Statement: Limited to those of flowering plants and does not include details of human reproduction.*)

Academic Context and Connections

Colorado Essential Skills and Science and Engineering Practices:

1. Develop models to describe phenomena (Developing and Using Models) (Personal: Initiative/Self-direction).

Elaboration on the GLE:

1. Students can answer the question: How do the structures of organisms enable life's functions?
2. LS1:B Growth and Development of Organisms: Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles.

Cross Cutting Concepts:

1. Patterns: Patterns of change can be used to make predictions.



Prepared Graduates:

6. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how living systems interact with the biotic and abiotic environment.

Grade Level Expectation:

2. Being part of a group helps animals obtain food, defend themselves and cope with changes.

Evidence Outcomes

Students Can:

- a. Construct an argument that some animals form groups that help members survive. (3-LS2-1)

Academic Context and Connections

Colorado Essential Skills and Science and Engineering Practices:

1. Construct an argument with evidence, data and/or a model. (Engaging in Argument from Evidence) (Personal: Initiative/Self-direction)

Elaboration on the GLE:

1. Students can answer the question: How do organisms interact with the living and nonliving environments to obtain matter and energy?
2. LS2:D Social Interactions and Group Behavior: Being part of a group helps animals obtain food, defend themselves and cope with changes. Groups may serve different functions and vary dramatically in size.

Cross Cutting Concepts:

1. Cause and Effect: Cause - and - effect relationships are routinely identified and used to explain change.

Prepared Graduates:

7. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how genetic and environmental factors influence variation of organisms across generations.

Grade Level Expectation:

3. Different organisms vary in how they look and function because they have different inherited information; the environment also affects the traits that an organism develops.

Evidence Outcomes

Students Can:

- a. Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. (3-LS3-1) *(Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.) (Boundary Statement: Does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.)*
- b. Use evidence to support the explanation that traits can be influenced by the environment. (3-LS3-2) *(Clarification Statement: Examples of the environment affecting a trait could that include normally tall plants grown with insufficient water are stunted; and a pet dog that is given too much food and little exercise may become overweight.)*

Academic Context and Connections

Colorado Essential Skills and Science and Engineering Practices:

1. Analyze and interpret data to make sense of phenomena using logical reasoning. (Analyzing and Interpreting Data) (Entrepreneurial: Critical thinking/Problem solving)
2. Use evidence (e.g., observations, patterns) to support an explanation. (Constructing Explanations and Designing Solutions) (Entrepreneurial: Critical thinking/Problem solving)

3. Use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. (Constructing Explanations and Designing Solutions) (Entrepreneurial: Critical thinking/Problem solving)

Elaboration on the GLE:

1. Students can answer the questions: How are the characteristics of one generation related to the previous generation? Why do individuals of the same species vary in how they look, function and behave?
2. LS3:A Inheritance of Traits: Many characteristics of organisms are inherited from their parents. Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment.
3. LS3:B Variation of Traits: Different organisms vary in how they look and function because they have different inherited information. The environment also affects the traits that an organism develops.

Cross Cutting Concepts:

1. Patterns: Similarities and differences in patterns can be used to sort and classify natural phenomena.
2. Cause and Effect: Cause - and - effect relationships are routinely identified and used to explain change.

Prepared Graduates:

7. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how genetic and environmental factors influence variation of organisms across generations.

Grade Level Expectation:

4. Some living organisms resemble organisms that once lived on Earth .

Evidence Outcomes

Students Can:

- a. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. (3-LS4-1)
(Clarification Statement: Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas and fossils of extinct organisms.) (Boundary Statement: Does not include identification of specific fossils or present plants and animals and is limited to major fossil types and relative ages.)
- b. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates and reproducing. (3-LS4-2)
(Clarification Statement: Examples of cause - and - effect relationships could be that plants that have larger thorns than other plants may be less likely to be eaten by predators; and animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.)

Academic Context and Connections

Colorado Essential Skills and Science and Engineering Practices:

1. Analyze and interpret data to make sense of phenomena using logical reasoning. (Analyzing and Interpreting Data) (Entrepreneurial: Critical thinking/Problem solving).

2. Use evidence (e.g., observations, patterns) to construct an explanation. (Constructing Explanations and Designing Solutions) (Entrepreneurial: Critical thinking/Problem solving).
3. Critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). (Engaging in Argument from Evidence) (Entrepreneurial: Critical thinking/Problem solving).

Elaboration on the GLE:

1. Students can answer the questions: What evidence shows that different species are related? How does genetic variation among organisms affect survival and reproduction?
2. LS4:A Evidence of Common Ancestry and Diversity: Some kinds of plants and animals that once lived on Earth are no longer found anywhere. Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.
3. LS4:B Natural Selection: Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates and reproducing.

Cross Cutting Concepts:

1. Scale, Proportion and Quantity: Observable phenomena exist from very short to very long time periods.
2. Systems and System Models
3. Cause and Effect: Cause - and - effect relationships are routinely identified and used to explain change.

Prepared Graduates:

8. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how natural selection drives biological evolution accounting for the unity and diversity of organisms.

Grade Level Expectation:

5. Sometimes differences in characteristics between individuals of the same species provide advantages in survival and reproduction.

Evidence Outcomes

Students Can:

- a. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well and some cannot survive at all. (3-LS4-3) (*Clarification Statement: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.*)
- b. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change. (3-LS4-4) (*Clarification Statement: Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food and other organisms.*) (*Boundary Statement: Limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.*)

Academic Context and Connections

Colorado Essential Skills and Science and Engineering Practices:

1. Analyze and interpret data to make sense of phenomena using logical reasoning. (Analyzing and Interpreting Data) (Entrepreneurial: Critical thinking/Problem solving)
2. Use evidence to construct an explanation. (Constructing Explanations and Designing Solutions) (Personal: Initiative/Self-direction)

3. Construct an argument with evidence. (Engaging in Argument from Evidence) (Entrepreneurial: Critical thinking/Problem solving).
4. Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (Engaging in Argument from Evidence) (Entrepreneurial: Critical thinking/Problem solving).

Elaboration on the GLE:

1. Students can answer the questions: How does the environment influence populations of organisms over multiple generations? What is biodiversity, how do humans affect it, and how does it affect humans?
2. LS2.C Ecosystem Dynamics, Functioning, and Resilience: When the environment changes in ways that affect a place's characteristics, temperature or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.
3. LS4:C Adaptation: For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.
4. LS4:D Biodiversity and Humans: Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

Cross Cutting Concepts:

1. Cause and Effect: Cause - and - effect relationships are routinely identified and used to explain change.
2. Systems and System Models: A system can be described in terms of its components and their interactions.





Prepared Graduates:

10. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how and why Earth is constantly changing.

Grade Level Expectation:

1. Climate describes patterns of typical weather conditions over different scales and variations; historical weather patterns can be analyzed.

Evidence Outcomes

Students Can:

- a. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. (3-ESS2-1) (*Clarification Statement: Examples of data could include average temperature, precipitation, and wind direction. Obtain and combine information to describe climates in different regions of the world.*) (*Boundary Statement: Graphical displays are limited to pictographs and bar graphs. Does not include climate change.*)
- b. Obtain and combine information to describe climates in different regions of the world. (3-ESS2-2)

Academic Context and Connections

Colorado Essential Skills and Science and Engineering Practices:

1. Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. (Analyzing and Interpreting Data) (Entrepreneurial: Critical thinking/Problem solving)
2. Obtain and combine information from books and other reliable media to explain phenomena. (Obtaining, Evaluating, and Communicating Information) (Professional: Information literacy).

Elaboration on the GLE:

1. Students can answer the question: What regulates weather and climate?
2. ESS2:D Weather and Climate: Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years.

Cross Cutting Concepts:

1. Patterns: Patterns of change can be used to make predictions.





Prepared Graduates:

10. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how and why Earth is constantly changing.

Grade Level Expectation:

2. A variety of weather hazards result from natural process; humans cannot eliminate weather-related hazards but can reduce their impacts.

Evidence Outcomes

Students Can:

- a. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard. (3-ESS3-1) (*Clarification Statement: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs and lightning rods.*)

Academic Context and Connections

Colorado Essential Skills and Science and Engineering Practices:

1. Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (Engaging in Argument from Evidence) (Personal: Initiative/Self-direction).

Elaboration on the GLE:

1. Students can answer the question: How do natural hazards affect individuals and societies?
2. ESS3:B Natural Hazards: A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.

Cross Cutting Concepts:

1. Cause and Effect: Cause - and - effect relationships are routinely identified, tested and used to explain change.