SCIENCE ACADEMIES FOR GRADES K–4, PART 2

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Overview

Goal

The goal of this initiative is to improve the overall instruction and achievement of science classrooms in order to meet and/or exceed grade-level state standards and ensure postsecondary readiness.

This training will familiarize participants with the science Texas Essential Knowledge and Skills (TEKS) while strengthening their knowledge of the College and Career Readiness Standards (CCRS), Response to Intervention (RtI), and the English Language Proficiency Standards (ELPS). This training will also provide an opportunity for participants to garner professional support from other educators through shared resources and ongoing academic networking.

Master Schedule

Day 1

Introduction

Top Three Reasons Teaching K–4 Is Important

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Overview

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Big Takeaways

EARTH AND SPACE VERTICAL ALIGNMENT

Earth and Space

Grade/TEKS	Topic(s)	K	1	2	3	4	5	6	7	8	B	ES	ESS	CCRS
K(7)(A) The student is expected to observe, describe, compare, and sort rocks by size, shape, color, and texture.	properties of rocks	*										(4)(C) (6)(A)	(9)(B) (11)(A) (12)(A)	VII.A.1 IX.A.1 IX.E.4 X.A.1 X.A.2
1(7)(A) The student is expected to observe, compare, describe, and sort components of soil by size, texture, and color.	properties of soil		*									(5)(A) (5)(C) (5)(F) (9)(A) (9)(B) (9)(C)	(12)(A)	VII.A.1 VII.A.2 IX.A.1 X.A.1 X.E.5
2(7)(A) The student is expected to observe and describe rocks by size, texture, and color.	properties of rocks			*								(4)(C) (6)(A)	(9)(B) (11)(A) (12)(A)	VII.A.1 IX.A.1 IX.E.4 X.A.1 X.A.2
3(7)(A) The student is expected to explore and record how soils are formed by weathering of rock and the decomposition of plant and animal remains.	weathering				*						(11)(D)	(4)(C) (4)(D) (6)(A)	(11)(A)	VI.G.2 VI.G.4 IX.E.4 X.A.1 X.A.2
	decomposition				*						(11)(C) (12)(C) (12)(E)	(5)(F)		VI.F.2 VI.G.2 IX.F.1
	soil formation				*						(12)(E)	(5)(C) (6)(A) (9))A)	(12)(C)	VI.G.4 VII.A.2 IX.A.1 X.A.2 X.E.5
4(7)(B) The student is expected to observe and identify slow changes to Earth's surface caused by weathering, erosion, and deposition from water, wind, and ice.	weathering, erosion, and deposition					*					(11)(D)	(4)(C) (4)(D) (6)(A)	(11)(A)	VI.G.2 VI.G.4 IX.E.4 X.A.1 X.A.2

B = Biology; **ES** = Environmental Systems; **ESS** = Earth and Space Science; **CCRS** = College and Career Readiness Standards

Earth and Space

Kindergarten

Grade: Kindergarten

Strand: Earth and space

Lesson: Rocks Rock

TEKS:
K(7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to:
(A) observe, describe, compare, and sort rocks by size, shape, color, and texture

Topic: properties of rocks

CCRS Correlation

VII. Chemistry
- A. Matter and its properties
  1. Know that physical and chemical properties can be used to describe and classify matter.

IX. Earth and Space Sciences
- A. Earth systems
  1. Know the major features and characteristics of atmosphere, geosphere, hydrosphere, and biosphere.
- E. Plate tectonics
  4. Describe the rock cycle and its products.

X. Environmental Science
- A. Earth systems
  1. Recognize the Earth's systems.
  2. Know the major features of the geosphere and the factors that modify them.

Curriculum Correlation

Earth and Space Science
(9) Solid Earth. The student knows Earth's interior is differentiated chemically, physically, and thermally. The student is expected to:
(B) examine the chemical, physical, and thermal structure of Earth's crust, mantle, and core, including the lithosphere and asthenosphere

(11) Solid Earth. The student knows that the geosphere continuously changes over a range of time scales involving dynamic and complex interactions among Earth's subsystems. The student is expected to:
(A) compare the roles of erosion and deposition through the actions of water, wind, ice, gravity, and igneous activity by lava in constantly reshaping Earth's surface

Earth and Space

Kindergarten

(12) Solid Earth. The student knows that Earth contains energy, water, mineral, and rock resources and that use of these resources impacts Earth's subsystems. The student is expected to:

(A) evaluate how the use of energy, water, mineral, and rock resources affects Earth's subsystems

Environmental Systems

(4) Science concepts. The student knows the relationships of biotic and abiotic factors within habitats, ecosystems, and biomes. The student is expected to:

(C) diagram abiotic cycles, including the rock, hydrologic, carbon, and nitrogen cycles

(6) Science concepts. The student knows the sources and flow energy through an environmental system. The student is expected to:

(A) define and identify the components of the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere and the interactions among them

Grade 6

(6) Matter and energy. The student knows matter has physical properties that can be used for classification. The student is expected to:

(C) test the physical properties of minerals, including hardness, color, luster, and streak

(10) Earth and space. The student understands the structure of Earth, the rock cycle, and plate tectonics. The student is expected to:

(B) classify rocks as metamorphic, igneous, or sedimentary by the processes of their formation

Grade 5

(7) Earth and space. The student knows Earth's surface is constantly changing and consists of useful resources. The student is expected to:

(A) explore the processes that led to the formation of sedimentary rocks and fossil fuels

Grade 4

(7) Earth and space. The students know that Earth consists of useful resources and its surface is constantly changing. The student is expected to:

(A) examine properties of soils, including color and texture, capacity to retain water, and ability to support the growth of plants

(B) observe and identify slow changes to Earth's surface caused by weathering, erosion, and deposition from water, wind, and ice

Texas Education Agency

Earth and Space

Kindergarten

Grade 3

(7) Earth and space. The student knows that Earth consists of natural resources and its surface is constantly changing. The student is expected to:

(A) explore and record how soils are formed by weathering of rock and the decomposition of plant and animal remains

Grade 2

(7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to:

(A) observe and describe rocks by size, texture, and color

Grade 1

(7) Earth and space. The student knows that the natural world includes rocks, soil, and water that can be observed in cycles, patterns, and systems. The student is expected to:

(A) observe, compare, describe, and sort components of soil by size, texture, and color

Grade 1

Grade: Grade 1

Strand: Earth and space

Lesson: Soil: Let's Dig In

TEKS:

1(7) Earth and space. The student knows that the natural world includes rocks, soil, and water that can be observed in cycles, patterns, and systems. The student is expected to:

(A) observe, compare, describe, and sort components of soil by size, texture, and color

Topic: properties of soil

CCRS Correlation

VII. Chemistry

- A. Matter and its properties
  1. Know that physical and chemical properties can be used to describe and classify matter.
  2. Recognize and classify pure substances (elements, compounds) and mixtures.

IX. Earth and Space Sciences

- A. Earth systems
  1. Know the major features and characteristics of atmosphere, geosphere, hydrosphere, and biosphere.

X. Environmental Science

- A. Earth systems
  1. Recognize the Earth's systems.
- E. Human practices and their impacts
  5. Understand how human practices affect air, water, and soil quality.

Curriculum Correlation

Earth and Space Science

(12) Solid Earth. The student knows that Earth contains energy, water, mineral, and rock resources and that use of these resources impacts Earth's subsystems. The student is expected to:

(A) evaluate how the use of energy, water, mineral, and rock resources affects Earth's subsystems

Grade 1

Environmental Systems

(5) Science concepts. The student knows the interrelationships among the resources within the local environmental system. The student is expected to:

- (A) summarize methods of land use and management and describe its effects on land fertility
- (C) document the use and conservation of both renewable and non-renewable resources as they pertain to sustainability
- (F) evaluate the impact of waste management methods such as reduction, reuse, recycling, and composting on resource availability

(9) Science concepts. The student knows the impact of human activities on the environment. The student is expected to:

- (A) identify causes of air, soil, and water pollution, including point and nonpoint sources
- (B) investigate the types of air, soil, and water pollution such as chlorofluorocarbons, carbon dioxide, pH, pesticide runoff, thermal variations, metallic ions, heavy metals, and nuclear waste
- (C) examine the concentrations of air, soil, and water pollutants using appropriate units

Grade 8

(11) Organisms and environments. The student knows that interdependence occurs among living systems and the environment and that human activities can affect these systems. The student is expected to:

- (B) investigate how organisms and populations in an ecosystem depend on and may compete for biotic and abiotic factors such as quantity of light, water, range of temperatures, or soil composition

Grade 7

(8) Earth and space. The student knows that natural events and human activity can impact Earth systems. The student is expected to:

- (B) analyze the effects of weathering, erosion, and deposition on the environment in ecoregions of Texas

Grade 5

(7) Earth and space. The student knows Earth's surface is constantly changing and consists of useful resources. The student is expected to:

- (B) recognize how landforms such as deltas, canyons, and sand dunes are the result of changes to Earth's surface by wind, water, and ice

Grade 4

(7) Earth and space. The students know that Earth consists of useful resources and its surface is constantly changing. The student is expected to:

- (A) examine properties of soils, including color and texture, capacity to retain water, and ability to support the growth of plants
- (B) observe and identify slow changes to Earth's surface caused by weathering, erosion, and deposition from water, wind, and ice

Earth and Space

Grade 1

Grade 3

(7) Earth and space. The student knows that Earth consists of natural resources and its surface is constantly changing. The student is expected to:

(A) explore and record how soils are formed by weathering of rock and the decomposition of plant and animal remains

Grade 2

(7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to:

(A) observe and describe rocks by size, texture, and color

Grade 1

Kindergarten

(7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to:

(A) observe, describe, compare, and sort rocks by size, shape, color, and texture

Earth and Space

Grade 2

Grade: Grade 2

Strand: Earth and space

Lesson: Let's Talk about Rocks

TEKS:

2(7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to:

(A) observe and describe rocks by size, texture, and color

Topic: properties of rocks

CCRS Correlation

VII. Chemistry

A. Matter and its properties

1. Know that physical and chemical properties can be used to describe and classify matter.

IX. Earth and Space Sciences

A. Earth systems

1. Know the major features and characteristics of atmosphere, geosphere, hydrosphere, and biosphere.

E. Plate tectonics

4. Describe the rock cycle and its products.

X. Environmental Science

A. Earth systems

1. Recognize the Earth's systems.
2. Know the major features of the geosphere and the factors that modify them.

Curriculum Correlation

Earth and Space Science

(9) Solid Earth. The student knows Earth's interior is differentiated chemically, physically, and thermally. The student is expected to:

(B) examine the chemical, physical, and thermal structure of Earth's crust, mantle, and core, including the lithosphere and asthenosphere

(11) Solid Earth. The student knows that the geosphere continuously changes over a range of time scales involving dynamic and complex interactions among Earth's subsystems. The student is expected to:

(A) compare the roles of erosion and deposition through the actions of water, wind, ice, gravity, and igneous activity by lava in constantly reshaping Earth's surface

Earth and Space

Grade 2

(12) Solid Earth. The student knows that Earth contains energy, water, mineral, and rock resources and that use of these resources impacts Earth's subsystems. The student is expected to:

- (A) evaluate how the use of energy, water, mineral, and rock resources affects Earth's subsystems

Environmental Systems

(4) Science concepts. The student knows the relationships of biotic and abiotic factors within habitats, ecosystems, and biomes. The student is expected to:

- (C) diagram abiotic cycles, including rock, hydrologic, carbon, and nitrogen cycles

(6) Science concepts. The student knows the sources and flow of energy through an environmental system. The student is expected to:

- (A) define and identify the components of the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere and the interactions among them

Grade 6

(6) Matter and energy. The student knows matter has physical properties that can be used for classification. The student is expected to:

- (C) test the physical properties of minerals, including hardness, color, luster, and streak

(10) Earth and space. The student understands the structure of Earth, the rock cycle, and plate tectonics. The student is expected to:

- (B) classify rocks as metamorphic, igneous, or sedimentary by the processes of their formation

Grade 5

(7) Earth and space. The student knows Earth's surface is constantly changing and consists of useful resources. The student is expected to:

- (A) explore the processes that led to the formation of sedimentary rocks and fossil fuels

Grade 4

(7) Earth and space. The students know that Earth consists of useful resources and its surface is constantly changing. The student is expected to:

- (A) examine properties of soils, including color and texture, capacity to retain water, and ability to support the growth of plants
- (B) observe and identify slow changes to Earth's surface caused by weathering, erosion, and deposition from water, wind, and ice

Texas Education Agency

Earth and Space

Grade 2

Grade 3

(7) Earth and space. The student knows that Earth consists of natural resources and its surface is constantly changing. The student is expected to:

(A) explore and record how soils are formed by weathering of rock and the decomposition of plant and animal remains

Grade 2

Grade 1

(7) Earth and space. The student knows that the natural world includes rocks, soil, and water that can be observed in cycles, patterns, and systems. The student is expected to:

(A) observe, compare, describe, and sort components of soil by size, texture, and color

Kindergarten

(7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to:

(A) observe, describe, compare, and sort rocks by size, shape, color, and texture

Earth and Space

Grade 3

Grade: 3

Strand: Earth and space

Lesson: Where Does Soil Come From?

TEKS:
3(7) Earth and space. The student knows that Earth consists of natural resources and its surface is constantly changing. The student is expected to:

- (A) explore and record how soils are formed by weathering of rock and the decomposition of plant and animal remains

Topic: weathering

CCRS Correlation

VI. Biology

- G. Ecology
  - 2. Know patterns of energy flow and material cycling in Earth's ecosystems.
  - 4. Know the process of succession.

IX. Earth and Space Sciences

- E. Plate tectonics
  - 4. Describe the rock cycle and its products.

X. Environmental Science

- A. Earth systems
  - 1. Recognize the Earth's systems.
  - 2. Know the major features of the geosphere and the factors that modify them.

Curriculum Correlation

Earth and Space Science
(11) Solid Earth. The student knows that the geosphere continuously changes over a range of time scales involving dynamic and complex interactions among Earth's subsystems. The student is expected to:

- (A) compare the roles of erosion and deposition through the actions of water, wind, ice, gravity, and igneous activity by lava in constantly reshaping Earth's surface

Earth and Space

Grade 3

Environmental Systems

(4) Science concepts. The student knows the relationships of biotic and abiotic factors within habitats, ecosystems, and biomes. The student is expected to:

- (C) diagram abiotic cycles, including the rock, hydrologic, carbon, and nitrogen cycles
- (D) make observations and compile data about fluctuations in abiotic cycles and evaluate the effects of abiotic factors on local ecosystems and local biomes

(6) Science concepts. The student knows the sources and flow of energy through an environmental system. The student is expected to:

- (A) define and identify the components of the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere and the interactions among them

Biology

(11) Science concepts. The student knows that biological systems work to achieve and maintain balance. The student is expected to:

- (D) describe how events and processes that occur during ecological succession can change populations and species diversity

Grade 8

(9) Earth and space. The student knows that natural events can impact Earth systems. The student is expected to:

- (C) interpret topographic maps and satellite views to identify land and erosional features and predict how these features may be reshaped by weathering

Grade 7

(8) Earth and space. The student knows that natural events and human activity can impact Earth systems. The student is expected to:

- (B) analyze the effects of weathering, erosion, and deposition on the environment in ecoregions of Texas

(10) Organisms and environments. The student knows that there is a relationship between organisms and the environment. The student is expected to:

- (C) observe, record, and describe the role of ecological succession such as in a microhabitat of a garden with weeds

Grade 6

(10) Earth and space. The student understands the structure of Earth, the rock cycle, and plate tectonics. The student is expected to:

- (B) classify rocks as metamorphic, igneous, or sedimentary by the processes of their formation

Earth and Space

Grade 3

Grade 5

(7) Earth and space. The student knows Earth's surface is constantly changing and consists of useful resources. The student is expected to:

- (A) explore the processes that led to the formation of sedimentary rocks and fossil fuels
- (B) recognize how landforms such as deltas, canyons, and sand dunes are the result of changes to Earth's surface by wind, water, and ice

Grade 4

(7) Earth and space. The students know that Earth consists of useful resources and its surface is constantly changing. The student is expected to:

- (A) examine properties of soils, including color and texture, capacity to retain water, and ability to support the growth of plants
- (B) observe and identify slow changes to Earth's surface caused by weathering, erosion, and deposition from water, wind, and ice

Grade 3

Grade 2

(7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to:

- (A) observe and describe rocks by size, texture, and color

Grade 1

(7) Earth and space. The student knows that the natural world includes rocks, soil, and water than can be observed in cycles, patterns, and systems. The student is expected to:

- (A) observe, compare, describe, and sort components of soil by size, texture, and color

Kindergarten

(7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to:

- (A) observe, describe, compare, and sort rocks by size, shape, color, and texture

3(7)(A)
Topic: decomposition
CCRS Correlation
VI. Biology F. Systems and homeostasis 2. Describe, compare, and contrast structures and processes that allow gas exchange, nutrient uptake and processing, waste excretion, nervous and hormonal regulation, and reproduction in plants, animals, and fungi; give examples of each. **G. Ecology** 2. Know patterns of energy flow and material cycling in Earth's ecosystems. **IX. Earth and Space Sciences** F. Energy transfer within and among systems 1. Describe matter and energy transfer in the Earth's systems.
Curriculum Correlation
Environmental Systems (5) Science concepts. The student knows the interrelationships among the resources within the local environmental system. The student is expected to: (F) evaluate the impact of waste management methods such as reduction, reuse, recycling, and composting on resource availability **Biology** (11) Science concepts. The student knows that biological systems work to achieve and maintain balance. The student is expected to: (C) summarize the role of microorganisms in both maintaining and disrupting the health of both organisms and ecosystems (12) Science concepts. The student knows that interdependence and interactions occur within an environmental system. The student is expected to: (C) analyze the flow of matter and energy through trophic levels using various models, including food chains, food webs, and ecological pyramids (E) describe the flow of matter through the carbon and nitrogen cycles and explain the consequences of disturbing these cycles

Earth and Space

Grade 3

Grade 8

(11) Organisms and environments. The student knows that interdependence occurs among living systems and the environment and that human activities can affect these systems. The student is expected to:

- (B) investigate how organisms and populations in an ecosystem depend on and may compete for biotic and abiotic factors such as quantity of light, water, range of temperatures, or soil composition

Grade 7

(5) Matter and energy. The student knows that interactions occur between matter and energy. The student is expected to:

- (B) demonstrate and explain the cycling of matter within living systems such as in the decay of biomass in a compost bin

Grade 6

(12) Organisms and environments. The student knows all organisms are classified into Domains and Kingdoms. Organisms within these taxonomic groups share similar characteristics which allow them to interact with the living and nonliving parts of their ecosystem. The student is expected to:

- (E) describe biotic and abiotic parts of an ecosystem in which organisms interact

Grade 5

(9) Organisms and environments. The student knows that there are relationships, systems, and cycles within environments. The student is expected to:

- (B) describe how the flow of energy derived from the Sun, used by produces to create their own food, is transferred through a food chain and food web to consumers and decomposers

Grade 4

(9) Organisms and environments. The student knows and understands that living organisms within an ecosystem interact with one another and with their environment. The student is expected to:

- (B) describe the flow of energy through food webs, beginning with the Sun, and predict how changes in the ecosystem affect the food web such as a fire in a forest

Grade 3

Texas Education Agency

Earth and Space

Grade 3

3(7)(A)

Topic: soil formation

CCRS Correlation

VI. Biology
- G. Ecology
  - 4. Know the process of succession.

VII. Chemistry
- A. Matter and its properties
  - 2. Recognize and classify pure substances (elements, compounds) and mixtures.

IX. Earth and Space Sciences
- A. Earth systems
  - 1. Know the major features and characteristics of atmosphere, geosphere, hydrosphere, and biosphere.

X. Environmental Science
- A. Earth systems
  - 2. Know the major features of the geosphere and the factors that modify them.
- E. Human practices and their impacts
  - 5. Understand how human practices affect air, water, and soil quality.

Curriculum Correlation

Earth and Space Science

(12) Solid Earth. The student knows that Earth contains energy, water, mineral, and rock resources and that use of these resources impacts Earth's subsystems. The student is expected to:

(C) discriminate between renewable and nonrenewable resources based upon rate of formation and use

Environmental Systems

(5) Science concepts. The student knows the interrelationships among the resources within the local environmental system. The student is expected to:

(C) document the use and conservation of both renewable and non-renewable resources as they pertain to sustainability

(6) Science concepts. The student knows the sources and flow of energy through an environmental system. The student is expected to:

(A) define and identify the components of the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere and the interactions among them

(9) Science concepts. The student knows the impact of human activities on the environment. The student is expected to:

(A) identify the causes of air, soil, and water pollution, including point and nonpoint sources

Earth and Space

Grade 3

Biology

(12) Science concepts. The student knows that interdependence and interactions occur within an environmental system. The student is expected to:

- (E) describe the flow of matter through the carbon and nitrogen cycles and explain the consequences of disrupting these cycles

Grade 8

(11) Organisms and environments. The student knows that interdependence occurs among living systems and the environment and that human activities can affect these systems. The student is expected to:

- (B) investigate how organisms and populations in an ecosystem depend on and may compete for biotic and abiotic factors such as quantity of light, water, range of temperatures, or soil composition

Grade 7

(10) Organisms and environments. The student knows that there is a relationship between organisms and the environment. The student is expected to:

- (C) observe, record, and describe the role of ecological succession such as in a microhabitat of a garden with weeds

Grade 6

(12) Organisms and environments. The student knows all organisms are classified into Domains and Kingdoms. Organisms within these taxonomic groups share similar characteristics which allow them to interact with the living and nonliving parts of their ecosystem. The student is expected to:

- (E) describe biotic and abiotic parts of an ecosystem in which organisms interact

Grade 5

(9) Organisms and environments. The student knows that there are relationships, systems, and cycles within environments. The student is expected to:

- (A) observe the way organisms live and survive in their ecosystem by interacting with the living and non-living elements

Grade 4

(7) Earth and space. The students know that Earth consists of useful resources and its surface is constantly changing. The student is expected to:

- (A) examine properties of soils, including color and texture, capacity to retain water, and ability to support the growth of plants

Grade 3

Texas Education Agency

Earth and Space

Grade 3

Grade 2

(7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to:

(A) observe and describe rocks by size, texture, and color

Grade 1

(7) Earth and space. The student knows that the natural world includes rocks, soil, and water that can be observed in cycles, patterns, and systems. The student is expected to:

(A) observe, compare, describe, and sort components of soil by size, texture, and color

Kindergarten

(7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to:

(A) observe, describe, compare, and sort rocks by size, shape, color, and texture

Earth and Space

Grade 4

Grade: Grade 4
Strand: Earth and space
Lesson: Slow Changes
TEKS: 4(7) Earth and space. The students know that Earth consists of useful resources and its surface is constantly changing. The student is expected to: (B) observe and identify slow changes to Earth's surface caused by weathering, erosion, and deposition from water, wind, and ice
Topic: WED Processes
CCRS Correlation
VI. Biology G. Ecology 2. Know patterns of energy flow and material cycling in Earth's ecosystems. 4. Know the process of succession. **IX. Earth and Space Sciences** E. Plate tectonics 4. Describe the rock cycle and its products. **X. Environmental Science** A. Earth systems 1. Recognize the Earth's systems. 2. Know the major features of the geosphere and the factors that modify them.
Curriculum Correlation
Earth and Space Science (11) Solid Earth. The student knows that the geosphere continuously changes over a range of time scales involving dynamic and complex interactions among Earth's subsystems. The student is expected to: (A) compare the roles of erosion and deposition through the actions of water, wind, ice, gravity, and igneous activity by lava in constantly reshaping Earth's surface

Earth and Space

Grade 4

Environmental Systems

(4) Science concepts. The student knows the relationships of biotic and abiotic factors within habitats, ecosystems, and biomes. The student is expected to:

- (C) diagram abiotic cycles, including the rock, hydrologic, carbon, and nitrogen cycles
- (D) make observations and compile data about fluctuations in abiotic cycles and evaluate the effects of abiotic factors on local ecosystems and local biomes

(6) Science concepts. The student knows the sources and flow of energy through an environmental system. The student is expected to:

- (A) define and identify the components of the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere and the interactions among them

Biology

(11) Science concepts. The student knows that biological systems work to achieve and maintain balance. The student is expected to:

- (D) describe how events and processes that occur during ecological succession can change populations and species diversity

Grade 8

(9) Earth and space. The student knows that natural events can impact Earth systems. The student is expected to:

- (C) interpret topographic maps and satellite views to identify land and erosional features and predict how these features may be reshaped by weathering

Grade 7

(8) Earth and space. The student knows that natural events and human activity can impact Earth systems. The student is expected to:

- (B) analyze the effects of weathering, erosion, and deposition on the environment in ecoregions of Texas

(10) Organisms and environments. The student knows that there is a relationship between organisms and the environment. The student is expected to:

- (C) observe, record, and describe the role of ecological succession such as in a microhabitat of a garden with weeds

Grade 6

(10) Earth and space. The student understands the structure of Earth, the rock cycle, and plate tectonics. The student is expected to:

- (B) classify rocks as metamorphic, igneous, or sedimentary by the processes of their formation

Earth and Space

Grade 4

Grade 5

(7) Earth and space. The student knows Earth's surface is constantly changing and consists of useful resources. The student is expected to:

- (A) explore the processes that led to the formation of sedimentary rocks and fossil fuels
- (B) recognize how landforms such as deltas, canyons, and sand dunes are the result of changes to Earth's surface by wind, water, and ice

Grade 4

Grade 3

(7) Earth and space. The student knows that Earth consists of natural resources and its surface is constantly changing. The student is expected to:

- (A) explore and record how soils are formed by weathering of rock and the decomposition of plant and animal remains

Grade 2

(7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to:

- (A) observe and describe rocks by size, texture, and color

Grade 1

(7) Earth and space. The student knows that the natural world includes rocks, soil, and water than can be observed in cycles, patterns, and systems. The student is expected to:

- (A) observe, compare, describe, and sort components of soil by size, texture, and color

Kindergarten

(7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to:

- (A) observe, describe, compare, and sort rocks by size, shape, color, and texture

ORGANISMS AND ENVIRONMENTS VERTICAL ALIGNMENT

Organisms and Environments

Grade/TEKS	Topic(s)	K	1	2	3	4	5	6	7	8	B	ES	CCRS
K(9)(A) The student is expected to differentiate between living and nonliving things based upon whether they have basic needs and produce offspring.	living and nonliving	*									(12)(E)	(4)(D)	X.A.6
K(9)(B) The student is expected to examine evidence that living organisms have basic needs such as food, water, and shelter for animals and air, water, nutrients, sunlight, and space for plants.	basic needs	*									(12)(D)	(7)(A)	VI.G.3
1(9)(A) The student is expected to sort and classify living and nonliving things based upon whether or not they have basic needs and produce offspring.	living and nonliving things		*								(12)(E)	(4)(D)	X.A.6
	basic needs		*								(12)(D)	(7)(A)	VI.G.3
1(9)(B) The student is expected to analyze and record examples of interdependence found in various situations such as terrariums and aquariums or pet and caregiver.	interdependence		*								(12)(A)	(5)(E)	VI.B.1
2(9)(A) The student is expected to identify the basic needs of plants and animals.	basic needs			*							(12)(D)	(7)(A)	VI.G.1

B = Biology; **ES** = Environmental Systems; **ESS** = Earth and Space Science; **CCRS** = College and Career Readiness Standards

Texas Education Agency

Organisms and Environments

Grade/TEKS	Topic(s)	K	1	2	3	4	5	6	7	8	B	ES	CCRS
2(9)(B) The student is expected to identify factors in the environment, including temperature and precipitation, that affect growth and behavior such as migration, hibernation, and dormancy of living things.	factors in the environment			*							(11)(B)	(4)(D)	VI.B.2 VI.G.1 X.C.1
	growth and behavior such as migration, hibernation, and dormancy			*							(11)(B) (12)(F)	(7)(D)	VI.G.3
3(9)(A) The student is expected to observe and describe the physical characteristics of environments and how they support populations and communities within an ecosystem.	dependence and interdependence				*						(11)(B (12)(D)	(5)(C) (7)(A)	VI.G.1 X.A.5 X.E.1
4(9)(A) The student is expected to investigate that most producers need sunlight, water, and carbon dioxide to make their own food, while consumers are dependent on other organisms for food.	living and nonliving					*					(12)(E)	(4)(C) (4)(D)	VI.G.2 X.A.6
	basic needs					*					(12)(D)	(4)(B)	VI.B.3 VI.B.4 VI.B.5
	dependence and interdependence					*					(12)(A) (12)(D)	(7)(A)	X.C.1

B = Biology; **ES** = Environmental Systems; **ESS** = Earth and Space Science; **CCRS** = College and Career Readiness Standards

Organisms and Environments

Kindergarten

Grade: Kindergarten
Strand: Organisms and environments
Lesson: Living versus Nonliving
TEKS: K(9) Organisms and environments. The student knows that plants and animals have basic needs and depend on the living and nonliving things around them for survival. The student is expected to: (A) differentiate between living and nonliving things based upon whether they have basic needs and produce offspring.
Topic: living and nonliving
CCRS Correlation
X. Environmental Science A. Earth systems 6. Describe the Earth's major biogeochemical cycles.
Curriculum Correlation
Environmental Systems (4) Science concepts. The student knows the relationships of biotic and abiotic factors within habitats, ecosystems, and biomes. The student is expected to: (D) make observations and compile data about fluctuations in abiotic cycles and evaluate the effects of abiotic factors on local ecosystems and local biomes **Biology** (12) Science concepts. The student knows that interdependence and interactions occur within an environmental system. The student is expected to: (E) describe the flow of matter through the carbon and nitrogen cycles and explain the consequences of disrupting these cycles **Grade 8** (11) Organisms and environments. The student knows that interdependence occurs among living systems and the environment and that human activities can affect these systems. The student is expected to: (B) investigate how organisms and populations in an ecosystem depend on and may compete for biotic and abiotic factors such as quantity of light, water, range of temperatures, or soil composition

Texas Education Agency

Organisms and Environments

Kindergarten

Grade 7

(10) Organisms and environments. The student knows that there is a relationship between organisms and the environment. The student is expected to:

- (A) observe and describe how different environments, including microhabitats in schoolyards and biomes, support different varieties of organisms

Grade 6

(12) Organisms and environments. The student knows all organisms are classified into Domains and Kingdoms. Organisms within these taxonomic groups share similar characteristics which allow them to interact with the living and nonliving parts of their ecosystem. The student is expected to:

- (E) describe biotic and abiotic parts of an ecosystem in which organisms interact

Grade 5

(9) Organisms and environments. The student knows that there are relationships, systems, and cycles within environments. The student is expected to:

- (A) observe the way organisms live and survive in their ecosystem by interacting with the living and non-living elements

Grade 4

(9) Organisms and environments. The student knows and understands that living organisms within an ecosystem interact with one another and with their environment. The student is expected to:

- (A) investigate that most producers need sunlight, water, and carbon dioxide to make their own food, while consumers are dependent on other organisms for food

Grade 3

(9) Organisms and environments. The student knows that organisms have characteristics that help them survive and can describe patterns, cycles, systems, and relationships within the environments. The student is expected to:

- (A) observe and describe the physical characteristics of environments and how they support populations and communities within an ecosystem

Grade 1

(9) Organisms and environments. The student knows that the living environment is composed of relationships between organisms and the life cycles that occur. The student is expected to:

- (A) sort and classify living and nonliving things based upon whether or not they have basic needs and produce offspring

Organisms and Environments

Kindergarten

Grade: Kindergarten

Strand: Organisms and environments

Lesson: Living versus Nonliving

TEKS:
K(9) Organisms and environments. The student knows that plants and animals have basic needs and depend on the living and nonliving things around them for survival. The student is expected to:
- (B) examine evidence that living organisms have basic needs such as food, water, and shelter for animals and air, water, nutrients, sunlight, and space for plants

Topic: basic needs

CCRS Correlation

VI. Biology
- G. Ecology
  1. Identify Earth's major biomes, giving their locations, typical climate conditions, and characteristic organisms.

Curriculum Correlation

Environmental Systems
(7) Science concepts. The student knows the relationship between carrying capacity and changes in populations and ecosystems. The student is expected to:
- (A) relate carrying capacity to population dynamics

Biology
(12) Science concepts. The student knows that interdependence and interactions occur within an environmental system. The student is expected to:
- (D) recognize that long-term survival of species is dependent on changing resource bases that are limited

Grade 8
(11) Organisms and environments. The student knows that interdependence occurs among living systems and the environment and that human activities can affect these systems. The student is expected to:
- (B) investigate how organisms and populations in an ecosystem depend on and may compete for biotic and abiotic factors such as quantity of light, water, range of temperatures, or soil composition

Grade 7
(10) Organisms and environments. The student knows that there is a relationship between organisms and the environment. The student is expected to:
- (A) observe and describe how different environments, including microhabitats in schoolyards and biomes, support different varieties of organisms

Texas Education Agency

Organisms and Environments

Kindergarten

Grade 5

(9) Organisms and environments. The student knows that there are relationships, systems, and cycles within environments. The student is expected to:

(A) observe the way organisms live and survive in their ecosystem by interacting with the living and non-living elements

Grade 4

(9) Organisms and environments. The student knows and understands that living organisms within an ecosystem interact with one another and with their environment. The student is expected to:

(A) investigate that most producers need sunlight, water, and carbon dioxide to make their own food, while consumers are dependent on other organisms for food

Grade 3

(9) Organisms and environments. The student knows that organisms have characteristics that help them survive and can describe patterns, cycles, systems, and relationships within the environments. The student is expected to:

(A) observe and describe the physical characteristics of environments and how they support populations and communities within an ecosystem

(B) identify and describe the flow of energy in a food chain and predict how changes in a food chain affect the ecosystem such as removal of frogs from a pond or bees from a field

Grade 2

(9) Organisms and environments. The student knows that living organisms have basic needs that must be met for them to survive within their environment. The student is expected to:

(A) identify the basic needs of plants and animals

Grade 1

(9) Organisms and environments. The student knows that the living environment is composed of relationships between organisms and the life cycles that occur. The student is expected to:

(A) sort and classify living and nonliving things based upon whether or not they have basic needs and produce offspring

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Organisms and Environments

Grade 1

Grade: Grade 1
Strand: Organisms and environments
Lesson: Depending on Basic Needs
TEKS: 1(9) Organisms and environments. The student knows that the living environment is composed of relationships between organisms and the life cycles that occur. The student is expected to: (A) sort and classify living and nonliving things based upon whether or not they have basic needs and produce offspring
Topic: living and nonliving
CCRS Correlation
X. Environmental Science A. Earth systems 6. Describe the Earth's major biogeochemical cycles.
Curriculum Correlation
Environmental Systems (4) Science concepts. The student knows the relationships of biotic and abiotic factors within habitats, ecosystems, and biomes. The student is expected to: (D) make observations and compile data about fluctuations in abiotic cycles and evaluate the effects of abiotic factors on local ecosystems and local biomes **Biology** (12) Science concepts. The student knows that interdependence and interactions occur within an environmental system. The student is expected to: (E) describe the flow of matter through the carbon and nitrogen cycles and explain the consequences of disrupting these cycles **Grade 8** (11) Organisms and environments. The student knows that interdependence occurs among living systems and the environment and that human activities can affect these systems. The student is expected to: (B) investigate how organisms and populations in an ecosystem depend on and may compete for biotic and abiotic factors such as quantity of light, water, range of temperatures, or soil composition

Texas Education Agency

Organisms and Environments

Grade 1

Grade 7

(10) Organisms and environments. The student knows that there is a relationship between organisms and the environment. The student is expected to:

- (A) observe and describe how different environments, including microhabitats in schoolyards and biomes, support different varieties of organisms

Grade 6

(12) Organisms and environments. The student knows all organisms are classified into Domains and Kingdoms. Organisms within these taxonomic groups share similar characteristics which allow them to interact with the living and nonliving parts of their ecosystem. The student is expected to:

- (E) describe biotic and abiotic parts of an ecosystem in which organisms interact

Grade 5

(9) Organisms and environments. The student knows that there are relationships, systems, and cycles within environments. The student is expected to:

- (A) observe the way organisms live and survive in their ecosystem by interacting with the living and non-living elements

Grade 4

(9) Organisms and environments. The student knows and understands that living organisms within an ecosystem interact with one another and with their environment. The student is expected to:

- (A) investigate that most producers need sunlight, water, and carbon dioxide to make their own food, while consumers are dependent on other organisms for food

Grade 3

(9) Organisms and environments. The student knows that organisms have characteristics that help them survive and can describe patterns, cycles, systems, and relationships within the environments. The student is expected to:

- (A) observe and describe the physical characteristics of environments and how they support populations and communities within an ecosystem

Grade 1

Kindergarten

(9) Organisms and environments. The student knows that plants and animals have basic needs and depend on the living and nonliving things around them for survival. The student is expected to:

- (A) differentiate between living and nonliving things based upon whether they have basic needs and produce offspring

Organisms and Environments

Grade 1

1(9)(A)
Topic: basic needs
CCRS Correlation
VI. Biology G. Ecology 1. Identify Earth's major biomes, giving their locations, typical climate conditions, and characteristic organisms.
Curriculum Correlation
Environmental Systems (7) Science concepts. The student knows the relationship between carrying capacity and changes in populations and ecosystems. The student is expected to: (A) relate carrying capacity to population dynamics **Biology** (12) Science concepts. The student knows that interdependence and interactions occur within an environmental system. The student is expected to: (D) recognize that long-term survival of species is dependent on changing resource bases that are limited **Grade 8** (11) Organisms and environments. The student knows that interdependence occurs among living systems and the environment and that human activities can affect these systems. The student is expected to: (B) investigate how organisms and populations in an ecosystem depend on and may compete for biotic and abiotic factors such as quantity of light, water, range of temperatures, or soil composition **Grade 7** (10) Organisms and environments. The student knows that there is a relationship between organisms and the environment. The student is expected to: (A) observe and describe how different environments, including microhabitats in schoolyards and biomes, support different varieties of organisms **Grade 5** (9) Organisms and environments. The student knows that there are relationships, systems, and cycles within environments. The student is expected to: (A) observe the way organisms live and survive in their ecosystem by interacting with the living and non-living elements (B) describe how the flow of energy derived from the Sun, used by producers to create their own food, is transferred through a food chain and food web to consumers and decomposers

Texas Education Agency

Organisms and Environments

Grade 1

Grade 4

(9) Organisms and environments. The student knows and understands that living organisms within an ecosystem interact with one another and with their environment. The student is expected to:

(A) investigate that most producers need sunlight, water, and carbon dioxide to make their own food, while consumers are dependent on other organisms for food

Grade 3

(9) Organisms and environments. The student knows that organisms have characteristics that help them survive and can describe patterns, cycles, systems, and relationships within the environments. The student is expected to:

(A) observe and describe the physical characteristics of environments and how they support populations and communities within an ecosystem

Grade 2

(9) Organisms and environments. The student knows that living organisms have basic needs that must be met for them to survive within their environment. The student is expected to:

(A) identify the basic needs of plants and animals

Grade 1

Kindergarten

(9) Organisms and environments. The student knows that plants and animals have basic needs and depend on the living and nonliving things around them for survival. The student is expected to:

(B) examine evidence that living organisms have basic needs such as food, water, and shelter for animals and air, water, nutrients, sunlight, and space for plants

Organisms and Environments

Grade 1

Grade: Grade 1

Strand: Organisms and environments

Lesson: Depending on Basic Needs

TEKS:
1(9) Organisms and environments. The student knows that the living environment is composed of relationships between organisms and the life cycles that occur. The student is expected to:
(B) analyze and record examples of interdependence found in various situations such as terrariums and aquariums or pet and caregiver

Topic: interdependence

CCRS Correlation

VI. Biology
C. Evolution and populations
1. Know multiple categories of evidence for evolutionary change and how this evidence is used to infer evolutionary relationships among organisms.

Curriculum Correlation

Environmental Systems
(5) Science concepts. The student knows the interrelationships among the resources within the local environmental system. The student is expected to:
(E) analyze and evaluate the economic significance and interdependence of resources within the environmental system

Biology
(12) Science concepts. The student knows that interdependence and interactions occur within an environmental system. The student is expected to:
(A) interpret relationships, including predation, parasitism, commensalism, mutualism, and competition among organisms

Grade 8
(11) Organisms and environments. The student knows that interdependence occurs among living systems and the environment and that human activities can affect these systems. The student is expected to:
(A) describe producer/consumer, predator/prey, and parasite/host relationships as they occur in food webs within marine, freshwater, and terrestrial ecosystems

Organisms and Environments

Grade 1

Grade 7

(10) Organisms and environments. The student knows that there is a relationship between organisms and the environment. The student is expected to:

(A) observe and describe how different environments, including microhabitats in schoolyards and biomes, support different varieties of organisms

Grade 6

(12) Organisms and environments. The student knows all organisms are classified into Domains and Kingdoms. Organisms within these taxonomic groups share similar characteristics which allow them to interact with the living and nonliving parts of their ecosystem. The student is expected to:

(E) describe biotic and abiotic parts of an ecosystem in which organisms interact

Grade 5

(9) Organisms and environments. The student knows that there are relationships, systems, and cycles within environments. The student is expected to:

(A) observe the way organisms live and survive in their ecosystem by interacting with the living and non-living elements

Grade 4

(9) Organisms and environments. The student knows and understands that living organisms within an ecosystem interact with one another and with their environment. The student is expected to:

(A) investigate that most producers need sunlight, water, and carbon dioxide to make their own food, while consumers are dependent on other organisms for food

Grade 3

(9) Organisms and environments. The student knows that organisms have characteristics that help them survive and can describe patterns, cycles, systems, and relationships within the environments. The student is expected to:

(A) observe and describe the physical characteristics of environments and how they support populations and communities within an ecosystem

Grade 2

(9) Organisms and environments. The student knows that living organisms have basic needs that must be met for them to survive within their environment. The student is expected to:

(C) compare and give examples of the ways living organisms depend on each other and on their environments such as food chains within a garden, park, beach, lake, and wooded area

Grade 1

Organisms and Environments

Grade 2

Grade: Grade 2

Strand: Organisms and environments

Lesson: Changes in the Environment

TEKS:

2(9) Organisms and environments. The student knows that living organisms have basic needs that must be met for them to survive within their environment. The student is expected to:

- (A) identify the basic needs of plants and animals

Topic: basic needs

CCRS Correlation

VI. Biology

- G. Ecology
  1. Identify Earth's major biomes, giving their locations, typical climate conditions, and characteristic organisms.

Curriculum Correlation

Environmental Systems

(7) Science concepts. The student knows the relationship between carrying capacity and changes in populations and ecosystems. The student is expected to:

- (A) relate carrying capacity to population dynamics

Biology

(12) Science concepts. The student knows that interdependence and interactions occur within an environmental system. The student is expected to:

- (D) recognize that long-term survival of species is dependent on changing resource bases that are limited

Grade 8

(11) Organisms and environments. The student knows that interdependence occurs among living systems and the environment and that human activities can affect these systems. The student is expected to:

- (B) investigate how organisms and populations in an ecosystem depend on and may compete for biotic and abiotic factors such as quantity of light, water, range of temperatures, or soil composition

Grade 7

(10) Organisms and environments. The student knows that there is a relationship between organisms and the environment. The student is expected to:

- (A) observe and describe how different environments, including microhabitats in schoolyards and biomes, support different varieties of organisms

Texas Education Agency

Organisms and Environments

Grade 2

Grade 5

(9) Organisms and environments. The student knows that there are relationships, systems, and cycles within environments. The student is expected to:

- (A) observe the way organisms live and survive in their ecosystem by interacting with the living and non-living elements
- (B) describe how the flow of energy derived from the Sun, used by producers to create their own food, is transferred through a food chain and food web to consumers and decomposers

Grade 4

(9) Organisms and environments. The student knows and understands that living organisms within an ecosystem interact with one another and with their environment. The student is expected to:

- (A) investigate that most producers need sunlight, water, and carbon dioxide to make their own food, while consumers are dependent on other organisms for food

Grade 3

(9) Organisms and environments. The student knows that organisms have characteristics that help them survive and can describe patterns, cycles, systems, and relationships within the environments. The student is expected to:

- (A) observe and describe the physical characteristics of environments and how they support populations and communities within an ecosystem

Grade 2

Grade 1

(9) Organisms and environments. The student knows that the living environment is composed of relationships between organisms and the life cycles that occur. The student is expected to:

- (A) sort and classify living and nonliving things based upon whether or not they have basic needs and produce offspring

Kindergarten

(9) Organisms and environments. The student knows that plants and animals have basic needs and depend on the living and nonliving things around them for survival. The student is expected to:

- (B) examine evidence that living organisms have basic needs such as food, water, and shelter for animals and air, water, nutrients, sunlight, and space for plants

Grade: Grade 2

Strand: Organisms and environments

Lesson: Changes in the Environment

TEKS:

2(9) Organisms and environments. The student knows that living organisms have basic needs that must be met for them to survive within their environment. The student is expected to:

- (B) identify factors in the environment, including temperature and precipitation, that affect growth and behavior such as migration, hibernation, and dormancy of living things

Topic: factors in the environment

CCRS Correlation

VI. Biology

- C. Evolution and populations
  - 2. Recognize variations in population sizes, including extinction, and describe mechanisms and conditions that produce these variations.
- G. Ecology
  - 1. Identify Earth's major biomes, giving their locations, typical climate conditions, and characteristic organisms.

X. Environmental Science

- C. Populations
  - 1. Recognize variations in population sizes, including human population and extinction, and describe mechanisms and conditions that produce these variations.

Curriculum Correlation

Environmental Systems

(4) Science concepts. The student knows the relationships of biotic and abiotic factors within habitats, ecosystems, and biomes. The student is expected to:

- (D) make observations and compile data about fluctuations in abiotic cycles and evaluate the effects of abiotic factors on local ecosystems and local biomes

Biology

(11) Science concepts. The student knows that biological systems work to achieve and maintain balance. The student is expected to:

- (B) The student is expected to investigate and analyze how organisms, populations, and communities respond to external factors

Organisms and Environments

Grade 2

Grade 8

(11) Organisms and environments. The student knows that interdependence occurs among living systems and the environment and that human activities can affect these systems. The student is expected to:

- (B) investigate how organisms and populations in an ecosystem depend on and may compete for biotic and abiotic factors such as quantity of light, water, range of temperatures, or soil composition

Grade 7

(13) Organisms and environments. The student knows that a living organism must be able to maintain balance in stable internal conditions in response to external stimuli. The student is expected to:

- (A) investigate how organisms respond to external stimuli found in the environment such as phototropism and fight or flight

Grade 6

(12) Organisms and environments. The student knows all organisms are classified into Domains and Kingdoms. Organisms within these taxonomic groups share similar characteristics which allow them to interact with the living and nonliving parts of their ecosystem. The student is expected to:

- (E) describe biotic and abiotic parts of an ecosystem in which organisms interact

Grade 5

(9) Organisms and environments. The student knows that there are relationships, systems, and cycles within environments. The student is expected to:

- (C) predict the effects of changes in ecosystems caused by living organisms, including humans, such as the overpopulation of grazers or the building of highways

Grade 4

(9) Organisms and environments. The student knows and understands that living organisms within an ecosystem interact with one another and with their environment. The student is expected to:

- (B) describe the flow of energy through food webs, beginning with the Sun, and predict how changes in the ecosystem affect the food web such as a fire in a forest

Grade 3

(9) Organisms and environments. The student knows that organisms have characteristics that help them survive and can describe patterns, cycles, systems, and relationships within the environments. The student is expected to:

- (B) identify and describe the flow of energy in a food chain and predict how changes in a food chain affect the ecosystem such as removal of frogs from a pond or bees from a field
- (C) describe environmental changes such as floods and droughts where some organisms thrive and others perish or move to new locations

Grade 2

Organisms and Environments

Grade 2

2(9)(B)

Topic: growth and behavior such as migration, hibernation, and dormancy

CCRS Correlation

VI. Biology

G. Ecology

3. Understand typical forms of organismal behavior.

Curriculum Correlation

Environmental Systems

(7) Science concepts. The student knows the relationship between carrying capacity and changes in populations and ecosystems. The student is expected to:

(D) analyze and make predictions about the impact on populations of geographic locales due to diseases, birth and death rates, urbanization, and natural events such as migration and seasonal changes

Biology

(11) Science concepts. The student knows that biological systems work to achieve and maintain balance. The student is expected to:

(B) investigate and analyze how organisms, populations, and communities respond to external factors

(12) Science concepts. The student knows that interdependence and interactions occur within an environmental system. The student is expected to:

(F) describe how environmental change can impact ecosystem stability

Grade 8

(11) Organisms and environments. The student knows that interdependence occurs among living systems and the environment and that human activities can affect these systems. The student is expected to:

(C) explore how short- and long-term environmental changes affect organisms and traits in subsequent populations

Grade 7

(11) Organisms and environments. The student knows that populations and species demonstrate variation and inherit many of the unique traits through gradual processes over many generations. The student is expected to:

(B) explain variation within a population or species by comparing external features, behaviors, or physiology of organisms that enhance their survival such as migration, hibernation, or storage of food in a bulb

Grade 5

(9) Organisms and environments. The student knows that there are relationships, systems, and cycles within environments. The student is expected to:

(C) predict the effects of changes in ecosystems caused by living organisms, including humans, such as the overpopulation of grazers or the building of highways

Organisms and Environments

Grade 2

Grade 4

(9) Organisms and environments. The student knows and understands that living organisms within an ecosystem interact with one another and with their environment. The student is expected to:

(B) describe the flow of energy through food webs, beginning with the Sun, and predict how changes in the ecosystem affect the food web such as a fire in a forest

Grade 3

(9) Organisms and environments. The student knows that organisms have characteristics that help them survive and can describe patterns, cycles, systems, and relationships within the environments. The student is expected to:

(C) describe environmental changes such as floods and droughts where some organisms thrive and others perish or move to new locations

Grade 2

Organisms and Environments

Grade 3

Grade: 3

Strand: Organisms and environments

Lesson: Support for Life

TEKS:
3(9) Organisms and environments. The student knows that organisms have characteristics that help them survive and can describe patterns, cycles, systems, and relationships within the environments. The student is expected to:
- (A) observe and describe the physical characteristics of environments and how they support populations and communities within an ecosystem

Topic: dependence/interdependence

CCRS Correlation

VI. Biology
- G. Ecology
  1. Identify Earth's major biomes, giving their locations, typical climate conditions, and characteristic organisms.

X. Environmental Science
- A. Earth Systems
  5. Be familiar with Earth's major biomes.
- E. Human practices and their impacts
  1. Describe the different uses for land (land management).

Curriculum Correlation

Environmental Systems
(5) Science concepts. The student knows the interrelationships among the resources within the local environmental system. The student is expected to:
- (C) document the use and conservation of both renewable and non-renewable resources as they pertain to sustainability

(7) Science concepts. The student knows the relationship between carrying capacity and changes in populations and ecosystems. The student is expected to:
- (A) relate carrying capacity to population dynamics

Organisms and Environments

Grade 3

Biology

(11) Science concepts. The student knows that biological systems work to achieve and maintain balance. The student is expected to:

(B) investigate and analyze how organisms, populations, and communities respond to external factors

(12) Science concepts. The student knows that interdependence and interactions occur within an environmental system. The student is expected to:

(D) recognize that long-term survival of species is dependent on changing resource bases that are limited

Grade 8

(11) Organisms and environments. The student knows that interdependence occurs among living systems and the environment and that human activities can affect these systems. The student is expected to:

(B) investigate how organisms and populations in an ecosystem depend on and may compete for biotic and abiotic factors such as quantity of light, water, range of temperatures, or soil composition

Grade 7

(10) Organisms and environments. The student knows that there is a relationship between organisms and the environment. The student is expected to:

(A) observe and describe how different environments, including microhabitats in schoolyards and biomes, support different varieties of organisms

Grade 6

(12) Organisms and environments. The student knows all organisms are classified into Domains and Kingdoms. Organisms within taxonomic groups share similar characteristics which allow them to interact with living and nonliving parts of their ecosystem. The student is expected to:

(E) describe biotic and abiotic parts of an ecosystem in which organisms interact

Grade 5

(9) Organisms and environments. The student knows that there are relationships, systems, and cycles within environments. The student is expected to:

(A) observe the way organisms live and survive in their ecosystem by interacting with the living and non-living elements

Grade 4

(9) Organisms and environments. The student knows and understands that living organisms within an ecosystem interact with one another and with their environment. The student is expected to:

(A) investigate that most producers need sunlight, water, and carbon dioxide to make their own food, while consumers are dependent on other organisms for food

Organisms and Environments

Grade 3

Grade 3

Grade 2

(9) Organisms and environments. The student knows that living organisms have basic needs that must be met for them to survive within their environment. The student is expected to:

- (A) identify the basic needs of plants and animals
- (B) identify the factors in the environment, including temperature and precipitation, that affect growth and behavior such as migration, hibernation, and dormancy of living things

Grade 1

(9) Organisms and environments. The student knows that the living environment is composed of relationships between organisms and the life cycles that occur. The student is expected to:

- (A) sort and classify living and nonliving things based upon whether or not they have basic needs and produce offspring
- (B) analyze and record examples of interdependence found in various situations such as terrariums and aquariums or pet and caregiver

Kindergarten

(9) Organisms and environments. The student knows that plants and animals have basic needs and depend on the living and nonliving things around them for survival. The student is expected to:

- (A) differentiate between living and nonliving things based upon whether they have basic needs and produce offspring
- (B) examine evidence that living organisms have basic needs such as food, water, and shelter for animals, and air, water, nutrients, sunlight, and space for plants

Organisms and Environments

Grade 4

Grade: 4
Strand: Organisms and environments
Lesson: Food Make and Take
TEKS: 4(9) Organisms and environments. The student knows and understands that living organisms within an ecosystem interact with one another and with their environment. The student is expected to: (A) investigate that most producers need sunlight, water, and carbon dioxide to make their own food, while consumers are dependent on other organisms for food
Topic: living and nonliving
CCRS Correlation
VI. Biology G. Ecology 2. Know patterns of energy flow and material cycling in Earth's ecosystems. **X. Environmental Science** A. Earth Systems 6. Describe the Earth's major biogeochemical cycles.
Curriculum Correlation
Environmental Systems (4) Science concepts. The student knows the relationships of biotic and abiotic factors within habitats, ecosystems, and biomes. The student is expected to: (C) diagram abiotic cycles, including rock, hydrologic, carbon, and nitrogen cycles (D) make observations and compile data about fluctuations in abiotic cycles and evaluate the effects of abiotic factors on local ecosystems and local biomes **Biology** (12) Science concepts. The student knows that interdependence and interactions occur within an environmental system. The student is expected to: (E) describe the flow of matter through the carbon and nitrogen cycles and explain the consequences of disrupting these cycles

Organisms and Environments

Grade 4

Grade 8
(11) Organisms and environments. The student knows that interdependence occurs among living systems and the environment and that human activities can affect these systems. The student is expected to:
(A) describe producer/consumer, predator/prey, and parasite/host relationships as they occur in food webs within marine, freshwater, and terrestrial ecosystems
(B) investigate how organisms and populations in an ecosystem depend on and may compete for biotic and abiotic factors such as quantity of light, water, range of temperatures, or soil composition

Grade 7
(5) Matter and energy. The student knows that interactions occur between matter and energy. The student is expected to:
(B) demonstrate and explain the cycling of matter within living systems such as in the decay of biomass in a compost bin

Grade 6
(12) Organisms and environments. The student knows all organisms are classified into Domains and Kingdoms. Organisms within these taxonomic groups share similar characteristics which allow them to interact with the living and nonliving parts of their ecosystem. The student is expected to:
(E) describe biotic and abiotic parts of an ecosystem in which organisms interact

Grade 5
(9) Organisms and environments. The student knows that there are relationships, systems, and cycles within environments. The student is expected to:
(A) observe the way organisms live and survive in their ecosystem by interacting with the living and non-living elements

Grade 4

Grade 3
(9) Organisms and environments. The student knows that organisms have characteristics that help them survive and can describe patterns, cycles, systems, and relationships within the environments. The student is expected to:
(A) observe and describe the physical characteristics of environments and how they support populations and communities within an ecosystem

Grade 2
(9) Organisms and environments. The student knows that living organisms have basic needs that must be met for them to survive within their environment. The student is expected to:
(B) identify factors in the environment, including temperature and precipitation, that affect growth and behavior such as migration, hibernation, and dormancy of living things

TEA Texas Education Agency

Grade 4

Kindergarten

(9) Organisms and environments. The student knows that plants and animals have basic needs and depend on the living and nonliving things around them for survival. The student is expected to:

- (B) examine evidence that living organisms have basic needs such as food, water, and shelter for animals, and air, water, nutrients, sunlight, and space for plants

Topic: basic needs (air, water, matter, and energy from food)

CCRS Correlation

VI. Biology

- B. Biochemistry
    - 3. Describe the major features chemical events of photosynthesis.
    - 4. Describe the major features and chemical events of cellular respiration.
    - 5. Know how organisms respond to presence or absence of oxygen, including mechanisms of fermentation.

Curriculum Correlation

Environmental Systems

(4) Science concepts. The student knows the relationships of biotic and abiotic factors within habitats, ecosystems, and biomes. The student is expected to:

- (B) assess the role of native plants and animals within a local ecosystem and compare them to plants and animals in ecosystems within four other biomes

Biology

(12) Science concepts. The student knows that interdependence and interactions occur within an environmental system. The student is expected to:

- (D) recognize that long-term survival of species is dependent on changing resource bases that are limited

Grade 8

(11) Organisms and environments. The student knows that interdependence occurs among living systems and the environment and that human activities can affect these systems. The student is expected to:

- (B) investigate how organisms and populations depend on and may compete for biotic and abiotic factors such as quantity of light, water, range of temperatures, or soil composition

Grade 7

(5) Matter and energy. The student knows that interactions occur between matter and energy. The student is expected to:

- (A) recognize that radiant energy from the Sun is transformed into chemical energy through the process of photosynthesis
- (B) demonstrate and explain the cycling of matter within living systems such as in the decay of biomass in a compost bin

Organisms and Environments

Grade 4

Grade 5

(9) Organisms and environments. The student knows that there are relationships, systems, and cycles within environments. The student is expected to:

- (B) describe how the flow of energy derived from the Sun, used by producers to create their own food, is transferred through a food chain and food web to consumers and decomposers
- (D) identify the significance of the carbon dioxide-oxygen cycle to the survival of plants and animals

Grade 4

Grade 2

(9) Organisms and environments. The student knows that living organisms have basic needs that must be met for them to survive within their environment. The student is expected to:

- (A) identify the basic needs of plants and animals

Grade 1

(9) Organisms and environments. The student knows that the living environment is composed of relationships between organisms and the life cycles that occur. The student is expected to:

- (A) sort and classify living and nonliving things based upon whether or not they have basic needs and produce offspring

Kindergarten

(9) Organisms and environments. The student knows that plants and animals have basic needs and depend on the living and nonliving things around them for survival. The student is expected to:

- (A) differentiate between living and nonliving things based upon whether they have basic needs and produce offspring
- (B) examine evidence that living organisms have basic needs such as food, water, and shelter for animals and air, water, nutrients, sunlight, and space for plants

4(9)(A)
Topic: dependence and interdependence
CCRS Correlation
X. Environmental Science C. Populations 1. Recognize variations in population sizes, including human population and extinction, and describe mechanisms and conditions that produce these variations.
Curriculum Correlation
Environmental Systems (7) Science concepts. The student knows the relationship between carrying capacity and changes in populations and ecosystems. The student is expected to: (A) relate carrying capacity to population dynamics **Biology** (12) Science concepts. The student knows that interdependence and interactions occur within an environmental system. The student is expected to: (A) interpret relationships, including predation, parasitism, commensalism, mutualism, and competition among organisms (D) recognize that long-term survival of species is dependent on changing resource bases that are limited **Grade 8** (11) Organisms and environments. The student knows that interdependence occurs among living systems and the environment and that human activities can affect these systems. The student is expected to: (A) describe producer/consumer, predator/prey, and parasite/host relationships as they occur in food webs within marine, freshwater, and terrestrial ecosystems (B) investigate how organisms and populations in an ecosystem depend on and may compete for biotic and abiotic factors such as quantity of light, water, range of temperatures, or soil composition **Grade 7** (10) Organisms and environments. The student knows that there is a relationship between organisms and the environment. The student is expected to: (A) observe and describe how different environments, including microhabitats in schoolyards and biomes, support different varieties of organisms

Organisms and Environments

Grade 4

Grade 5

(9) Organisms and environments. The student knows that there are relationships, systems, and cycles within environments. The student is expected to:

(A) observe the way organisms live and survive in their ecosystem by interacting with the living and non-living elements

Grade 4

Grade 3

(9) Organisms and environments. The student knows that organisms have characteristics that help them survive and can describe patterns, cycles, systems, and relationships within the environments. The student is expected to:

(A) observe and describe the physical characteristics of environments and how they support populations and communities within an ecosystem

Grade 2

(9) Organisms and environments. The student knows that living organisms have basic needs that must be met for them to survive within their environment. The student is expected to:

(B) identify factors in the environment, including temperature and precipitation, that affect growth and behavior such as migration, hibernation, and dormancy of living things

Grade 1

(9) Organisms and environments. The student knows that the living environment is composed of relationships between organisms and the life cycles that occur. The student is expected to:

(B) analyze and record examples of interdependence found in various situations such as terrariums and aquariums or pet and caregiver

Texas Education Agency

VOCABULARY ALIGNMENT TABLES

Earth and Space

	K	1	2	3	4
rocks					
shape					
size					
texture					
color					
components					
soil					
weathering					
decomposition					
deposition					
erosion					

TEA Texas Education Agency

Organisms and Environments

	K	1	2	3	4
basic needs					
depend					
evidence					
living					
nonliving					
nutrients					
offspring					
organism					
produce					
shelter					
survival					
aquarium					
interdependence					
terrarium					
behavior					
dormancy					
environment					
factors					
hibernation					
migration					
precipitation					
temperature					
characteristic					
community					
ecosystem					
population					
carbon dioxide					
consumer					
producer					

WORD WALL

Word Wall

A______________ ______________ ______________ ______________	B______________ ______________ ______________ ______________	C______________ ______________ ______________ ______________
G______________ ______________ ______________ ______________	H______________ ______________ ______________ ______________	I______________ ______________ ______________ ______________
M______________ ______________ ______________ ______________	N______________ ______________ ______________ ______________	O______________ ______________ ______________ ______________
S______________ ______________ ______________ ______________	T______________ ______________ ______________ ______________	U______________ ______________ ______________ ______________
Y______________ ______________ ______________ ______________	Z______________ ______________ ______________ ______________	**Notes**

Word Wall

D	E	F
J	K	L
P	Q	R
V	W	X

SUPPORT FRAMEWORKS

College and Career Readiness Standards

The 79th Texas Legislature passed House Bill 1, the "Advancement of College Readiness in Curriculum," Section 28.008 of the Texas Education Code, to increase the number of students who are college and career ready when they graduate high school. The Texas College and Career Readiness Standards (CCRS) that resulted from that legislation were developed and assessed by vertical teams composed of secondary and postsecondary faculty across the content areas of English/language arts, mathematics, science, and social studies, using a multilevel framework that focuses on subject matter and the way it is organized and presented in the classroom.

Incorporated into the Texas Essential Knowledge and Skills (TEKS) in 2008, the CCRS emphasize secondary-level content knowledge that stimulates students to engage in deeper levels of thinking. The framework of the CCRS recognizes that at a postsecondary level, students must (1) have core foundational knowledge of a discipline and be able to use that knowledge with facility and fluency; and (2) be able to understand the vertical structure of a discipline and how knowledge expands from the initial study of a topic.

The CCRS also address cross-disciplinary foundational knowledge and skills, which delineate the horizontal structure of learning across all disciplines and how core foundational knowledge of one subject is utilized in the mastery of other subjects. For example, when students utilize scientific inquiry, they utilize other foundational skills such as mathematics, communication, and social ethics, as well as personal skills such as time management, self-discipline, and organization.

CCRS for Science

The Science CCRS are extensive yet specific and strongly emphasize the importance of acquiring the cross-disciplinary, foundational cognitive skills needed to succeed in all entry-level college science courses. The CCRS view science vocabulary as a tool. College-ready students should be able to engage actively in the study of science and communicate with others in a clear, concise, and meaningful manner.

The Science CCRS extend the TEKS standards for each of the three traditional high school science courses—biology, chemistry, and physics—in the requirement of student mastery of the core principles and procedures for scientific inquiry, i.e., collecting, analyzing, evaluating, and synthesizing, that are necessary for the study of all science disciplines. Overall, the Science CCRS are focused to ensure student readiness to explore and appreciate the richness and complexity of the natural world, to process and develop new ideas and divergent interpretations, and to master the powerful techniques of scientific investigation.

Source: *Texas College and Career Readiness Standards*, Texas Education Agency and Texas Higher Education Coordinating Board

For a complete list of CCRS, see Texas College and Career Readiness Standards at http://www.thecb.state.tx.us/collegereadiness/CRS.pdf .

English Language Proficiency Standards

The English Language Proficiency Standards (ELPS) require that teachers provide linguistically accommodated instruction that corresponds to the students' levels of English proficiency. Districts are required to determine qualifying students' proficiency levels in the domains of listening, speaking, reading, and writing. Descriptors at each proficiency level—Beginning, Intermediate, Advanced, and Advanced High are used to determine reasonable expectations for students in each of the four domains. It is important to remember that English language learners are a diverse group, and students may have achieved a higher level of language proficiency in one or more of the domains than others.

Beginning—Indicates the initial stages of learning English and minimal ability to communicate in English in academic settings. Comprehension is demonstrated through action, gestures, and drawings. Students often communicate using memorized words and phrases.

Intermediate—Indicates the ability to use common, basic English in routine classroom activities. Comprehension is demonstrated through the use of key words and phrases and nonverbal responses. Students communicate simply when the topic of conversation is familiar, can generally follow social conversations, but not understand the details.

Advanced—Indicates the ability to use academic English in classroom activities, using more complex phrases and sentences with English language assistance provided when needed. Comprehension is demonstrated in context-reduced situations, both orally and in writing. Students still may have trouble with unfamiliar vocabulary and grammar.

Advanced High—Indicates the ability to use academic English in classroom activities with little English language support. Comprehension is demonstrated in situations with and without a context, both orally and in writing. Students communicate clearly in most situations.

From *Embedding the ELPS With E's: High School Science*, 2009, Houston, TX: Region 4 Education Service Center. Reprinted with permission.

Meet the Students

Student Name	Profile	Instructional Considerations
Ben	Hi! You haven't met me yet, but you will because you're going to be my teacher this year. I'm Ben. School is a struggle for me because I have trouble keeping up. I'm a slow reader, and it's hard to write. If we did more and read less, that would be fine with me. I want you to know that just because I have a disability, it doesn't mean I'm dumb. I have lots of ideas, and I'm really good at drawing and building things with my construction kit.	
Ten	My name is Ten. My family comes from Vietnam. I think you had my older sister in class. Soon it will be my turn. I'm like my sister because we both love to learn, and I can already read some words in English. I can speak it all right, too. I'm excited to learn how to read more and even write it. I'll need help learning how to organize words on paper. My favorite subjects are math and science.	
Marisa	Hi, I'm Marisa. What's your name? My parents tell people I'm like a sponge. I'm not sure what that means, but I do know I'm curious and like to learn. My favorite time is when I get to read with my parents. I've even recorded myself reading a story. My backpack looks kind of messy, but that's because it's more fun to learn and explore than it is to organize stuff. It should be fun to explore in your class. I hope you don't mind if I ask a lot of questions.	
Darius	Hi. I'm Darius. I don't have many friends. I'm worried that you won't like me because I have a hard time sitting still, and sometimes I just can't pay attention. Do you have a lot of stuff on your walls? Are you going to make lots of assignments? I have a hard time remembering school stuff. Playing ball is a lot easier. Race cars are cool, too. They go fast like me.	
NeeCee	Hello, future teacher of mine. My name is NeeCee. I can hardly wait to get to your class to make new friends and experience different ways to learn. I'm interested in doing a good job and believe that if I work hard, I'll make good grades. If I need help with anything, I'll be sure to ask. By the way, my favorite subjects are . . . all of them, but I like reading, writing, and science the best! See you soon!	
Silvia	Hola, me nombre es Silvia. I from family new to Texas, and I am oldest of three. Habla español in mi casa, so no speak inglés. I try hard in your class. I no like to speak, but sometimes I know answer. Could you help read and speak inglés? Could we work sometime, you and me? My parents say I need a good learning so I can make good later.	

Student Writing Samples

Writing Sample 1

Third leero Piggs to da Lirro Piggs
is Cona doo Lobo is Cond for to
is Coud For da hose For da Liro,
Piggs Is Cand duet hause for
~~to~~ Lobo Is Can anar Coriendo
Faster Para que el lobo no dos
agare der to 3 Piggs Is Cand
Construir van hase Cada One
Para que no lo agare one Pigs
I Cand duet your hose Four to
stroa and a ~~otro~~ lire Pig is Can
duet ~~to~~ leña And to Liro One
Pig is Can duet Foor da
ladrillo.

Student Writing Samples

Writing Sample 2

Wat I like and I don't like
For science

The First tig I don't
like For science Is tad
Wi jaFtw rid and raid
OF samtig. Like today wy
meik sam questions and
wy hafto raid the answer.
And sometimes I don't no
the answer thats way I
don't Like. sometimes I Like
science because wy doo
som Project oF Plant's, Planets,
Fosils and electricity tas wat
I like oF science. Bot I
stil don't like science
tas nat may feibr sbject
from the school I don't
like science bot lik I
sed I Like sometimes
tas wen wy do som
Project on the science
lab. wen I go to the lab
Is Fun because wy do som
Project's.

Sources:
Texas English Language Proficiency Assessment System (TELPAS)
http://tea.texas.gov/student.assessment/ell/telpas/

Annotated Examples of Student Writing
http://tea.texas.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=2147488968&libID=2147488967

Response to Intervention (RtI)

Response to Intervention, or RtI, a multitiered approach to instruction, is evolving as the framework of the general education program for all students including those who experience difficulties either academically or behaviorally. RtI helps to ensure that students have the opportunity to experience a full range of educational opportunities through the general education program.

Driven and documented by reliable data, the implementation of RtI in Texas schools can result in

- more effective instruction;
- increased student achievement;
- more appropriate LD identification;
- increased professional collaboration; and
- overall school improvement.

Source: *2008–2009 Response to Intervention Guidance*, Texas Education Agency

Core RtI Features

- high-quality, research-based classroom instruction
- universal screenings of academics and behavior
- continuous progress monitoring
- research-based interventions
- continuous progress monitoring during interventions
- integrity of instruction and interventions

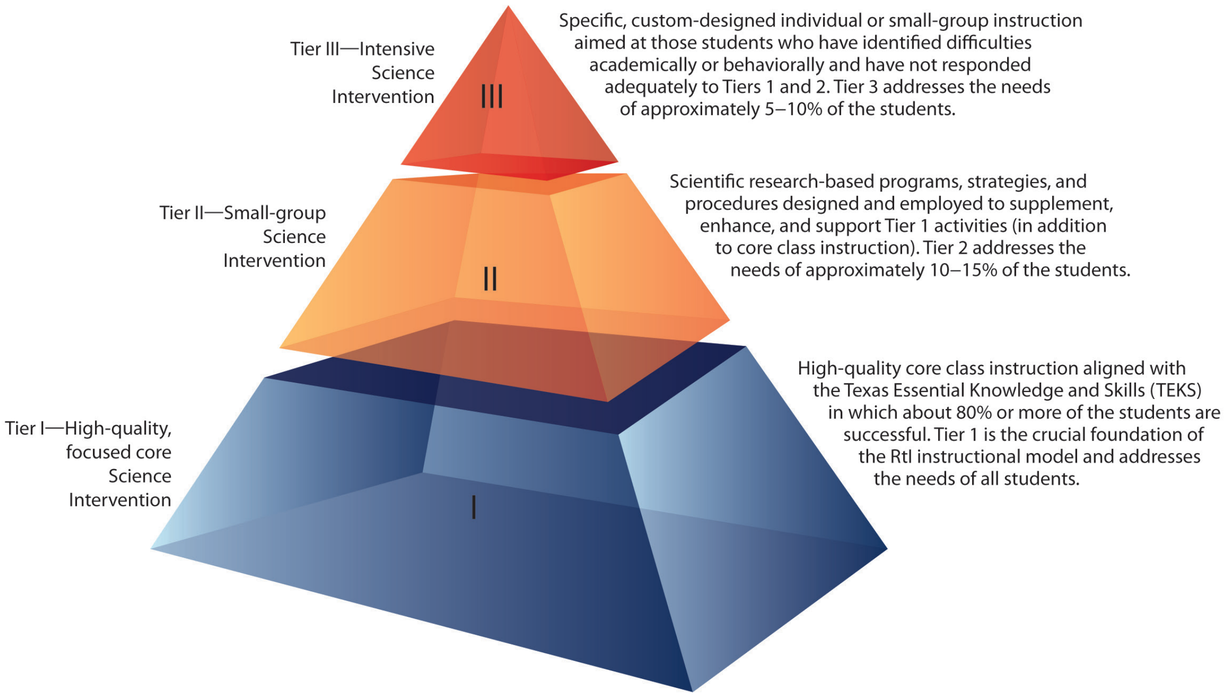
Core RtI Attributes

- tiered interventions
- implementation of differentiated curriculum
- instruction delivered by staff other than classroom teachers at higher tiers
- varied duration and frequency of interventions
- placement decisions that serve students with varied abilities
- standardized treatment protocol

Source: National Research Center on Learning Disabilities

Response to Intervention (RtI)

3-Tier Intervention Model



Sources:
RtI from All Sides: What Every Teacher Needs to Know, Mary Howard
2008–2009 Response to Intervention Guidance, Texas Education Agency

Gifted/Talented Students

Texas State Goal for Gifted/Talented Students
Students who participate in services designed for gifted/talented students will demonstrate skills in self-directed learning, thinking, research, and communication as evidenced by the development of innovative products and performances that reflect individuality and creativity and are advanced in relation to students of similar age, experience, or environment. High school graduates who have participated in services for gifted/talented students will have produced products and performances of professional quality as part of their program services.

Training on the differentiation of curriculum, instruction, and assessment is essential for meeting the needs of students who are gifted/talented. These students require special provisions because of their strengths and above-grade instructional level or potential.

How can Response to Intervention (RtI) be used with gifted/talented students?

RtI is the practice of meeting the academic and behavioral needs of all students through a variety of services containing the following key elements:

- High-quality instruction and scientific research-based tiered interventions aligned with individual student need
- Frequent monitoring of student progress to make results-based academic and/or behavioral decisions
- Application of student response data to important educational decisions (such as those regarding placement, intervention, curriculum, and instructional goals and methodologies)

Using the three elements above, shift the focus from struggling learners to those students who learn at a faster pace or have a need to delve deeper into a subject. Each one could be applied when deciding how to implement an educational plan for a gifted/talented student using RtI.

Resources
Texas State Plan for the Education of Gifted/Talented Students
http://tea.texas.gov/Curriculum_and_Instructional_Programs/Special_Student_Populations/Gifted_and_Talented_Education/Gifted_Talented_Education/

Gifted/Talented Resources (Texas)
http://tea.texas.gov/Curriculum_and_Instructional_Programs/Special_Student_Populations/Gifted_and_Talented_Education/Gifted_Talented_Education/

Response to Intervention for Gifted Children, Council of Exceptional Children–The Association for the Gifted (CEC–TAG) http://ektron.nagc.org/index.aspx?id=6266

CEC–TAG Position Paper on RtI and Gifted/Talented Students http://www.gifted.uconn.edu/siegle/TAG/PositionPapers/CEC-TAG%20Position%20RtI.pdf

Response to Intervention (RtI): A Practitioner's Guide to Implementation, Colorado Department of Education http://www.cde.state.co.us/sites/default/files/documents/rti/downloads/pdf/rtiguide.pdf

Response to Intervention and Gifted and Talented Education, Montana Office of Public Instruction
http://opi.mt.gov/PDF/Gifted/RtI_GTFramework.pdf

Tier 1 Instruction Checklist

Imagine a classroom of days gone by—everyone sitting in rows, reading the same book, and producing the same product. One size fits all, or most.

What outcomes do you think you would see from students?

Now consider a classroom with flexible seating, leveled books, and a variety of student work products. Instruction tailored by the teacher based on students' diverse learning needs, strengths, and interests.

What outcomes do you think you would see from students?

Considering the following checklist, in which classroom would you likely see more characteristics of quality Tier I instruction?

Quality Tier 1 instruction . . .	
	Is the crucial foundation of the RtI instructional model
	Is proactive and intentional
	Is engaging differentiated instruction provided by the classroom teacher in the classroom, during class time
	Is intervention without labeling students
	Gives all students access to quality general curriculum and instruction
	Builds on student strengths and interests
	Lays the foundation for future learning
	Uses ongoing formative assessment to drive instruction
	Removes learning barriers
	Adjusts the classroom environment
	Includes • research-based strategies, supports, and interventions in each lesson • differentiated language support, when needed • flexible grouping (whole class and small groups)
	Values variety • in students • in student work learning needs and styles (varied instructional strategies and materials) • in student products (choice or tiered options for student work)
	Is supported by ongoing teacher professional development

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Texas Education Agency, Division of Curriculum, & Texas Higher Education Coordinating Board, Division for P-16 Initiatives, College Readiness Initiatives. (2009). *Texas college and career readiness standards*. Austin, TX: The University of Texas.

NOTES

NOTES

INSTRUCTIONAL RESOURCES

The 5E Lesson Model

An effective lesson provides the most impact on student achievement by ensuring that students are actively engaged in learning. It also allows students to reflect upon their learning to make sense of their activities. Students are provided with opportunities to use, extend, and apply what is learned. The Five E (5E) instructional model developed and modified by Roger W. Bybee, past executive director of the National Research Council and Center for Science, Mathematics, and Engineering Education, provides such a model. Learning something new or understanding something familiar in greater depth involves making sense of both our prior experiences and first-hand knowledge gained from new explorations.

The Components of the 5E Instructional Model:

ENGAGE: The instructor initiates the Engage by asking well-chosen questions, defining a problem to be solved, or by showing something intriguing, such as a discrepant event. The activity is designed to interest students in the concept and to provide opportunities for making connections to past and present learning.

EXPLORE: The Explore provides the opportunity for students to become directly involved with the key concepts of the lesson through guided exploration that requires them to probe, inquire, and discover. As we learn, the puzzle pieces (processes and concepts necessary to solve the problem) begin to fit together or have to be broken down and reconstructed several times. In this stage, instructors observe and listen to students as they interact with each other and the materials used in the activity. Instructors provide probing questions to help students clarify their understanding of major concepts and redirect their questions and thinking when necessary. The exploration stage provides students with a set of common experiences and social interactions as they begin making sense of the new concept.

EXPLAIN: In the Explain, collaborative learning teams begin to sequence logically the events/facts from the investigation and communicate these findings to each other and the instructor. The instructor, acting in a facilitation role, uses this phase to offer further explanations and provide additional meaning or information, such as correct terminology. Giving labels or correct terminology is far more meaningful and helpful in retention if it is done after the learner has had a direct experience. The explanation stage is used to record the learner's development and grasp of the key processes and concepts of the lesson.

ELABORATE: The Elaborate allows students to apply, extend, and expand their understanding of the processes and concepts of the lesson. Students can then connect this knowledge with their prior learning to create understanding. During the elaboration stage, students are encouraged to use the terms and definitions provided previously. It is critical that instructors verify students' understanding during this stage.

EVALUATE: Throughout the learning experiences, the ongoing process of evaluation allows the instructor to determine whether the learner has reached the desired level of understanding of the key processes and concepts. In the Evaluate, both the teacher and the student check the student's understanding of the learning goal of the lesson.

Scientific Investigations

Students are expected to design and conduct an experiment in Grade 4.

Question: An investigation begins with a question you want answered.

Hypothesis: After doing some research, you can write a hypothesis and decide how you want to test your hypothesis. A hypothesis is a prediction (or an educated guess) you make that tells what you think will happen in the experiment.

Procedure: A procedure is a set of instructions that tells you how to do the experiment. Within the procedure, repeat the investigation multiple times to make sure your data is reliable. Compare data from different trials to make sure your results are similar. Repeated investigations are called trials.

Results: Scientists examine their data and summarize their results.

Conclusion: A conclusion is drawn after all the trials are complete and results are analyzed. Scientists reflect on their predictions, or hypotheses, to see if the data supports their hypothesis.

Next Steps: Scientists list the things that were done well in the experiment as well as the things that could have been done differently or better. Based on the conclusions, you may plan future experiments that build on your results.

Instructional Resources

Instructional Strategies

Alternate Response Products—Students produce varied products to show what they have learned. Teachers may assign tiered products or allow students to choose their output products, which encourages student engagement and ownership of learning.

Brainstorming/Discussion—Whole-class or small-group activities encourage students to discuss their thinking or ideas about a given topic. This process values student knowledge and ability while helping students share and build on their ideas.

Choice—Providing students with choice in the process and product of their learning is a way to engage students and allow them to create their own meaning.

Experience-Based Writing/Reading—Students are provided the opportunity to recognize and tap into their experiential knowledge, including cultural influences and interests.

Graphic Organizers—Graphic or visual displays can be used to show how ideas, facts, and terms are related to each other. Concept maps, Venn diagrams, T-charts, and labeled illustrations are examples of graphic organizers that are effective strategies for supporting student comprehension throughout a lesson cycle.

Grouping/Cooperative Learning—Varied grouping helps meet the needs of students and facilitates materials management. Working in cooperative learning groups allows students to discuss new content; get new ideas; and ask questions in a smaller, safer group before completing a task and/or speaking to the whole class. Students can work in pairs or in groups of three to five depending on the task and/or age of the students.

Think-Pair-Share is one instructional strategy that provides structure for cooperative learning in pairs. Pairing an English language learner (ELL) with a proficient English speaker will provide the ELL student with a language model and an opportunity to practice English skills one-on-one before sharing with the class.

Hands-on Learning/Activities—Students have their hands on materials and do science. Engaging students in hands-on learning allows them to learn by doing and helps them apply in real time what they think, know, and learn. Hands-on learning may include working with models or manipulatives. The student is actively involved in investigating and observing during the learning process.

Manipulatives/Cards—Physical objects or photo representations of objects or concepts allow students to manipulate or get their hands on the content. Teachers can differentiate manipulatives and card sorts by size, color, and number (increase/reduce the number of cards for students as needed).

Music and Rhyme—This method engages students in learning new information by using words in rhythm to songs and chants.

Instructional Strategies

Notebooking—Notebooks are used to document and organize information from class discussions, investigations, and activities. In kindergarten or first grade, teachers might use a large spiral-bound chart that has been turned on its side to function as a class notebook. In second grade and higher, students may use individual or personal notebooks to record information, observations, and reflections. Writing and/or drawing opportunities provide a means for students to express their understanding through art and nonlinguistic representations.

Pictures/Photos—Giving a visual image or context clue for students to use builds an understanding of a concept or helps identify unfamiliar vocabulary.

Role Playing—Acting taps into the interpersonal and verbal skills of students by allowing them to become involved through acting out concepts.

Rubrics—Assess and encourage student performance and reflection by explaining various ranges of skills and/or behaviors required for a task or assignment.

Sentence Frames/Starters—Visually displaying phrases and well-formed sentences provides language support needed to speak or write in complete sentences about a given topic. Sentence frames may be used throughout the lesson cycle and can be posted around the classroom.

Stations—Activity centers are set aside for students (individually or in small groups) to simultaneously complete various assigned tasks. With planning, stations can be used to differentiate instruction and can help with materials management. (Providing materials for one station is easier than providing materials for the entire class.) Teachers may allow students to choose a center using a menu or may ask all students to work through centers with leveled activities.

Technology—Differentiate activities and allow for customized, flexible/varied student materials and products by using audio and video recordings, digital copies of books, Internet searches, and apps on mobile devices.

Visual aids—Help students visualize new and/or difficult concepts using demonstrations, models, pictures, or images that support learning. Adding pictures to reading passages or task instruction cards for hands-on activities can help students read text with less difficulty and remove barriers in understanding and/or completing tasks. Refer to the following example of using a visual aid on a task instruction card.

1. Put on your safety goggles. 

Instructional Strategies

Vocabulary Games—Games engage students in using key vocabulary in unique ways that can activate prior knowledge, reinforce key vocabulary terms, clarify meanings, and catch student misconceptions.

Word Associations—Combine a vocabulary word, a key term or phrase from the definition, and an illustration to visually display vocabulary. Students have the opportunity to make their own connections and to take ownership of their learning.

Word Bank—Listing words related to a unit of study, organized by category, supports students in accessing the vocabulary needed to complete specific tasks or assignments.

Word Wall/Personal Word Wall—Continuously displaying vocabulary needed to complete specific tasks or assignments throughout the year helps students retain information. Teachers and students can add new vocabulary words as words are covered in class.

Instructional Resources

Earth and Space Lessons Reflection Sheet

Grade Level	Vertical Support	Tier I Instructional Strategies
Grade 4, Earth and Space	This lesson supports Grade 5 by . . .	Observed: Possible Tier I Tailoring:
Grade 3, Earth and Space	This lesson supports Grade 5 by . . .	Observed: Possible Tier I Tailoring:

Earth and Space Lessons Reflection Sheet

Grade Level	Vertical Support	Tier I Instructional Strategies
Grade 2, Earth and Space	This lesson supports Grade 5 by . . .	Observed: Possible Tier I Tailoring:
Grade 1, Earth and Space	This lesson supports Grade 5 by . . .	Observed: Possible Tier I Tailoring:

Earth and Space Lessons Reflection Sheet

Grade Level	Vertical Support	Tier I Instructional Strategies
Kindergarten, Earth and Space	This lesson supports Grade 5 by . . .	Observed: Possible Tier I Tailoring:

Organisms and Environments Lessons Reflection Sheet

Grade Level	Vertical Support	Tier I Instructional Strategies
Grade 4, Organisms and Environments	This lesson supports Grade 5 by . . .	Observed: Possible Tier I Tailoring:
Grade 3, Organisms and Environments	This lesson supports Grade 5 by . . .	Observed: Possible Tier I Tailoring:

Organisms and Environments Lessons Reflection Sheet

Grade Level	Vertical Support	Tier I Instructional Strategies
Grade 2, Organisms and Environments	This lesson supports Grade 5 by . . .	Observed: Possible Tier I Tailoring:
Grade 1, Organisms and Environments	This lesson supports Grade 5 by . . .	Observed: Possible Tier I Tailoring:

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Organisms and Environments Lessons Reflection Sheet

Grade Level	Vertical Support	Tier I Instructional Strategies
Kindergarten, Organisms and Environments	This lesson supports Grade 5 by . . .	Observed: Possible Tier I Tailoring:

SCIENCE:

KINDERGARTEN—EARTH AND SPACE

KINDERGARTEN

Earth and Space

Rocks Rock

Science Concept

K(7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to:

(A) observe, describe, compare, and sort rocks by size, shape, color, and texture

Content Objective

I can observe, describe, compare, and sort rocks by size, shape, color, and texture.

Science Process Skills

K(1) Scientific investigation and reasoning. The student conducts classroom and outdoor investigations following home and school safety procedures and uses environmentally appropriate and responsible practices. The student is expected to:

(A) identify and demonstrate safe practices as described in the Texas Safety Standards during classroom and outdoor investigations, including wearing safety goggles, washing hands, and using materials appropriately

K(2) Scientific investigation and reasoning. The student develops abilities to ask questions and seek answers in classroom and outdoor investigations. The student is expected to:

(D) record and organize data and observations using pictures, numbers, and words

(E) communicate observations with others about simple descriptive investigations

K(4) Scientific investigation and reasoning. The student uses age-appropriate tools and models to investigate the natural world. The student is expected to:

(A) collect information using tools, including computers, hand lenses, primary balances, cups, bowls, magnets, collecting nets, and notebooks; timing devices, including clocks and timers; non-standard measuring items such as paper clips and clothespins; weather instruments such as demonstration thermometers and wind socks; and materials to support observations of habitats of organisms such as terrariums and aquariums; and

(B) use senses as a tool of observation to identify properties and patterns of organisms, objects, and events in the environment.

Earth and Space

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English Language Proficiency Standards

(3) Cross-curricular second language acquisition/speaking. The ELL speaks in a variety of modes for a variety of purposes with an awareness of different language registers (formal/informal) using vocabulary with increasing fluency and accuracy in language arts and all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in speaking. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. The student is expected to:

(E) share information in cooperative learning interactions

(G) express opinions, ideas, and feelings ranging from communicating single words and short phrases to participating in extended discussions on a variety of social and grade-appropriate academic topics

Language Objective

I will orally describe to a partner the size, shape, color, and texture of rocks.

Response to Intervention/Tier 1 Differentiation

All science lessons support students in receiving quality Tier 1 instruction. Using the 5E model, knowledge is taught in a variety of contexts, integrating math, science, and ELAR content, thus supporting the active engagement of the students with the content. Lesson-specific differentiation strategies for addressing diverse student needs can be found in sections titled "Differentiation Strategy."

Differentiation should

- focus on skills students did not understand, and extend the lesson for advanced students;
- be conducted in small groups or embedded in whole-group instruction; and
- provide students with a variety of strategies to process the information, such as
  - allowing for additional opportunities for verbal brainstorming of words associated with a topic (with teacher taking dictation);
  - making clear connections of new and more complex concepts to foundational aspects and prior knowledge;
  - participating in more tangible experiences, such as experiments, investigations, and active exploration;

Earth and Space

- sorting academic vocabulary words into categories by common attributes, such as process words or science content vocabulary;
- organizing results of brainstorming into semantic maps or creating graphic organizers;
- discussing the meaning of a graphic organizer with a partner; and
- creating a visual representation to demonstrate understanding.

See the handout in the Instructional Resources section that addresses instructional strategies.

College and Career Readiness Standards—Science Standards

I.C.3 Collaborative and safe working practices. Demonstrate skill in the safe use of a wide variety of apparatuses, equipment, techniques, and procedures.

I.E.1 Effective communication of scientific information. Use several modes of expression to describe or characterize natural patterns and phenomena. These modes of expression include narrative, numerical, graphical, pictorial, symbolic, and kinesthetic.

I.E.2 Effective communication of scientific information. Use essential vocabulary of the discipline being studied.

V.D.1 Classification. Understand that scientists categorize things according to similarities and differences.

Vocabulary Focus
color
rocks
shape
size
texture

Earth and Space

5E Lesson Summary

Engage
Students identify rocks.

Explore
Students observe, compare, and sort rocks.

Explain
Students explain the size, shape, color, and texture of rocks.

Elaborate
Students observe, describe, and compare rocks.

Evaluate
Students compare and sort rocks.

Materials

For teacher

- chart paper
- class science notebook
- marker
- masking tape (optional)
- resealable plastic bags, sandwich size
- resealable plastic bags, jewelry size (2" x 2")
- packing tape

For student groups

- hand lenses
- 8–10 rocks of different size, shape, color, and texture, such as river rocks and pebbles
- small bag of sand
- objects that are not rocks, such as:
  - apple
  - BB, in plastic bag

continued . . .

Engage

Safety Alert

Monitor students as they work with small objects, such as BBs, small rocks, and sand. Remind students to avoid putting materials in their mouths to prevent choking hazards.

Content Builder

Students in Kindergarten may have varied experiences and knowledge of rocks. Kindergarten students are expected to observe, describe, compare, and sort rocks by size, shape, color, and texture. They do not need to learn about the different types of rock or about the rock cycle. In fifth grade, students will explore how sedimentary rocks form as part of the rock cycle.

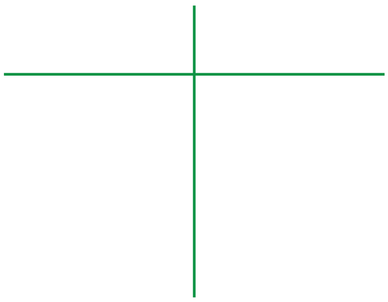
Teacher Note

Collect a variety of rocks from nature or purchase sets from discount stores, home improvement stores, or education supply companies. Throughout this lesson, you will need rocks of different size, shape, color, and texture. Try to use rocks as they naturally occur rather than cut or polished rocks. Ask coworkers, friends, and neighbors if they have rock collections they are willing to share with your class for this lesson. Students should learn that there are many different rocks in the world—more than what they find in the driveway.

RM 1: Rock or Not includes pictures of the materials listed and a boulder. Use the real objects and the images from *RM 1* for this activity.

Advance Preparation

Collect materials, and create a set for each group of 3–4 students. Place each small object such as the BB and bean inside a jewelry-size resealable plastic bag and seal with packing tape. Seal the bag of sand with packing tape. For each group, create a T-chart on chart paper as shown below. Do not label the T-chart. You may choose to create T-charts on tabletops using masking tape. You may also choose to allow students to use a brainstorming or whiteboard digital application to create a T-chart.



Prepare *RM 1* for each group by cutting along the dotted line and placing pictures in a resealable plastic bag for future use.

Teacher Instruction

- Divide the class into groups of 3–4 students, and assign each group a place to work.
- Distribute a set of materials to each group.
- Instruct students to observe the objects, and sort them into two groups. *Students may sort the objects any way they choose.*
- Instruct students to identify and label their two groups based on how they sorted them using the note cards.
- Allow adequate time for students to observe and sort the objects.
- Ask: How did you sort the objects? *Allow each group to share how they sorted their objects. Some groups may sort by size or texture while others may sort them into groups of objects that are rocks and objects that are not rocks.*
- Instruct students who had labels other than "Rocks" and "Not Rocks" to use the back of the note cards to create new labels—"Rocks" and "Not Rocks."

. . . continued

- bean, in plastic bag
- brick
- coins
- cotton ball
- cup
- glass marble
- magnet
- plastic ball
- shells of various sizes and shapes

- 2 note cards, 3" x 5"
- pencil
- RM 1, cut and bagged
- tablet (optional)
- tray or bag for materials

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Earth and Space

- Instruct students to sort the objects into two groups—rocks and not rocks.
- Allow adequate time for students to complete the sort.
- Ask: How did you decide whether an object was a rock? *Answers will vary depending on student experiences with and knowledge of rocks. Students may place the BB, brick, and shell in the Rocks column. Students may place the sand in the Not Rocks column because they do not know that sand is tiny pieces of rock.*
- Debrief the activity by creating a T-chart in the class science notebook. Use the pictures from *RM 1* for this activity. You may also choose to use a brainstorming digital application to create a T-chart.

Explore

Safety Alert

Because students will be working with rocks, review the appropriate ways to handle rocks. Advise students to refrain from throwing the rocks. Students should always wash their hands after handling rocks.

Content Builder

Rocks can be many different sizes, and the size of a rock determines what we call it. Boulders are big rocks; they are larger than a soccer ball. Cobbles are medium-size rocks; they are larger than a pebble or about the size of a baseball. Pebbles are small rocks; they are smaller than a golf ball. A grain of sand is a tiny rock. Rocks can feel smooth or rough to the touch. Polished and tumbled rocks will feel smooth and appear shiny. It is important to note that although some rocks found in nature appear polished and tumbled, rocks purchased from a rock shop that have been polished or tumbled will likely be more smooth and shiny.

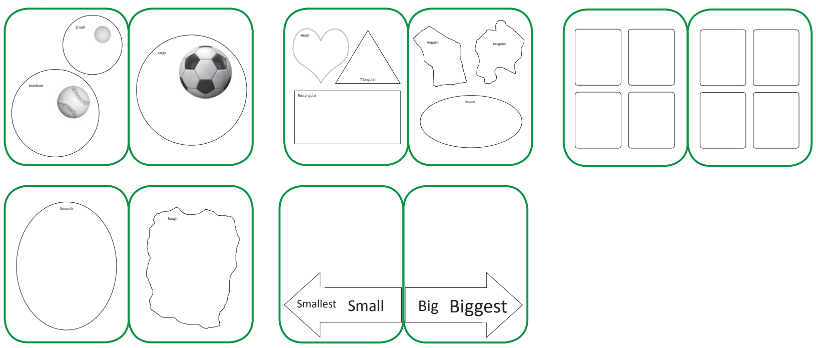
Teacher Note

Model how to observe the rocks by touch and sight, using your eyes, a hand lens, and your hands. You may choose to display a golf ball, a baseball, and a soccer ball so that students can use these as models for the different sizes of rocks.

Advance Preparation

Ask students to bring three rocks from home or take students outside to collect rocks to use in the sorting activities. Add these to the rocks from Engage to create a set of 10–12 rocks for each group.

Prepare sorting folders using *RM 2: Rock Sorting Pages*. Glue each pair of pages as shown inside one file folder. You may need to prepare two or three sets so that each group of 3–4 students has one folder at a time.



Materials

For teacher

- chart paper or class science notebook
- digital camera (optional)
- file folders
- glue stick
- marker
- RM 2
- timer

For student groups

- folders prepared using RM 2
- hand lenses
- rocks from Engage
- 10–12 additional rocks
- tablet (optional)
- tray for materials

Earth and Space

Differentiation Strategy

Some students may not need the support of *RM 2* to complete each sort. You may ask these students to sort the rocks in as many ways as they are able. Students should sort the rocks by size, shape, color, and texture. Acknowledge any other sorting categories (type of rock, etc.), but do not focus on them as they are outside the scope of this lesson. Students should label each group and then take a picture using a digital camera or tablet to document each sort.

Teacher Instruction

- Divide the class into groups of 3–4 students.
- Assign each group a place to work.
- Distribute one sorting folder and a collection of rocks to each group. Students will work with this group of rocks for each sort.
- Instruct students to sort the rocks by using the sorting folder, a hand lens, and their senses of sight and touch.
- Allow 5–7 minutes for students to complete the sort using their assigned folder.
- Give each group a different folder, allow them time to sort the rocks, and repeat until each group has sorted the rocks by size, shape, color, and texture and has sequenced the rocks from smallest to biggest.
- Use the Facilitation Questions to debrief the activity and create a poster or class science notebook entry listing words that describe rocks.
  Sample entry:

Rocks

are	**can be**	**have**
hard	round	spots
nonliving	square	stripes
natural	smooth	rings
found everywhere	rough	sparkles
	red	dots
	white	
	black	
	orange	
	large	

Earth and Space

KINDERGARTEN

Facilitation Questions

- What did you notice about the rocks? *Answers will vary depending on the rocks but may include words to describe the size, shape, color, and texture of rocks.*
- What is a collection? *A collection is a group of things like rocks.*
- What shapes are the rocks in your collection? *Answers will vary depending on the rocks. Rocks can be round, angular, rectangular, square, triangular, heart shaped, and irregularly shaped.*
- What color are the rocks in your collection? *Answers will vary depending on the rocks. Depending on what they are made of, rocks may be tan, black, pink, red, gray, brown, white, or a combination of these and other colors.*
- What size are the rocks in your collection? *Answers will vary depending on the rocks. Rocks can range in size from large like a boulder to tiny like a grain of sand and all sizes in between.*
- Where have you seen bigger or smaller rocks than those in our collection? *Depending on their experiences and the size of rocks in the collection, students may say they have seen bigger rocks in flower beds, in landscaping in yards, or large rocks or boulders near mountains. They may have seen smaller rocks in their yards, at parks, on playgrounds, at the beach, in driveways, and along pathways or found rocks in their shoes*.
- What other words can you use to describe how the rocks look? *Students may describe some rocks as shiny, sparkly, dull, spotted, or striped.*
- What is texture? *Texture is how something feels when you touch it.*
- What is the texture of the rocks in your collection? *Answers will vary depending on the rocks. Rocks can be smooth, rough, bumpy, gritty, or sometimes a combination.*

Explain

Materials

For teacher

- *My Rocks: Snapshots of My Rock Collection* book
- poster or class science notebook entry from Explore
- marker

Teacher Note

Students will describe and compare rocks during Elaborate. Creating or adding to the list of ways to describe rocks will assist all students in completing the activity. You will notice that some of the rocks in the book are identified by name; Kindergarten students do not need to know the types of rocks pictured in the book; they should instead focus on the size, shape, color, and texture of each rock and how the rocks compare to each other (e.g., bigger/smaller, smooth/rough, etc.).

Teacher Instruction

- Read and discuss the book with students.
- Facilitate a class discussion, allow students to share what they have learned about rocks, and add this information to the poster or class science notebook entry you created during Explore.

Rocks

are	**can be**	**have**
hard	round	spots
nonliving	square	stripes
natural	smooth	rings
found everywhere	rough	sparkles
	red	dots
	white	
	black	
	orange	
	large	

Facilitation Questions

- What shapes are the rocks in the book? *The rocks in the book are round, angular, rectangular, square, triangular, heart shaped, and irregularly shaped.*
- What color are the rocks in the book? *The rocks in the book are orange, pink, white, green, red, gray, brown, white, tan, and a combination of these colors.*

- What are the different sizes of rocks that we read about? *Boulders are big rocks; they are larger than a soccer ball. Cobbles are medium-size rocks; they are larger than a pebble. Pebbles are small rocks. A grain of sand is a tiny rock.*
- Where have you seen big rocks? *Depending on their experiences, students may say they have seen big rocks in flower beds or landscaping in yards or have noticed large rocks or boulders near mountains.*
- Where have you seen small rocks? *Depending on their experiences, students may have seen smaller rocks in their yards, at parks, on playgrounds, at the beach, in driveways, and along pathways or found rocks in their shoes.*
- What other words can you use to describe how the rocks look? *Students may describe some rocks as shiny, sparkly, dull, spotted, or striped.*
- What other words can you use to describe the texture of a rock? *Students may describe rocks as smooth, rough, bumpy, lumpy, gritty, or sometimes a combination of textures.*

Elaborate

Materials

For teacher

- poster or class science notebook entry from Explore and Explain

For each student

- art supplies (optional)
  - crayons
  - construction paper
  - scissors
- 1 rock
- RM 3

Teacher Instruction

- Display the poster or classroom science notebook entry from Explain so that all students can access or see it easily.
- Instruct students to select one rock.
- Assign each student a partner. Pairing an ELL student with a proficient speaker will provide the ELL student with a language model and provide an opportunity to practice English skills one on one before sharing with the class.
- Instruct student pairs to observe, compare, and describe their rocks using *RM 3: My Rock Rocks!*
- Allow adequate time for students to complete the activity.
- Allow each pair to display and share their comparisons with the class.

Facilitation Questions

- What color is your rock? *Answers will vary depending on the rocks. Students should describe the color of their rock. Rocks can be orange, pink, white, green, red, gray, brown, white, tan, and a combination of these colors.*
- What size is your rock? *Answers will vary depending on the rocks. Students should describe the size of their rock. Boulders are big rocks; they are larger than a soccer ball. Cobbles are medium-size rocks; they are larger than a pebble. Pebbles are small rocks. A grain of sand is a tiny rock.*
- What is the texture of your rock? *Answers will vary depending on the rocks. Students should describe the texture of their rock. Rocks can be smooth, rough, bumpy, lumpy, gritty, and sometimes a combination.*
- What shape is your rock? *Answers will vary depending on the rocks. Students should describe the shape of their rock. Rocks can be round, angular, rectangular, square, triangular, heart shaped, and irregularly shaped.*
- How does your rock compare to your partner's rock? How is your rock similar to your partner's rock? *Answers will vary depending on the rocks. Students should compare their rock with a partner's rock using words to describe the size, shape, color, and texture of both rocks.*

Evaluate

Teacher Note

Students will complete an individual rock sort that requires students to describe the rocks in each group and explain how they determined the groups. You may choose to have students sort the rocks independently, take a photo of their sort, and type or write a few sentences telling how and why they sorted them.

You may also choose to allow students to use a screencasting digital application to take a picture of their sort and record their comments. You may choose to allow students to work in pairs using the video feature on a mobile device to record their "My Rock" movie.

Materials

For teacher

- rocks from the lesson
- digital camera or tablet (optional)

Teacher Instruction

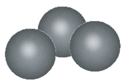
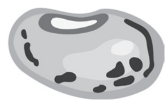
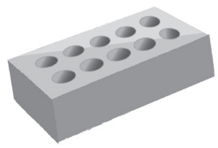
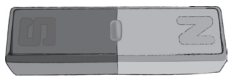
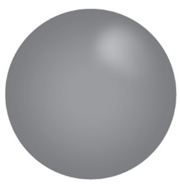
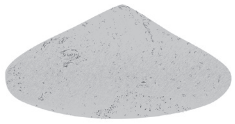
- Instruct each student to sort the rocks and describe how they determined the groups.
- Support student responses with the following sentence starters:
  - I sorted the rocks by _______.
  - The rocks in this group are bigger/smaller than the rocks in that group.
  - The rocks in the group are ________________.

Facilitation Questions

- How did you determine how you would sort the rocks? *Answers will vary but should include that the rocks were sorted by size, shape, color, or texture.*

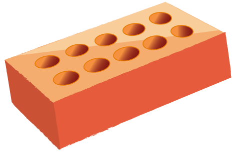
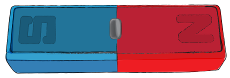
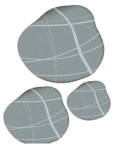
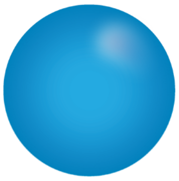
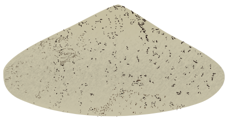
Kindergarten

RM 1: Rock or Not

 Apple	 BB	 Bean	 Boulder	 Brick
 Coins	 Cotton ball	 Cup	 Glass marble	 Magnet
 Pebbles	 Plastic ball	 River rocks	 Sand	 Shell

Kindergarten

RM 1: Rock or Not—Color Version

 Apple	 BB	 Bean	 Boulder	 Brick
 Coins	 Cotton ball	 Cup	 Glass marble	 Magnet
 Pebbles	 Plastic ball	 River rocks	 Sand	 Shell

RM 2: Rock Sorting Pages

Sort the rocks by size.

Small

Medium

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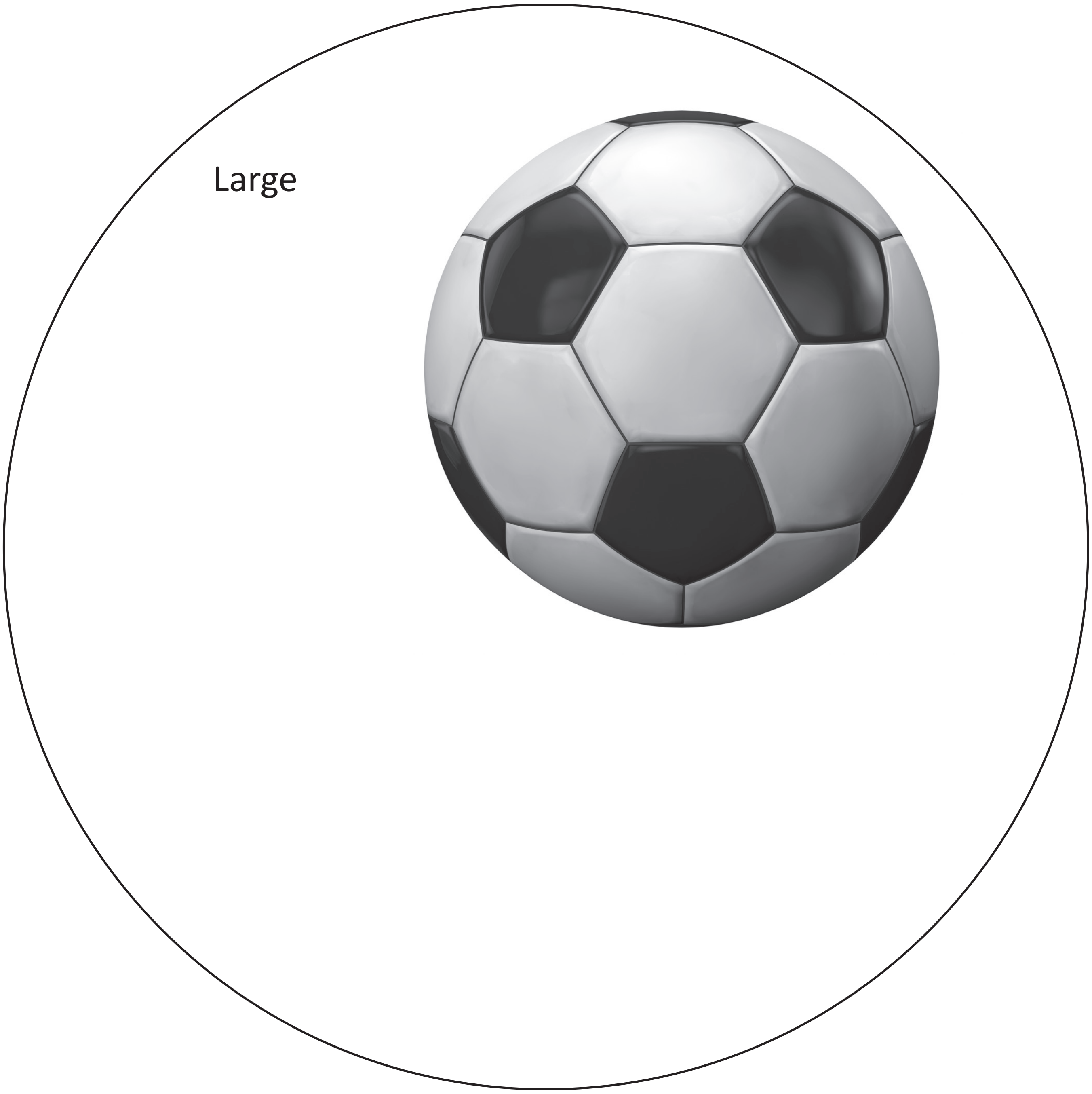
Kindergarten

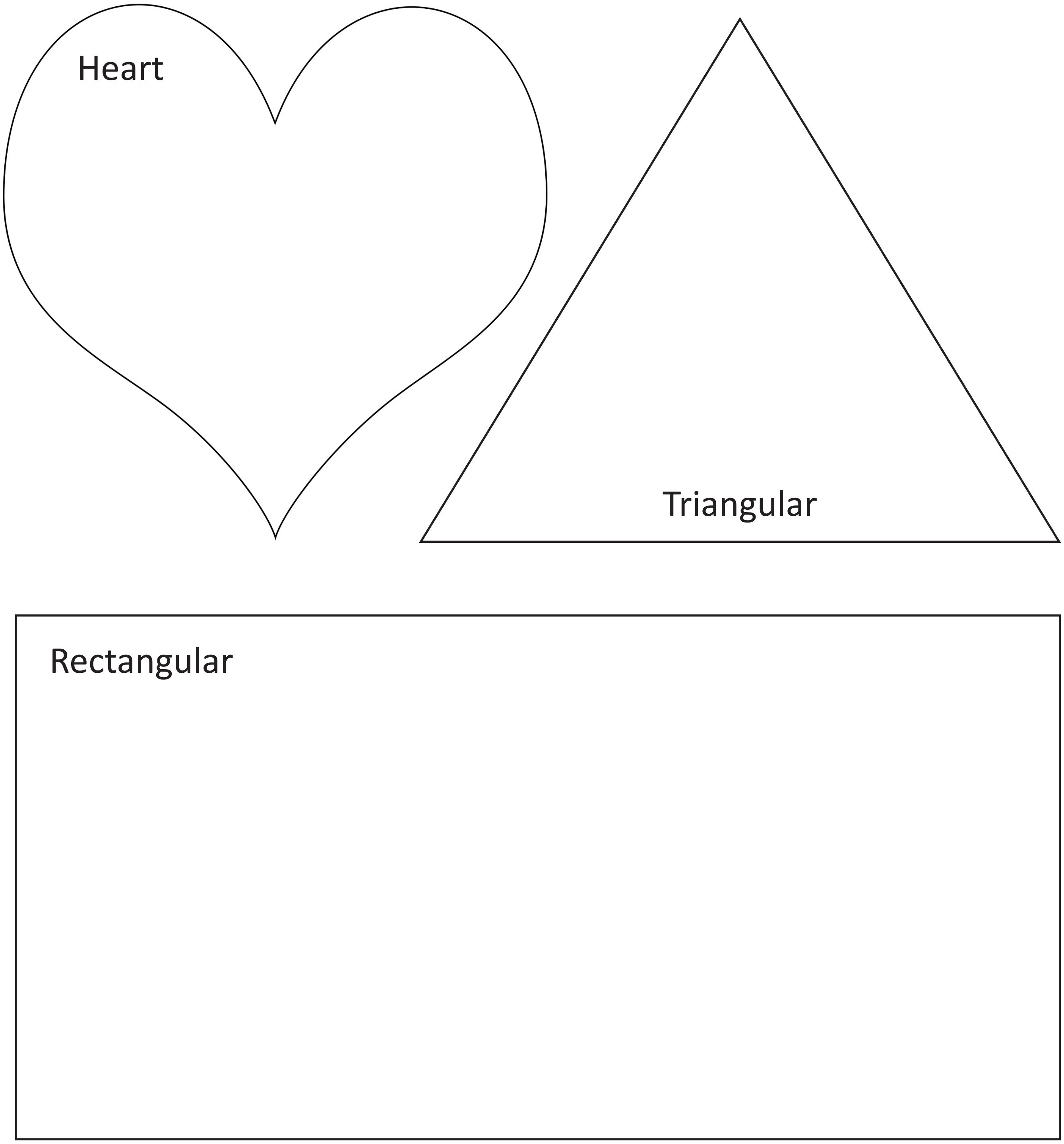
RM 2: Rock Sorting Pages continued

Sort the rocks by size.



RM 2: Rock Sorting Pages continued

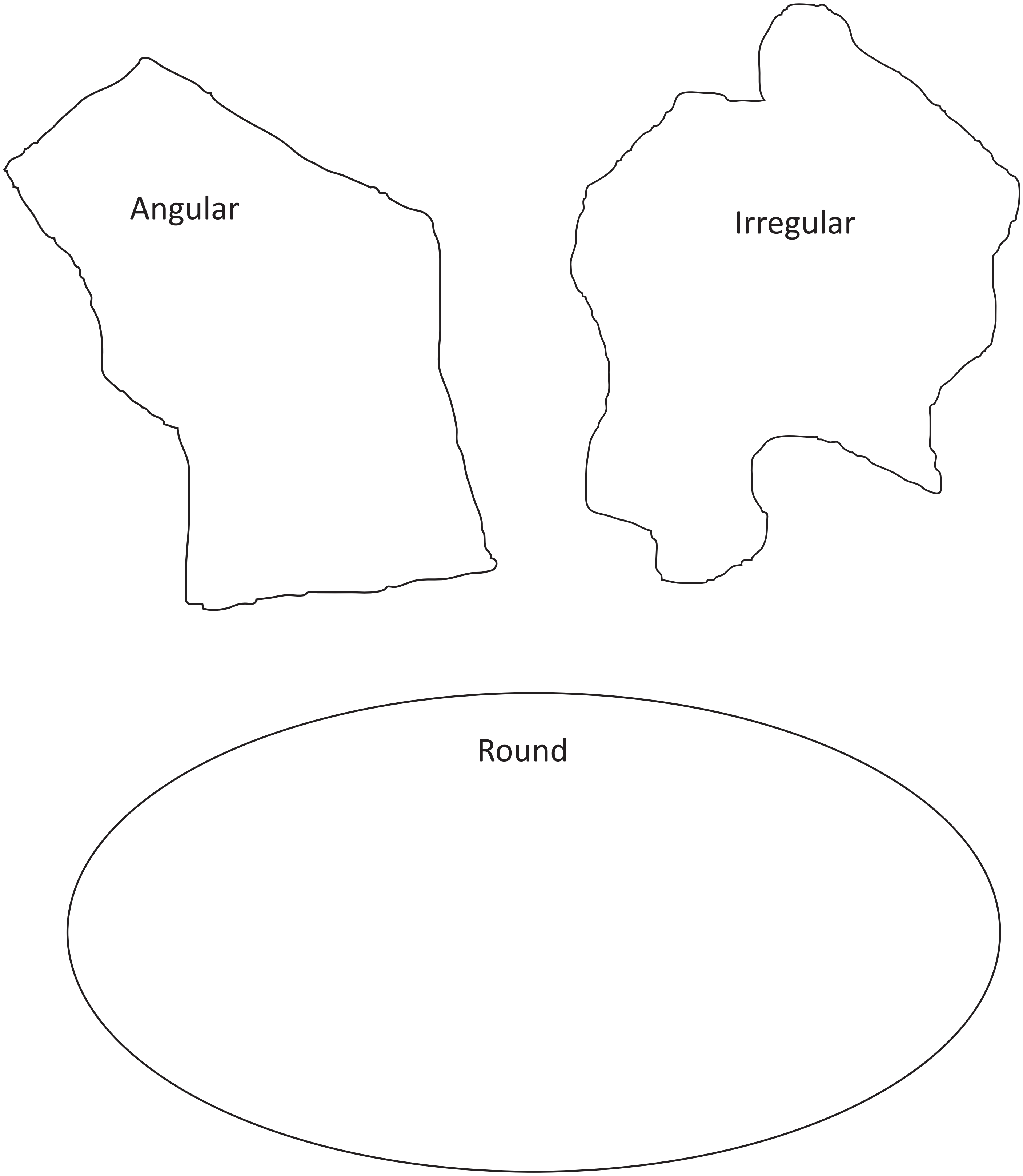
Sort the rocks by shape.



Kindergarten

RM 2: Rock Sorting Pages continued

Sort the rocks by shape.



RM 2: Rock Sorting Pages continued

Sort the rocks by color.

RM 2: Rock Sorting Pages continued

Sort the rocks by color.

RM 2: Rock Sorting Pages continued

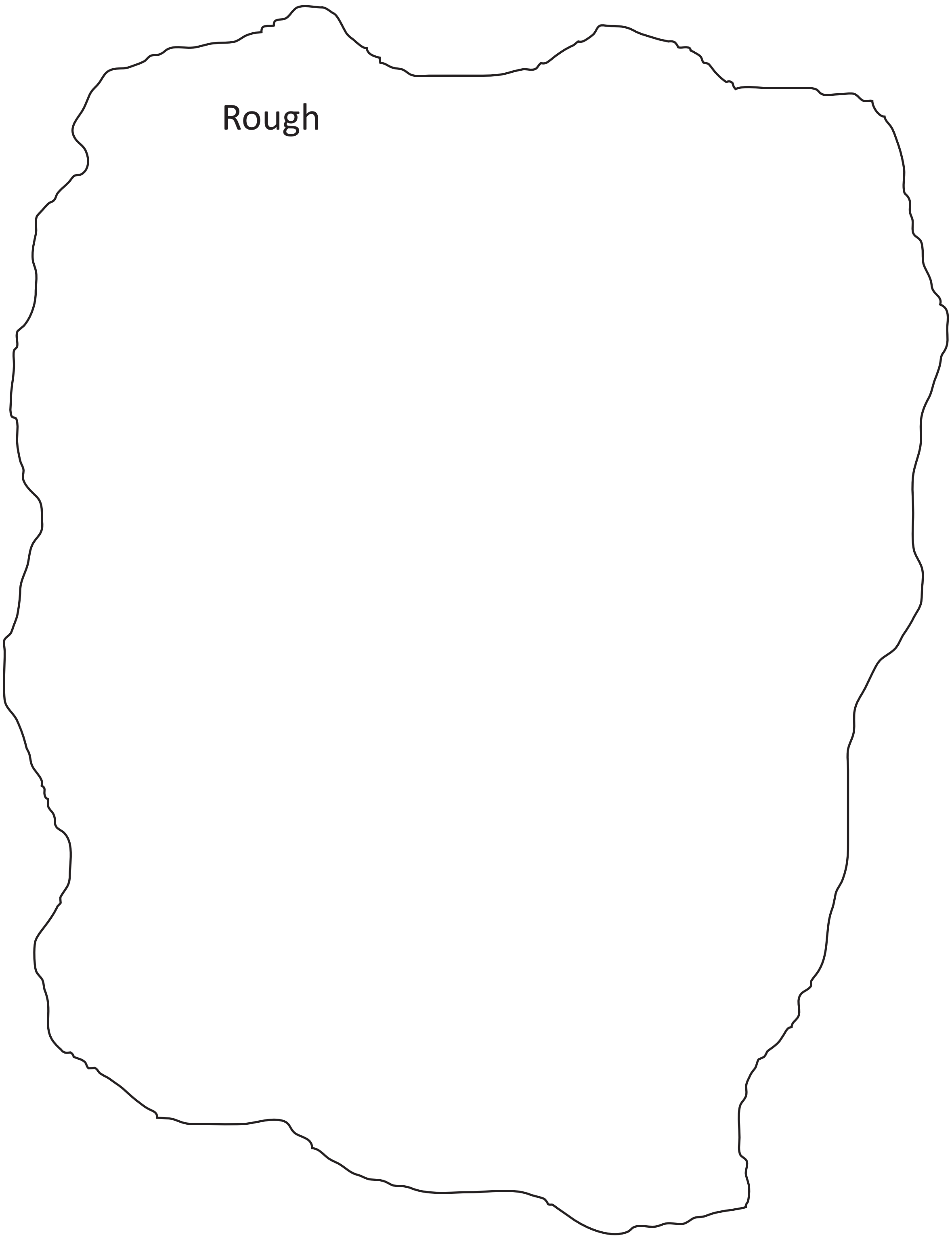
Sort the rocks by texture.

Smooth

Kindergarten

RM 2: Rock Sorting Pages continued

Sort the rocks by texture.



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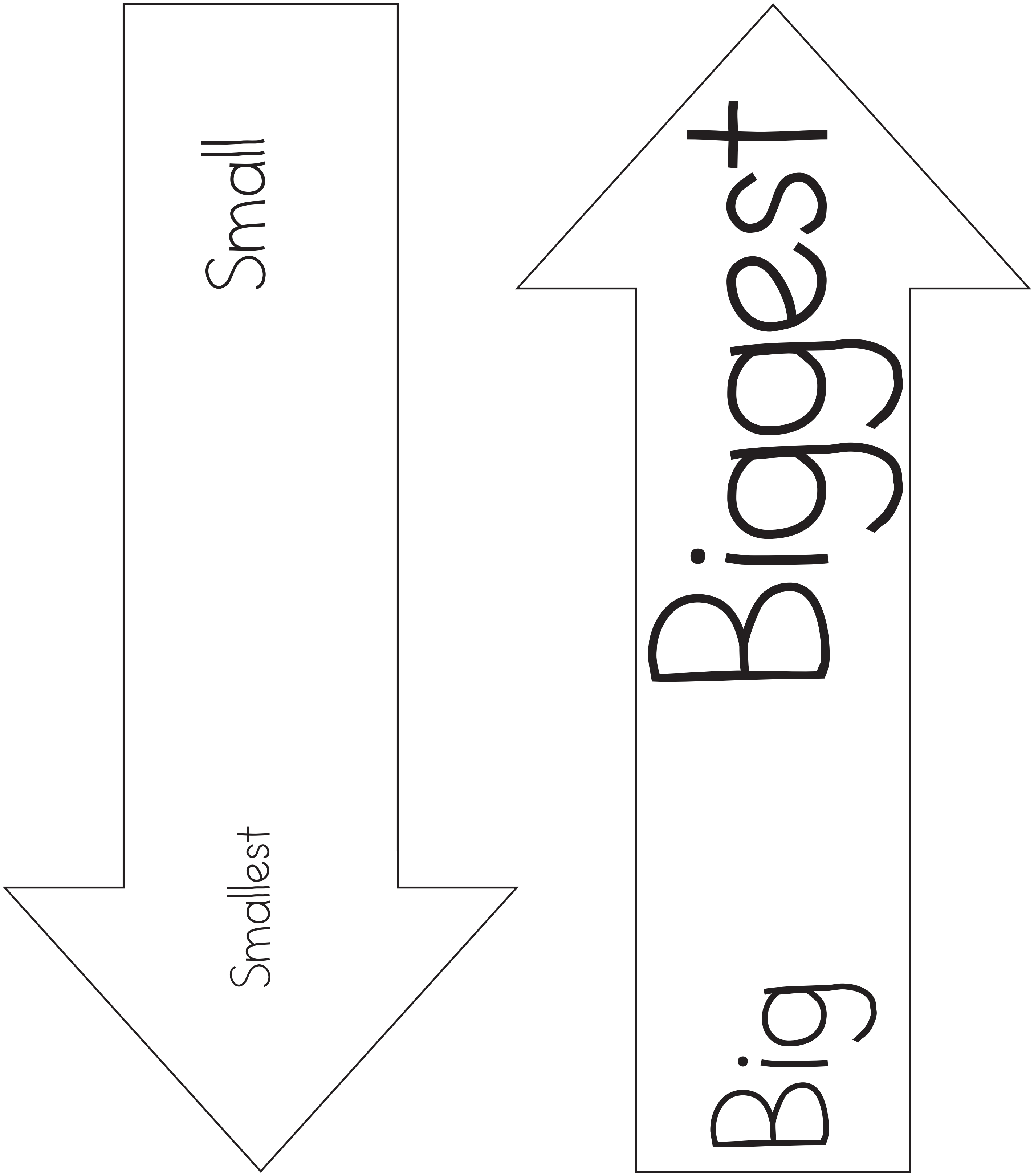
Kindergarten

RM 2: Rock Sorting Pages continued



Kindergarten

RM 3: My Rock Rocks!

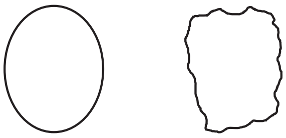
Name: ______________________________

The color of my rock is ______________.

The size of my rock is ______________.

small medium large

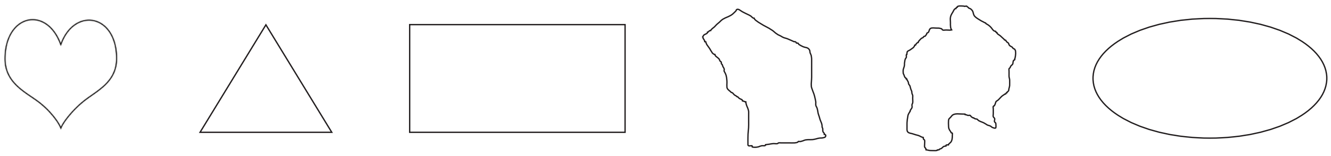
The texture of my rock is ______________.



smooth rough

Draw a picture of your rock.

The shape of my rock is ______________.



heart triangle rectangle angular irregular round

My rock rocks because ____

____

____

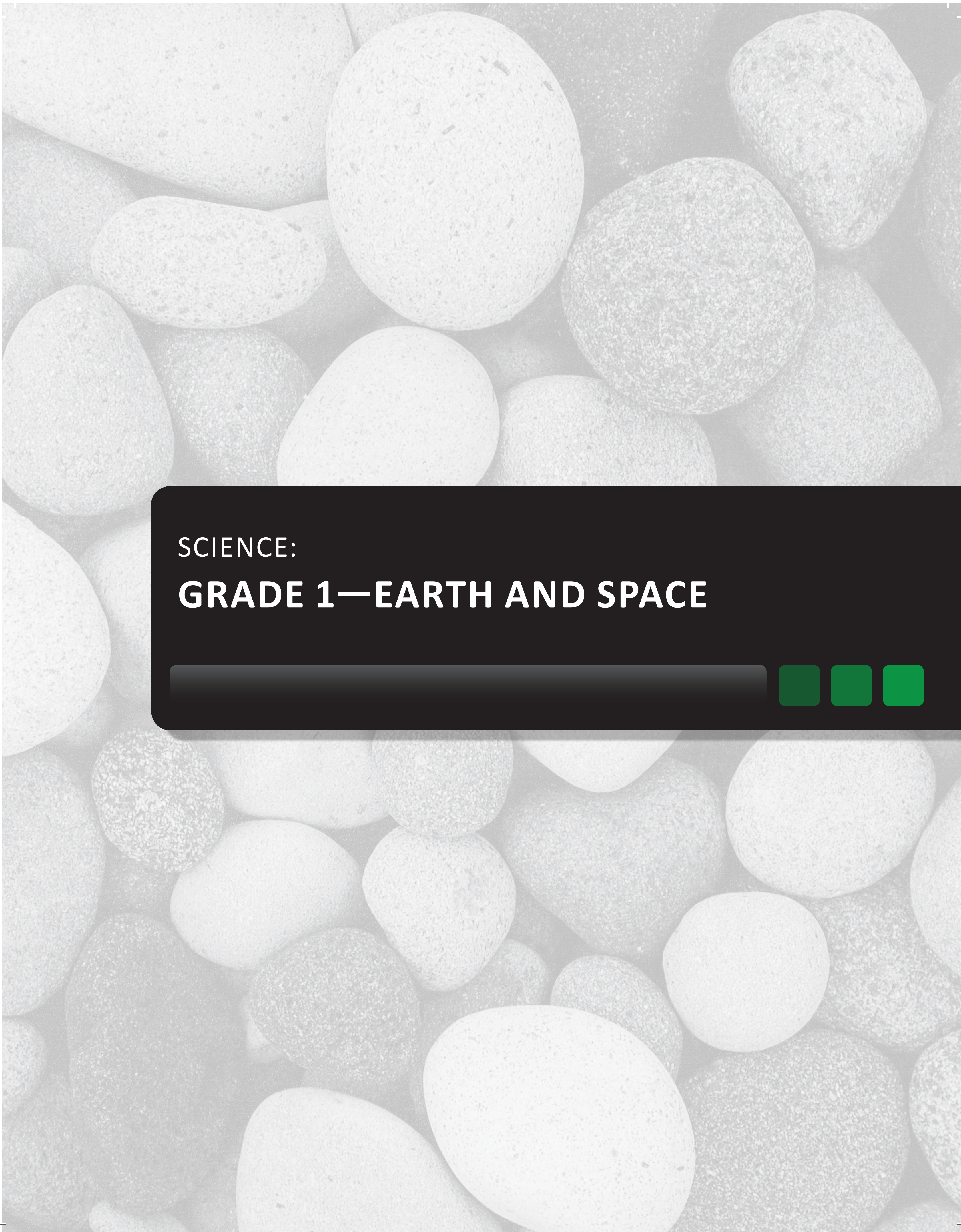
____.

Compare your rock with your partner's rock. Draw a star ☆ by all of the ways the two rocks are the same. On the back of this page, write 2–3 sentences comparing your rocks.

My rock is _____________than _________'s rock.

My rock is a different _________________than ____________'s rock.

Both of our rocks are ___________________.



SCIENCE:

GRADE 1—EARTH AND SPACE

GRADE 1

Earth and Space

Soil: Let's Dig In

Science Concept

1(7) Earth and space. The student knows that the natural world includes rocks, soil, and water that can be observed in cycles, patterns, and systems. The student is expected to:

(A) observe, compare, describe, and sort components of soil by size, texture, and color

Content Objective

I can observe, compare, describe, and sort components of soil by size, texture, and color.

Science Process Skills

1(1) Scientific investigation and reasoning. The student conducts classroom and outdoor investigations following home and school safety procedures and uses environmentally appropriate and responsible practices. The student is expected to:

(A) recognize and demonstrate safe practices as described in the Texas Safety Standards during classroom and outdoor investigations, including wearing safety goggles, washing hands, and using materials appropriately

1(2) Scientific investigation and reasoning. The student develops abilities to ask questions and seek answers in classroom and outdoor investigations. The student is expected to:

(A) ask questions about organisms, objects, and events observed in the natural world

(C) collect data and make observations using simple equipment such as hand lenses, primary balances, and non-standard measurement tools

(D) record and organize data using pictures, numbers, and words

1(4) Scientific investigation and reasoning. The student uses age-appropriate tools and models to investigate the natural world. The student is expected to:

(A) collect, record, and compare information using tools, including computers, hand lenses, primary balances, cups, bowls, magnets, collecting nets, and notebooks and safety goggles; timing devices including clocks and timers; non-standard measuring items such as paper clips and clothespins; weather instruments such as classroom demonstration thermometers and wind socks; and materials to support observations of habitats of organisms such as aquariums and terrariums

English Language Arts and Reading

1(27) Listening and Speaking/Listening. Students use comprehension skills to listen attentively to others in formal and informal settings. Students continue to apply earlier standards with greater complexity. Students are expected to:

(B) follow, restate, and give oral instructions that involve a short related sequence of actions

1(28) Listening and Speaking/Speaking. Students speak clearly and to the point, using the conventions of language. Students continue to apply earlier standards with greater complexity. Students are expected to share information and ideas about the topic under discussion, speaking clearly at an appropriate pace, using the conventions of language.

1(29) Listening and Speaking/Teamwork. Students work productively with others in teams. Students continue to apply earlier standards with greater complexity. Students are expected to follow agreed-upon rules for discussion, including listening to others, speaking when recognized, and making appropriate contributions.

Figure 19

Reading/Comprehension Skills. Students use a flexible range of metacognitive reading skills in both assigned and independent reading to understand an author's message. Students will continue to apply earlier standards with greater depth in increasingly more complex texts as they become self-directed, critical readers. The student is expected to:

(B) ask literal questions of text

(C) monitor and adjust comprehension (e.g., using background knowledge, creating sensory images, re-reading a portion aloud)

(F) make connections to own experiences, to ideas in other texts, and to the larger community and discuss textual evidence

Earth and Space

English Language Proficiency Standards

(5) Cross-curricular second language acquisition/writing. The ELL writes in a variety of forms with increasing accuracy to effectively address a specific purpose and audience in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in writing. In order for the ELL to meet grade-level learning expectations across foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. For Kindergarten and Grade 1, certain of these student expectations do not apply until the student has reached the stage of generating original written text using a standard writing system. The student is expected to:

(B) write using newly acquired basic vocabulary and content-based grade-level vocabulary

Language Objective

I will write a sentence describing the size, texture, and color of the components of soil.

Response to Intervention/Tier 1 Differentiation

All science lessons support students in receiving quality Tier 1 instruction. Using the 5E model, knowledge is taught in a variety of contexts, integrating math, science, and ELAR content, thus supporting the active engagement of the students with the content. Lesson-specific differentiation strategies for addressing diverse student needs can be found in sections titled "Differentiation Strategy."

Differentiation should

- focus on skills students did not understand, and extend the lesson for advanced students;
- be conducted in small groups or embedded in whole-group instruction; and
- provide students with a variety of strategies to process the information, such as
  - allowing for additional opportunities for verbal brainstorming of words associated with a topic (with teacher taking dictation);
  - making clear connections of new and more complex concepts to foundational aspects and prior knowledge;
  - participating in more tangible experiences, such as experiments, investigations, and active exploration;
  - sorting academic vocabulary words into categories by common attributes, such as process words or science content vocabulary;

- organizing results of brainstorming into semantic maps or creating graphic organizers;
- discussing the meaning of a graphic organizer with a partner; and
- creating a visual representation to demonstrate understanding.

See the handout in the Instructional Resources section that addresses instructional strategies.

College and Career Readiness Standards—Science Standards

I.C.3 Collaborative and safe working practices. Demonstrate skill in the safe use of a wide variety of apparatuses, equipment, techniques, and procedures.

I.E.1 Effective communication of scientific information. Use several modes of expression to describe or characterize natural patterns and phenomena. These modes of expression include narrative, numerical, graphical, pictorial, symbolic, and kinesthetic.

I.E.2 Effective communication of scientific information. Use essential vocabulary of the discipline being studied.

V.D.1 Classification. Understand that scientists categorize things according to similarities and differences.

Vocabulary Focus
color
components
size
soil
texture

Prerequisite Science Knowledge

K(5) Matter and energy. The student knows that objects have properties and patterns. The student is expected to:

(A) observe and record properties of objects, including relative size and mass, such as bigger or smaller and heavier or lighter, shape, color, and texture

GRADE 1

Earth and Space

5E Lesson Summary

Engage
Students learn that components are parts of a whole.

Explore
Students observe, describe, and compare components of soil.

Explain
Students explain the components of soil.

Elaborate
Students observe, describe, compare, and sort soil samples.

Evaluate
Students list, illustrate, and describe components of soil.

Engage

Teacher Note

During the Engage, students will build an understanding of what the word component means by thinking about the ingredients/components of a chocolate chip cookie. You may choose to have the ingredients listed on *RM 1: Chocolate Chip Cookie Recipe* available for students to observe the different components that are part of a cookie. Just like soil, a cookie contains ingredients/components mixed together that you cannot see in the final product.

Check with the school nurse and note any student allergies to ingredients in chocolate chip cookies.

Advance Preparation

Collect a small amount of soil in a resealable plastic bag.

Teacher Instruction

- Pass one chocolate chip cookie to each student.
- Ask: What are the parts, or components, of a chocolate chip cookie? *Allow time for students to answer and record student responses on chart paper.*
- Display the recipe for chocolate chip cookies. You may choose to project *RM 1* or list the ingredients on chart paper or a whiteboard.
- Point to the ingredients list and say: This is the ingredients list for making chocolate chip cookies. The ingredients are components, or parts of the whole cookie.
- Read the ingredients as a class.
- Ask: Can you see all of the ingredients, or components, in your cookie? *Answers will vary and may include "I can see the chocolate chips, but I do not see the eggs, flour, sugar, or butter."*
- Ask: What would happen if I used butterscotch or peanut butter chips instead of chocolate chips? *Answers may include that the cookie would taste different and may be a different color. You would make a different kind of cookie.*

Materials

For teacher

- computer
- marker
- projector
- resealable plastic bag for soil sample
- RM 1
- hand shovel

For each student

- chocolate chip cookie
- napkin

Earth and Space

- Ask: What is a component? *A component is like an ingredient—like chocolate chips and sugar in a chocolate chip cookie recipe. A component is part of a whole. Wheels are a component of a car. Eyes, ears, and hands are components of our bodies.*
- Display the soil sample and say: We are going to observe the components of soil. Just like with the cookie, you may not be able to see all of the components of soil in the samples we observe.

GRADE 1

Explore

Safety Alert

Because students will be working with soil, review the appropriate ways to handle soil and to use a hand lens when making observations. Safety goggles should be worn to protect the eyes. Advise students to refrain from blowing on or throwing the soil. Some soil contains fungi and bacteria that may be harmful if ingested; students should wash their hands after each activity.

Content Builder

First-grade students may have varied experiences and knowledge of soil, its components, its texture, and its uses. Many may think that dirt and soil are the same. Students will learn that dirt is loose soil found in places soil does not belong, like the dirt you sweep off the floor or shake off your shoe. Students will learn that soil is everywhere and is an important part of our world.

It is important for students to understand that different types of soil contain different components. The type and amount of each component in the soil determines its color, its capacity to retain water, its texture, and the way(s) it is used. These components include air, water, decayed material, and tiny pieces of rock. Depending on the size of their particles, we call these rock pieces sand, silt, or clay. Students will discover they cannot easily see the particle size of clay and silt, but they can see the sand particles and some pieces of organic matter in the decayed materials. Students will not be able to see air and water in the soil but should understand that they are components of soil.

Advance Preparation

Walk the school grounds to identify soil collection sites (e.g., flower bed, playground, garden). You may have greater variety in soil samples by asking students to bring samples from home. You may choose to ask 3–4 students to bring soil samples from home for this lesson.

Materials

For teacher

- computer
- projector
- RM 2
- wet wipes

For student groups

- access to soap and water
- 1 piece of chart paper
- marker
- craft sticks (optional)
- paper towels
- plastic spoons
- RM 2, page 1
- resealable quart-size plastic bag or container for soil
- hand shovel
- small spray bottle of water
- strainer/sieve
- tablecloth or newspaper
- tray for materials

continued . . .

Earth and Space

. . . continued

For each student

- gloves (optional)
- hand lens
- RM 3 or science notebook
- small paper plate
- safety goggles
- glue or clear tape

Teacher Note

It is recommended students work in groups of 3–4 as you complete this activity as a whole class.

Use the facilitation questions, as a whole class or individually, to debrief the activity and check for understanding. This can be done orally and written as a classroom science notebook entry to model how a scientist might record his or her observations.

You may choose to have students use *RM 3: Soil Sample Observations* to record observations or have them record the observations directly into their science notebooks.

Teacher Instruction

- As a class, use a hand shovel to gather five soil samples from the school grounds.
- In the classroom, divide the class into 4–5 groups and give one soil sample and set of materials to each group. Pairing an ELL student with a proficient English speaker will provide the ELL student with a language model and provide an opportunity to practice English skills one on one before sharing with the class.
- Display page 1 of *RM 2: Observing the Components of Soil* and explain the steps for observing the soil.
- Lead students through making observations of the soil by following the steps on *RM 2*. Teachers use pages 2 and 3 of *RM 2* as a guide for asking questions.
- Allow adequate time for each student to make and record their observations.
- Allow student groups to share their observations of the soil and compare their soil sample with the other groups.
- Ask: Are all of the soil samples the same? *Student responses will vary depending on the soil samples.* Note: If all of the soil samples came from the school grounds, there will be little variation among group observations.
- Conduct a class discussion using the facilitation questions. Allow students to share what they have observed about the components of soil.

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Facilitation Questions

- What did you see when you used the hand lens to observe the soil? *Students should describe what they observed. Encourage students to use the following sentence stem to answer: "When I used a hand lens to observe the soil, I saw _________."*
- A particle is a tiny or very small piece of something. How many different size particles did you see when you used the hand lens to observe the soil? *Students should be able to see and describe the size of the sand particles. The sand particles are very small rocks. Sand particles are larger than silt or clay particles. Students will need a tool more powerful than a hand lens to observe the particles of silt and clay. They may see different-size pieces of organic and inorganic materials in the decayed materials.*
- What colors did you see in the soil? *Students should name or describe the color(s) they observe. Encourage students to use the following sentence stems to answer: "The soil is (color)," or "The soil is the color of ______." Some students may know soil can be different shades of red, brown, gray, black, or white.*
- What is texture? *Texture is how something feels when you touch it.*
- What is the texture of the soil? What did you observe when you touched the soil? *Students should describe how the soil feels to the touch. The texture of the soil will vary based on the amount of different-size rock pieces and decayed material. Sandy soil feels gritty when dry and wet. Clay soil feels smooth when dry and sticky when it is wet. Silt soil feels silky or like powder when dry and may feel smooth or slippery when it is wet. The texture of decayed material varies by what it contains. There may be small and large pieces.*
- How did the soil change when you sprayed it with water? *Answers will vary and may include that it changed color or that it felt different. Students may find that clay soil sticks together and holds water while sandy soil lets water flow through more easily and does not stick together.*

Explain

Teacher Instruction

- Read and discuss *Soil! Let's Dig In* as a class.
- Invite students to help make a list of words on an anchor chart or a science notebook entry that describes soil and its components.

Materials

For teacher

- *Soil! Let's Dig In* book
- class science notebook or chart paper
- marker

Facilitation Questions

- What is dirt? *Dirt is loose soil found in places where soil does not belong.*
- Where might you find soil? *Soil is found almost everywhere. Soil is in my yard, on the playground, and at the baseball field and park. Soil is under buildings and in gardens.*
- What are the parts/components of soil? *Air, water, tiny pieces of rock (sand, silt, and clay), and decayed materials are the components of soil.*
- What are decayed materials? *Decayed materials are a mix of remains of plants and animals, which add helpful nutrients to the soil.*
- How do we depend on soil? How does soil help meet our needs? *We eat and make our clothing from plants that grow in soil. We build our homes and buildings using parts of plants and trees that grow in soil, and we mix different types of soil to create some building materials. We use clay to make bricks and pots.*
- Is all soil the same? How are soils different? How are they the same? *Accept all reasonable answers. Some students may know soil can be different colors and textures. Soil is made of different components, and the amount of each component in the soil determines the color and texture of the soil.*

Elaborate

Teacher Instruction

- Ask: Are all of the soil samples from Explore the same? *Student responses will vary depending on the soil samples.*
- Lead the student groups in using the soil samples to do the activity you read about in the book. Students should work with the same group they worked with during Explore.

1. Using a funnel and the soil sample, fill the empty water bottle half full of soil.
2. Fill the bottle with water, add a small drop of liquid dish soap, and secure the lid.
3. Record your observations about the bottle on *RM 4: Shake and Settle Soil Observations*. In the first bottle on the page, draw what you see, and in the section labeled "Before," describe what you see.
4. Shake the bottle vigorously and make observations. On the second bottle on the page and in the section labeled "After Shaking," record your observations. *Students may observe that the water is cloudy and that some of the soil has started to settle at the bottom of the bottle.*
5. Set the timing device and observe the bottle in 1 hour, at the end of the school day, and at the beginning of class the next school day. Record your observations each time on *RM 4*. You may choose to use a digital camera to take pictures of the bottle at each observation time.

- Facilitate a class discussion, allowing students to share their observations. Students may label the different soil components in their drawings on *RM 4*.

Materials

For student groups

- digital camera (optional)
- empty plastic water bottle with wide mouth
- funnel
- hand shovel
- gloves (optional)
- liquid dish soap
- paper towels
- soil samples from Explore
- timing device
- tray for materials
- water or access to a sink
- wet wipes

For each student

- hand lens
- science notebook or RM 4
- safety goggles

Earth and Space

Facilitation Questions

- Are all of the soil samples the same? *Student responses will vary depending on the soil samples.*
- What did you observe about the soil in the bottle at the end of the school day? At the beginning of the next school day? *At the end of the school day, students should be able to observe the soil settling into different layers. At the beginning of the next school day, students should observe that the soil has settled in layers. Students should be able to observe different layers in each container. Sand and pebbles (if present) in the soil will fill the bottom layer. Silt will settle above the sand. Clay will settle above the silt. Plant pieces and other organic material from the humus will be on top and will possibly float in the layer of water that fills the space above the clay.*

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Evaluate

Differentiation Strategy

Students will list, illustrate, and describe the components of soil. Some students may draw and label all of the components while others will draw only two. Assist students with labeling and describing their illustrations as needed.

Support students by offering sentence starters similar to the following:

- One component of soil is ___________.
- Sandy soil is/feels________.
- Clay and silt particles are smaller/larger than _________ particles.
  Choose one.
- Sand has smaller/larger particles than _________.
  Choose one.
- I can see the _______ in the soil but cannot see the ______.

Teacher Instruction

- Display the ingredients for chocolate chip cookies (*RM 1*) from Engage.
- Instruct each student to write an ingredients list for soil in their science notebooks. Students should draw a picture of the components of soil.
- Instruct students to write two sentences comparing the components of soil.
- You may choose to allow students to use a screencasting digital application to draw a picture of the components of soil and to record their comments. You also may choose to allow students to work in pairs using the video feature on a mobile device to record their components list.

Materials

For teacher

- RM 1
- computer
- projector
- soil sample
- video camera or tablet

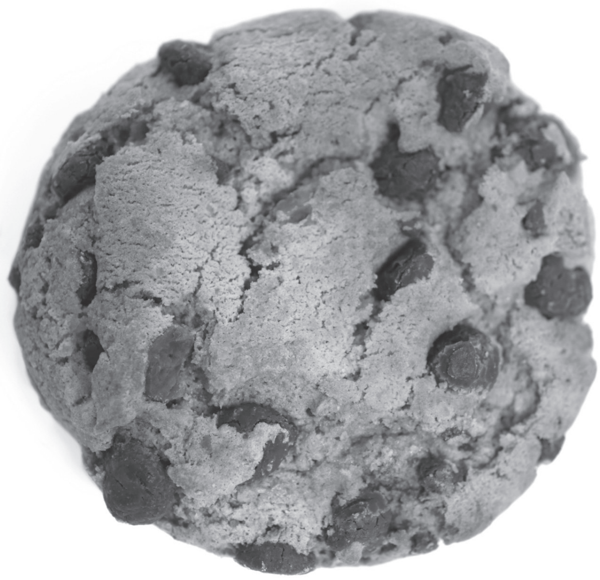
For each student

- science notebook

Grade 1

RM 1: Chocolate Chip Cookie Recipe

Chocolate Chip Cookies



Ingredients

- flour
- salt
- butter, softened
- granulated sugar
- packed brown sugar
- vanilla extract
- large eggs
- chocolate chips

Instructions

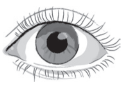
1. Preheat oven to 375 °F.
2. In a small bowl, combine flour, baking soda, and salt.
3. In a large mixing bowl, beat butter, granulated sugar, brown sugar, and vanilla extract until creamy.
4. Add eggs one at a time, continuing to beat between each egg.
5. Add in flour mixture gradually.
6. Stir in chocolate chips.
7. Use a tablespoon to drop the mixture onto ungreased baking sheets.
8. Bake for 9–11 minutes or until golden brown.

RM 2: Observing the Components of Soil

Observing the Components of Soil

1. Put on your safety goggles. 

2. Use the spoon  to place a spoonful of soil on your paper plate.

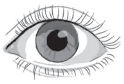
3. Use your sense of sight  to observe the soil. Record your observations.

4. Use the hand lens  to observe the soil. Record your observations.

5. Use your sense of touch  to observe the soil. Take a pinch of the material and rub it back and forth between your fingers. Record your observations.

6. Sort the different components you can see and feel. Use the strainer  to help separate the parts of the soil.

7. Use the spray bottle to  spray the soil on your plate with two squirts.

8. Use your sense of sight  and the hand lens  to observe the wet soil. Record your observations.

9. Use your sense of touch  to observe the wet soil. Take a pinch of the soil and rub it back and forth between your fingers. Record your observations.

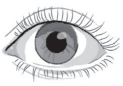
10. Place your materials back on the tray, and your teacher will collect them.

RM 2: Observing the Components of Soil continued

Observing the Components of Soil

1. Put on your safety goggles. 

2. Use the spoon  to place a spoonful of soil on your paper plate.

3. Use your sense of sight  to observe the soil. Record your observations.

   - What color  is it?

   - Do you see separate pieces/particles?

4. Use the hand lens  to observe the soil. Record your observations.

   - What do you see?

   - Do you see separate pieces/particles?

5. Use your sense of touch  to observe the soil. Take a pinch of the material and rub it back and forth between your fingers. Record your observations.

   - What do you feel?

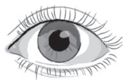
   - Does it feel smooth or gritty?

6. Sort the different components you can see and feel. Use the strainer  to help separate
   the parts of the soil.

   - How many different components did you observe?

RM 2: Observing the Components of Soil continued

7. Use the spray bottle to  spray the soil on your plate with two squirts.

8. Use your sense of sight  and the hand lens  to observe the wet soil. Record your observations.

    - What do you see?
    - Do you see separate pieces/particles?
    - Did the soil soak up the water or did the water soak into the plate?

9. Use your sense of touch  to observe the wet soil. Take a pinch of the soil and rub it back and forth between your fingers. Record your observations.

    - What do you feel?
    - How does the wet material feel compared to the dry?
    - Does it stick together or fall apart?
    - Can you make a shape with the wet soil?

10. Place your materials back on the tray, and your teacher will collect them.

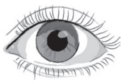
Grade 1

RM 3: Soil Sample Observations

Name ____________________

Draw  a picture of the different components of the soil.

What do you observe about the soil?

I see  ____________________

____

____

Glue a sample of
your soil here.

I feel  ____________________

____

____

Look closer! What do you observe with a hand lens? 

____

____

____

____

____

Draw what you see.

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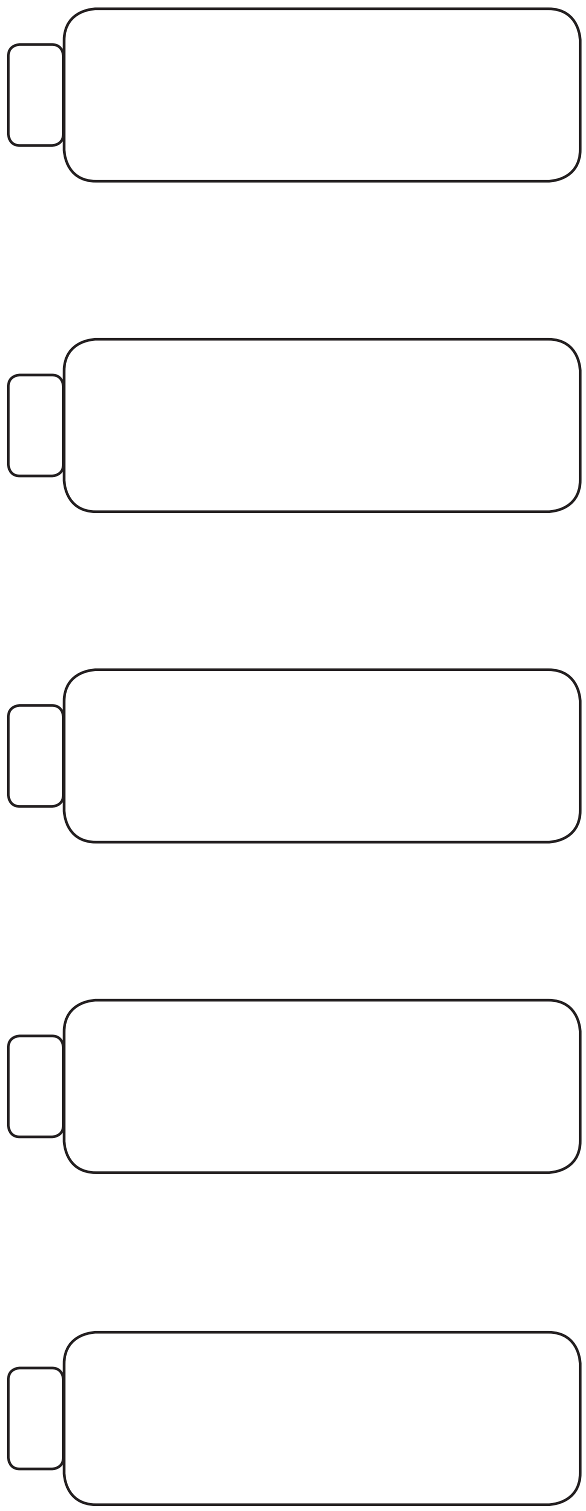
RM 4: Shake and Settle Soil Observations

Name: ______________________________



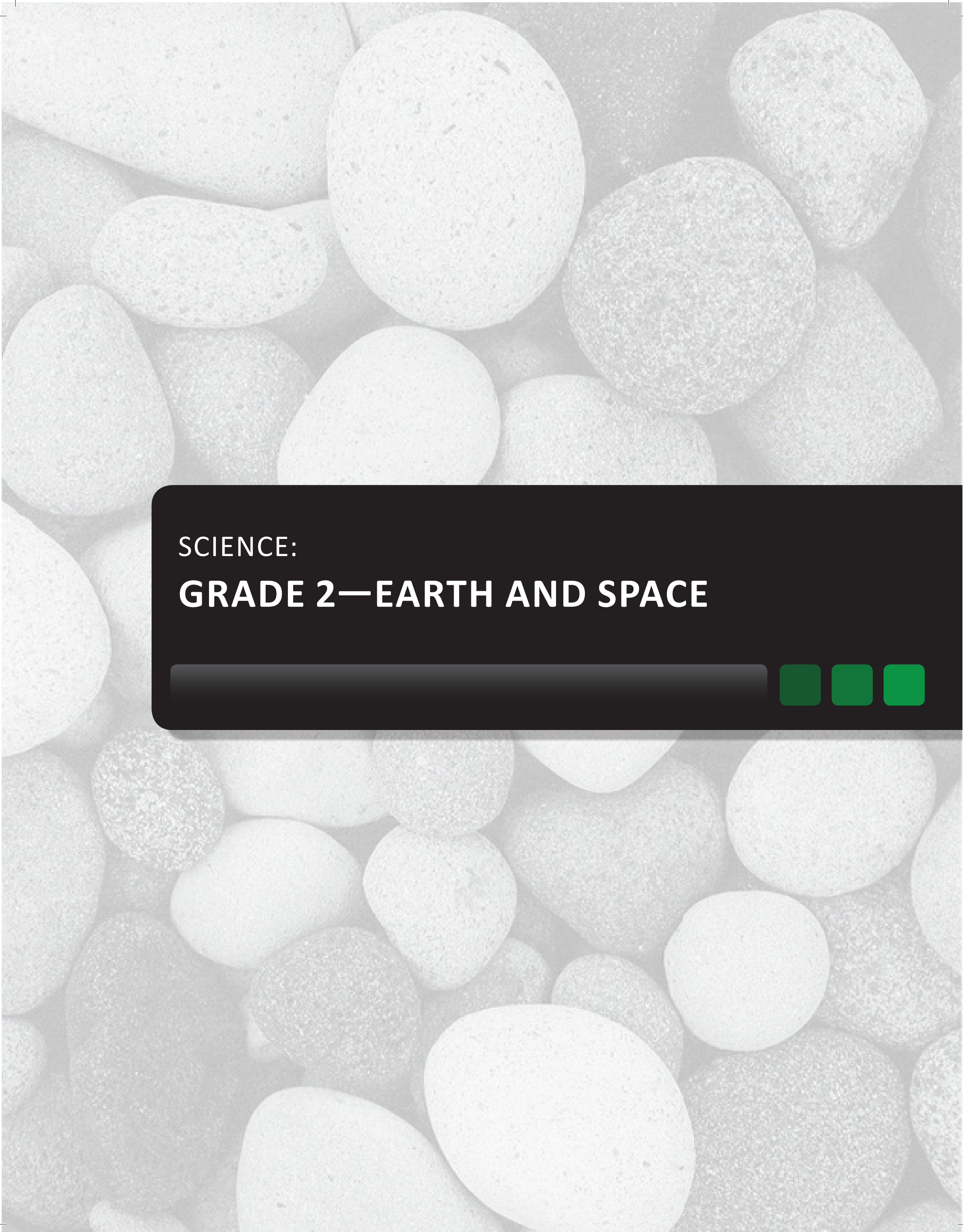
Next Day

End of the Day

After 1 hour

After Shaking

Before



SCIENCE:

GRADE 2—EARTH AND SPACE

Earth and Space

Let's Talk about Rocks

Science Concept

2(7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to:

(A) observe and describe rocks by size, texture, and color

Content Objective

I can observe and describe rocks by size, texture, and color.

Science Process Skills

2(1) Scientific investigation and reasoning. The student conducts classroom and outdoor investigations following home and school safety procedures. The student is expected to:

(A) identify and demonstrate safe practices as described in the Texas Safety Standards during classroom and outdoor investigations, including wearing safety goggles, washing hands, and using materials appropriately

2(2) Scientific investigation and reasoning. The student develops abilities necessary to do scientific inquiry in classroom and outdoor investigations. The student is expected to:

(D) record and organize data using pictures, numbers, and words

(F) compare results of investigations with what students and scientists know about the world

2(3) Scientific investigation and reasoning. The student knows that information and critical thinking, scientific problem solving, and the contributions of scientists are used in making decisions. The student is expected to:

(C) identify what a scientist is and explore what different scientists do

2(4) Scientific investigation and reasoning. The student uses age-appropriate tools and models to investigate the natural world. The student is expected to:

(A) collect, record, and compare information using tools, including computers, hand lenses, rulers, primary balances, plastic beakers, magnets, collecting nets, notebooks, and safety goggles; timing devices, including clocks and stopwatches; weather instruments such as thermometers, wind vanes, and rain gauges; and materials to support observations of habitats of organisms such as terrariums and aquariums

Earth and Space

GRADE 2

Mathematics

2(9) Geometry and measurement. The student applies mathematical process standards to select and use units to describe length, area, and time. The student is expected to:

(A) find the length of objects using concrete models for standard units of length

(C) represent whole numbers as distances from any given location on a number line

(D) determine the length of an object to the nearest marked unit using rulers, yardsticks, meter sticks, or measuring tapes

English Language Proficiency Standards

(5) Cross-curricular second language acquisition/writing. The ELL writes in a variety of forms with increasing accuracy to effectively address a specific purpose and audience in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in writing. In order for the ELL to meet grade-level learning expectations across foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. For Kindergarten and Grade 1, certain of these student expectations do not apply until the student has reached the stage of generating original written text using a standard writing system. The student is expected to:

(B) write using newly acquired basic vocabulary and content-based grade-level vocabulary

Language Objective

I will describe rocks by writing two sentences using newly acquired vocabulary to describe the size, texture, and color of rocks.

Earth and Space

Response to Intervention/Tier 1 Differentiation

All science lessons support students in receiving quality Tier 1 instruction. Using the 5E model, knowledge is taught in a variety of contexts, integrating math, science, and ELAR content, thus supporting the active engagement of the students with the content. Lesson-specific differentiation strategies for addressing diverse student needs can be found in sections titled "Differentiation Strategy."

Differentiation should

- focus on skills students did not understand, and extend the lesson for advanced students;
- be conducted in small groups or embedded in whole-group instruction; and
- provide students with a variety of strategies to process the information, such as
    - allowing for additional opportunities for verbal brainstorming of words associated with a topic (with teacher taking dictation);
    - making clear connections of new and more complex concepts to foundational aspects and prior knowledge;
    - participating in more tangible experiences, such as experiments, investigations, and active exploration;
    - sorting academic vocabulary words into categories by common attributes, such as process words or science content vocabulary;
    - organizing results of brainstorming into semantic maps or creating graphic organizers;
    - discussing the meaning of a graphic organizer with a partner; and
    - creating a visual representation to demonstrate understanding.

See the handout in the Instructional Resources section that addresses instructional strategies.

Earth and Space

GRADE 2

College and Career Readiness Standards—Science Standards

I.E.1 Effective communication of scientific information. Use several modes of expression to describe or characterize natural patterns and phenomena. These modes of expression include narrative, numerical, graphical, pictorial, symbolic, and kinesthetic.

I.E.2 Effective communication of scientific information. Use essential vocabulary of the discipline being studied.

Vocabulary Focus
color
rocks
size
texture

Prerequisite Science Knowledge

K(7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to:

(A) observe, describe, compare, and sort rocks by size, shape, color, and texture

1(7) Earth and space. The student knows that the natural world includes rocks, soil, and water that can be observed in cycles, patterns, and systems. The student is expected to:

(A) observe, compare, describe, and sort components of soil by size, texture, and color

5E Lesson Summary

Engage
Students identify a rock.

Explore
Students observe and describe rocks.

Explain
Students explain the size, texture, and color of rocks and learn how geologists describe rocks.

Elaborate
Students observe and describe rocks using new terminology.

Evaluate
Students observe and describe a rock for a rock museum.

Engage

Materials

For teacher

- RM 5
- glue or clear tape
- chart paper or whiteboard
- marker
- rock that will fit in a shoe box
- cardboard shoe box with lid

For each student

- science notebook (optional)

Content Builder

Second grade students should have experience observing, describing, comparing, and sorting rocks. They should know that tiny pieces of rock, like sand, are components of soil. In second grade, students will make more detailed observations and descriptions of the size, texture, and color of rocks. Second grade students do not need to learn about the different types of rock (igneous, sedimentary, or metamorphic) or about the rock cycle. In fifth grade, students will explore how sedimentary rocks form as part of the rock cycle.

Teacher Note

During Engage, you will record on chart paper clues and student-generated words that describe a rock. In Explore and Explain, you will create an additional poster with words to describe the size, texture, and color of rocks.

Advance Preparation

Collect a rock, and place it inside the shoe box.

Ask coworkers, friends, and neighbors if they have rock collections they are willing to share with your class for this lesson.

Prepare *RM 5: Rock Size Classification Scale* by cutting out the pieces and gluing or taping them together as directed. Check your printer settings before printing. Be sure you are printing the file “actual size” so that the centimeter measurements will be correct.

Teacher Instruction

- Divide the class into teams of 3–4 students.
- Display the box. Do not reveal what is in the box at this time.
- Say: We are going to play a game of 20 Questions to determine what is in this box. I will give you two clues, and then your team can ask “yes” or “no” questions to try to determine what is in the box. The first clue is it is nonliving. *Record the clues on chart paper by writing the word(s) and an illustration to depict the word when possible.* The second clue is it is solid. *Record the clue on chart paper. You may choose to have students record the clues in their science notebooks.*

- Say: Now it is your turn. As a class, you have 20 questions to see if you can figure out what is in the box. Work with your team to come up with a "yes" or "no" question. After each team has had a chance to ask a question, if your team believes they know what is in the box, have one member of your team raise a hand. Each team gets two incorrect guesses, and then they are out. *Allow each team to ask one question and make a guess each round. As teams ask questions, keep a tally of the number of questions and guesses from each team, and record the clue from each question you answer with "yes." You may choose to give an additional clue after each round, if needed.*

- Stop the game and reveal what is in the box after 20 questions have been asked or after students guess that it is a rock.

- Ask: Would this rock be described as a pebble, cobble, or boulder? How do you know? *Answers may vary depending on students' knowledge of the the size descriptions of sand, pebble, cobble, and boulder. Remind students that boulders are big rocks; they are larger than a soccer ball. Cobbles are medium-size rocks; they are larger than a pebble or about the size of a baseball. Pebbles are small rocks; they are smaller than a golf ball. A grain of sand is a tiny rock.*

- Display the scale from *RM 5* and say: We can use this Rock Size Classification Scale to describe the size of this rock. Model how to measure from the end by placing one end/side of the rock at the zero end of the scale. Remind students to always begin at zero when measuring. Ask a student volunteer to observe the rock and share the length of the rock using centimeters. Ask the student to determine the rock size classification. Add the words *pebble*, *cobble*, and *boulder* to the poster of words that describe rocks.

- Review the clues or describing words on the poster. Allow students to add other words to describe rocks to the poster.

Words that describe rocks . . .

nonliving
gray
striped
solid
pebble
rough
cobble
boulder
hard
gritty
spotted
white
sparkly

Explore

Teacher Note

During Explore, student pairs will observe and describe a rock. At this time, their descriptions may include details they can observe with their senses and facts they know about rocks, depending on their experiences and knowledge of rocks. Over the course of this lesson, your students will learn how geologists observe rocks—what they look for and how they describe rocks. In the end, students should be able to describe the size (grain size), color, and texture (grain shape) of several types of rock using scientifically appropriate terminology.

You may choose to use *RM 1: Lost Rock* for student descriptions rather than white paper.

Check your printer settings before printing. Be sure you are printing the file "actual size" so that the centimeter measurements will be correct.

You may choose to allow students to use centimeter cubes along with *RM 5* to measure their rocks and compare the different rock sizes. For example, you may have students line up 6 cubes to represent a pebble and 24 cubes to represent a cobble, then compare the two.

Materials

For teacher

- chart paper or class science notebook
- permanent markers, fine tip
- correction fluid
- marker
- poster from Engage

For each student

- RM 5

For student pairs

- crayons or colored pencils
- hand lens
- 1 piece of white paper or RM 1
- rock
- centimeter cubes (optional)
- clear tape or glue stick
- scissors

Advance Preparation

You will need one rock per student pair for Explore and one per student for Elaborate and Evaluate. You may purchase rock kits or prepare your own. Your classroom set should have 2–3 of each type of rock. It is recommended that all or a selection of the rocks listed in the table shown are used for the activities in this lesson.

Some rock sets are labeled with a numbered sticker. If you create your own kit or need to label sets, prepare the rocks by placing a dot of correction fluid on the bottom of each rock, and then number the rocks beginning with the number one. You may choose to use a different color marker on one of each type of rock, creating sets of rocks distinguished by the color used. Keep a record of the color and number assigned to each rock in order to help identify which rock the students are describing.

Earth and Space

There can be variations in color for some rocks. For example, granite can be light in color with small amounts of dark-colored crystals. Other pieces of granite may have more black and pink with less white. If you are creating your own rock kit, be sure the samples of each rock are similar in color and size. For example, all pieces of granite should be similar in color and size.

General Characteristics of Common Rocks

Name of Rock	Color (light or dark)	Luster (shiny or dull)	Grain Shape (round or angular)	Texture/Grain Size (fine, medium, or coarse)
gneiss	layers of light and dark	mostly dull	angular	fine to medium
mica schist	light	shiny	angular	sheets
marble	light	shiny	angular	fine
hornfels	dark	dull	angular	fine to medium
conglomerate	varies, more light	dull	round pieces	very coarse (particles) with fine grains (glue)
sandstone	light	dull	round	medium
breccia	varies, more light	dull	angular	very coarse (particles) with fine grains (glue)
siltstone	light to medium	dull	round (difficult to see, small particle size)	fine
limestone	light	dull	round	fine
granite	ranges from light to dark	shiny with crystals	angular	medium to coarse
gabbro	dark	dull, some crystals are shiny	angular	medium to coarse
basalt	dark	dull	angular	fine
obsidian	dark	shiny	none	fine or glassy
pumice	light to medium	dull	angular	fine

Earth and Space

Teacher Instruction

- Divide the class into pairs, and give each pair a set of materials.
- Instruct students to cut out the pieces on *RM 5* and glue or tape them together using the directions to create a Rock Size Classification Scale.
- Instruct students to use the hand lens, their senses of sight and touch, and the Rock Size Classification Scale to observe their rocks.
- Instruct student pairs to pretend they have lost their rock and that they need to place a lost ad that describes their rock in order to find it.
- Instruct students to record the number on their rock at the top of the paper and list 8–10 different details about their rock that will help someone identify and return their rock. Students can use words and illustrations to create on the white paper or *RM 1: Lost Rock* a "Lost Rock" ad describing their rock. Depending on your students, you may instruct students to list describing words or write sentences/statements that describe their rocks. During Explore, students should describe the rocks using their own words and ideas. Facilitate the activity without influencing student descriptions/responses.
- Allow adequate time for student pairs to describe their rocks.
- Collect the rocks and redistribute them to different pairs.
- Ask one pair of students to read the description (not the number) of their lost rock while the other pairs listen and observe their "found" rocks.
- Instruct student pairs to stand if the description describes their "found" rock. If more than one pair believes their rock fits a description, ask the pairs to identify each rock by looking at the number on it. Ask the pairs who described those numbered rocks to read their descriptions.
- Return the rocks to their original owners once matched with their descriptions.
- Facilitate a discussion about the words or statements from the descriptions. Briefly discuss whether the descriptions are specific enough to identify only one rock or if more than one rock fits the description. There may be some detailed descriptions that help easily identify a rock. Most will likely be general or vague descriptions that would fit several of the same type of rock. At this point in the lesson, that is okay.
- Continue until all rocks are "found" and returned to their original owners.

- Add the words to describe rocks to the poster from Engage.

Words that describe rocks . . .

nonliving gray striped

pebble solid rough

hard cobble boulder gritty

spotted white sparkly

Facilitation Questions

- What did you see when you used the hand lens to observe your rock? *Answers will vary depending on the rocks in your collection. Students may observe and describe the overall size of the rocks or may observe different-size pieces or grains in the rocks using a hand lens. Students may observe that they are unable to see separate grains in the rock.*
- What colors did you observe in your rock? *Answers will vary depending on the rocks in your collection but could include shades of red, brown, black, or white.*
- What did you observe when you touched the rock? What is the texture of your rock? *Answers will vary depending on the rocks in your collection but could include responses such as the rock is smooth, rough, gritty, or both smooth and rough. (Encourage students to answer in complete sentences.)*
- What did you observe about the size of your rock? *Answers will vary depending on the rocks in your collection but could include responses such as the rocks are small or medium in size. Depending on the size of their rocks, students may use the words* pebble, cobble, *or* boulder *to describe the size. (Encourage students to answer in complete sentences.)*
- What other words could you use to describe rocks? *Answers will vary depending on student experiences with rocks. Record the words on the poster from Engage.*

Earth and Space

- Are all of the rocks the same? *Answers will vary depending on the rocks provided. Some of the rocks may be similar sizes. Some may be similar in color or texture.*
- How could you improve your description? *Students may identify a need for more detailed observations, such as grain size, specific color descriptions, and the texture of the rock.*
- A geologist is a scientist who studies Earth. Rocks are part of Earth. How do you think a geologist would describe your rock? *Accept all reasonable answers, and use this as an opportunity to lead students into the next portion of the lesson about using more scientific rock descriptions.*

Explain

Content Builder

In Kindergarten, students learned that rocks can be different sizes, and the size of a rock determines what we call it. Boulders are big rocks; they are larger than a soccer ball. Cobbles are medium-size rocks; they are larger than a pebble and about the size of a baseball. Pebbles are small rocks; they are smaller than a golf ball. A grain of sand is a tiny rock. We will not address particles smaller than sand.

The Wentworth Scale

Particle Size Range (diameter, cm)	Particle Name
Greater than 25.6	Boulder
6.4–25.6	Cobble
0.2–6.4	Pebble
0.0062–0.2	Sand
0.0004–0.0062	Silt
Less than 0.0004	Clay

Source: Denecke, E. (2003). *Let's review: earth science—The physical setting*. (2nd ed.). Barron's Educational Series: Hauppuage, NY.

Students should know that rocks can feel smooth or rough to the touch. Rocks that have been polished and tumbled will feel smooth and appear shiny. It is important to point out that polished and tumbled rocks have been changed by man and would look and feel different if found in nature. Students may have seen many different colors of rocks, and they may know that some rocks have spots, stripes, or layers.

Second grade students will observe and describe the size, texture, and color of rocks. During this lesson, students will learn that a geologist is a scientist who studies Earth. Students will learn that geologists use specific words to describe

Materials

For teacher

- *Rock Notes* book
- chart paper
- marker
- poster from Explore

For student pairs

- rocks and descriptions from Explore
- scissors (optional)
- RM 2 (optional)

rocks in their work. The book *Rock Notes* will introduce geology terms like *luster*, *fine*, *coarse*, and *angular*. While the hope is that students will use these terms as they describe rocks during Elaborate and Evaluate, they are not required to master the use of these terms in second grade.

Geologists refer to the shape (round or angular) of the grains that make up a rock. Angular grains have jagged edges, straight sides, and sharp corners. Round grains have round edges.

Geologists refer to grains when describing texture rather than the way a rock feels to the touch. Students will learn that a grain is the smallest part that makes up a rock and that grains can be different sizes. Your eyes or a hand lens can help you see some grains; a microscope is required to see others. They may observe that a rock can be made of different sizes of grains.

Geologists describe color as light, medium, or dark. The color descriptions are relative; students may need a few different colored rocks to reference in determining whether a rock is light, medium, or dark. Geologists may also include an actual color when describing a rock by saying a rock is, for example, light gray or dark gray.

Luster refers to how light reflects off the surface of a rock. Rocks have a shiny or dull luster. The words *reflect* and *reflection* may be new to second grade students. Students may be familiar with seeing their reflection in a mirror or when looking at the window of a car; the mirror and the window reflect light, creating the image they see. Rocks and other items that reflect light are described as shiny or glassy. Rocks or other items that do not reflect light are described as dull; for example, students will not see their reflection in a piece of wood or a book.

Teacher Note

You may choose to allow student pairs to use *RM 2: Description Cards* when revising their rock descriptions in addition to the posters you create as a class. If so, cut *RM 2* on the dotted lines and give each pair a set of cards. Student pairs can keep the cards that describe their rock and discard those that do not.

Teacher Instruction

- Read and discuss *Rock Notes*.
- Create an additional poster by writing “Words a geologist would use to describe a rock” on chart paper.

- Ask students to recall from the book the words a geologist might use, and add those words to the poster.

Words a geologist would use to describe a rock . . .

light
medium
color
dark
fine
grain size
medium
coarse
texture
angular
grain shape
round
glassy
luster
dull
shiny

- Instruct student pairs to refine their rock description from Explore using words a geologist might use to describe their rock.

Facilitation Questions

- What is a geologist? *A geologist is a scientist who studies Earth. Some geologists observe and describe rocks.*
- What do geologists observe and describe about rocks? *Geologists describe the grain size, grain shape, luster, and color of rocks.*
- Rocks have grains. What is a grain? *A grain is the smallest part that makes up a rock. Different rocks have grains of different sizes.*
- What words do geologists use to describe the texture of rocks? *Geologists use grain shape and grain size to describe the texture of rocks. Grains can be round or angular. Grains can be fine, medium, or coarse.*
- What words do geologists use to describe the color of rocks? *Geologists describe the color of rocks as light, medium, or dark. They may also use a color; e.g., a dark brown rock or a light brown rock.*

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- What is luster? *Luster is one way geologists describe rocks. Luster describes the way light is reflected off the surface of the rock.*
- What words do geologists use to describe the luster of rocks? *Geologists use shiny and dull to describe the luster of rocks.*
- Pick a rock from the collection, and ask: How do you think a geologist would describe this rock? *Answers will vary depending on the rock. Words that describe luster, color, grain size, and grain shape should be included in the description.*

Elaborate

Advance Preparation

Identify an area (classroom, hallway, or multipurpose room) with enough table space or wall space to post student descriptions and enough space for students to move around the room.

Teacher Note

You may choose to use *RM 3: Scientific Descriptions* in addition to the posters for students to use when using scientific/geology terms to describe rocks. Record the number of the rock you give to each student.

Teacher Instruction

- Distribute a set of materials to each student. Students should describe a different rock than they described during Explore.
- Instruct students to write 6–8 statements that describe their rocks. Instruct students to describe their rocks using only words on the front of *RM 3* and to draw and color on the back a detailed picture of their rock. Remind students of the words that geologists use to describe rocks, and display the posters from Explore and Explain.
- Allow adequate time for students to observe, describe, and draw their rocks.
- Collect the descriptions.
- Post the descriptions with the description facing up, and ensure there is plenty of room for students to move around and read the descriptions.
- Collect the rocks, and distribute them to different students.
- Instruct students to observe the rock and read each description to find the one that best describes their rock. Once they believe they have found their description, they should look at the back of the description and see if the picture matches their rock. If they believe they have found the description for their rock, they should stay by the description. If another student believes their rock matches the same description, both students should work together to locate another description for one of their rocks. If they find that there are two very similar descriptions and are unable to decide which rock matches each description, they should move the two descriptions next to one another and stand together.

Materials

For teacher

- tape or staples
- posters from Explore and Explain

For each student

- crayons or colored pencils
- hand lens
- 1 piece of white paper
- 1 rock from Explore rock set
- RM 3 (optional)

Earth and Space

Facilitation Questions

- How were these descriptions different from those in Explore? *Students should observe that the descriptions written during Elaborate are more specific and offer more details than those written during Explore. The descriptions also should include words that a geologist would use to describe rocks.*
- Which details helped you match your rock to the description? *Answers will vary depending on the rocks and the descriptions. Students should list identifying details from the descriptions.*
- Why do geologists have a set of words they use to describe rocks? *Geologists are scientists who study Earth. Geologists study Earth in many different parts of the world. Using common vocabulary is important because it allows geologists to communicate clearly about rocks so that others can understand their work and compare their findings with their own or those of other geologists.*

Evaluate

Teacher Note

You may choose to allow students to use *RM 3* as they work to create their display for the rock museum. Students should describe a different rock for the museum than they have described for the previous activities. Record the number of the rock you give to each student.

You may choose to have a virtual museum and allow students to create a digital presentation or record themselves reading their descriptions and play the recording as others view their display.

You may choose to have students write a description and create an illustration to post on a bulletin board. You may choose to use shoe boxes and box lids for student displays. Paint the boxes or line them with paper and allow students to create their own displays.

Materials

For each student

- rock
- craft materials
  - paper
  - crayons
  - shoe boxes
  - construction paper
- RM 3 (optional)
- RM 4
- tablet (optional)

Content Builder

Second grade students may have varied experiences with museums. If your students have not been to a museum, locate a virtual museum display, and show students how museums display items and descriptions within an exhibit.

You may choose to share the following sites with your class to show the different geological exhibits around the country and to show how museums display or present rocks.

Smithsonian National Museum of Natural History (Virtual Tour of the Geology, Gems, and Minerals Hall)

http://www.mnh.si.edu/vtp/2-mobile/066.html

Virtual Museum of Geology

http://www.virtualmuseumofgeology.com/recommended-locations-to-visit.html

Advance Preparation

Ask coworkers, friends, and neighbors if they have rock collections they are willing to share with your class for this lesson. If you are using a borrowed set of rocks for the rock museum, number the rocks with stickers to help identify which rock each student is describing.

Locate an area for a rock museum. The format of the student projects will determine the space you will need for the display.

Teacher Instruction

- Instruct students or pairs of students to select a rock and create a display for a rock museum.
- Discuss the details and layout of the display and description. As a class, determine the layout or layout options for the museum. The description should include the actual name of the rock, if known, and words that identify the grain shape, grain size, color, and luster of the rock. Depending on the space available, the display should include the rock or a color illustration of the rock. You may ask some students to research their rocks and find one or two interesting facts to add to their description.
- Instruct students to use *RM 4: Rock Museum Rubric* to assess and correct their own work. You may choose to allow students to work in pairs to assess their work.
- Display the rock museum.

RM 1: Lost Rock!

Rock number________

Lost Rock!

If found, please return to ____.

Here is a description of the rock.

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

Grade 2

RM 2: Description Cards

Light color	Dark color	Coarse grain	Dull	Round grains
Medium grain	Shiny	Angular grains	Fine grain	Medium color

Light color	Dark color	Coarse grain	Dull	Round grains
Medium grain	Shiny	Angular grains	Fine grain	Medium color

Light color	Dark color	Coarse grain	Dull	Round grains
Medium grain	Shiny	Angular grains	Fine grain	Medium color

Light color	Dark color	Coarse grain	Dull	Round grains
Medium grain	Shiny	Angular grains	Fine grain	Medium color

Grade 2

RM 3: Scientific Descriptions

Name: ______________________________

Circle the words that best describe your rock.

Grain shape	Grain size	Color	Luster
Angular Round	Fine Medium Coarse	Light Medium Dark	Shiny Dull

Write your description below. Include an illustration on the back of this paper.

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Grade 2

RM 4: Rock Museum Rubric

Name: ________________________________

Circle One	The description includes
Yes No	- grain shape (angular, round)
Yes No	- grain size (fine, medium, coarse)
Yes No	- rock color (light, medium, dark)
Yes No	- luster (shiny, dull)
Yes No	- name of the rock
	The display
Yes No	- is easy to read and neat in appearance
Yes No	- has illustrations that include color and labels

Name: ________________________________

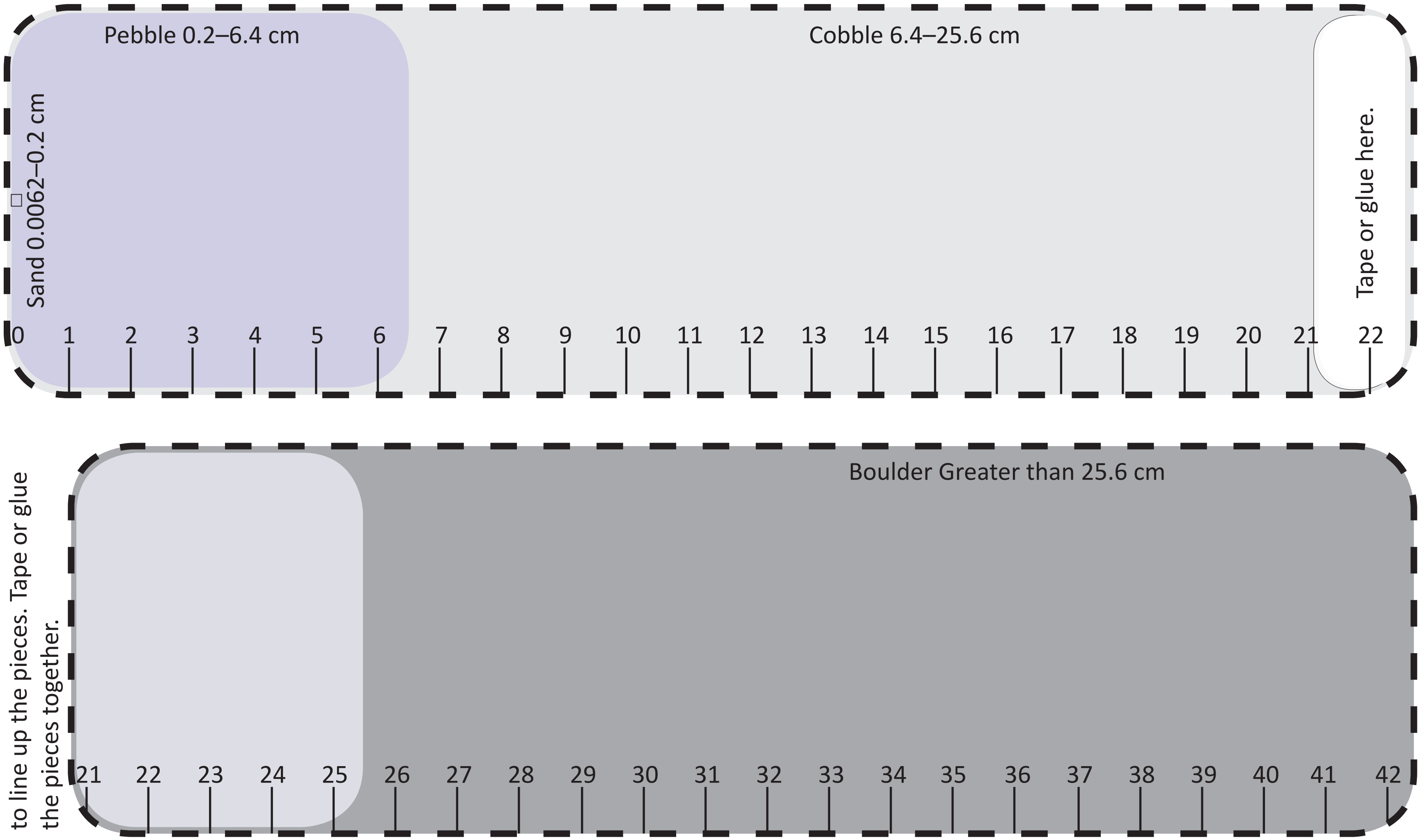
Circle One	The description includes
Yes No	- grain shape (angular, round)
Yes No	- grain size (fine, medium, coarse)
Yes No	- rock color (light, medium, dark)
Yes No	- luster (shiny, dull)
Yes No	- name of the rock
	The display
Yes No	- is easy to read and neat in appearance
Yes No	- has illustrations that include color and labels

Grade 2

RM 5: Rock Size Classification Scale

Cut along the dotted lines.

Use the 21 cm mark to line up the pieces. Tape or glue the pieces together.



After cutting, use the 21 cm mark to line up the pieces. Tape or glue the pieces together.

SCIENCE:

GRADE 3—EARTH AND SPACE

GRADE 3

Earth and Space

Where Does Soil Come From?

Science Concept

3(7) Earth and space. The student knows that Earth consists of natural resources and its surface is constantly changing. The student is expected to:

(A) explore and record how soils are formed by weathering of rock and the decomposition of plant and animal remains

Content Objective

I can explore and record how soil is formed.

Science Process Skills

3(4) Scientific investigation and reasoning. The student knows how to use a variety of tools and methods to conduct science inquiry. The student is expected to:

(A) collect, record, and analyze information using tools, including microscopes, cameras, computers, hand lenses, metric rulers, Celsius thermometers, wind vanes, rain gauges, pan balances, graduated cylinders, beakers, spring scales, hot plates, meter sticks, compasses, magnets, collecting nets, notebooks, sound recorders, and Sun, Earth, and Moon system models; timing devices, including clocks and stopwatches; and materials to support observation of habitats of organisms such as terrariums and aquariums; and

(B) use safety equipment as appropriate, including safety goggles and gloves.

English Language Arts and Reading

3(4) Reading/Vocabulary Development. Students understand new vocabulary and use it when reading and writing. The students are expected to:

(A) identify the meaning of common prefixes (e.g., in-, dis-) and suffixes (e.g., -full, -less), and know how they change the meaning of roots

3(15) Reading/Comprehension of Informational Text/Procedural Texts. Students understand how to glean and use information in procedural texts and documents. The students are expected to:

(A) follow and explain a set of written multi-step directions

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Figure 19

Reading/Comprehension Skills. Students use a flexible range of metacognitive reading skills in both assigned and independent reading to understand an author's message. Students will continue to apply earlier standards with greater depth in increasingly more complex texts as they become self-directed, critical readers. The student is expected to:

(D) make inferences about text and use textual evidence to support understanding

(E) summarize information in text, maintaining meaning and logical order

English Language Proficiency Standards

(5) Cross-curricular second language acquisition/writing. The ELL writes in a variety of forms with increasing accuracy to effectively address a specific purpose and audience in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in writing. In order for the ELL to meet grade-level learning expectations across foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. For Kindergarten and Grade 1, certain of these student expectations do not apply until the student has reached the stage of generating original written text using a standard writing system. The student is expected to:

(G) narrate, describe, and explain with increasing specificity and detail to fulfill content area writing needs as more English is acquired

Language Objective

I can compose a piece of writing that explains how soil is formed.

Earth and Space

Response to Intervention/Tier 1 Differentiation

All science lessons support students in receiving quality Tier 1 instruction. Using the 5E model, knowledge is taught in a variety of contexts, integrating math, science, and ELAR content, thus supporting the active engagement of the students with the content. Lesson-specific differentiation strategies for addressing diverse student needs can be found in sections titled "Differentiation Strategy."

Differentiation should

- focus on skills students did not understand, and extend the lesson for advanced students;
- be conducted in small groups or embedded in whole-group instruction; and
- provide students with a variety of strategies to process the information, such as
    - allowing for additional opportunities for verbal brainstorming of words associated with a topic (with teacher taking dictation);
    - making clear connections of new and more complex concepts to foundational aspects and prior knowledge;
    - participating in more tangible experiences, such as experiments, investigations, and active exploration;
    - sorting academic vocabulary words into categories by common attributes, such as process words or science content vocabulary;
    - organizing results of brainstorming into semantic maps or creating graphic organizers;
    - discussing the meaning of a graphic organizer with a partner; and
    - creating a visual representation to demonstrate understanding.

See the handout in the Instructional Resources section that addresses instructional strategies.

College and Career Readiness Standards—Science Standards

I.E.1 Effective communication of scientific information. Use several modes of expression to describe or characterize natural patterns and phenomena. These modes of expression include narrative, numerical, graphical, pictorial, symbolic, and kinesthetic.

Earth and Space

Vocabulary Focus

weathering

decomposition

soil

Prerequisite Science Knowledge

K(7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to:

(A) observe, describe, compare, and sort rocks by size, shape, color, and texture

1(7) Earth and space. The student knows that the natural world includes rocks, soil, and water that can be observed in cycles, patterns, and systems. The student is expected to:

(A) observe, compare, describe, and sort components of soil by size, texture, and color

2(7) Earth and space. The student knows that the natural world includes earth materials. The student is expected to:

(A) observe and describe rocks by size, texture, and color

3(5) Matter and energy. The student knows that matter has measurable physical properties and those properties determine how matter is classified, changed, and used. The student is expected to:

(D) explore and recognize that a mixture is created when two materials are combined such as gravel and sand and metal and plastic paper clips

Earth and Space

5E Lesson Summary

Engage
Students consider possible connections between raw materials and soil.

Explore
Students explore the process of weathering and decomposition.

Explain
Students read a story to understand how soil is formed.

Elaborate
Students revisit the process of soil formation through role-play.

Evaluate
Students revisit the Engage activity and record how soil is formed.

Engage

Teacher Note

The purpose of the Engage is to elicit prior knowledge and to ignite student thinking about how ingredients, scientifically referred to as *parent material*, transform into soil. Students may have a variety of responses when you first ask about the connection between the group of different things and the soil. They may respond that vegetables and plants are grown in soil, that worms live in the soil, or that rocks are found in soil. Introducing the "Before" and "After" labels allows students to slowly refine their thinking. This is an important moment for students to begin considering that these things, while often found in or near soil, become the soil.

Advance Preparation

- Collect 2 cups of soil from an area around your home or school. Do not use purchased potting soils because they contain foreign matter such as vermiculite and fertilizer pellets.
- Place the soil sample on the paper plate.
- Place the plate of soil at one end of the rectangular table.
- Place the rocks, banana, and leaves at the other end of the table.
- Place the earthworms in a container with cool and moist paper towels or a small amount of moist soil. Earthworms can be fed oatmeal, slices of banana, and/or decaying leaves.
- Tape the two sentence strips together to form one long sentence strip.
- Place the sentence strip between the soil materials and the other materials at the end of the table.

Teacher Instruction

- Instruct students to observe the setup and ask: "What is the relationship between the materials on one end of the table and the materials on the opposite end of the table?"
- Allow students to share their ideas while one student records the ideas on the board or on chart paper.

Materials

For teacher

- 2 cups of soil
- paper plate
- 3–4 rocks of various sizes
- 1 banana
- handful of dead or decaying leaves
- several earthworms in a container
- 2 sentence strips
- tape
- marker
- 2 pieces of 8 1/2" x 11" card stock
- chart paper (optional)
- long rectangular table

Earth and Space

- Fold one piece of card stock in half and use the marker to write “Before” on the front of it.
- Place the “Before” sign next to raw materials.
- Fold one piece of card stock in half and use the marker to write “After” on the front of it.
- Place the “After” sign next to the plate of soil.
- Ask: “What is the relationship between the materials on one end of the table and the materials on the opposite end of the table?”
- Allow students to revise their thinking and record any new ideas.

Explore

Content Builder

Weathering of rocks is caused by the force of wind, water, and ice. Wind can sandblast rocks to weather them over time. Moving water can break rocks apart over time or smooth them by grinding the rocks against each other. This often occurs in swiftly moving rivers or along the coastlines of oceans and major lakes such as the Pacific Ocean or the Great Lakes. This weathering from water eventually breaks rocks down into pieces as small as a grain of sand, clay, or silt. Water trapped inside rock cracks can freeze if outside temperatures drop below zero degrees Celsius. The expansion of the water as it freezes creates larger cracks. These larger cracks fill with water and expand as the water freezes. Over time, this process breaks the rock into smaller pieces. While these are the predominant methods of weathering, humans do play a minor role in this process through acts such as mining and crushing rocks for construction materials.

Decomposition of plant and animal materials takes less time than weathering. Decay can happen in weeks or months, whereas weathering of rock can take hundreds or thousands of years. With exposure to the elements and organisms in the soil, plant and animal material is broken down into a material called humus. While decomposing animal material may not be appropriate for classroom observation, it is important to remind students that it does play a role in the development of humus.

Teacher Note

For Station 1, fake rocks could be made as an alternative to sugar cubes. To create fake rocks, combine 2 cups of flour, 1 cup of salt, 1/2 cup of playground sand, and 1 cup of water in a mixing bowl until it creates a thick dough. Form into rock shapes and place on a baking sheet covered with parchment paper. Bake in the oven at 200 °F for 20 minutes or until hard. Allow to cool before use.

Advance Preparation

Laminate *RM 1: Grinding Away* and the three sheets of black construction paper for Station 1. Laminate and cut out the directions and each image on *RM 2: Spoiled Rotten*, creating two sets for Station 2. Place the set of banana cards in one envelope and the set of leaves cards in the second envelope.

Materials

Station 1

For each student

- safety goggles
- science notebook

For student groups

- RM 1
- sugar cubes
- 3 pieces of sandpaper, 2" x 2"
- 3 sheets black construction paper, laminated
- 3 hand lenses

Station 2

For each student

- science notebook

For student groups

- RM 2
- 2 envelopes, size DL

Earth and Space

Teacher Instruction

- Divide the class into student groups of three.
- Reproduce station materials to meet the requirements of your class size.
- Allow adequate time for student groups to complete the stations.
- Use facilitation questions to guide discussion after students complete the stations.

Facilitation Questions

Station 1

- What happened when you rubbed the sandpaper on the corner of the sugar cube? *Parts of the sugar cube came off.*
- What force caused the parts of the sugar cube to break off? *The force of pushing the sandpaper caused parts of the sugar cube to break off.*
- What happened when you applied more force when rubbing the sandpaper on the sugar cube? *The sugar cube broke apart even more.*
- What do you think would happen if you continued to apply force to the sugar cube with the sandpaper? *If we kept rubbing the sugar cube with sandpaper, the sugar cube would eventually become a pile of sugar grains.*
- What if you were given a rock instead of a sugar cube? Could you cause the same change to a rock in the same amount of time using sandpaper? Why? *No, because most rocks are harder than a sugar cube. It would take a lot longer to smooth out corners on a rock with sandpaper.*

Station 2

- What is the correct order of the images? *The correct order of the banana images is: D, C, B, and A. The correct order of the leaves images is: B, D, A, and C.*
- What is happening in these images? *The banana and the leaves are rotting.*
- How do you know the banana and the leaves are decaying, or rotting? *Answers will vary but may include that they are getting darker or that they are changing and do not look like a banana or leaves in the last pictures.*

- What do you think will eventually happen to the banana and the leaves? *Accept all reasonable answers, but answers should include that they will break down.*
- Do you see anything like this when you are outside of school? *Answers may vary but could include leaves on the ground, compost bins at home, or crops left in a field.*

Earth and Space

Explain

Materials

For teacher

- *Curious Miguel Asks about Soil* book

For each student

- RM 3
- pencil

For student pairs

- Print or digital copy of *Curious Miguel Asks about Soil*

Teacher Instruction

- Read and discuss *Curious Miguel Asks about Soil*.
- Ask students to work in pairs to complete *RM 3: Just the Facts*. Students should provide text evidence and page numbers from the story to justify their responses. Students may or may not use all of the available boxes for the facts.

Facilitation Questions

- What was Miguel curious about? *Miguel was curious about why the vegetable scraps and yard waste were going in the bin and why his mother was adding the contents of the bin to her flower bed.*
- What did he learn about how soil is formed? *He learned that soil is formed from rocks that are weathered into smaller pieces and from plant and animal material that decomposed into humus. Miguel also learned that there are many other components to soil, including air, water, nutrients, and organisms.*
- How do rocks get broken into smaller pieces? *The process of weathering breaks rocks into smaller pieces.*
- What forces are involved in weathering? *Natural forces such as wind, water, and ice can weather rocks over time. Humans can also play a small role in breaking down rocks into smaller pieces during mining and construction.*
- Which Explore station modeled the process of weathering? *Station 1 because it was breaking down the sugar cube.*
- Do rocks break down quickly, or does it happen slowly? *Rocks take a long time to break down.*
- What is the term that scientists use to describe the process of plant and animal material decaying, or breaking down? *The term for the process is decomposition.*
- Which Explore station showed decomposition? *Station 2 because it was about plant material decaying and breaking down.*

- What is plant and animal material called after it decomposes? *The decomposed material is called humus.*
- What does Miguel's family's compost bin model? *The compost bin is a model for how decomposition happens in the natural world.*
- Why was Miguel's mother adding the humus to her flower bed? *Soil is a mixture, and the soil in the flower bed didn't have enough humus for the flowers to grow well. She was changing the composition, or recipe, of the soil by adding humus so the plants would grow better.*
- In the story, Miguel's mom was mixing the humus in with the soil. How is the mixing of soil different in the natural world? *In the natural world, organisms in the soil and the roots of plants help create the mixture of weathered rock and humus.*
- Does soil ever stop forming? Why? *No, because rock is always being weathered and plant and animal material is always left behind to decay.*
- Is the formation of soil a fast process or something that takes a long time? *It takes a long time because rocks take a long time to be weathered, and it takes some time for plant and animal material to decay.*

Elaborate

Materials

For teacher

- RM 5

For each student

- 1 card from RM 4

Advance Preparation

- Copy, laminate, and cut out cards from *RM 4: Soil Formation Role-Play Cards*.
- Read through *RM 5: A Story of Soil* and consider how you would prefer students to act out their parts. Sample scenarios for role-playing may include instructing students to
  - stand in or on a "stage" area of the classroom and act out their part (this may include modeling appropriate physical contact between students);
  - hold their card and stand when their role is mentioned;
  - stand in a circle and step forward when their role is mentioned; or
  - form a line that predicts the general order in which the formation of soil occurs and determine if they are correct as the story is read.

Teacher Instruction

- Provide each student with one card from *RM 4*.
- Read *RM 5* aloud while students act out their given parts.

Facilitation Questions

- What connection can you make between the *Curious Miguel Asks about Soil* book and this activity? *Answers may vary but should include the following: The book was about soil and how it is formed. In this activity, we role-played the processes that form soil.*
- What two processes are the most important in the formation of soil? *The process of weathering and the process of decomposition.*
- What happens to rock that is weathered? *Rock that is weathered is broken down into smaller pieces.*
- After plant and animal material is decayed or decomposed, into what does it transform? *The plant and animal materials are transformed into humus.*

- What role do living organisms play in the formation of soil? *Living plants lose their leaves, which become part of the soil. Plant roots help mix the weathered rock and humus. Animals continue to leave waste products behind. Fly larvae, worms, microorganisms, and other living things help the plant and animal material decay.*
- How did this activity help you better understand how soil is formed? *Answers will vary. Accept all reasonable answers.*

Evaluate

Materials

For teacher

- Setup from Engage displayed for class

For each student

- RM 6
- paper plate
- hand lens
- safety goggles

Advance Preparation

- Instruct students to bring a small sample of soil from home in a resealable plastic bag.
- Gather some soil to provide to students who do not bring a sample.
- Remind students to wash their hands after handling the soil.

Teacher Instruction

- Ask students to review the setup from Engage.
- Instruct students to carefully pour their soil samples onto their paper plates.
- Ask students to review *RM 6: My Story Rubric*, which will be used to evaluate the content of their stories.
- Ask students to write about the story of soil. In their writing, they should answer the following questions:
  - How did the soil form?
  - What other players in the story of soil are not represented by the objects in the Engage setup or in your soil sample?

Differentiation Strategy

- Allow students to approach this activity as a piece of RAFT writing. RAFT writing is a strategy that gets students to think about their **R**ole as a writer, who their **A**udience is, what **F**ormat their writing will be in, and what **T**opic they are writing about. This strategy gives students choice in how they write about the story of soil. The student reader from the Explain portion of the lesson is an example of a piece of RAFT writing. RAFT examples for this topic could include writing from the perspective of the weathered rock.

Grade 3

RM 1: Grinding Away

1. Put on your safety goggles.
2. Retrieve one sugar cube, one piece of sandpaper, and a black mat for each group member.
3. Draw a picture of your sugar cube in your science notebook.
4. Predict what will happen if you rub the sandpaper on one corner of your sugar cube.
5. Record this prediction in your science notebook.
6. Rub one corner of the sugar cube with the sandpaper three times.
7. Record in your science notebook what changed about your sugar cube.
8. Rub a different corner of the sugar cube with the sandpaper three times, but with more force that you did in Step 6.
9. Record in your science notebook any differences between the corners.
10. Repeat Step 8 for the remaining corners of the sugar cube.
11. Draw in your science notebook a picture of your sugar cube.
12. Record in your science notebook responses to the following reflection questions:
    a. What force caused the change?
    b. What happened when you rubbed the sandpaper on the sugar cube with more force?
    c. Imagine you are using a rock instead of a sugar cube. Do you think it would take more or less time to break down the rock than it did the sugar cube? Why?
13. Clean up the station for the next group, and place any loose sugar in the trash.

RM 2: Spoiled Rotten

1. Remove the pictures from the envelopes.
2. Observe and discuss the pictures in your subgroups.
3. Work with the members of your group to place the images in chronological order.
4. Be prepared to justify how you ordered the pictures.
5. Invite your teacher to check your work.
6. Record in your science notebook responses to the following reflection questions:
   a. What change is occurring in the images?
   b. Where have you seen similar changes to what you observed in the images?
   c. What do you think will eventually happen to the banana and the leaves?
7. Shuffle the order of the images, and place them in the appropriate envelope for the next group.

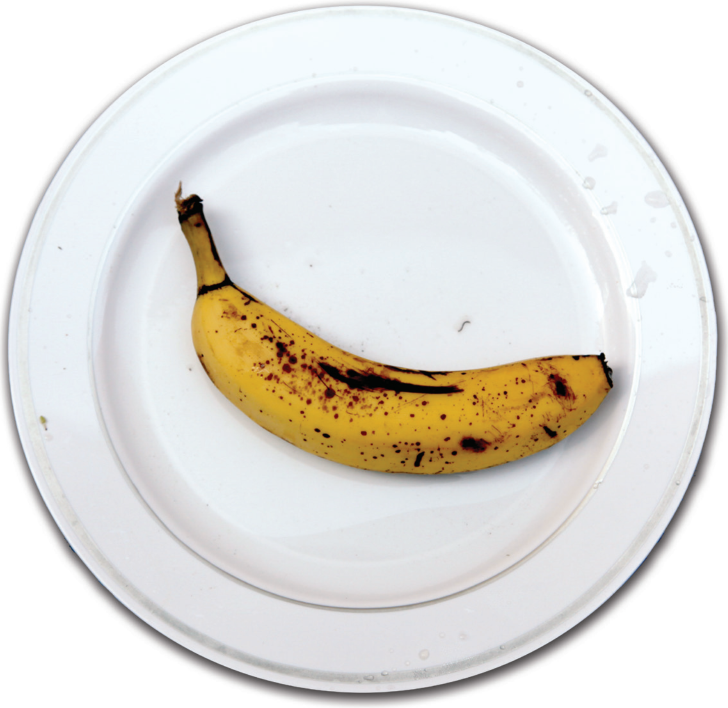
RM 2: Spoiled Rotten continued

A

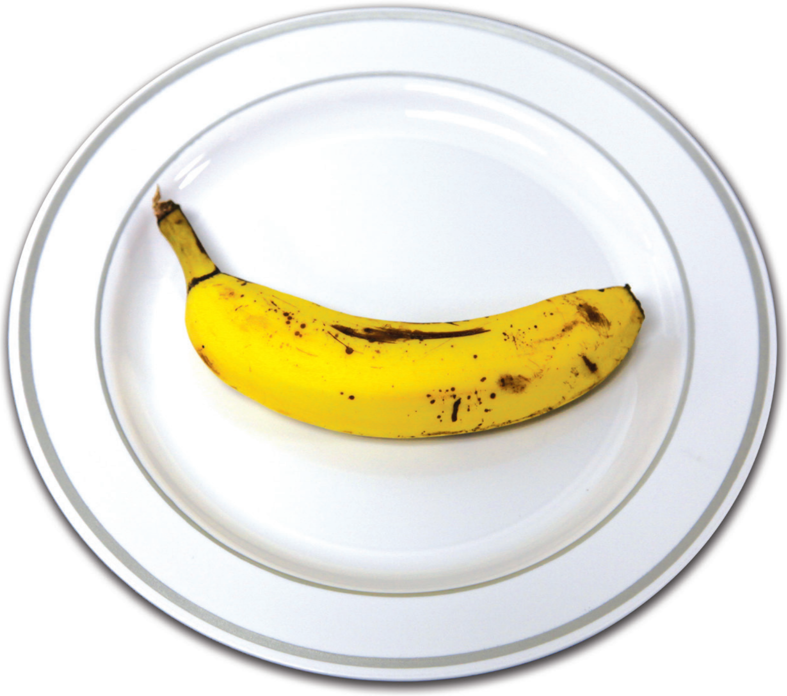
B

Grade 3

RM 2: Spoiled Rotten continued



C



D

Grade 3

RM 2: Spoiled Rotten continued

A

B

Grade 3

RM 2: Spoiled Rotten continued

C

D

Grade 3

RM 3: Just the Facts

Name___________________________________

Weathering

Concept

The process of weathering—

Definition

Facts

RM 3: Just the Facts continued

Decomposition

Concept

The process of decomposition—

Definition

Facts

RM 3: Just the Facts continued

How is soil
formed?

Big Question

Explanation

Facts

RM 4: Soil Formation Role-Play Cards

bedrock

Bedrock is solid rock on Earth's surface.

bedrock

Bedrock is solid rock on Earth's surface.

bedrock

Bedrock is solid rock on Earth's surface.

bedrock

Bedrock is solid rock on Earth's surface.

RM 4: Soil Formation Role-Play Cards continued

weathering

Weathering is the process of breaking down rock; it is caused by the forces of wind, water, ice, and human interaction.

weathering

Weathering is the process of breaking down rock; it is caused by the forces of wind, water, ice, and human interaction.

weathering

Weathering is the process of breaking down rock; it is caused by the forces of wind, water, ice, and human interaction.

weathering

Weathering is the process of breaking down rock; it is caused by the forces of wind, water, ice, and human interaction.

Grade 3

RM 4: Soil Formation Role-Play Cards continued

boulders

Boulders are large rocks that have been weathered.

cobbles

Cobbles are rocks that have been weathered and are smaller than boulders but larger than pebbles.

pebbles

Pebbles are rocks that have been weathered and are smaller than cobbles but larger than sand.

sand

Sand is made of small particles that result from the weathering of rocks; the particles are smaller than pebbles but larger than the particles in silt.

RM 4: Soil Formation Role-Play Cards continued

silt

Silt is made of even smaller particles that result from the weathering of rock and are then carried by moving water to a new location; the particles are smaller than those in sand but larger than those in clay.

clay

Clay is made of even smaller particles that result from the weathering of rock; the particles are smaller than those in silt.

decomposition

Decomposition is the process of breaking down plant and animal material.

decomposition

Decomposition is the process of breaking down plant and animal material.

RM 4: Soil Formation Role-Play Cards continued

decomposition

Decomposition is the process of breaking down plant and animal material.

decomposition

Decomposition is the process of breaking down plant and animal material.

plants

Different types of plants begin to grow in the soil.

leaves

Dead leaves from living plants and trees fall to the ground.

RM 4: Soil Formation Role-Play Cards continued

animal waste

Waste products from animals are left behind.

fly larvae

Larvae from flies are organisms that help decompose plant and animal material.

worms

Worm waste becomes part of the soil. Worms burrow through the soil, providing pathways for air and water.

humus

A component of soil made of decomposed plant and animal material.

RM 4: Soil Formation Role-Play Cards continued

plant roots

The roots of plants dig deep in the soil and push the soil in all directions.

burrowing animals

Animals dig in the soil, causing the soil components to mix.

Grade 3

RM 5: A Story of Soil

The story of soil starts with a piece of solid rock called bedrock. Over a long period of time, bedrock is weathered by the force of wind, moving water, ice, and even humans breaking the solid rock apart.

The pieces of broken bedrock have special names depending on their size. Boulders are the larger pieces that have broken off because of weathering. Cobbles are smaller than boulders but are also broken-off bedrock that has been weathered. Cobbles are often rounded due to weathering. Pebbles are smaller than boulders or cobbles. Pebbles are often smooth and rounded from weathering by moving water.

As the boulders, cobbles, and pebbles continue to be weathered over a long time, even smaller pieces break off. Sand, silt, and clay are the smallest rock particles, or pieces. Sand is the largest of the three and has a very grainy texture. Silt has smaller rock particles and is often moved by water and left in a new place. Clay is the smallest of the rock particles, and you often need a microscope to see the individual particles.

Once the rock is broken down into these small particles, different types of plants begin to grow in the soil. As the plants grow, they lose leaves, and the roots continue to weather the bedrock below. Leaves, twigs, and dead plants form piles on the ground.

Animals in the area leave behind waste products such as cow manure or bird droppings. Dead insects and other organisms also litter the ground with the leaves. These animal remains begin to decay with the plant remains.

Decomposition is the process of breaking down these plant and animal remains. Fly larvae are one of the organisms that help break down the plant and animal remains. The larvae feed on the plant and animal material and leave their waste products behind. Other living things such as worms and small organisms that can only be seen with a microscope also help with the decomposition process. After some time passes, the decomposition process is complete and humus is what is left of all the materials.

The rock particles mix with humus to form the soil mixture over time from the force of plant roots, worms, and other burrowing organisms. This mixture can be different depending on the type of small rock particles present and the types of plants and animals in the area. The story of soil is one that never ends. Rocks everywhere are weathered as time passes, and plant and animal materials are always decomposing.

Grade 3

RM 6: My Story Rubric

My Story Rubric

4

- Information is complete, accurate, and thoroughly explained with explicit detail.
- The writing demonstrates deep understanding of the content.
- The writing is well organized and cohesive.
- Processes of weathering and decomposition in soil formation are clearly understood.

3

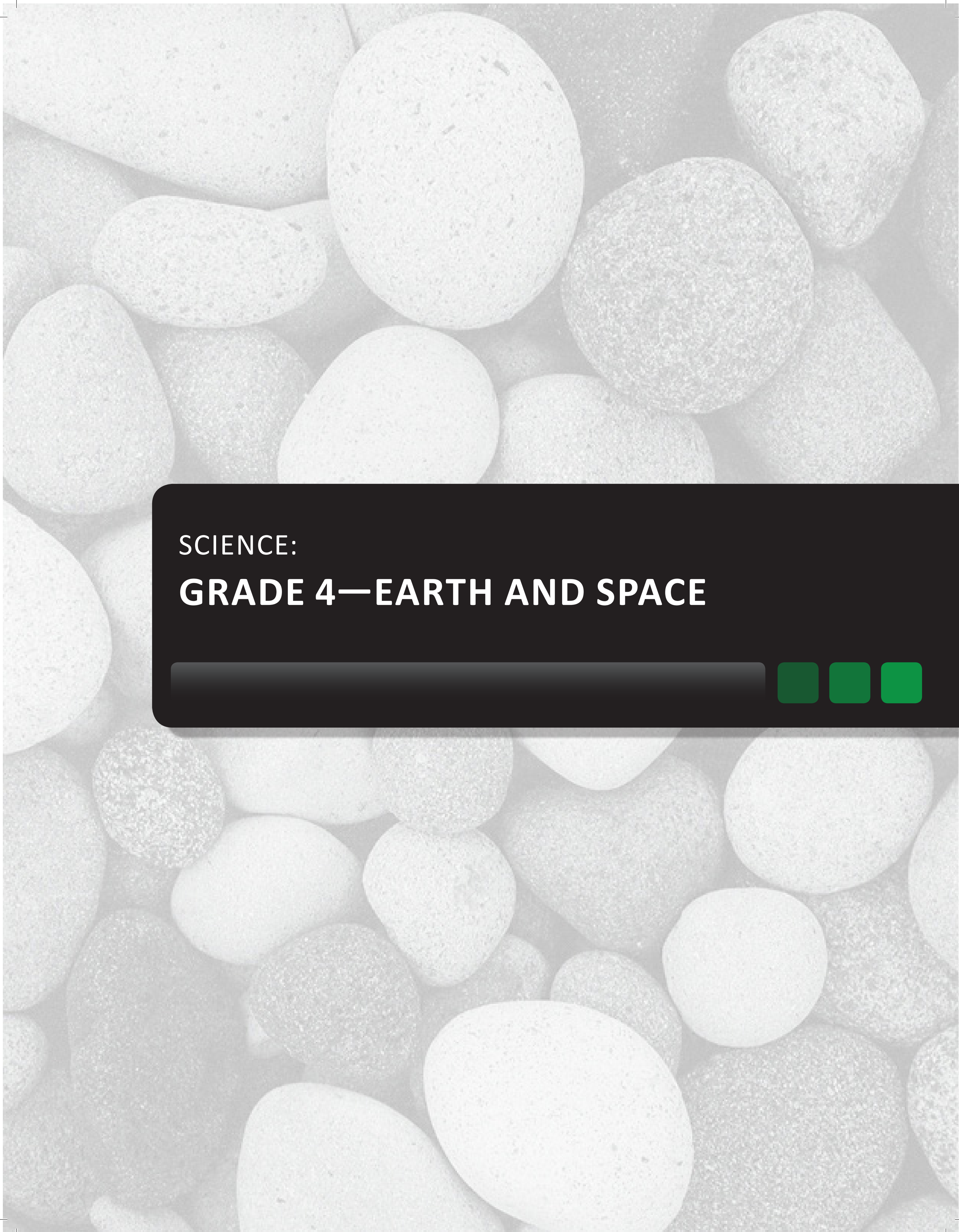
- Information is complete and accurate.
- Information is presented clearly.
- The writing demonstrates clear understanding of the content.
- Processes of weathering and decomposition in soil formation are understood.

2

- Information is mostly accurate and is present but minimal.
- Information is presented reasonably well.
- The writing demonstrates some understanding of the content.
- The writing is somewhat organized and cohesive.
- Processes of weathering and decomposition in soil formation are only partially understood.

1

- Information is incomplete, inaccurate, and/or confusing.
- Information is presented poorly.
- The writing demonstrates lack of understanding of the content.
- The writing is unorganized and fragmented.
- Processes of weathering and decomposition in soil formation are not understood.



SCIENCE:

GRADE 4—EARTH AND SPACE

GRADE 4

Earth and Space

Slow Changes

Science Concept

4(7) Earth and space. The students know that Earth consists of useful resources and its surface is constantly changing. The student is expected to:

(B) observe and identify slow changes to Earth's surface caused by weathering, erosion, and deposition from water, wind, and ice

Content Objective

I can identify that Earth's surface can slowly change from the force of water, wind, and ice.

Science Process Skills

4(3) Scientific investigation and reasoning. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to:

(C) represent the natural world using models such as rivers, stream tables, or fossils, and identify their limitations, including accuracy and size

4(4) Scientific investigation and reasoning. The student knows how to use a variety of tools, materials, equipment, and models to conduct science inquiry. The student is expected to:

(A) collect, record, and analyze information using tools, including calculators, microscopes, cameras, computers, hand lenses, metric rulers, Celsius thermometers, mirrors, spring scales, pan balances, triple beam balances, graduated cylinders, beakers, hot plates, meter sticks, compasses, magnets, collecting nets, and notebooks; timing devices, including clocks and stopwatches; and materials to support observation of habitats of organisms such as terrariums and aquariums; and

(B) use safety equipment as appropriate, including safety goggles and gloves.

English Language Arts and Reading

4(2) Reading/Vocabulary Development. Students understand new vocabulary and use it when reading and writing. Students are expected to:

(B) use the context of the sentence (e.g., in-sentence example or definition) to determine the meaning of unfamiliar words or multiple meaning words

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4(6) Reading/Comprehension of Literary Text/Fiction. Students understand, make inferences and draw conclusions about the structure and elements of fiction and provide evidence from text to support their understanding. Students are expected to:

(A) sequence and summarize the plot's main events and explain their influence on future events

(B) describe the interaction of characters including their relationships and the changes they undergo

4(13) Reading/Comprehension of Informational Text/Procedural Texts. Students understand how to glean and use information in procedural texts and documents. Students are expected to:

(A) determine the sequence of activities needed to carry out a procedure (e.g., following a recipe)

4(15) Writing/Writing Process. Students use elements of the writing process (planning, drafting, revising, editing, and publishing) to compose text. Students are expected to:

(A) plan a first draft by selecting a genre appropriate for conveying the intended meaning to an audience and generating ideas through a range of strategies (e.g., brainstorming, graphic organizers, logs, journals);

(B) develop drafts by categorizing ideas and organizing them into paragraphs;

(C) revise drafts for coherence, organization, use of simple and compound sentences, and audience;

(D) edit drafts for grammar, mechanics, and spelling using a teacher-developed rubric; and

(E) revise final draft in response to feedback from peers and teacher and publish written work for a specific audience.

Figure 19

Reading/Comprehension skills. Students use a flexible range of metacognitive reading skills in both assigned and independent reading to understand an author's message. Students will continue to apply earlier standards with greater depth in increasingly more complex texts as they become self-directed, critical readers. The student is expected to:

(D) make inferences about text and use textual evidence to support understanding

(E) summarize information in text, maintaining meaning and logical order

GRADE 4

Earth and Space

Technology Applications—Grades 3–5

(3) Research and information fluency. The student acquires and evaluates digital content. The student is expected to:

(A) use various search strategies such as keyword(s); the Boolean identifiers *and*, *or*, and *not*; and other strategies appropriate to specific search engines;

(B) collect and organize information from a variety of formats, including text, audio, video, and graphics;

(C) validate and evaluate the relevance and appropriateness of information; and

(D) acquire information appropriate to specific tasks.

English Language Proficiency Standards

(4) Cross-curricular second language acquisition/reading. The ELL reads a variety of texts for a variety of purposes with an increasing level of comprehension in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in reading. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. For Kindergarten and Grade 1, certain of these student expectations apply to text read aloud for students not yet at the stage of decoding written text. The student is expected to:

(I) demonstrate English comprehension and expand reading skills by employing basic reading skills such as demonstrating understanding of supporting ideas and details in text and graphic sources, summarizing text, and distinguishing main ideas from details commensurate with content area needs

(J) demonstrate English comprehension and expand reading skills by employing inferential skills such as predicting, making connections between ideas, drawing inferences and conclusions from text and graphic sources, and finding supporting text evidence commensurate with content area needs

Language Objective

I can use a story map to summarize a story about forces that change Earth.

(5) Cross-curricular second language acquisition/writing. The ELL writes in a variety of forms with increasing accuracy to effectively address a specific purpose and audience in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in writing. In order for the ELL to meet grade-level learning expectations across foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. For Kindergarten and Grade 1, certain of these student expectations do not apply until the student has reached the stage of generating original written text using a standard writing system. The student is expected to:

(G) narrate, describe, and explain with increasing specificity and detail to fulfill content area writing needs as more English is acquired

Language Objective

I can write a composition to explain forces that slowly change the surface of Earth.

Response to Intervention/Tier 1 Differentiation

All science lessons support students in receiving quality Tier 1 Instruction. Using the 5E model, knowledge is taught in a variety of contexts, integrating math, science, and ELAR content, thus supporting the active engagement of the students with the content. Lesson-specific differentiation strategies for addressing diverse student needs can be found in sections titled "Differentiation Strategy."

Differentiation should

- focus on skills students did not understand, and extend the lesson for advanced students;
- be conducted in small groups or embedded in whole-group instruction; and
- provide students with a variety of strategies to process the information, such as
  - allowing for additional opportunities for verbal brainstorming of words associated with a topic (with teacher taking dictation);
  - making clear connections of new and more complex concepts to foundational aspects and prior knowledge;
  - participating in more tangible experiences, such as experiments, investigations, and active exploration;
  - sorting academic vocabulary words into categories by common attributes, such as process words or science content vocabulary;

Earth and Space

- organizing results of brainstorming into semantic maps or creating graphic organizers;
- discussing the meaning of a graphic organizer with a partner; and
- creating a visual representation to demonstrate understanding.

See the handout in the Instructional Resources section that addresses instructional strategies.

College and Career Readiness Standards—Science Standards

I.E.1 Effective communication of scientific information. Use several modes of expression to describe or characterize natural patterns and phenomena. These modes of expression include narrative, numerical, graphical, pictorial, symbolic, and kinesthetic.

Vocabulary Focus

weathering

erosion

deposition

Prerequisite Science Knowledge

3(6) Force, motion, and energy. The student knows that forces cause change and that energy exists in many forms. The student is expected to:

(C) observe forces such as magnetism and gravity acting on objects

3(7) Earth and space. The student knows that Earth consists of natural resources and its surface is constantly changing. The student is expected to:

(C) identify and compare different landforms, including mountains, hills, valleys, and plains

4(5) Matter and energy. The student knows that matter has measurable physical properties and those properties determine how matter is classified, changed, and used. The student is expected to:

(B) predict the changes caused by heating and cooling such as ice becoming liquid water and condensation forming on the outside of a glass of ice water

4(6) Force, motion, and energy. The student knows that energy exists in many forms and can be observed in cycles, patterns, and systems. The student is expected to:

(D) design an experiment to test the effect of force on an object such as a push or a pull, gravity, friction, or magnetism

Earth and Space

5E Lesson Summary

Engage
Students harness forces to change the location of an object.

Explore
Students explore changes caused by wind, water, and ice.

Explain
Students explain weathering, erosion, and deposition caused by wind, water, and ice.

Elaborate
Students conduct research to identify slow changes to Earth's surface as a result of weathering, erosion, and/or deposition from wind, water, and/or ice.

Evaluate
Students demonstrate their understanding.

Earth and Space

Engage

Materials

For student groups

- 10 pieces of round toasted oats cereal
- wrapped straw
- wooden block (any size or shape)
- napkin
- metric ruler
- masking tape
- dark-colored marker

Content Builder

This activity focuses on force and motion so that the connection between forces and weathering, erosion, and deposition (WED) processes can be made later in the lesson. Students cannot understand WED processes without having an understanding of how a force greater than the force of gravity can move an object in the same direction as the force. When the force acting on the object is less than the force of gravity, the object stops or settles in a given location. This basic understanding prepares students for understanding Newton's laws in grade 8 and lays the foundation for physics in high school.

Teacher Note

This activity is meant to be an open-ended problem-solving activity. You may choose to take students outside to look for examples of weathering, erosion, and deposition.

Check with the school nurse and note any student allergies to ingredients in toasted oats cereal.

Advance Preparation

Cut two 30 cm strips of masking tape for each group of 3–4 students.

Teacher Instruction

- Provide each student group with one set of materials.
- Instruct students to place the masking tape near the edge of the desk and write *Finish Line* on the masking tape using the marker.
- Instruct students to use their metric ruler and measure 35 cm toward the side of the desk opposite from the finish line. Place the other piece of masking tape here. Label the tape *Starting Line*.
- Instruct students to line up their toasted oat cereal pieces along the starting line.
- Explain the following guidelines to students before beginning the activity:
    - You must get all of the cereal pieces across the finish line.

- All group members must assist in getting the cereal pieces across the finish line.
- No member of the group may allow the cereal to touch their skin.
- You may only use the materials provided. The use of additional materials will result in disqualification.
- The first group to get all their cereal pieces across the finish line wins. None of the pieces can be broken or crushed; this will result in disqualification.

- Instruct students to gather all materials and ensure no cereal pieces are on the floor.
- Debrief the activity using the facilitation questions.

Facilitation Questions

- Before the activity began, what were your pieces of cereal doing? *The cereal was resting along the starting line. The pieces were not moving*.
- What was the goal of the activity? *To move the pieces across the finish line.*
- How did you move the pieces? *Answers will vary.*
- Even though each group used different techniques, what forces were needed? *Answers may vary but should include pushes and/or pulls.*
- What happened to the cereal pieces when you stopped applying the force? *The pieces stopped moving.*
- If some of your cereal pieces fell off the desk, what caused the pieces to fall to the floor? *The force of gravity caused the cereal pieces to fall to the floor.*

Explore

Content Builder

The station activities are to familiarize students with the processes of weathering, erosion, and deposition. *Weathering* is the process where rocks are broken down into smaller and smaller pieces either physically or chemically. *Erosion* is the movement of these rock materials from one place to another. Once this movement occurs, the rock material have the scientific name *sediment*. *Deposition* is when sediments come to rest in a new location. Weathering and erosion are often confused, so the first three stations represent weathering from wind, water, and ice; the second three stations represent erosion and deposition from wind, water, and ice.

Ice Strikes Again

Materials

For each student

- RM 1

For student groups

- RM 2
- 1 PVC elbow pipe, 1/2 in, threaded at both ends
- 2 PVC plugs, 1/2 in, threaded at one end
- small bowl of water
- 1 sandwich-size resealable plastic bag
- dark-colored marker

Teacher Instruction

- Place students in groups of 3–4, and begin with the Ice Strikes Again activity as a whole group. Allow students to move through the remaining stations. These stations would likely need to be duplicated to support student groups. The stations can be visited in any order.
- Instruct students to follow the procedures on *RM 2: Ice Strikes Again.*
- Instruct students to label their group bags with a team name.
- Place the bags in a freezer and leave overnight.
- Allow students to observe their bags the next day and record their observations and inferences on *RM 1: Student Recording Sheet*.

Facilitation Questions

- What happened to the pipe after it was in the freezer overnight? *The pipe broke.*
- What do you see inside the broken pipe? *There is ice inside the broken pipe.*
- Why do you believe the pipe broke? *The water froze and expanded, which pushed the pipe walls until they broke.*
- What would happen if water seeped into a crack in a rock and the temperature dropped to below freezing? *The frozen water may crack the rock and break it apart.*

- Our pipe setup was a model for what happens when water freezes inside cracks in rocks. How is our model, the pipe, similar to and different from what happens with water and rocks? *Answers will vary but should include the following: Differences: The pipe is made of plastic, and many rocks are harder than plastic; the freezing happened in the refrigerator instead of outside in the natural world; the pipe broke apart quickly, but a rock would take longer to break down; Similarities: The water expands in the pipe just as it does inside rock when the water freezes; the pipe broke in a similar way to how a rock breaks apart when water freezes inside a crack in the rock.*

Shake, Rattle, and Roll (Weathering from Water)

Teacher Instruction

- Instruct students to follow the procedures on *RM 3: Shake, Rattle, and Roll*, and record their observations and inferences on *RM 1: Student Recording Sheet*.

Facilitation Questions

- What did you observe in the bottom of the bottle after shaking it? *There were many small pieces of rock.*
- From where do you think these smaller pieces of rock came? *They broke off from the limestone rock.*
- What do you think caused the pieces of rock to break off? *The force placed on the bottle when shaking caused the water to move. This fast-moving water combined with the rocks hitting each other and the inside walls of the bottle caused the limestone to break down into smaller pieces.*
- What do we call the pieces of rock that break off from a larger rock? *Sediments*
- Where would you find this type of water movement? *This type of movement can be found in swift currents in rivers, crashing waves on a rocky shore, or the bottom of a waterfall.*
- How would water break apart rocks on a rocky shoreline? *The waves crash against the shore. The force of the waves and the grinding against other rocks during this movement cause the rocks to break apart into smaller and smaller pieces.*

Materials

For each student

- safety goggles

For student groups

- RM 3
- 3 small limestone samples, no more than 2 cm in diameter
- 16.9 oz plastic bottle with cap
- 250 mL of water in a 250 mL beaker
- timing device
- funnel

- How would water break apart rocks at the bottom of a waterfall? *The force of the water being pulled down by gravity causes the water to crash into the rocks below. The force of the water in addition to the rocks being pushed against each other causes the rocks to break apart into smaller and smaller pieces.*

Windy Weathering (Weathering from Wind)

Materials

For each student

- safety goggles

For student groups

- RM 4
- 1 gallon-size resealable plastic bag
- 1 cup of moist sand
- individually wrapped straws
- balloon hand pump
- 2 bamboo skewers, each 24.5 cm in length
- modeling clay

Teacher Instruction

- Instruct students to follow the procedures on *RM 4: Windy Weathering*, and record their observations and inferences on *RM 1: Student Recording Sheet*.

Facilitation Questions

- What did you observe? *The air from the straw and from the balloon hand pump changed the shape of the mountain.*
- Was there a difference in how much the sand mountain changed depending on whether you used the balloon hand pump or the straw? *Yes, the balloon hand pump caused more sand to move.*
- Why do you think the balloon hand pump caused more change than the straw? *The balloon hand pump blows the air with more force.*
- What could cause a greater break down in rocks: a very windy place or a place with calm winds? Why? *The windy place because the wind has more force, which should cause more change to the rocks.*
- How is the model different from how the breakdown of rocks from wind occurs in the natural world? *Answers will vary but should include the following: The wind blows for longer periods of time and sometimes with much more force than a straw or balloon hand pump. Wind changes directions, which will break down various sides of the rock.*

Earth and Space

Mountain Glacier (Erosion and Deposition from Ice)

Teacher Instruction

- Instruct students to follow the procedures on *RM 5: Mountain Glacier*, and record their observations and inferences on *RM 1: Student Recording Sheet*.

Facilitation Questions

- What did you observe during the investigation? *The white liquid flowed down the side of the sand mountain.*
- The white liquid represents a glacier. Did the glacier model move any sand with it as it flowed down between the sand mountains? How do you know? *Yes, there is a line of sand outside of the line along the front edge of the glacier model, and there is sand underneath the model. This sand was not there before.*
- A glacier is made of layers of ice and compacted snow hundreds or even thousands of meters thick and kilometers wide. Do you believe a real glacier would move quickly like the model did or more slowly? Why? *A glacier has a larger mass than our sample of white liquid; because of this difference in mass, the glacier would move more slowly than the model did.*

Materials

For each student

- safety goggles

For student groups

- RM 5
- paper plate
- 1 cup of moist sand
- dark-colored marker
- water
- graduated cylinder
- tablespoon
- cornstarch
- small plastic cup
- wooden stirring stick

GRADE 4

Earth and Space

Materials

For each student

- safety goggles

For student groups

- RM 6
- One-half of a 16.9 oz plastic bottle, cut lengthwise
- 1/3 cup moist sand
- 50 mL of water

Flowing Water (Erosion and Deposition from Water)

Advance Preparation

Cut one plastic bottle in half lengthwise. Secure the lid to the bottle.

Teacher Instruction

- Instruct students to follow the procedures on *RM 6: Flowing Water*, and record their observations and inferences on *RM 1: Student Recording Sheet*.

Facilitation Questions

- What did you observe as you poured the water onto the sand? *The water flowed past the sand and to the other end of the bottle. Some of the sand moved with the water.*
- How did the sand change shape when the water was poured on it? *The water carved out the sand, leaving an open space.*
- When the container was rocked back and forth, what did you observe? *The water moved back and forth and moved some of the sand with it.*
- What is this motion similar to? *The movement is similar to waves from an ocean or other large body of water.*

Blowing in the Wind (Erosion and Deposition from Wind)

Teacher Instruction

- Instruct students to follow the procedures on *RM 7: Blowing in the Wind*, and record their observations and inferences on *RM 1: Student Recording Sheet*.

Facilitation Questions

- What did you observe when you blew through the straw onto the dry sand? *The pieces of sand scattered everywhere in the bag.*
- What did you observe when you blew through the straw on the wet sand? *Some of the sand moved around.*
- How did the movement of the dry and wet sand compare? *The dry sand moved much farther than the wet sand.*
- Why do you believe this difference occurs? *The wet sand has more mass than dry sand. The pieces of sand stick together more when wet, which makes it harder to move when blowing on it.*

Materials

For each student

- safety goggles

For student groups

- RM 7
- gallon-size plastic bag
- 2 bamboo skewers, each 24.5 cm in length
- modeling clay
- 1 capful of moist sand
- 1 capful of dry sand
- individually wrapped straws

Earth and Space

Explain

Teacher Instruction

Materials

For teacher

- *The Adventures of Sandy, the Not-So-Sedentary Sediment* book

For students

- RM 8

- Tell students that you will be reading a short story. During this story, when students see or hear each of the following vocabulary words for the first time, stop to see if the group can determine what the word means using context clues. Explain to students that the word could be slightly different, for example *weathering* may be used in the past tense, *weathered*.
  - weathering
  - erosion
  - deposition
- During the story, do the following:
  - Invite students to determine the meaning of the words based on experiences in Explore and context of the story.
  - Ask students, at appropriate times in the story, to predict what they believe will happen next.
  - Stop throughout the story to make connections for students between the events in the story and the Explore stations they experienced.
- After reading the story, create a story map using *RM 8: Story Map*, and review with students what happened in the story in terms of erosion, weathering, and deposition. Students should have a clear understanding of the following.
  - Weathering—breaking down of rocks and other Earth materials
  - Erosion—movement of Earth materials from one place to another by water, wind, or ice
  - Deposition—the settling of Earth materials in a new place, generally following erosion

Earth and Space

GRADE 4

Facilitation Questions

- What happened first in the story? *Sandy was part of a rock that broke off from the cliff due to weathering.*
- What happened to the cliff? *The cliff was weathered by the crashing waves and the strong winds.*
- What does it mean when something is weathered? *It is broken down or worn.*
- What happened to Sandy as a result? *A piece of the cliff with Sandy broke away and fell into the ocean below.*
- What do we call the movement of the rock from the cliff to the ocean below? *Erosion due to gravity.*
- What happened to the rock Sandy was part of after it fell from the cliff? *It deposited in the water below, but the force of waves caused the rock to be pushed back and forth. This motion weathered the rock even more as the rock slammed into the cliff and against the other rocks.*
- What process caused Sandy to be deposited on the beach? *Erosion by water, specifically ocean waves.*
- How did Sandy end up in Kansas? *Sandy stuck to the blanket of someone visiting Muir Beach.*
- How did Sandy get to Colorado? *Erosion due to wind.*
- Where was Sandy deposited? *In a river.*
- What happened next? *The snow began to melt, and the extra water flowed into the river. As the water flowed into the river, the force of the moving water increased and Sandy was carried by the water.*
- Was Sandy involved in any weathering of other rocks in the river, and if so, how do you know? *Sandy was involved. Sandy sandblasted the rocks as all of the sediments grinded against the rocks like sandpaper.*
- What happened to Sandy as a result of the weathering in the river? *Sandy had small pieces break off and became smoother.*
- How is Aunt Allie's experience similar to or different from Sandy's? *Answers may vary but should include the following: Aunt Allie also experienced the process of erosion from water as she was swept into the glacier and then from ice after she deposited at the bottom of the glacier.*

Earth and Space

Sandy experienced erosion from wind, but Aunt Allie experienced erosion from water and ice.

- Why did Sandy say it would be the last blog post? *Sandy deposited where the river slows down as it meets the lake.*
- Sandy traveled on a human's blanket, and Aunt Allie traveled on a human's boot. In reality, movement of sediments by humans usually is limited. What are the major ways that sediments move? *Sediments are moved by wind, flowing water, or moving ice such as a glacier.*
- How were the events in the story similar to the investigations you experienced? *Answers may vary but should include the following: Sandy washing up on the shore is similar to how the sand moved in the water bottle stream table as we rocked it back and forth. Sandy experiencing erosion by wind is similar to when we blew on the dry sand using the straw.*

Differentiation Strategy

- Provide an audio recording of the book for students to listen to as they read.

GRADE 4

Elaborate

Teacher Note

The locations listed in the teacher instructions are provided as examples. Teachers can choose other locations if enough information regarding those locations can be found online.

Materials

For each student

- access to the Internet via computer, tablet, etc.
- RM 8
- STAAR® Expository Writing Rubric

Teacher Instruction

- Review with students the STAAR Writing Rubric for expository text to clarify expectations for expository writing.
- Compare and contrast expository writing to narrative writing, such as *The Adventures of Sandy the Not-So-Sedentary Sediment* book.
- Instruct students to pick one of the locations listed below and write a 1–2 page expository composition that includes a description of the location and interesting facts and (most importantly) identifies how weathering, erosion, and/or deposition from wind, water, and/or ice changed this part of Earth's surface over a long period of time.
  - Palo Duro Canyon—formed by water erosion from the Prairie Dog Town Fork of the Red River; wind and water erosion continue to gradually widen the canyon
  - Chimney Bluffs State Park—shaped by glacial activity initially but continually shaped by erosion from wind and waves from Lake Ontario
  - The Great Lakes—carved out by glaciers and filled with the resulting melted ice
  - The Grand Canyon—carved by the Colorado River but the walls of the canyon are continually weathered by wind and water
  - Apostle Islands Sea Caves—rock cliffs formed by rivers carrying sandy sediment; the caves are created by wave action from Lake Superior; some weathering is due to freezing water in cracks along the cliffs
- Review with students how to search for information using the Internet and how to collect, validate, and evaluate information. Use the site http://www.kidrex.org for safe searches.

Earth and Space

- Review with students the plan for writing: generating ideas via brainstorming or graphic organizers, developing drafts, revising and editing in response to peer and teacher feedback. Students could use a new copy of *RM 8* as a guide for planning their essay. Students should also review their own work using the STAAR Writing Rubric as a guide.
- Provide time to conference with students about their writing.
- Provide students with opportunities to self-edit and peer edit their compositions.
- Provide time for students to showcase their completed work.

GRADE 4

Evaluate

Teacher Instruction

- Instruct students to use their knowledge of weathering, erosion, and deposition to complete *RM 9: Evaluate—Slow Changes*.

Materials

For each student

- RM 9

RM 9 Answer Key

1. D
2. B
3. The data was collected from a small sand island where the river meets a lake. The sediments likely were brought here by the process of erosion because of the moving water in the river. The river meets the still waters of the lake, slows down, and flows with less force. The force of gravity would be greater than the force of the river, which would allow the sediments to deposit on the lake bottom. As these deposited sediments piled up over time, the island would be formed. If sediments continue depositing, the island will probably continue to increase in size.
4. The rock is being weathered. The weathering is probably caused by expanding ice. Water could get into the large crack in the rock, and if the temperature outside is cold enough, the water will freeze. When water freezes, it expands and pushes the rock apart. This would explain the long, wide crack in the center of the rock and that it split into two pieces.
5. The glacier scrapes the land as it moves, which changes the shape of the land. The glacier travels slowly and brings with it both large and small sediments. When these sediments are deposited, it can build up the land in other areas.

Grade 4

RM 1: Student Recording Sheet

Ice Strikes Again Observations: I think that . . .
Shake, Rattle, and Roll Observations: I think that . . .
Windy Weathering Observations: I think that . . .

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RM 1: Student Recording Sheet continued

Mountain Glacier Observations: I think that . . .
Flowing Water Observations: I think that . . .
Blowing in the Wind Observations: I think that . . .

Grade 4

RM 2: Ice Strikes Again

1. Screw one plug tightly into one end of the elbow pipe.
2. Place the pipe into the bowl and hold it under the surface of the water.
3. Tilt the pipe slightly so all of the air bubbles escape from the pipe and it fills completely with water.
4. Screw the other plug tightly into the remaining end of the pipe.
5. Create a team name, and label the bag with your team's name.
6. Remove the pipe from the water, and place it into your resealable plastic bag.
7. Seal the plastic bag.
8. Wait for teacher instructions.

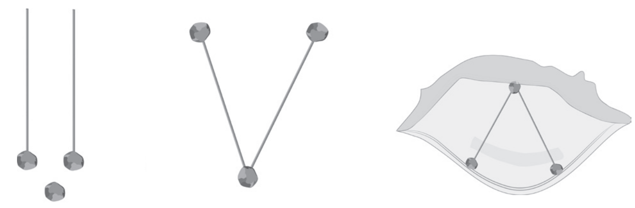
Grade 4

RM 3: Shake, Rattle, and Roll

1. Put on your safety goggles.
2. Observe the color and shape of the limestone samples.
3. Place the limestone samples in the water bottle.
4. Pour 250 mL of water into the water bottle.
5. Screw the cap tightly onto the bottle.
6. Tilt the bottle to ensure it is sealed properly and that there are no water leaks.
7. Allow each student in your group to shake the bottle vigorously for 1 minute, using both hands at all times.
8. Observe the limestone and the bottom of the bottle when the shaking process is complete.
9. Record your observations.

Grade 4

RM 4: Windy Weathering



1. Put on your safety goggles.
2. Use modeling clay to create three small balls no wider than a dime.
3. Place one ball of modeling clay at one end of each piece of bamboo.
4. Join the other two ends of the bamboo pieces with the remaining ball of modeling clay to form a V shape.
5. Place the resealable plastic bag on the table.
6. Open the resealable plastic bag.
7. Stand the bamboo pieces and clay just inside the open end so the V appears to be upside down.
8. Line up the top clay ball with the top groove of the seal, and then line up the bottom two clay balls with the bottom groove of the seal; this will keep your resealable plastic bag open.
9. Place one cup of moist sand inside the bag so that the top of the bag is not touching the sand.
10. Form the cup of sand into the shape of a mountain.
11. Remove the wrapper from the straw.
12. Line up one end of the straw with the edge of the opened bag.
13. Place the other end of the straw in your mouth, and blow toward the sand mountain with three large breaths.
14. Record your observations.
15. Reform the sand into the shape of a mountain.
16. Line up the end of the balloon pump with the edge of the opened bag.
17. Use the balloon pump to deliver two bursts of air toward the sand mountain.
18. Record your observations.

Grade 4

RM 5: Mountain Glacier

1. Put on your safety goggles.
2. Measure 1 cup of moist sand.
3. Place the sand onto the paper plate.
4. Form the sand into a mountain with two peaks.
5. Draw a line along the outside edge of your mountain using a dark-colored marker, making sure there is no sand outside of the line.
6. On the outside line, label one mountain peak “A” and the other mountain peak “B.”
7. Measure 15 mL of water.
8. Pour water into the small plastic cup.
9. Place two tablespoons of cornstarch into the plastic cup, and stir vigorously.
10. Pour the cornstarch mixture slowly onto the side of peak “A” that is closest to peak “B.”
11. Record your observations.

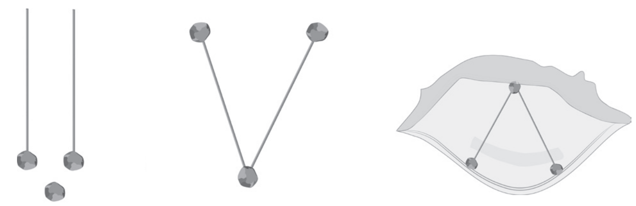
Grade 4

RM 6: Flowing Water

1. Put on your safety goggles.
2. Place the bottle that has been cut in half on the table with the open side facing up. Make sure the lid is secure on the bottle.
3. Place 1/2 cup of moist sand in the narrow end of the bottle that has been cut in half.
4. Place one hand under the sandy end of the bottle.
5. Slowly pour the 50 mL of water onto the moist sand.
6. Record your observations.
7. Hold the bottle that has been cut in half in the palm of one hand.
8. Gently rock the bottle back and forth so the ends of the bottle rise and fall.
9. Record your observations.

Grade 4

RM 7: Blowing in the Wind



Step 3 Step 4 Step 7

1. Put on your safety goggles.
2. Use modeling clay to create three small balls no wider than a dime.
3. Place one ball of modeling clay at one end of each piece of bamboo.
4. Join the other two ends of the bamboo pieces with the remaining ball of modeling clay to form a V shape.
5. Place the resealable plastic bag on the table.
6. Open the resealable plastic bag, and ensure the bag is unsealed.
7. Stand the bamboo pieces and clay just inside the open end so the V appears to be upside down.
8. Line up the top clay ball with the top groove of the seal, and then line up the bottom two clay balls with the bottom groove of the seal; this will keep your resealable plastic bag open.
9. Pour one capful of dry sand into a pile inside the plastic bag.
10. Remove the wrapper from a straw.
11. Line up one end of the straw with the edge of the bag opening.
12. Place the other end of the straw in your mouth, and then blow toward the sand pile with three large breaths.
13. Record your observations.
14. Pour one capful of moist sand into a pile inside the plastic bag.
15. Remove the wrapper from a straw.
16. Line up one end of the straw with the edge of the bag opening.
17. Place the other end of the straw in your mouth, and then blow toward the sand pile with three large breaths.
18. Record your observations.

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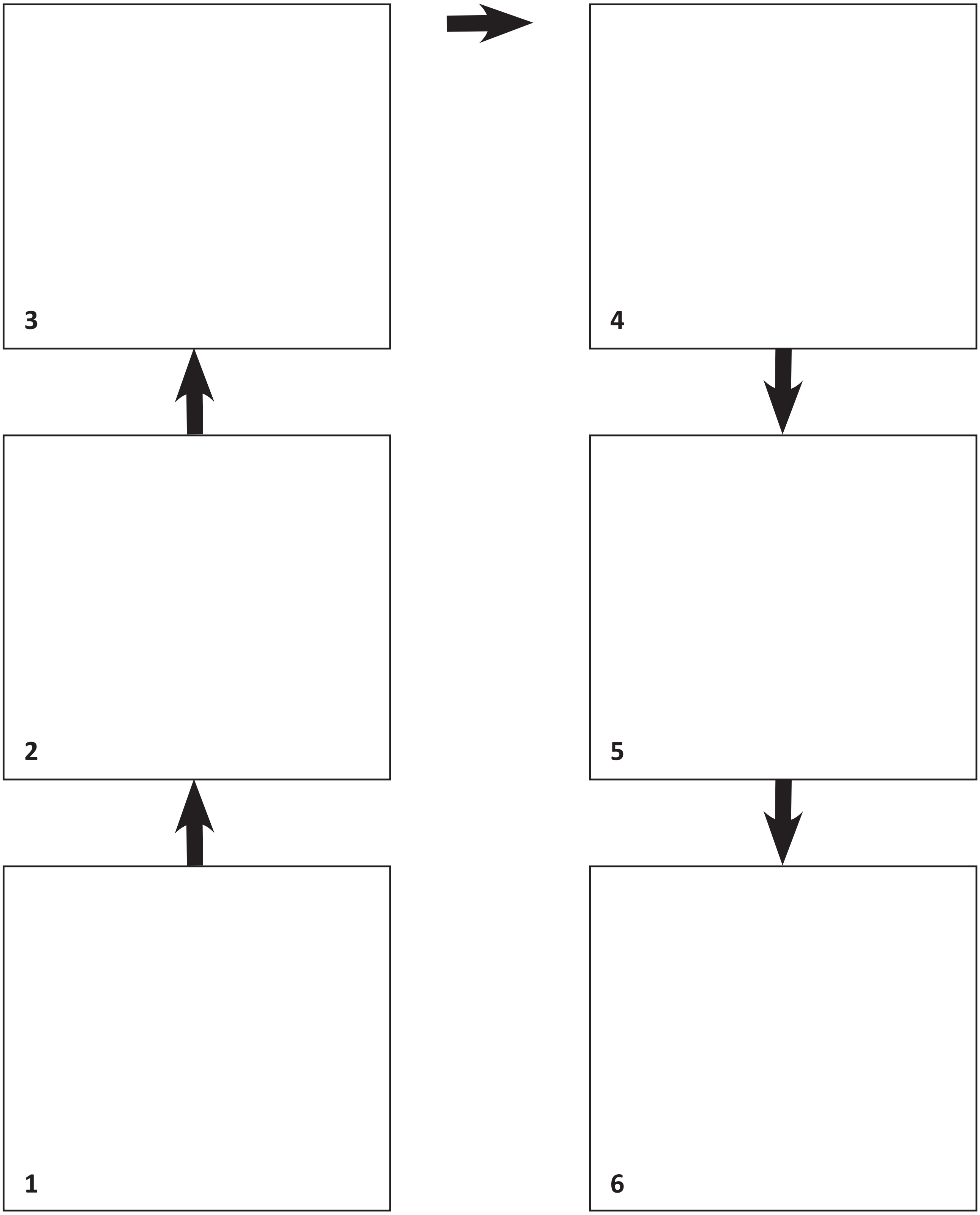
Grade 4

RM 8: Story Map



Grade 4

RM 9: Evaluate—Slow Changes

Location A

- Hot summers
- Warm winters
- Very little precipitation
- Strong winds

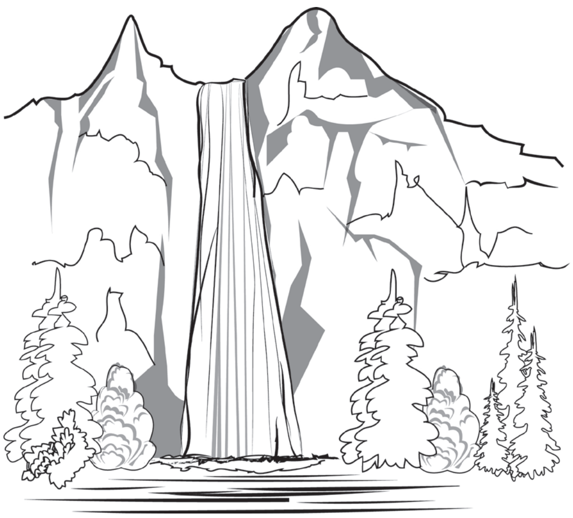
1. The shape of the land at Location A likely would change over time due to—

   A. Deposition from water

   B. Weathering from ice

   C. Erosion from water

   D. Erosion from wind



2. The V-shape in the rocky cliff at the top of the waterfall likely was created by the process of—

   A. Decomposition

   B. Weathering

   C. Deposition

   D. Heating

Grade 4

RM 9: Evaluate—Slow Changes continued

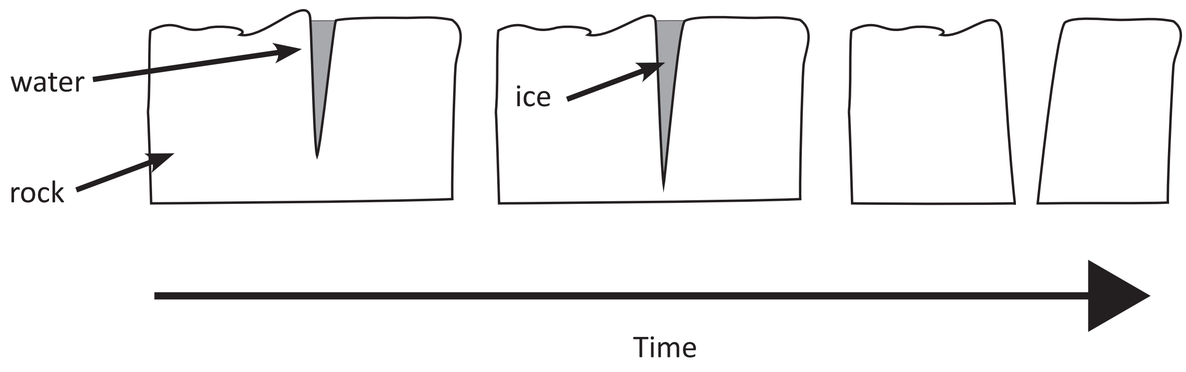
3. The table below shows the age of sediment and the depth below the surface where it was collected. The data was collected from a small sand island where a river meets a lake.

Sediment Age (years)	Sediment Depth (cm)
10	4.5
20	10.1
30	14.7
40	15.6

Using the data above, write a short paragraph identifying what slow change is happening to this island as well as what processes and forces are involved.

RM 9: Evaluate—Slow Changes continued

4. Identify and explain what happened in the image below.



5. Explain how a glacier can change Earth's surface.

SCIENCE:

KINDERGARTEN—ORGANISMS AND ENVIRONMENTS

Organisms and Environments

Living versus Nonliving

Science Concept

K(9) Organisms and environments. The student knows that plants and animals have basic needs and depend on the living and nonliving things around them for survival. The student is expected to:

(A) differentiate between living and nonliving things based upon whether they have basic needs and produce offspring; and

(B) examine evidence that living organisms have basic needs such as food, water, and shelter for animals and air, water, nutrients, sunlight, and space for plants.

Content Objective

I can tell the difference between living and nonliving things.

Science Process Skills

K(2) Scientific investigation and reasoning. The student develops abilities to ask questions and seek answers in classroom and outdoor investigations. The student is expected to:

(A) ask questions about organisms, objects, and events observed in the natural world

(D) record and organize data and observations using pictures, numbers, and words

K(4) Scientific investigation and reasoning. The student uses age-appropriate tools and models to investigate the natural world. The student is expected to:

(B) use senses as a tool of observation to identify properties and patterns of organisms, objects, and events in the environment

English Language Arts and Reading

K(21) Listening and Speaking/Listening. Students use comprehension skills to listen attentively to others in formal and informal settings. Students continue to apply earlier standards with greater complexity. Students are expected to:

(A) listen attentively by facing speakers and asking questions to clarify information

K(22) Listening and Speaking/Speaking. Students speak clearly and to the point, using the conventions of language. Students continue to apply earlier standards with greater complexity. Students are expected to share information and ideas by speaking audibly and clearly using the conventions of language.

Organisms and Environments

K(23) Listening and Speaking/Teamwork. Students work productively with others in teams. Students continue to apply earlier standards with greater complexity. Students are expected to follow agreed-upon rules for discussion, including taking turns and speaking one at a time.

<u>Figure 19</u>

Reading/Comprehension Skills. Students use a flexible range of metacognitive reading skills in both assigned and independent reading to understand an author's message. Students will continue to apply earlier standards with greater depth in increasingly more complex texts as they become self-directed, critical readers. The student is expected to:

(B) ask and respond to questions about text

(C) monitor and adjust comprehension (e.g., using background knowledge, creating sensory images, re-reading a portion aloud)

(F) make connections to own experiences, to ideas in other texts, and to the larger community and discuss textual evidence

KINDERGARTEN

<u>English Language Proficiency Standards</u>

(3) Cross-curricular second language acquisition/speaking. The ELL speaks in a variety of modes for a variety of purposes with an awareness of different language registers (formal/informal) using vocabulary with increasing fluency and accuracy in language arts and all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in speaking. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. The student is expected to:

(D) speak using grade-level content area vocabulary in context to internalize new English words and build academic language proficiency

Language Objective

I will orally describe to my class the differences between living and nonliving things.

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Organisms and Environments

Response to Intervention/Tier 1 Differentiation

All science lessons support students in receiving quality Tier 1 Instruction. Using the 5E model, knowledge is taught in a variety of contexts, integrating math, science, and ELAR content, thus supporting the active engagement of the students with the content. Lesson-specific differentiation strategies for addressing diverse student needs can be found in sections titled “Differentiation Strategy.”

Differentiation should

- focus on skills students did not understand, and extend the lesson for advanced students;
- be conducted in small groups or embedded in whole-group instruction; and
- provide students with a variety of strategies to process the information, such as
  - allowing for additional opportunities for verbal brainstorming of words associated with a topic (with teacher taking dictation);
  - making clear connections of new and more complex concepts to foundational aspects and prior knowledge;
  - participating in more tangible experiences, such as experiments, investigations, and active exploration;
  - sorting academic vocabulary words into categories by common attributes, such as process words or science content vocabulary;
  - organizing results of brainstorming into semantic maps or creating graphic organizers;
  - discussing the meaning of a graphic organizer with a partner; and
  - creating a visual representation to demonstrate understanding.

See the handout in the Instructional Resources section that addresses instructional strategies.

College and Career Readiness Standards—Science Standards

I.A.3 Cognitive skills in science. Formulate appropriate questions to test understanding of natural phenomena.

I.E.2 Effective communication of scientific information. Use essential vocabulary of the discipline being studied.

V.D.1 Classification. Understand that scientists categorize things according to similarities and differences.

Organisms and Environments

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Vocabulary Focus

basic needs

depend

evidence

living

nonliving

nutrients

offspring

organism

produce

shelter

survival

5E Lesson Summary

Engage
Students identify living organisms.

Explore
Students differentiate between living and nonliving things.

Explain
Students define living organisms as plants and animals based on their ability to produce offspring and the fact that they have basic needs.

Elaborate
Students examine the basic needs of organisms.

Evaluate
Students differentiate between living and nonliving things and examine evidence showing that organisms have basic needs.

Organisms and Environments

Engage

Materials

For teacher

- RM 1
- dry erase marker
- whiteboard
- tape or magnets
- resealable plastic bag

Content Builder

Most basic needs of living organisms are nonliving, such as water, air, space, sunlight, nutrients, and shelter. However, be careful not to label all basic needs as nonliving. Animals need food. Animals eat plants or other animals that are living. Plants make their own food through the process of photosynthesis. Glucose is nonliving. Therefore, food may be considered living (a basic need of animals) or nonliving (if a basic need of plants).

Advance Preparation

Print one copy of *RM 1: What Is Living?* on card stock, laminate, cut out the cards, and place them in a resealable plastic bag.

Teacher Note

Students have varying levels of knowledge about living and nonliving things. Related vocabulary is introduced in Engage and Explore and formally defined in Explain. The goal of Engage is to find out what the students know.

Teacher Instruction

- Draw a T-chart on the whiteboard. Label one side of the T-chart *living* and the other side *nonliving*.
- Announce items from *RM 1* one at a time and instruct students to work in pairs to identify whether the item is living or nonliving. Place the items on the T-chart according to the answers students provide.

Facilitation Questions

- How do you know if something is living? *Something is living if it grows, produces offspring (has babies or seeds), and has basic needs.*
- What pictures show living things? *The horse, bee, dog, fish, flower, and tree are living things.*
- How do you know if something is nonliving? *Something is nonliving if it does not grow or produce offspring. Nonliving things do not have basic needs.*
- What are two groups of living things? *Plants and animals are living things.*

Explore

Advance Preparation

- Number the table tennis balls 1 through 24 with a permanent marker.
- Label one bucket or basket "Living."
- Label the other bucket or basket "Nonliving."
- Print *RM 2: Living and Nonliving* on card stock and cut out the images to display.

Materials

For teacher

- RM 2
- 24 table tennis balls
- permanent marker
- 3 buckets or baskets
- meter stick

Teacher Instruction

- Place all of the table tennis balls in one bucket or basket in the front, center area of the classroom about 2–3 meters from the front wall.
- Position the other two buckets or baskets against the front wall about 3 feet apart. These containers should be centered in front of the container holding the table tennis balls.
- Divide the class into two groups.
- Explain to the class that a student from one group will randomly choose a table tennis ball. The student will read the number on the ball to the class. The teacher will show the corresponding pictured item. That student will then explain why the item on the card is living or nonliving. After that, the student will toss the ball into the appropriate bucket or basket. If the student's answer is incorrect, discuss with the class why the item belongs in the opposite category. Students do not receive points for incorrect answers. The student should display the picture of the item on the wall above the appropriate bucket or basket. If the student is correct, his or her team wins a point. A student from the second group will then have a turn. Each student should get a turn.

Facilitation Questions

- What items are in the living category? *The ivy plant, cat, corn plant, grass, rosemary, sunflower, tree, ladybug, spider, bear, bird, and lizard are in the living category.*
- How did you decide that those items are living things? *Each of those things has basic needs such as air, water, and nutrients or food. Living things have seeds or can have babies.*

Organisms and Environments

- What items are in the nonliving category? *Air, bucket of water, radio, sunlight, soil, rocks, pond, rain, clouds, shoe, pencil, and book are in the nonliving category.*
- How did you decide that those items are nonliving things? *Nonliving things do not grow, do not have basic needs, do not have seeds, and cannot have babies.*

Explain

Teacher Note

The words of this book are written to the tune of the song “Dem Bones” and can be sung aloud as a class. Students do not need to be able to read the words.

First, read the book to the students. Stop to discuss how the pictures relate to the words on each page.

Then, reread the book, singing it to the students.

Instruct students to sing along with you as you read the book a third time. This will help the students pronounce the new vocabulary words.

Materials

For teacher

- *Living Things* book

Teacher Instruction

- Read the book to the students. Stop to discuss how the pictures relate to the words on each page.

Facilitation Questions

- What is an organism? *An organism is a living thing.*
- How do you know if something is an organism? *Something is an organism if it grows, eats, or has seeds or babies.*
- What are offspring? *Offspring are seeds to a plant or babies to an animal.*
- What are basic needs? *Basic needs are things plants and animals need to live and survive.*
- What are some examples of basic needs of organisms? *Basic needs of plants include air, water, space, nutrients, and sunlight. Animals need air, water, food, and shelter.*
- What happens if an organism does not have access to water? *The animal would be thirsty and would search for water. If the animal does not find a water source, it would eventually die.*
- What does it mean to depend on something or someone? *To depend on something or someone means you need that thing or person.*
- What do living things depend on? *Living things, or organisms, depend on each other and air, water, nutrients, and sunlight.*

Organisms and Environments

Teacher Instruction

- Reread the book, singing it to the students.
- Instruct students to sing along with you as you read the book a third time. This will help students pronounce the new vocabulary words.

Facilitation Questions

- What did you learn about living and nonliving things? *Student answers may vary and include: Living things can be plants and animals that have basic needs and produce offspring. If students do not use academic vocabulary words such as offspring, debrief using these words so that they become familiar with hearing them.*

Elaborate

Advance Preparation

Determine how many groups you will have and gather twice as many large plastic plates or trays. Stack two plates or trays per group. Place the materials onto each stack of plates or trays.

Teacher Instruction

- Divide class into groups of 4 students.
- Distribute one set of materials to each group.
- Instruct students to divide the materials into two groups based on what the materials can do, such as materials that have basic needs and materials that do not have basic needs.

Facilitation Questions

- How did you group the materials? *Students should have grouped the plant and mealworms together. The water, air, potting soil, Sun, and metric ruler should be in the second group.*
- Why did you group the materials in a certain way? *The plant and mealworms are living things. Living things can produce offspring and have basic needs. The water, air, potting soil, Sun, and metric ruler represent nonliving things that living things need for survival.*
- What evidence can be observed to know if something is living or nonliving? *Students might need help understanding that evidence is something that can be observed to help people make decisions about something. For example, students may observe that plants wilt if they do not receive water. Therefore, plants need water.*

Teacher Instruction

- Explain to student that a terrarium is a land shelter and that the root word of terrarium is *terra-*, which means Earth.
- Ask a student volunteer to pour dry oats into one of the clear plastic containers until it is half full.

Materials

For teacher

- 2 clear plastic containers such as small animal terrariums
- canister of dry oats
- apple slices or a moist paper towel
- potting soil
- water

For student groups

- small plant
- 2–3 mealworms in small plastic container
- 8-ounce bottle of water
- resealable bag full of air
- small resealable bag of potting soil
- picture or model of Sun
- metric ruler
- 2 large stackable plastic plates or trays

Organisms and Environments

- Ask one student from each group to place their mealworms in the container of oats.
- Add a few apple slices or a moist paper towel for the mealworms. (The container does not need a lid because darkling beetles—mealworm adults—do not fly.)

Facilitation Questions

- What did we build for the mealworms? *We built a shelter for the mealworms.*
- What does the shelter provide for the mealworms? *The mealworms eat the dry oats (food), get moisture from the apple slices or paper towel (water), are protected in the container (shelter), and have air to breathe.*

Teacher Instruction

- Ask a student volunteer to pour soil into the other clear plastic container until it is half to three-fourths full.
- Ask one student from each group to plant their small plant in the soil.
- Pour a small amount of water into the container.

Facilitation Questions

- What did we do for the plants? *We provided them a terrarium in which to grow.*
- What does the terrarium provide for the plants? *The soil provides nutrients for the plants, water helps the plants grow, there is air to make food, and the terrarium provides space for the plants.*
- Where should we place the terrarium? *The terrarium needs to be next to a window or outside where it will receive sunlight.*
- How are the basic needs of mealworms and plants the same? *Mealworms and plants both need air, water, and food, or nutrients.*
- How are the basic needs of mealworms different from the basic needs of plants? *Mealworms need shelter. Plants need sunlight and space.*
- What is the relationship between living and nonliving things? *Living things depend on other organisms as well as nonliving things to survive. Nonliving things do not need air, water, food, or shelter.*

Organisms and Environments

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Science Notebook Entry

- Instruct students to draw a picture of the terrarium with mealworms and another picture of the terrarium with plants.
- Brainstorm what living and nonliving things need to be labeled in each picture. Model for students how to add labels to their drawings.

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Organisms and Environments

Evaluate

Materials

For each student

- white paper
- crayons or colored pencils

Teacher Instruction

- Ensure that each student has a sheet of white paper and access to crayons.
- Instruct students to draw one picture that includes living and nonliving things. Students should label the living and nonliving things.
- Ask students to copy and complete the following sentence frames below their pictures.
    - Animals need ______________________________ to live.
    - Plants need _______________________________ to live.

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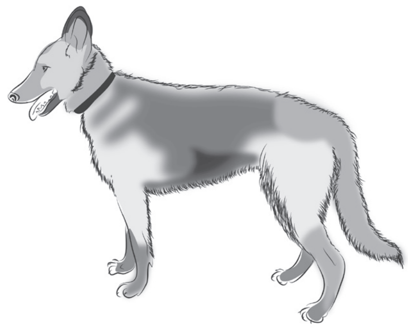
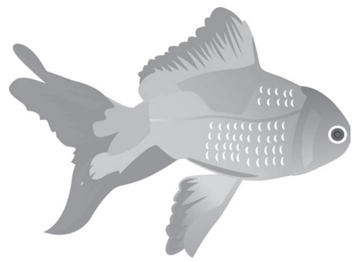
RM 1: What Is Living?

bee

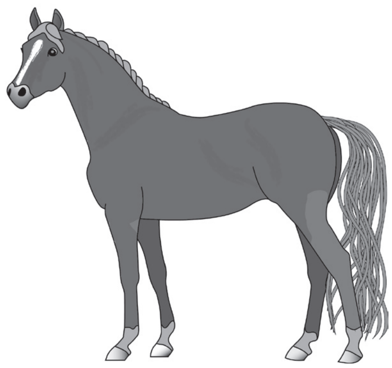


dog

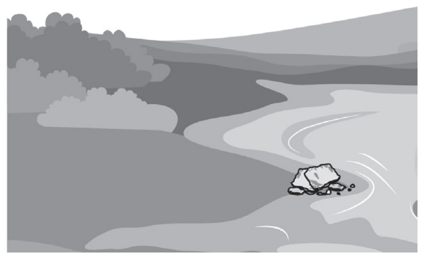


fish

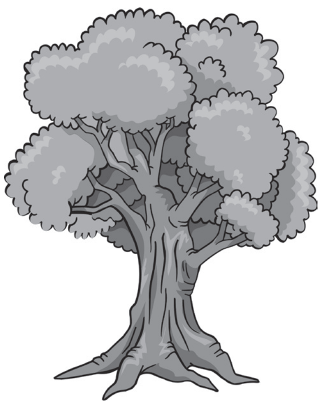
flower



horse

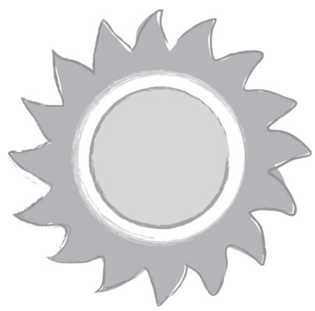


pond



tree

rain



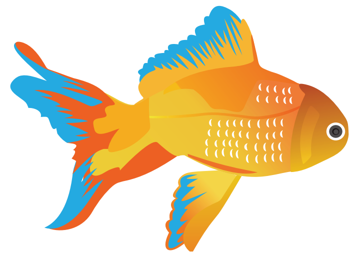
Sun

KINDERGARTEN

RM 1: What is Living?—Color Version

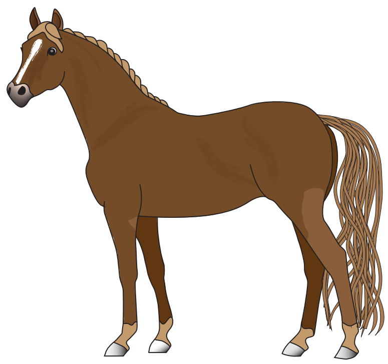
bee

dog



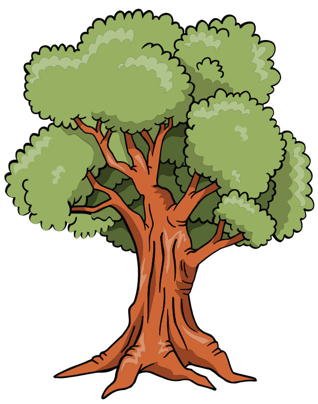
fish

flower



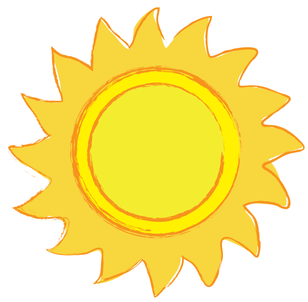
horse

pond



tree

rain



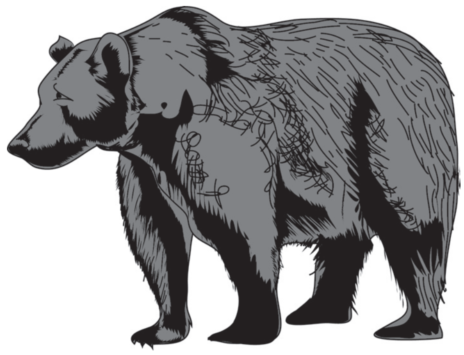
Sun

RM 2: Living and Nonliving

1

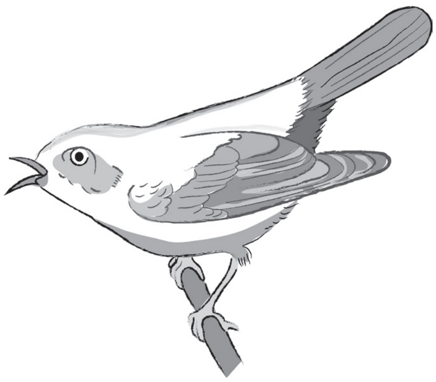
air

2



bear

3



bird

4

book

5

cat

6

clouds

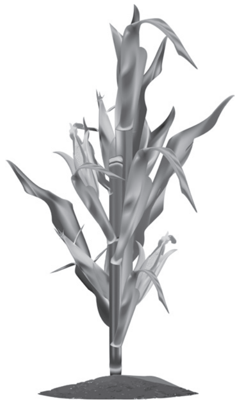
KINDERGARTEN

RM 2: Living and Nonliving continued

7

bucket of water

8

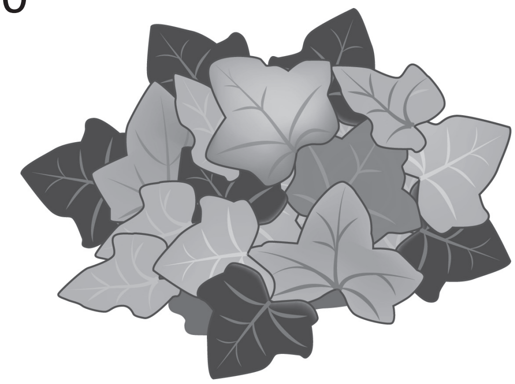


corn plant

9

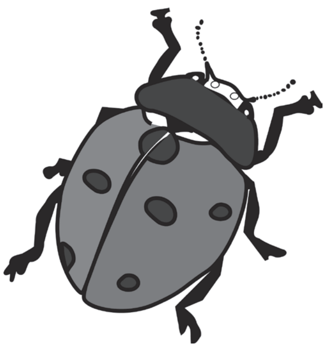
grass

10



ivy plant

11



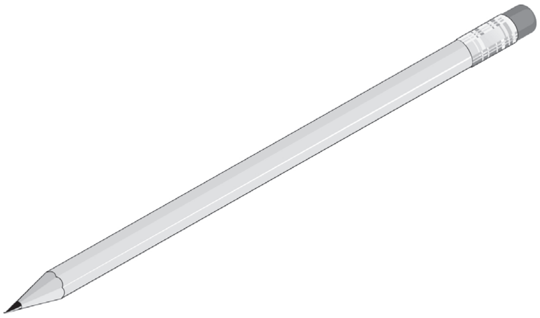
ladybug

12

lizard

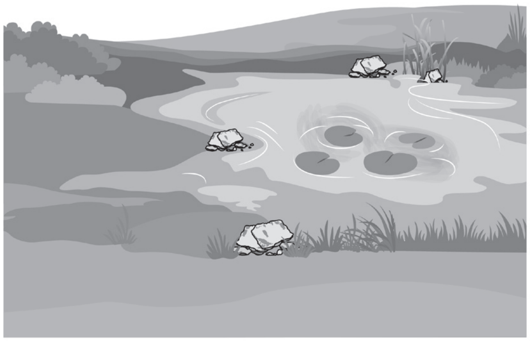
RM 2: Living and Nonliving continued

13



pencil

14



pond

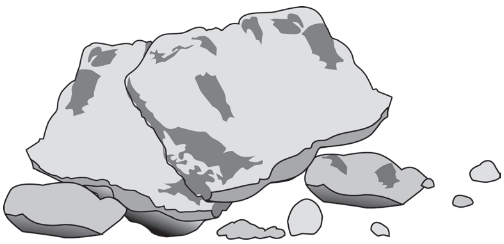
15

radio

16

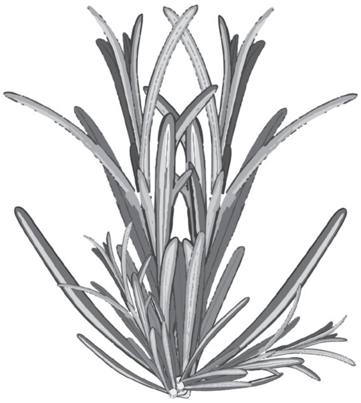
rain

17



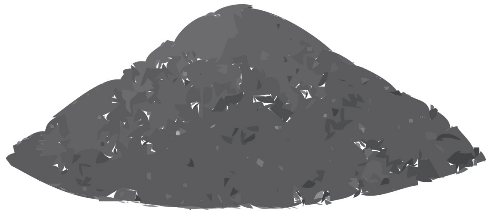
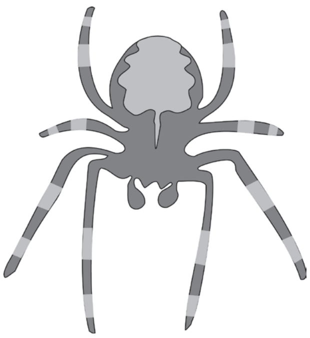
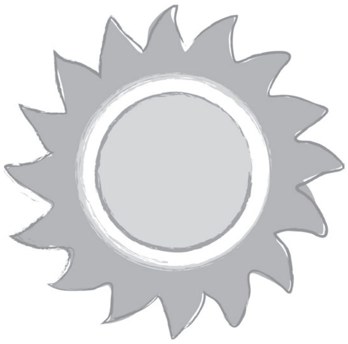
rocks

18



rosemary

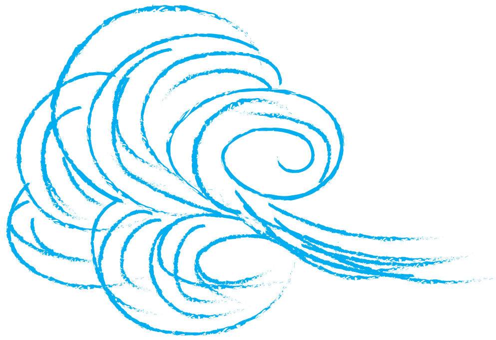
RM 2: Living and Nonliving continued

19  shoe	20  soil
21  spider	22  sunflower
23  sunlight	24  tree

KINDERGARTEN

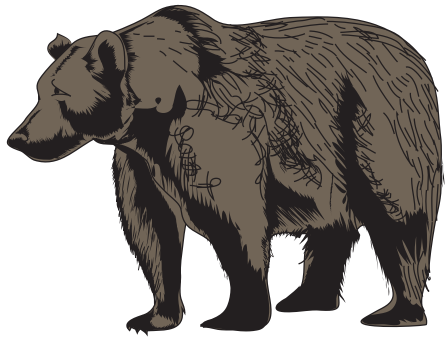
RM 2: Living and Nonliving—Color Version

1



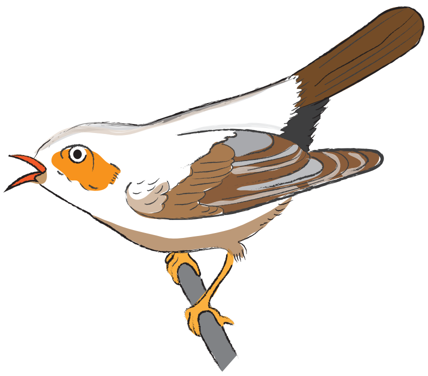
air

2



bear

3



bird

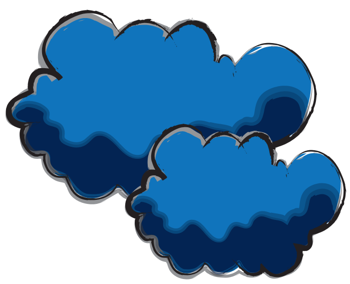
4

book

5

cat

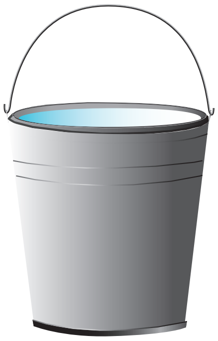
6



clouds

RM 2: Living and Nonliving continued—Color Version

7



bucket of water

8

corn plant

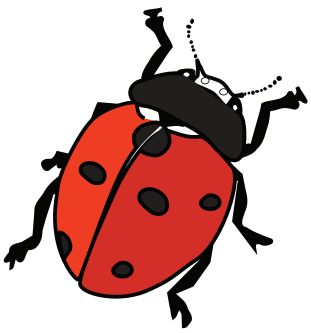
9

grass

10

ivy plant

11



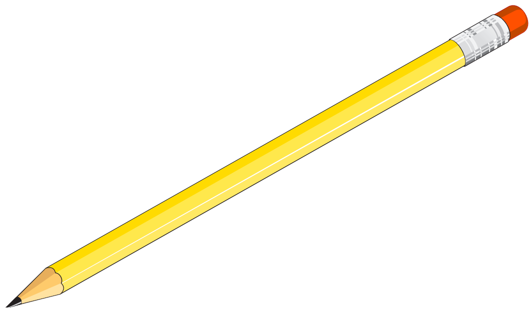
ladybug

12

lizard

RM 2: Living and Nonliving continued—Color Version

13



pencil

14

pond

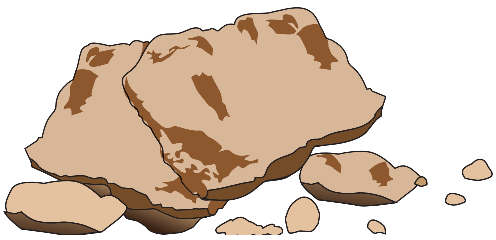
15

radio

16

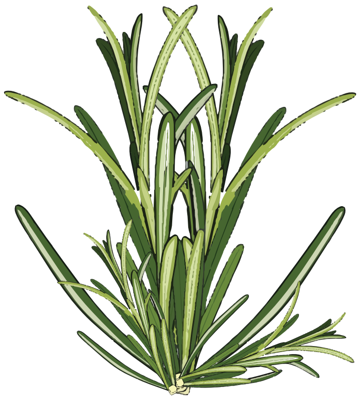
rain

17



rocks

18



rosemary

RM 2: Living and Nonliving continued—Color Version

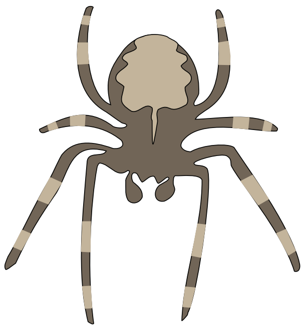
19

shoe

20

soil

21

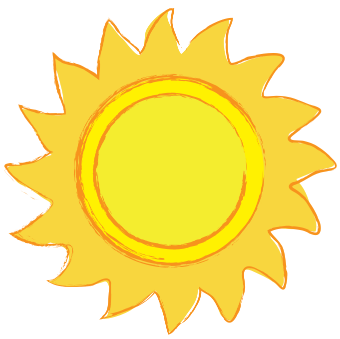


spider

22

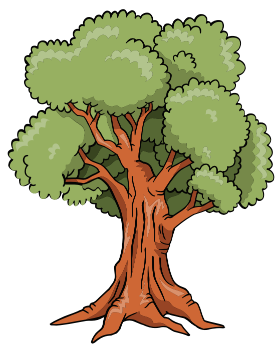
sunflower

23

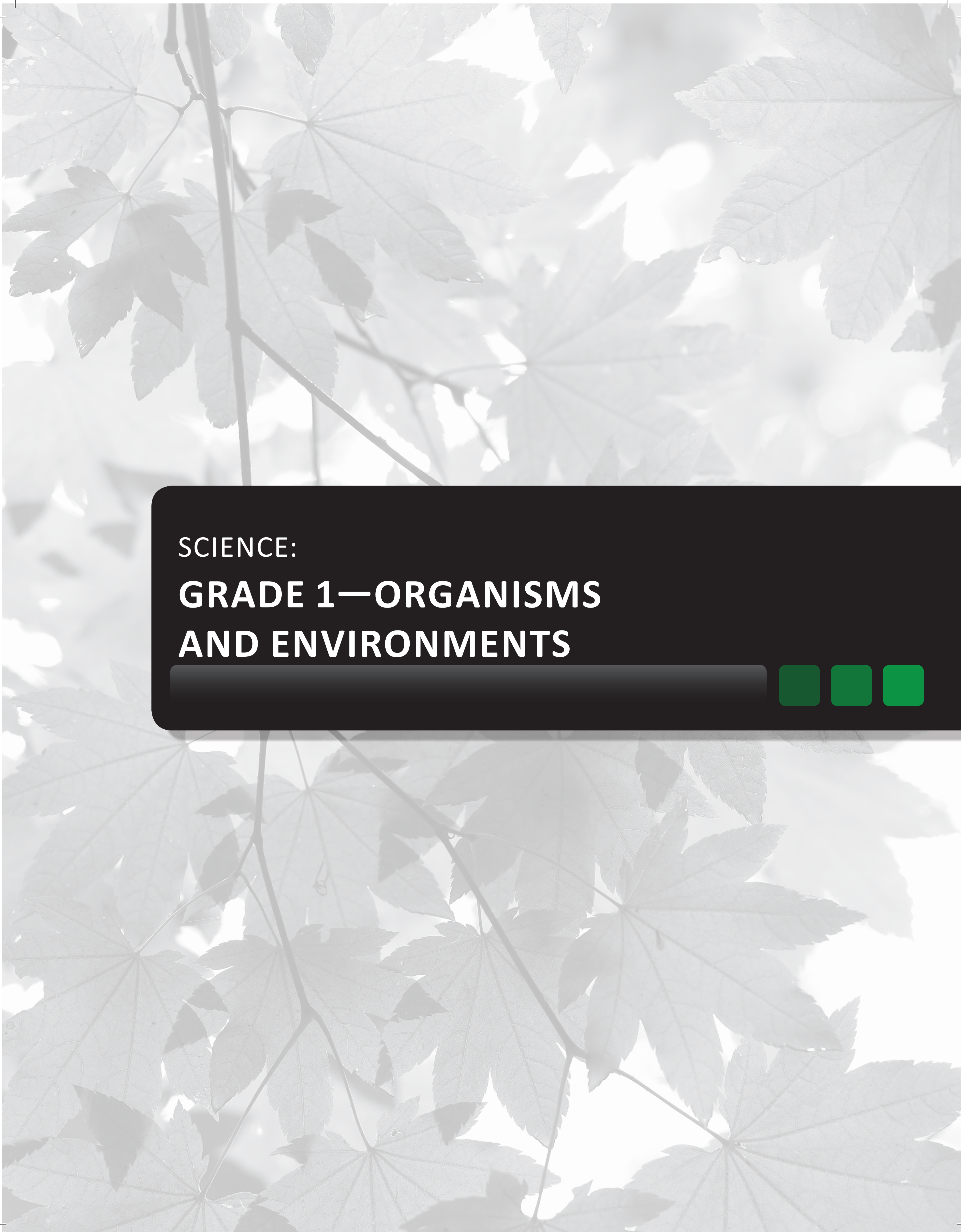


sunlight

24



tree



SCIENCE:

GRADE 1—ORGANISMS AND ENVIRONMENTS

GRADE 1

Organisms and Environments

Depending on Basic Needs

Science Concept

1(9) Organisms and environments. The student knows that the living environment is composed of relationships between organisms and the life cycles that occur. The student is expected to:

(A) sort and classify living and nonliving things based upon whether or not they have basic needs and produce offspring

(B) analyze and record examples of interdependence found in various situations such as terrariums and aquariums or pet and caregiver

Content Objective

I can sort and classify living and nonliving things. I can give examples of how things depend on each other.

Science Process Skills

1(2) Scientific investigation and reasoning. The student develops abilities to ask questions and seek answers in classroom and outdoor investigations. The student is expected to:

(A) ask questions about organisms, objects, and events observed in the natural world

1(3) Scientific investigation and reasoning. The student knows that information and critical thinking are used in scientific problem solving. The student is expected to:

(A) identify and explain a problem such as finding a home for a classroom pet and propose a solution in his/her own words

1(4) Scientific investigation and reasoning. The student uses age-appropriate tools and models to investigate the natural world. The student is expected to:

(A) collect, record, and compare information using tools, including computers, hand lenses, primary balances, cups, bowls, magnets, collecting nets, notebooks, and safety goggles; timing devices, including clocks and timers; non-standard measuring items such as paper clips and clothespins; weather instruments such as classroom demonstration thermometers and wind socks; and materials to support observations of habitats of organisms such as aquariums and terrariums

Texas Education Agency

Organisms and Environments

GRADE 1

<u>**English Language Arts and Reading**</u>

1(14) Reading/Comprehension of Informational Text/Expository Text. Students analyze, make inferences and draw conclusions about expository text and provide evidence from text to support their understanding. Students are expected to:

(B) identify important fact or details in text, heard or read

1(27) Listening and Speaking/Listening. Students use comprehension skills to listen attentively to others in formal and informal settings. Students continue to apply earlier standards with greater complexity. Students are expected to:

(A) listen attentively to speakers and ask relevant questions to clarify information; and

(B) follow, restate, and give oral instructions that involve a short related sequence of actions.

1(28) Listening and Speaking/Speaking. Students speak clearly and to the point, using the conventions of language. Students continue to apply earlier standards with greater complexity. Students are expected to share information and ideas about the topic under discussion, speaking clearly at an appropriate pace, using the conventions of language.

1(29) Listening and Speaking/Teamwork. Students work productively with others in teams. Students continue to apply earlier standards with greater complexity. Students are expected to follow agreed-upon rules for discussion, including listening to others, speaking when recognized, and making appropriate contributions.

<u>**Figure 19**</u>

Reading/Comprehension Skills. Students use a flexible range of metacognitive reading skills in both assigned and independent reading to understand an author's message. Students will continue to apply earlier standards with greater depth in increasingly more complex texts as they become self-directed, critical readers. The student is expected to:

(C) monitor and adjust comprehension (e.g., using background knowledge, creating sensory images, re-reading a portion aloud)

(D) make inferences about text and use textual evidence to support understanding

(F) make connections to own experiences, to ideas in other texts, and to the larger community and discuss textual evidence

GRADE 1

Organisms and Environments

English Language Proficiency Standards

(5) Cross-curricular second language acquisition/writing. The ELL writes in a variety of forms with increasing accuracy to effectively address a specific purpose and audience in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in writing. In order for the ELL to meet grade-level learning expectations across foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. For Kindergarten and Grade 1, certain of these student expectations do not apply until the student has reached the stage of generating original written text using a standard writing system. The student is expected to:

(B) write using newly acquired basic vocabulary and content-based grade-level vocabulary

Language Objective

I will write two sentences about how living things depend on nonliving things for survival.

Response to Intervention/Tier 1 Differentiation

All science lessons support students in receiving quality Tier 1 Instruction. Using the 5E model, knowledge is taught in a variety of contexts, integrating math, science, and ELAR content, thus supporting the active engagement of the students with the content. Lesson-specific differentiation strategies for addressing diverse student needs can be found in sections titled "Differentiation Strategy."

Differentiation should

- focus on skills students did not understand, and extend the lesson for advanced students;
- be conducted in small groups or embedded in whole-group instruction; and
- provide students with a variety of strategies to process the information, such as
  - allowing for additional opportunities for verbal brainstorming of words associated with a topic (with teacher taking dictation);
  - making clear connections of new and more complex concepts to foundational aspects and prior knowledge;
  - participating in more tangible experiences, such as experiments, investigations, and active exploration;

- sorting academic vocabulary words into categories by common attributes, such as process words or science content vocabulary;
- organizing results of brainstorming into semantic maps or creating graphic organizers;
- discussing the meaning of a graphic organizer with a partner; and
- creating a visual representation to demonstrate understanding.

See the handout in the Instructional Resources section that addresses instructional strategies.

College and Career Readiness Standards—Science Standards

I.A.3 Cognitive skills in science. Formulate appropriate questions to test understanding of natural phenomena.

I.E.2 Effective communication of scientific information. Use essential vocabulary of the discipline being studied.

V.D.1 Classification. Understand that scientists categorize things according to similarities and differences.

Vocabulary Focus
aquarium
basic needs
interdependence
living
nonliving
offspring
organism
produce
terrariums

GRADE 1

Organisms and Environments

5E Lesson Summary

Engage
Students sort and classify living and nonliving things.

Explore
Students sort and classify living and nonliving things based upon whether or not they have basic needs and produce offspring.

Explain
Students define and analyze situations to find examples of interdependence.

Elaborate
Students assemble a terrarium containing earthworms and a plant.

Evaluate
Students complete a statement that summarizes the main ideas from the lesson.

Engage

Advance Preparation

Print *RM 1: Living and Nonliving* on card stock and laminate it. Cut out images and place them in a resealable plastic bag for repeated use.

Materials

For teacher

- RM 1
- resealable plastic bag

Teacher Instruction

- Distribute one image to each student.
- Assign one side of the classroom to be Group A and the other side to be Group B.
- Instruct students to divide themselves into two groups based on what is on their cards.
- Provide about 5 minutes for the students to divide into two groups.
- Instruct students in each group to elect a spokesperson to explain why they grouped themselves together.

Facilitation Questions

- How did you divide yourselves into two groups? *Students may divide themselves based on whether the items on their cards are living or nonliving.*
- Why did you choose to divide yourselves that way? *Answers may vary depending on student knowledge and prior experiences, including that they know some things are living plants and animals and the other things are not.*

Teacher Instruction

- Instruct students to group themselves according to whether the items on their cards are living or nonliving if they did not do that the first time.

Facilitation Questions

- What do living things need to survive? *Living things need air, water, food, nutrients, space, shelter, and sunlight to grow and produce offspring.*

Organisms and Environments

- How do nonliving things help living organisms? *Nonliving things such as air, water, sunlight, space, nutrients, and shelter keep organisms from being hungry and thirsty. They also keep them healthy and protected.*

Teacher Instruction

- Ask students to place the living and nonliving cards back into the resealable plastic bag.

Explore

Teacher Instruction

- Divide the class into groups of three students.
- Instruct students to cut out the images at the bottom of *RM 3: Beach Scene*. Students may color the images if time permits.
- Ask students to divide the images into living and nonliving groups using the chart on *RM 2: T-Chart*.

Facilitation Questions

- What did you place in the living category? *The crab, fish, kelp, pelican, and sea turtle are all living things.*
- What did you place in the nonliving category? *The clouds, picnic basket, shells, towel, and umbrella are all nonliving things.*
- How are living and nonliving things different? *Living things are alive; they produce offspring, grow, and need to eat and drink. Nonliving things are not living; therefore, they do not have needs.*

Teacher Instruction

- Instruct students to place and then glue the images onto *RM 3* to complete the picture.

Facilitation Questions

- Where are the living and nonliving things in the scene? *Living and nonliving things are found throughout the scene.*
- Do any of the living things need nonliving things to stay alive? *Yes, the living things need some of the nonliving things to stay alive.*
- Which nonliving things do living things need to stay alive? *In order to stay alive, living things need nonliving things, including air, water to drink, sunlight for warmth and to help plants make food, and space to grow.*
- Do living things need other living things to stay alive? *Yes, some living things need other living things to stay alive. For example, butterflies need milkweed for food and shelter and milkweed needs butterflies to spread its pollen.*

Materials

For student groups

- RM 2
- RM 3
- scissors
- glue
- map pencils or crayons (optional)

GRADE 1

GRADE 1

Organisms and Environments

- What are some examples of living things that need other living things to stay alive? *Some animals eat other animals to stay alive, such as a pelican eats fish.*

Explain

Teacher Note

The main idea of this book is organisms depend on living and nonliving things for survival. The words on the first page are written to the tune of *This Old Man* and can be sung aloud as a class. Students do not need to be able to read the words.

The concept shown on page 9 of rearranging some of the letters in the word *depend* to create the word *need* may be difficult for some students. You may choose to use letter tiles or magnetic letters to demonstrate to students how you can manipulate the letters in the word *depend* to make the word *need*. Begin by spelling the word *depend* with the letters. Then, remove one *d* and the *p*. You will be left with d-e-e-n. Move the *n* from the right side to the left and the *d* from the left side to the right. You now have the word *need*.

Materials

For teacher

- *A Need to Survive* book
- whiteboard and dry erase markers or projector
- RM 4
- letter tiles or magnetic letters, optional

Teacher Instruction

- Read the book to the students. Stop to discuss how the pictures relate to the words on each page.

Facilitation Questions

- What is this book about? *This book is about how living things depend on each other to survive.*
- What is it called when two organisms depend on each other for survival? *When two organisms depend on each other for survival, it is called interdependence.*
- Give an example from the book of two living things that depend on each other. *Students may use any of the examples provided in the book.*
- How do those living things depend on each other? *Student answers will vary based on the examples they choose.*
- Do you depend on anyone or anything to survive? *Student answers may vary and include depending on a parent or caretaker.*
- Why do you depend on that person or thing? *Student answers may vary and include depending on a parent or caretaker for food or shelter.*
- Does that person or thing depend on you? *Answers may vary depending on student knowledge and prior experiences.*

Organisms and Environments

- How might that person or thing depend on you? *Student answers may vary and include that a person depends on them for friendship or love.*
- In order to survive, what do we need in our environments? *In order to survive, we need our environments to provide what we need to satisfy our basic needs.*
- What is an environment? *An environment is the area in which organisms live.*

Teacher Instruction

- Divide the class into groups of four students.
- Explain the rules to the students.
  - Every group will have the chance to answer each question. Groups can write the answers down or orally provide the answer to the teacher one group at a time. Do not give away the correct answer until every group has provided an answer of their own.
  - If students struggle to answer a question, hints can be provided. Hints include providing answer choices or a word bank, providing the first letter of the word that is the answer, or telling students if the answer is one or two words. Teachers can easily differentiate by showing all four answer choices versus only two or three.
  - Answers for sentence starter 2 are only suggestions. Evaluate student answers and award credit for accurate responses.
  - Groups will earn 2 points for providing a correct answer without hints or 1 point for a correct answer with hints.
- Write or project the sentence stems from *RM 4: Vocabulary Debate* on a whiteboard or screen.
- Ask groups to answer each question.

RM 4 Answer Key

1. A living thing also can be called an organism.
   Without hints, students may complete this statement with plant or animal. Lead them to the more general answer that requires them to use their academic vocabulary.

Organisms and Environments

2. Three examples of organisms are _plants, animals, and insects_.
   Without hints, students may complete this statement with any combination of plants and/or animals. All answers should be accepted as long as all three are living things.
3. Kittens, babies, and seeds all are examples of _offspring_.
   Without hints, students may complete this statement with living things or organisms. While those answers are correct, point out that each of the listed organisms is the young of a parent plant or animal.
4. _Nonliving things_ cannot grow or have babies.
   Without hints, students may complete this statement with specific nonliving things, such as a rock or water. Help them think more generally in terms of a category.
5. When two organisms need each other to survive, it is called _interdependence_.
   Students may need to reference the A Need to Survive book to find this answer.

Elaborate

Materials

For teacher

- RM 5
- RM 6

For each student

- science notebook

For student groups

- 2–3 earthworms
- dead leaves
- large, clear plastic container
- netting (optional)
- garden soil (enough to fill half the container)
- large rubber band (optional)
- small plant with roots
- water in a spray bottle

Teacher Note

The large, clear plastic containers should be deep enough to keep earthworms from escaping. As an option, students can cover their containers with netting such as tulle or cheese cloth and secure it with a large rubber band.

Allow students to keep their terrariums in the classroom following the Elaborate activity. Brainstorm ways students can investigate needs of earthworms. For example, one group could put apple slices in their container to see if the earthworms would eat them. Another group might use banana slices while another group might use raw potato pieces. Groups can record their observations over time in a class notebook or in individual notebooks. Remind students to use the spray bottle to mist their fingers before handling the earthworms. This will protect the earthworms' skin.

Teacher Instruction

- Project *RM 5: Earthworm Information* for students to view and read as a class.
- Make sure students understand an earthworm's needs before beginning the activity on *RM 6: Terrarium vs. Aquarium*.
- Divide the class into groups of four students.
- Distribute one set of materials to each group.
- Instruct students to take the following steps:
    - Pour the garden soil into the large, clear plastic container.
    - Place the plant in the soil. Make sure the roots are covered.
    - Spray the plant and soil with water to keep the environment moist. Be careful not to over water the soil.
    - Lay the earthworms on the surface of the soil and observe what they do.
    - Observe the sides of the container to see if the earthworms can be seen in the soil.
    - Spread the dead leaves over the surface of the soil.

- As an option, cover the container with netting and secure it with a large rubber band to prevent the earthworms from escaping.

Facilitation Questions

- What are the living and nonliving things in your container? *The plant and earthworms are living. The soil, water, container, netting, and rubber band are nonliving. The leaves once were alive but are no longer living.*
- What do the earthworms depend on for survival? *The earthworms depend on water, nutrients in the soil, dead leaves, air, and shelter to survive.*
- What does the plant depend on for survival? *The plant depends on soil, water, air, light to survive, and must have space to grow.*
- Do the plant and earthworms depend on each other? If so, how? *The earthworms eat soil and small pieces of dead leaves and then expel the leaf pieces as waste. The waste adds nutrients to the soil. Those nutrients help the plant grow. Earthworms eat pieces of dead plant parts to stay alive. Earthworms also loosen the soil, which helps plant roots grow longer and farther.*
- What is it called when two living organisms depend on each other to stay alive? *It is called interdependence when two living organisms depend on each other to stay alive.*
- What is the clear plastic container with everything in it called? *The clear plastic container with everything in it could be called an environment or terrarium. Students may not be familiar with the term terrarium. The prefix* terra *means earth or land. Explain that a terrarium is an environment for plants and animals that live on land.*

Teacher Instruction

- Instruct students to draw in their science notebooks a picture of the terrarium with the plant and earthworms.
- Brainstorm what should be labeled as living or nonliving things. Model for students how to add labels to their drawings.
- Assist students in completing the following sentence frames:
  - Earthworms depend on __________________ because they need those things to survive.
    Answer: *Earthworms depend on soil, plant roots, water, and air because they need those things to survive.*

Organisms and Environments

- Plants depend on ____________________ because they need those things to survive.
  Answer: *Plants depend on nutrients in the soil, water, air, space to grow, and sunlight because they need those things to survive.*

Teacher Instruction

- Display *RM 6* for students.
- Instruct students to observe the two pictures.

Facilitation Questions

- What is in Picture 1? *Picture 1 shows a clear glass container with plants. There could be small animals in it such as insects or a lizard. Help students realize that air also is in the container.*
- What is the environment in Picture 1 called? *Picture 1 shows a terrarium.*
- How is the earthworm terrarium similar to the terrarium in Picture 1? *Both terrariums have plants and air and can support living things.*
- Does anyone have a terrarium in their home? If so, what is in it? *Student answers may vary and include things such as iguanas, snakes, turtles, or hermit crabs.*
- What is in Picture 2? *Picture 2 shows a clear glass container with water, fish, and coral.*
- What is the environment in Picture 2 called? *Picture 2 shows an aquarium. Students may or may not be familiar with aquariums. The prefix aqua means water. Aquariums are environments for plants and animals that live in water. Students most likely will be more familiar with aquariums than terrariums.*
- Does anyone have an aquarium in their home? If so, what is in it? *Student answers may vary and include things such as soil, sand, air, rocks, fish, or frogs.*
- How are terrariums and aquariums similar? *The words terrarium and aquarium sound and look similar. They are both environments that provide resources to meet basic needs for animals and plants.*
- How are terrariums and aquariums different? *Terrariums are for plants and animals that live on land. Aquariums are for plants and animals that live in water.*

Evaluate

Teacher Instruction

- Distribute *RM 7: Evaluate* to each student.
- Instruct students to complete the assignment. Assist students as necessary.
- Student answers will vary.

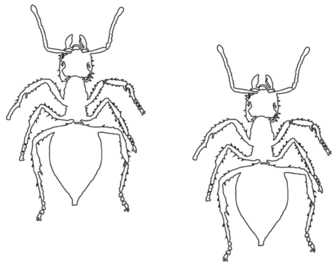
Materials

For each student

- RM 7

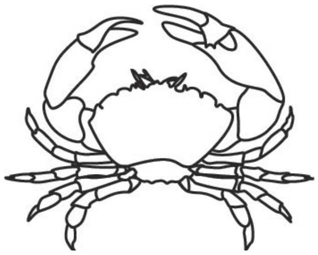
Grade 1

RM 1: Living and Nonliving

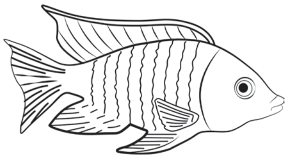


ants

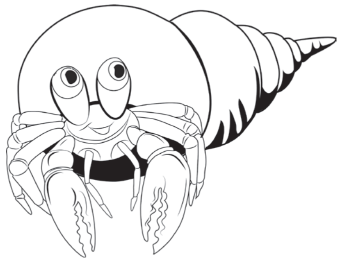
butterfly



crab



fish



hermit crab

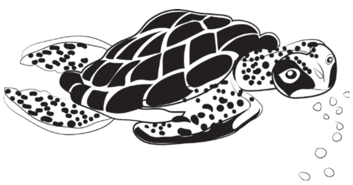
kelp

jellyfish

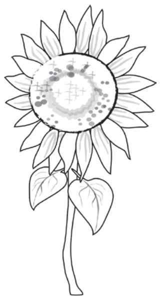
pelican

person

seagulls



sea turtle



wild sunflower

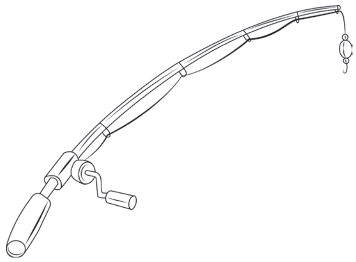
Grade 1

RM 1: Living and Nonliving continued

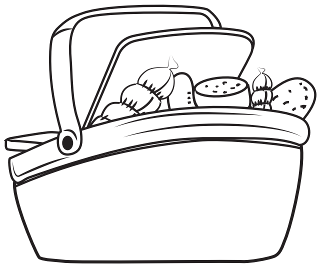
air

boat

clouds



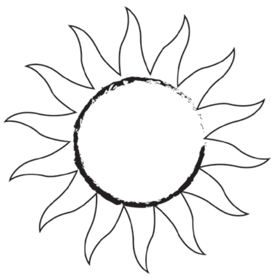
fishing pole



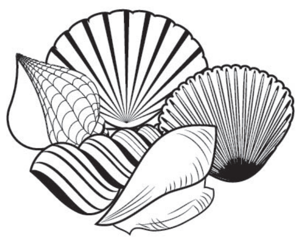
picnic basket

salt water

sand

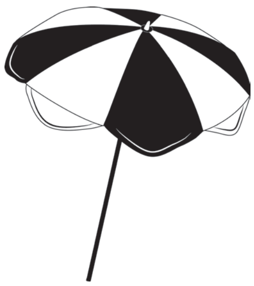


sunlight



shells

towel



umbrella

water bottle

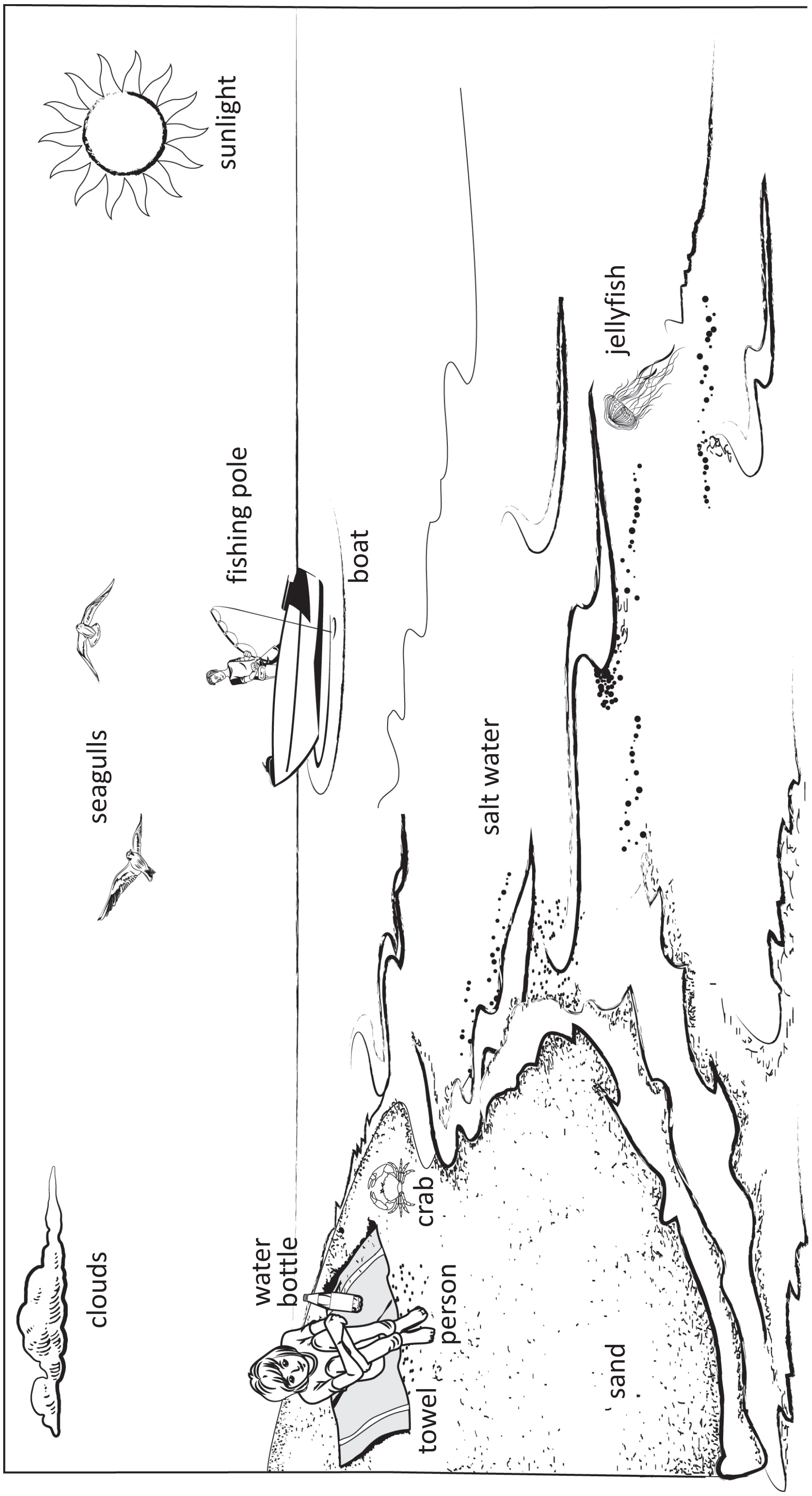
Grade 1

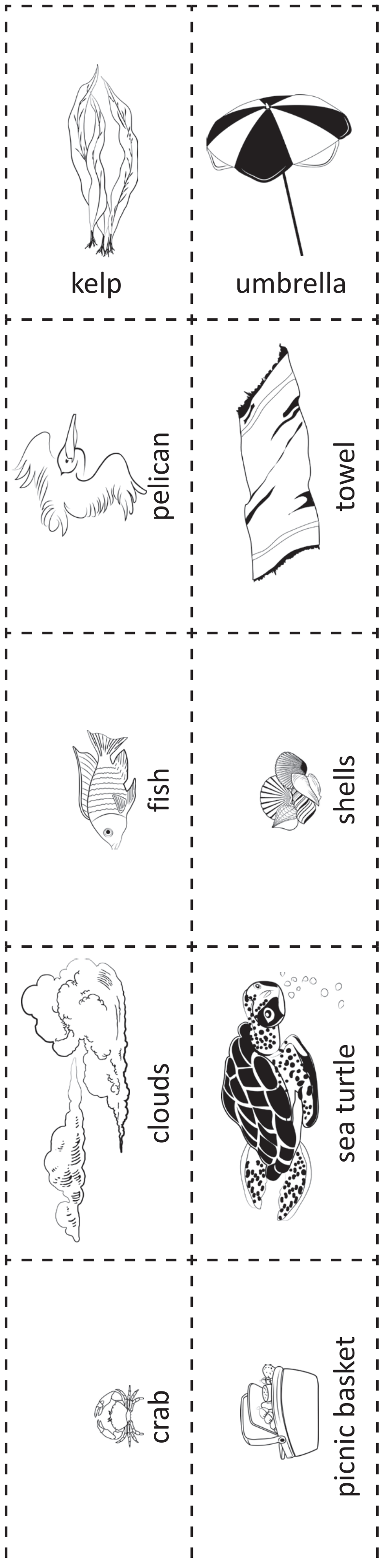
RM 2: T-Chart

Living	Nonliving

Grade 1

RM 3: Beach Scene





Grade 1

RM 4: Vocabulary Debate

1. A living thing also can be called _________________________.
    - a relationship
    - an environment
    - an organism
    - interdependence

2. Three examples of organisms are ________________________.
    - air, rocks, and water
    - net, butterfly, and hand lens
    - nest, cave, and house
    - plants, animals, and insects

3. Kittens, babies, and seeds are all examples of ___________________.
    - animals
    - basic needs
    - energy
    - offspring

4. ____________________ cannot grow or have offspring.
    - Frogs
    - Living things
    - Nonliving things
    - Organisms

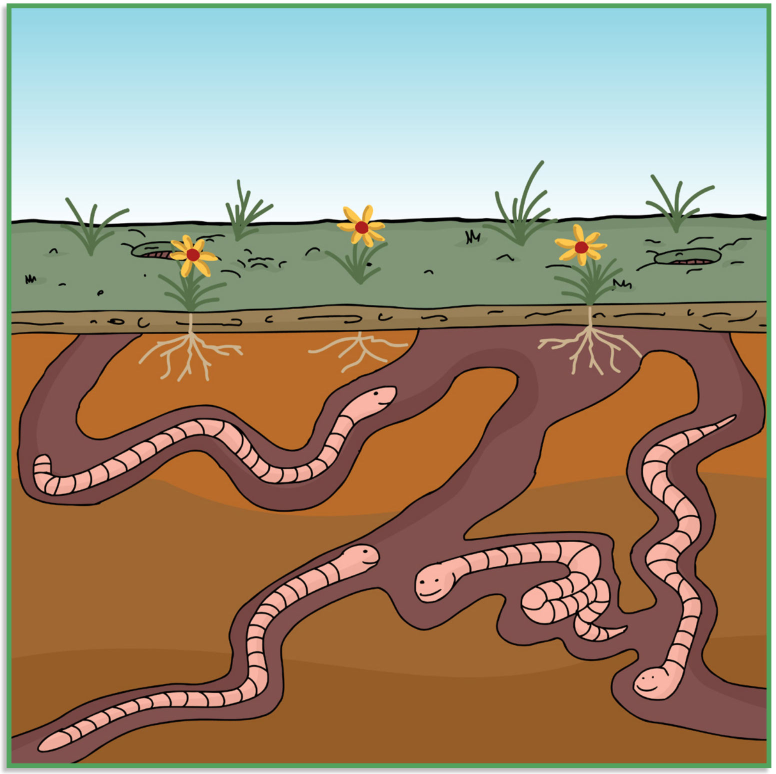
5. When two organisms need each other to survive, it is called _______________________.
    - a basic need
    - an environment
    - conversation
    - interdependence

Grade 1

RM 5: Earthworm Information

Earthworms live underground because it is dark. They can hide from birds and other animals that might eat them.

Earthworms live in soil that is moist because they can tunnel easier and faster. They also live below plant roots because they can eat them.



Earthworms also eat pieces of dead plants. If you took food scraps outside and started piling them up, you might soon find earthworms in the soil under the pile.

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Grade 1

RM 6: Terrarium vs. Aquarium

Picture 1

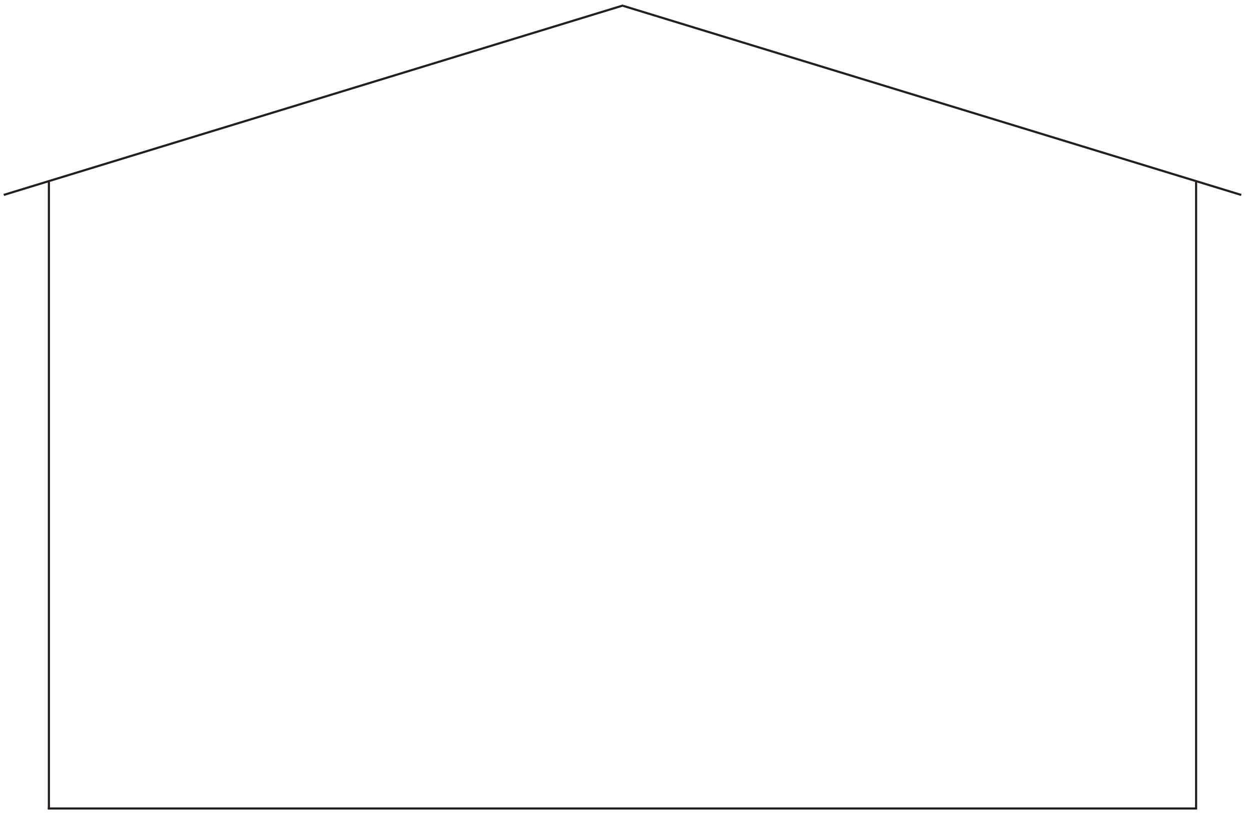
Grade 1

RM 6: Terrarium vs. Aquarium continued

Picture 2

RM 7: Evaluate

Directions: Draw the organisms that live in your home. Complete the sentences below the home. You may not need all of the sentences.



Think about how the living organisms you drew help you survive.

I depend on __________________ for ____.

I depend on __________________ for ____.

I depend on __________________ for ____.

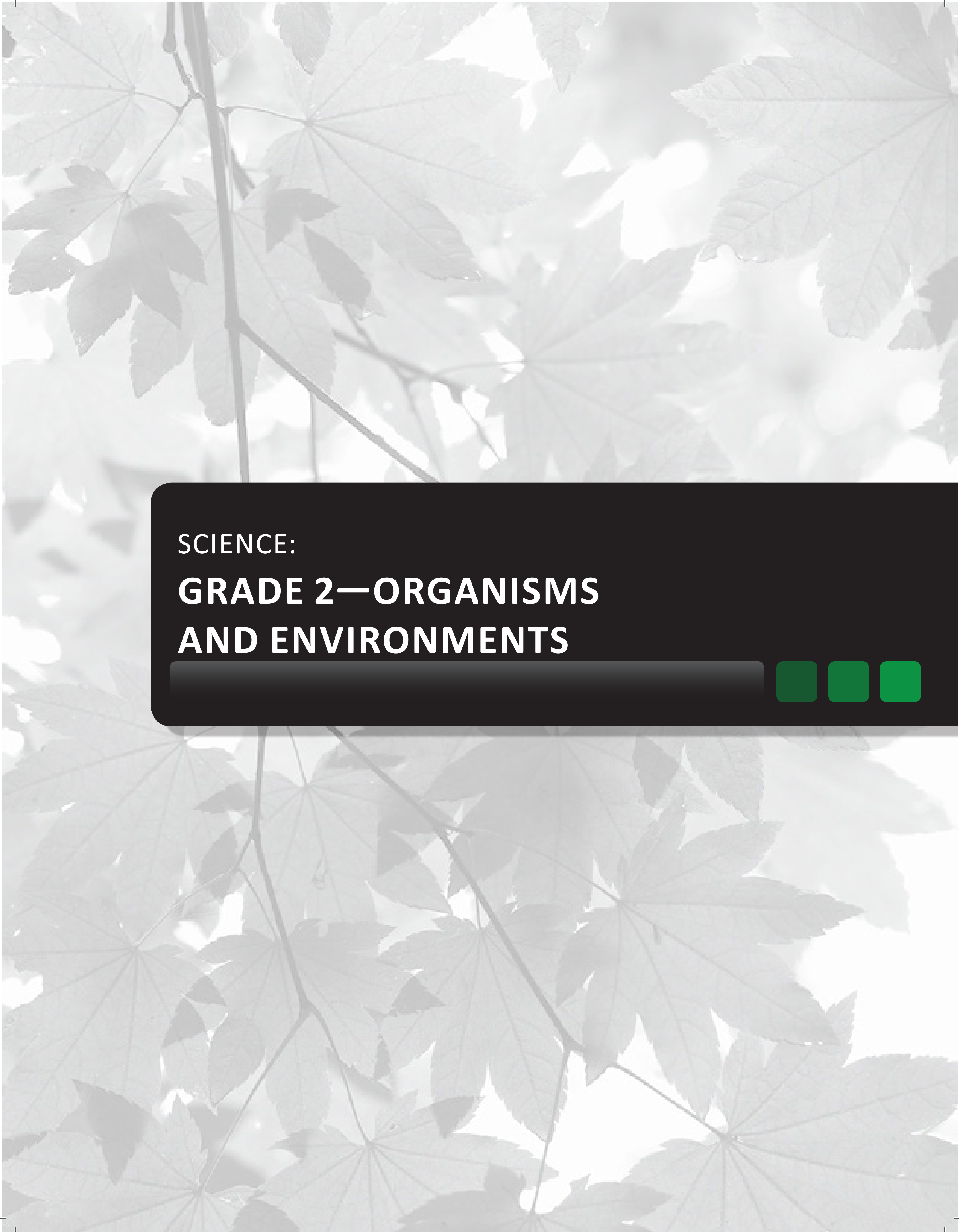
Think about the nonliving things in your home that help you survive.

I depend on __________________ for ____.

I depend on __________________ for ____.

I depend on __________________ for ____.

I need all of these things to help me _____________________________________.



SCIENCE:

GRADE 2—ORGANISMS AND ENVIRONMENTS

Organisms and Environments

Changes in the Environment

Science Concept

2(9) Organisms and environments. The student knows that living organisms have basic needs that must be met for them to survive within their environment. The student is expected to:

(A) identify basic needs of plants and animals

(B) identify factors in the environment, including temperature and precipitation, that affect growth and behavior such as migration, hibernation, and dormancy of living things

Content Objective

I can identify factors in the environment that affect how organisms grow and behave.

Science Process Skills

2(3) Scientific investigation and reasoning. The student knows that information and critical thinking, scientific problem solving, and the contributions of scientists are used in making decisions. The student is expected to:

(A) make predictions based on observable patterns

English Language Arts and Reading

1(28) Listening and Speaking/Listening. Students use comprehension skills to listen attentively to others in formal and informal settings. Students continue to apply earlier standards with greater complexity. Students are expected to:

(A) listen attentively to speakers and ask relevant questions to clarify information

1(29) Listening and Speaking/Speaking. Students speak clearly and to the point, using the conventions of language. Students continue to apply earlier standards with greater complexity. Students are expected to share information and ideas about the topic under discussion, speaking clearly at an appropriate pace, using the conventions of language.

1(30) Listening and Speaking/Teamwork. Students work productively with others in teams. Students continue to apply earlier standards with greater complexity. Students are expected to follow agreed-upon rules for discussion, including listening to others, speaking when recognized, and making appropriate contributions.

Organisms and Environments

Figure 19

Reading/Comprehension Skills. Students use a flexible range of metacognitive reading skills in both assigned and independent reading to understand an author's message. Students will continue to apply earlier standards with greater depth in increasingly more complex texts as they become self-directed, critical readers. The student is expected to:

(C) monitor and adjust comprehension (e.g., using background knowledge, creating sensory images, re-reading a portion aloud, generating questions)

(D) make inferences about text using textual evidence to support understanding

(F) make connections to own experiences, to ideas in other texts, and to the larger community and discuss textual evidence

English Language Proficiency Standards

(5) Cross-curricular second language acquisition/writing. The ELL writes in a variety of forms with increasing accuracy to effectively address a specific purpose and audience in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in writing. In order for the ELL to meet grade-level learning expectations across foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. For Kindergarten and Grade 1, certain of these student expectations do not apply until the student has reached the stage of generating original written text using a standard writing system. The student is expected to:

(B) write using newly acquired basic vocabulary and content-based grade-level vocabulary

Language Objective

I will write three brief paragraphs about how factors in the environment can cause an organism to migrate, hibernate, or go dormant.

Organisms and Environments

Response to Intervention/Tier 1 Differentiation

All science lessons support students in receiving quality Tier 1 Instruction. Using the 5E model, knowledge is taught in a variety of contexts, integrating math, science, and ELAR content, thus supporting the active engagement of the students with the content. Lesson-specific differentiation strategies for addressing diverse student needs can be found in sections titled "Differentiation Strategy."

Differentiation should

- focus on skills students did not understand, and extend the lesson for advanced students;
- be conducted in small groups or embedded in whole-group instruction; and
- provide students with a variety of strategies to process the information, such as
  - allowing for additional opportunities for verbal brainstorming of words associated with a topic (with teacher taking dictation);
  - making clear connections of new and more complex concepts to foundational aspects and prior knowledge;
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  - sorting academic vocabulary words into categories by common attributes, such as process words or science content vocabulary;
  - organizing results of brainstorming into semantic maps or creating graphic organizers;
  - discussing the meaning of a graphic organizer with a partner; and
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See the handout in the Instructional Resources section that addresses instructional strategies.

College and Career Readiness Standards—Science Standards

I.A.3 Cognitive skills in science. Formulate appropriate questions to test understanding of natural phenomena.

I.E.2 Effective communication of scientific information. Use essential vocabulary of the discipline being studied.

V.D.1 Classification. Understand that scientists categorize things according to similarities and differences.

Organisms and Environments

Vocabulary Focus

basic needs

behavior

dormancy

environment

factors

hibernation

migration

organism

precipitation

survive

temperature

5E Lesson Summary

Engage
Students identify factors in their environments that help organisms survive.

Explore
Students identify basic needs of plants and animals and how those needs affect the organisms' growth and behavior.

Explain
Students define *migration*, *hibernation*, and *dormancy*.

Elaborate
Students identify changes in factors that cause organisms to migrate, hibernate, or go dormant.

Evaluate
Students identify factors that cause changes in the growth and behavior of organisms.

Organisms and Environments

Engage

Materials

For teacher

- RM 1
- whiteboard
- dry erase markers

Teacher Instruction

- Display *RM 1: Geese* to the class.
- Write the following question on the whiteboard for students to view: What are the basic needs of the geese?
- Read the question to the students, and tell them they will participate in a think-pair-share strategy.
- Provide 2–3 minutes of wait time for students to silently contemplate an answer.
- Ask students to discuss their answers with a partner.
- Discuss the question and answers as a class.

Facilitation Questions

- What are basic needs of organisms? *Basic needs are things organisms need to survive.*
- What are the basic needs of the geese? *Air, water, food, and shelter help the geese survive.*

Teacher Instruction

- Write the following question on the whiteboard for students to view: What factors in the environment affect the geese?
- Read the question to the students, and tell them they will participate in a think-pair-share strategy.
- Provide 2–3 minutes of wait time for students to silently contemplate an answer.
- Ask students to discuss their answers with a partner.
- Discuss the question and answer as a class.

Facilitation Questions

- What is an environment? *An environment is an area surrounding an organism.*

Organisms and Environments

- What are factors in an environment? *Factors are things in an environment such as temperature and precipitation.*
- What are some examples of factors in our environment? *Answers will vary but may include temperature and amount of rain.*
- Do factors in an environment always stay the same? Explain your answer. *The factors in an environment do not always stay the same. There may be more or less rain. The temperature might be colder or hotter.*
- How do changing factors affect your life? *We might wear shorts if it is hot outside or wear sweaters if it is cold. We might not be able to play outside if it is raining.*
- What do animals do when factors in the environment change? *Answers will vary and may include that some animals find shelter when it rains or that some animals have thick fur coats to keep them warm in cold weather.*

Explore

Materials

For teacher

- RM 2
- RM 3
- RM 4
- RM 5
- 13 resealable plastic bags

For student pairs

- set of factor cards from RM 2
- organism card from RM 3, 4, or 5
- RM 6

Advance Preparation

Make 12 copies of *RM 2: Environmental Factors*, pages 1 and 2, on card stock and laminate them. Cut apart the cards on page 1, and place one set of cards in each resealable plastic bag. Make one two-sided copy each of *RMs 3–5* on card stock and laminate the pages. Cut the cards apart, making sure the definitions and pictures are correctly aligned. Place all the organism cards in a resealable plastic bag. Make a copy of *RM 6: Organisms' Needs and Factors in the Environment* on white paper for each student pair.

Teacher Note

The goal of this activity is for students to think about and discuss what an organism may need or have in its environment. There may not be a definitive correct answer as long as students can justify their answers. For example, students may have different answers for the amount of nutrients in the soil based on where they think a plant lives and the type of soil in which it grows.

Teacher Instruction

- Divide the class into pairs.
- Distribute a set of cards and the place mat from *RM 2* to each student pair.
- Ask students to sort the cards into the following categories: temperature, precipitation, soil and nutrients, sunlight, space, shelter, and food. Students can use the place mat from page 2 of *RM 2* to sort the cards.
- Give each pair an organism card and a copy of *RM 6*.
- Instruct students to read the facts on their organism cards from *RMs 3–5* to determine which needs and factor cards will be placed on *RM 6*. The student pairs with plants will not use the cards for shelter and food. The student pairs with animals will not use the cards for soil with nutrients, sunlight, and space.
- Instruct pairs to place the needs and factor cards on *RM 6* and be ready to justify their answers.

Organisms and Environments

Facilitation Questions

- What organism do you have? *Student answers will include the organisms on* RMs 3–5*.*
- Is your organism a plant or animal? *Our organism is a plant (or animal).*
- How could you describe your organism's environment? *Descriptions may include cold, cool, warm, or hot depending on the season. Amounts of food, precipitation, shelter, soil with nutrients, space, or sunlight also may be used as descriptions.*
- How did you decide which cards to place in the boxes? *We decided to place cards in the boxes based on the facts or information offered on the organism cards.*
- How do needs and factors affect an organism? *Fulfilling or meeting needs helps an organism survive and stay healthy. Factors determine how an organism responds. For example, an organism that prefers warm weather might travel to a place with warmer weather if the weather gets colder.*

Organisms and Environments

Explain

Materials

For teacher

- *What Would You Do?* book

For each student

- white copy paper
- pencil
- colored pencils or crayons
- clear adhesive tape or glue stick
- science notebook

Teacher Note

The main idea of this book is that organisms respond in certain ways to changing factors in their environments.

For the second part of the Explain, students will create word associations based on the book. Students may create their own word associations or simply recreate the examples in the book. Award credit for correct connections but beware of misconceptions such as connecting migration to the word *inactive*. This activity is helpful in discovering errors in student learning and processing. You could post the best word associations in the classroom or take pictures of them to create a digital vocabulary book.

Content Builder

Animals migrate, or move to a new location, in search of food, water, a mate, or a different temperature.

Dormancy is a state of inactivity due to a slowed metabolic rate as a result of harsh environmental factors such as lack of water, food, or decreased temperature or amount of daylight. If plants become inactive or slow their growth, they are considered dormant. Inactive animals can also be considered dormant in a variety of ways.

Hibernation is a type of winter dormancy that involves slowed metabolic, heart, and respiration rates. Only a few animals are true hibernators. For example, Arctic ground squirrels, little brown bats, chipmunks, common poorwills (a species of bird), hedgehogs, and woodchucks (also called groundhogs or marmots) can significantly decrease their body temperatures to that of the surrounding air even if the temperature is at or a little below 0 ˚C. These animals are small and warm blooded. Due to these two characteristics, the animals are able to raise their body temperature enough to awaken every few weeks. They will eat and drink a little, excrete wastes, and then return to a state of true hibernation. True hibernators cannot be easily awakened because they are physiologically close to death.

It is highly debated as to whether bears are true hibernators. Because they are so large, they cannot drop their body temperatures more than a few degrees. However, for months, they are able to go without consuming food and water and do not excrete wastes, unlike other animals. Most researchers consider bears to be winter lethargic or in a state of light hibernation since they can be awakened easily due to a higher body temperature. In order to avoid ambiguity, bears will not be used as examples of true hibernators in this lesson.

For the purpose of teaching second-grade students, define *hibernation* as a type of dormancy for the small animals listed as examples (i.e., Arctic ground squirrel, little brown bat, chipmunk, common poorwill, hedgehog, and woodchuck).

Teacher Instruction

- Read the book to the students. Stop to discuss how the pictures relate to the words on each page.

Facilitation Questions

- What is the main idea of the book? *The main idea of this book is that organisms respond to changing factors in their environments.*
- What factors can change in an environment? *Factors that can change in an environment include temperature and amounts of daylight, food, nutrients in soil, precipitation/water, shelter, and space.*
- How do some plants respond to drastic changes in their environments? *Some plants can go dormant.*
- What does dormant mean? *Dormant means to stop growing and become inactive to conserve energy.*
- What does behavior mean? *Behavior is the way an organism acts.*
- How does an animal's behavior change in response to drastic changes in their environments? *Some animals will migrate, and others will go dormant or hibernate.*
- What does migrate mean? *Migrate means to move, travel, or relocate. Animals migrate in search of food, water, shelter, a mate, or a different temperature.*
- What does hibernate mean? *Hibernate means to become inactive or to go into a state of deep sleep. Hibernating animals can lower their body temperatures to conserve energy and then raise their body temperatures to wake up.*

Organisms and Environments

Teacher Instruction

- Distribute white paper and colored pencils or crayons to each student.
- Explain how to create a word association.
    - Write the vocabulary word.
    - Use the definition to choose a word or two that help you remember the meaning of the word.
    - Connect the word(s) to the vocabulary word, similar to an acrostic poem.
    - Add an illustration that shows the meaning of the vocabulary word and definition.
- Instruct students to create their own word associations for *migration*, *dormancy*, and *hibernation* if they are able. Some students may choose to recreate the word associations from the Explain book. Take time to discuss the different forms of each word, such as *migration* and *migrate*, *dormancy* and *dormant*, and *hibernation* and *hibernate*. Students need to be familiar with and know that the different forms of each word refer to the same meaning. Students may refer to the Explain book for examples.
- Instruct students to secure their word associations in their science notebooks upon completion.

Elaborate

Teacher Note

Students may need assistance with appropriate Internet search practices. You can choose to let students look at the information on the back of the cards from *RMs 3–5* or not. The words *migrate*, *dormant*, and *hibernate* are not used on the cards. Students can use context clues to come to those conclusions.

Materials

For teacher
- whiteboard

For each student
- science notebook

For student pairs
- 1 organism card from RMs 3–5
- RM 7
- access to library or Internet

Teacher Instruction

- Divide the class into student pairs.
- Distribute *RM 7: Organism Research* to each student and an organism card from *RMs 3–5* to each pair. Make sure each pair receives a different card than they used in Explore.
- Read and discuss the directions and each question with students.
- Allow students an adequate amount of time to complete their research and *RM 7*.

Facilitation Questions

- How did you find the information you needed? *We found information about our organism on the organism card, in a book, and/or on the Internet.*
- What is the environment like where your organism lives? *Student answers will vary and may include hot and dry; cold and snowy; or some rain, temperature changes a lot.*
- What factors in the environment help your organism survive or affect its behavior? *Plants need precipitation, soil with nutrients, space, and sunlight to survive. Depending on the plant, they need a certain temperature range to survive. Animals need food, precipitation (water), shelter, and a certain temperature range to survive.*
- How do factors change during a year? *Student answers will vary and include that some environments have great changes in temperature, amounts of precipitation, food, and sunlight while other environments do not have as much change.*

Organisms and Environments

- How do the factors change the growth and behavior of the organism? *Changing factors can cause an organism to migrate if they need to find more of a basic need, to go dormant if they cannot migrate and must deal with unfavorable environments, or to hibernate if the environmental conditions are too harsh at points during the year.*

Science Notebook Entry

- Instruct students to choose an organism from the card set.
- Instruct students to draw a picture of the organism in its environment.
- Write the following question and statement on a whiteboard: "What changing factors in the organism's environment would cause it to move, relocate, or become less active or go into deep sleep? Use the terms migrate, dormant, or hibernate in your answer."
- Instruct students to write their answers in their science notebooks. If they need assistance starting the science notebook entry, provide the following sentence stems:
  - "The organism would move or relocate if ________________________."
    Possible answer: The organism would move or relocate if *the amount of food, precipitation/water, or shelter decreased and it needed to find more of those things. This happens when animals migrate to meet more of their basic needs.*
  - "The organism would become less active if________________________."
    Possible answer: The organism would become less active if *there was a decrease in the temperature or amount of food or precipitation/water. This happens when plants go dormant because their basic needs are not met.*
  - "The organism would go to sleep if ______________________________."
    Possible answer: The organism would go to sleep if *there was a great decrease in temperature or amount of food or precipitation/water. This happens when animals hibernate to survive harsh environments.*

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Organisms and Environments

GRADE 2

Differentiation Strategy

Instruct students to pretend they are one of the organisms from the card set. Ask students to explain how they would respond to a changing environment from the organism's point of view. They can complete this task using their science notebooks to record their stories.

Evaluate

Teacher Instruction

Materials

For each student

- RM 8

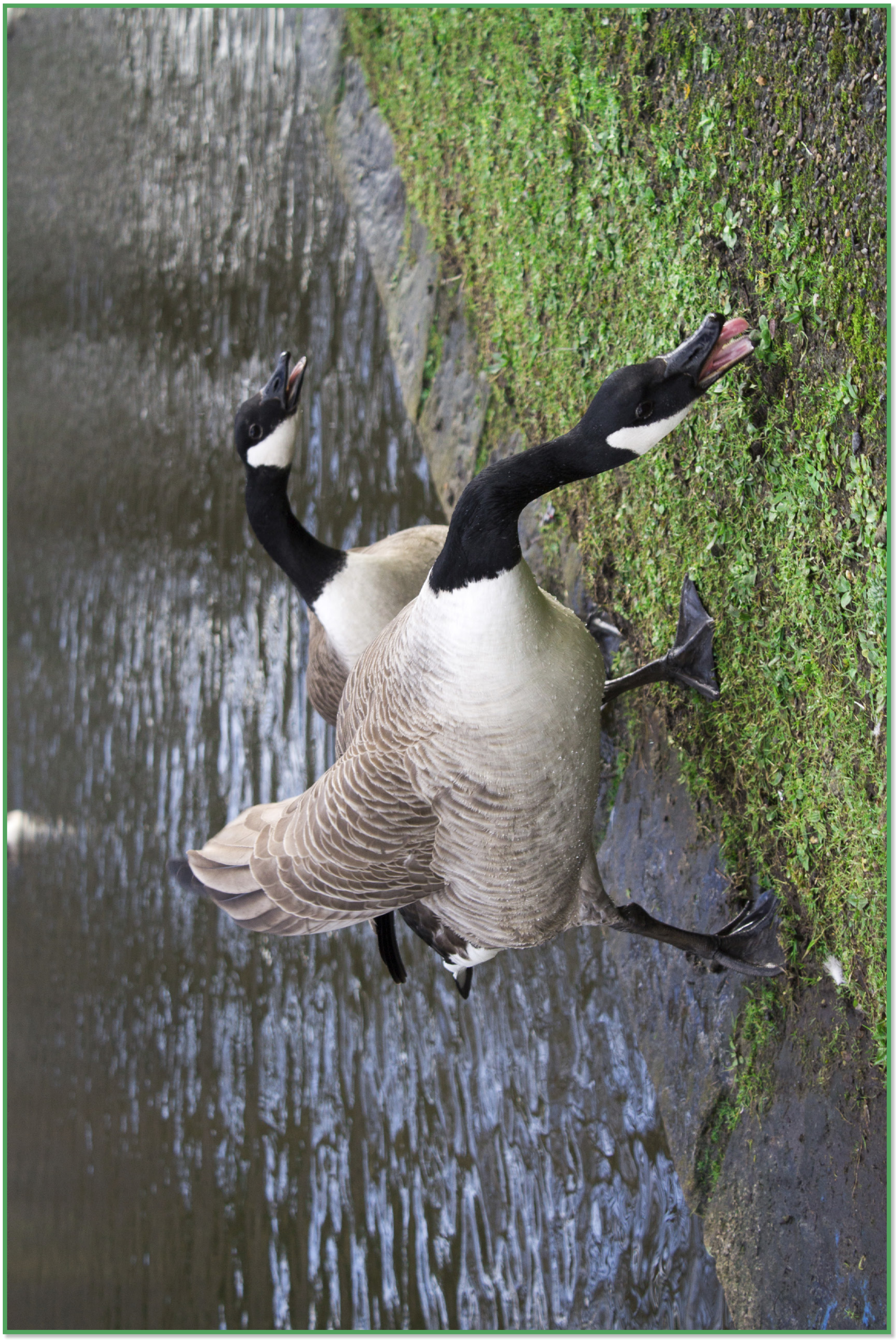
- Distribute *RM 8: Identifying Factors in the Environment* to each student.
- Read and explain the instructions for *RM 8* one section at a time, allowing students time to answer each question as it is read.

RM 8 Answer Key

- A plant goes dormant due to changes in precipitation, soil with nutrients, space, sunlight, and temperature.
- A woodchuck may hibernate due to changes in the amount of sunlight each day or due to a decrease in temperature. Students also may circle food, precipitation, and shelter since those factors are basic needs of animals. If students can justify their answers, award credit. For example, the combination of decreased daylight, temperature, food, water, and shelter could cause the woodchuck to hibernate.
- A zebra migrates in search of food and precipitation (water). Students may also circle shelter and temperature since those factors also affect animals. If students can justify their answers, award credit. For example, students may argue that while zebras migrate mainly in search of food and water, a lack of shelter or decrease in temperature may cause them to migrate.
- Refer to the Explain for word association examples. Student answers will vary based on their individual learning connections. Be aware of misconceptions, but award credit for all reasonable answers. Students also may choose to create a picture, or nonlinguistic representation (without words), of each vocabulary word.

Grade 2

RM 1: Geese



Grade 2

RM 2: Environmental Factors

hot temperatures	warm temperatures	cool temperatures	cold temperatures
a lot of rain	some rain	no rain	
soil with a lot of nutrients	soil with some nutrients	soil with no nutrients	
a lot of sunlight	some sunlight	no sunlight	
a lot of space	some space	no space	
many places for shelter	some places for shelter	no place for shelter	
a lot of food	some food	no food	

RM 2: Environmental Factors

	Environmental Factors			
Temperature				
Precipitation				
Nutrients				
Sunlight				
Space				
Shelter				
Food				

Grade 2

RM 3: Migratory Organisms

bison

hummingbird

humpback whale

Monarch butterfly

polar bear

zebra

RM 3: Migratory Organisms continued

hummingbird

Location and Environment: wooded areas in Central America and North America

Weight: less than 85 grams

Diet: flowers, insects, nectar, sap, spiders

Facts:

- Their wings can beat up to 53 times per second.
- They can fly upside down and backward.
- They travel 450 miles over the Gulf of Mexico.

bison

Location and Environment: grasslands in the Great Plains of the United States

Weight: 450–900 kilograms

Diet: grasses, herbs, shrubs, twigs

Facts:

- A bison is the heaviest land animal in North America.
- They can run at speeds up to 65 kilometers per hour.

Monarch butterfly

Location and Environment: wooded areas or deserts in Mexico and North America

Weight: less than 1 gram

Diet: milkweed

Facts:

- They will travel up to 3,000 miles to find warmer temperatures.
- They can live up to eight months.
- Their bright pattern and coloring warns animals that it is poisonous and tastes bad.

humpback whale

Location and Environment: oceans

Weight: 36,000 kilograms

Diet: krill, plankton, small fish

Facts:

- They travel from the North Pole or South Pole to the equator and back.
- They are powerful swimmers.
- A humpback whale is known for its songs.

zebra

Location and Environment: grasslands in Africa

Weight: 225–450 kilograms

Diet: grass

Facts:

- Each zebra's striped pattern is unique.
- Stripes help camouflage the animal.
- They can travel in herds of several thousand animals.

polar bear

Location and Environment: snow and ice in the Arctic

Weight: 450–675 kilograms

Diet: seals, dead whales

Facts:

- They have slightly webbed front paws for swimming.
- They can swim great distances in search of seals.
- Their white fur provides camouflage.

RM 4: Hibernating Organisms

Arctic ground squirrel

little brown bat

chipmunk

common poorwill

hedgehog

woodchuck

Grade 2

RM 4: Hibernating Organisms continued

little brown bat

Location and Environment: Alaska and Central Mexico

Weight: less than 14 grams

Diet: insects

Facts:

- Bats are the only mammals that can fly.
- They can survive extreme cold but can also migrate to warmer environments.
- Bats hunt at night.

Arctic ground squirrel

Location and Environment: wooded areas in North America

Weight: largest ground squirrel

Diet: flowers, fruits, leaves, roots, seeds, insects, animals that are already dead

Facts:

- Their body temperatures can drop below 0 ˚C.
- They shiver and shake to warm up their bodies to normal temperatures.
- They burrow to build habitats.
- They can run at speeds up to 65 kilometers per hour.

common poorwill

Location and Environment: wooded areas and deserts in North America

Weight: less than 1 gram

Diet: insects

Facts:

- They become inactive when there is a lack of food.
- They are well camouflaged.

chipmunk

Location and Environment: forests and deserts in North America and Russia

Weight: less than 170 grams

Diet: berries, fruit, grain, insects, nuts, seeds

Facts:

- Chipmunks keep a food store for the winter.
- They have big cheeks for holding food.
- They build homes in burrows, bushes, logs, and nests.

woodchuck

Location and Environment: wooded areas that open to fields or water in North America

Weight: 6 kilograms

Diet: fruits, grasses, plants, tree bark

Facts:

- Woodchucks also are known as groundhogs.
- They are the largest of the squirrel family.
- They build up fat reserves before winter.

hedgehog

Location and Environment: underbrush or wooded areas in Europe, Asia, and Africa

Weight: 450–900 grams

Diet: centipedes, frogs, insects, mice, snails, snakes, worms

Facts:

- They are covered in stiff, sharp spines.
- They can curl up in a ball when afraid.
- They search for food at night.
- They become much less active in hot and cold environments.

RM 5: Dormant Organisms

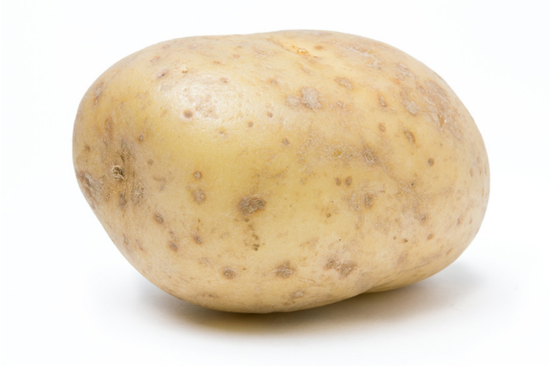
acorn from an oak tree

apple tree

seed from an avocado plant

oak tree

bulb from an onion plant



stem from a potato plant

Grade 2

RM 5: Dormant Organisms continued

apple tree

Location and Environment: cooler northern areas in North America, Asia, and Europe

Plant type: fruit tree

Facts:

- Apples are ready for picking in the fall.
- Trees need at least six hours of sunlight.
- There are several different kinds of apple trees.
- Trees drop or lose leaves in colder weather to save energy.

acorn

Location and Environment: wooded areas all over the world

Plant type: seed of an oak tree

Facts:

- Acorns are considered a nut.
- They come in many shapes and sizes depending on the kind of oak tree they come from.
- They can be stored in the refrigerator before planting.
- They serve as food for many animals.

oak tree

Location and Environment: wooded areas all over the world

Plant type: tree

Facts:

- Oak trees lose leaves in winter to save energy when temperatures and the amount of daylight decrease.
- At least 55 kinds of oak trees exist.
- They are used to build homes and furniture.
- They grow slowly over long periods of time.

avocado seed

Location and Environment: warmer areas in North America, Central America, and South America

Plant type: seed of an avocado tree

Facts:

- An avocado is a fruit; it is considered a large berry.
- There are eight different kinds of avocados.
- It may take 4–10 years for seeds to grow into mature avocado trees.

potato

Location and Environment: mostly cooler areas all over the world

Plant type: tuber, vegetable

Facts:

- There are several different kinds of potatoes.
- Sprouts are poisonous to humans.
- They can be stored from a few weeks up to a year.
- Potatoes grow slowly over long periods of time.

onion

Location and Environment: areas close to the Equator where the temperature is more constant

Plant type: bulb, vegetable

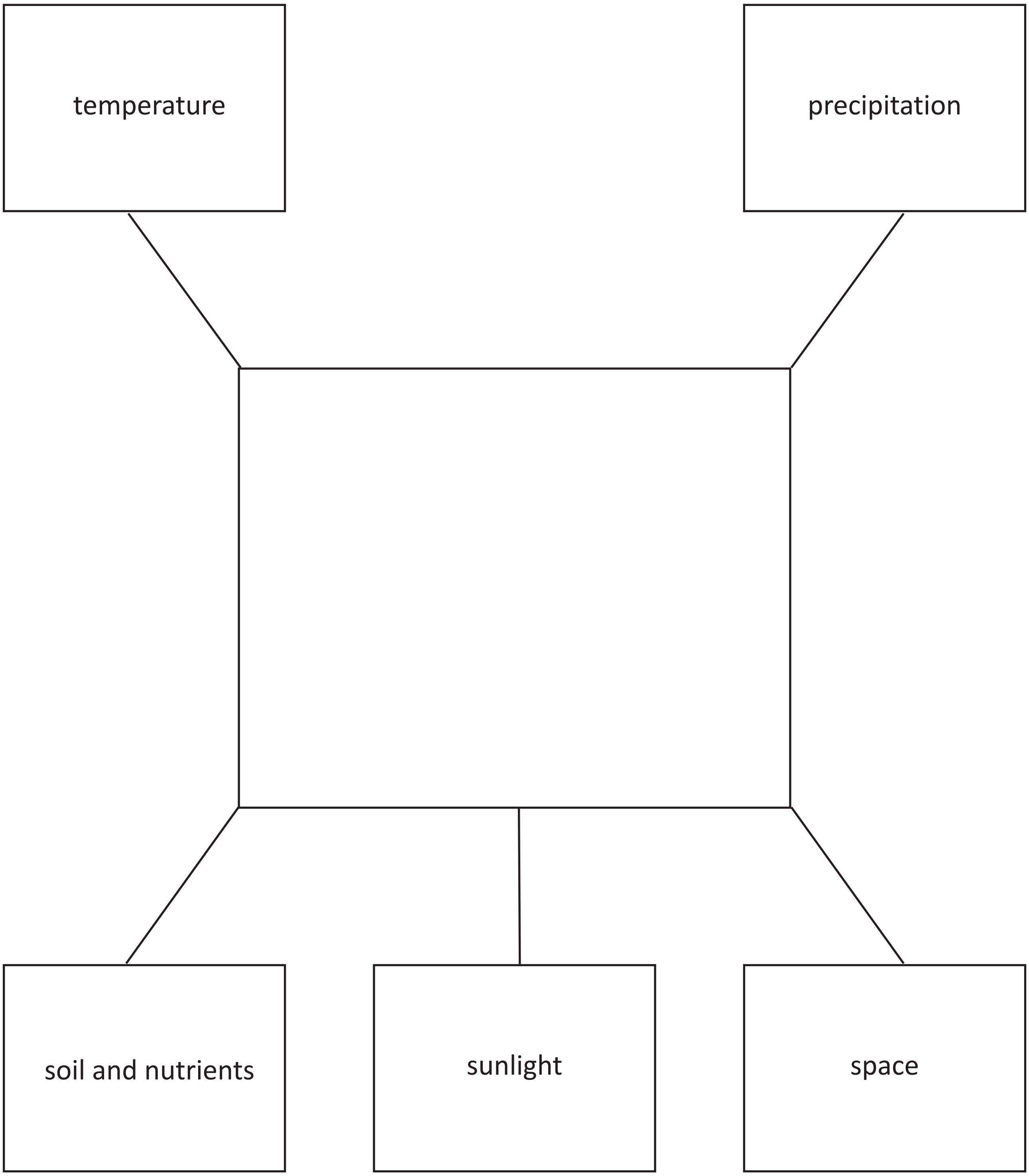
Facts:

- There are several kinds of onions.
- They need at least 11 hours of sunlight to grow.
- Onions need to grow 6–8 months before they are ready for harvest or to be picked for eating.

Grade 2

RM 6: Organisms' Needs and Factors in the Environment

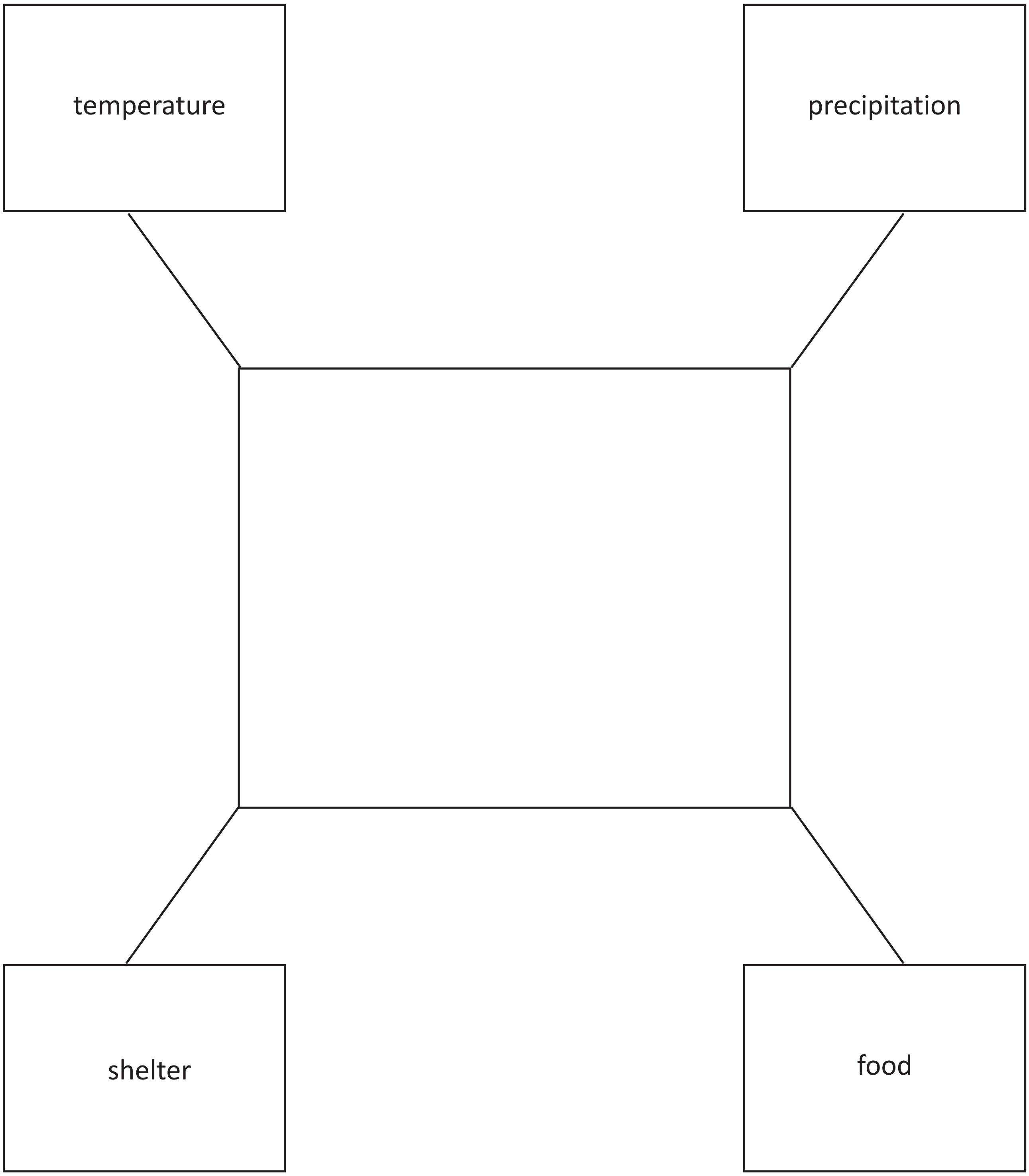
Organism: Plant



Grade 2

RM 6: Organisms' Needs and Factors in the Environment continued

Organism: Animal



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Grade 2

RM 7: Organism Research

Name of organism:

1. Where does the organism live?

2. Describe the environment where the organism lives.

3. What factors in the environment help the organism live?

4. How do those factors in the environment change during the year?

5. How do changes in environmental factors affect the growth and behavior of the organism?

Grade 2

RM 8: Identifying Factors in the Environment

A plant goes *dormant*. Circle the factor(s) in the environment that could change and cause this behavior to happen.

food precipitation shelter soil with nutrients

space sunlight temperature

Create a word association or picture that helps you remember the meaning of *dormant*.

D O R M A N T

A woodchuck is *hibernating*. Circle the factor(s) in the environment that could change and cause this behavior to happen.

food precipitation shelter soil with nutrients

space sunlight temperature

Create a word association or picture that helps you remember the meaning of *hibernate*.

H I B E R N A T E

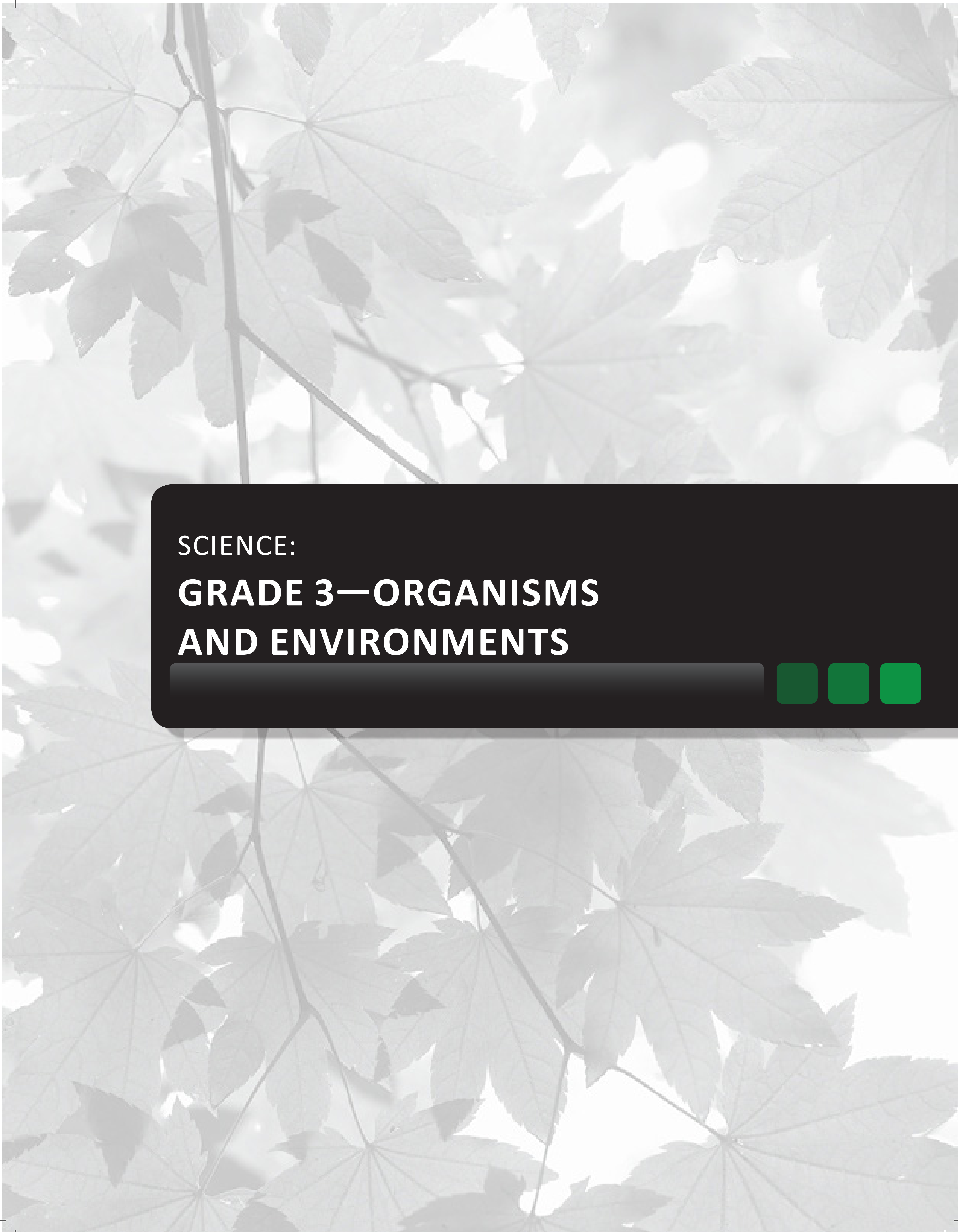
A zebra is *migrating*. Circle the factor(s) in the environment that could change and cause this behavior to happen.

food precipitation shelter soil with nutrients

space sunlight temperature

Create a word association or picture that helps you remember the meaning of *migrate*.

M I G R A T E



SCIENCE:

GRADE 3—ORGANISMS AND ENVIRONMENTS

GRADE 3

Organisms and Environments

Support for Life

Science Concept

3(9) Organisms and environments. The student knows that organisms have characteristics that help them survive and can describe patterns, cycles, systems, and relationships within the environments. The student is expected to:

(A) observe and describe the physical characteristics of environments and how they support populations and communities within an ecosystem

Content Objective

I can observe and describe an environment and explain how it supports populations and communities of organisms within the ecosystem.

Science Process Skills

3(2) Scientific investigation and reasoning. The student uses scientific inquiry methods during laboratory and outdoor investigations. The student is expected to:

(D) analyze and interpret patterns in data to construct reasonable explanations based on evidence from investigations

(F) communicate valid conclusions supported by data in writing, by drawing pictures, and through verbal discussion

English Language Arts and Reading

3(13) Reading/Comprehension of Informational Text/Expository Text. Students analyze, make inferences and draw conclusions about expository text and provide evidence from text to support their understanding. Students are expected to:

(A) identify the details or facts that support the main idea

(B) draw conclusions from the facts presented in text and support those assertions with textual evidence

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Figure 19

Reading/Comprehension Skills. Students use a flexible range of metacognitive reading skills in both assigned and independent reading to understand an author's message. Students will continue to apply earlier standards with greater depth in increasingly more complex texts as they become self-directed, critical readers. The student is expected to:

(B) ask literal, interpretive, and evaluative questions of text

(D) make inferences about text and use textual evidence to support understanding

(E) summarize information in text, maintaining meaning and logical order

English Language Proficiency Standards

(3) Cross-curricular second language acquisition/speaking. The ELL speaks in a variety of modes for a variety of purposes with an awareness of different language registers (formal/informal) using vocabulary with increasing fluency and accuracy in language arts and all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in speaking. In order for the ELL to meet grade-level learning expectations across the foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. The student is expected to:

(D) speak using grade-level content area vocabulary in context to internalize new English words and build academic language proficiency

Language Objective

I can use academic vocabulary such as characteristic, population, community, *and* ecosystem *to make an oral presentation describing the ecosystem product I create.*

GRADE 3

Organisms and Environments

Technology Applications—Grades 3–5

(1) Creativity and innovation. The student uses creative thinking and innovative processes to construct knowledge and develop digital products. The student is expected to:

(A) create original products using a variety of resources

(2) Communication and collaboration. The student collaborates and communicates both locally and globally using digital tools and resources to reinforce and promote learning. The student is expected to:

(A) draft, edit, and publish products in different media individually and collaboratively

(B) use font attributes, color, white space, and graphics to ensure that products are appropriate for multiple communication media, including monitor display, web, and print

(3) Research and information fluency. The student acquires and evaluates digital content. The student is expected to:

(A) use various search strategies such as keyword(s); the Boolean identifiers *and*, *or*, and *not*; and other strategies appropriate to specific search engines

(B) collect and organize information from a variety of formats, including text, audio, video, and graphics

(C) validate and evaluate the relevance and appropriateness of information

(4) Critical thinking, problem solving, and decision making. The student researches and evaluates projects using digital tools and resources. The student is expected to:

(C) evaluate student-created products through self and peer review for relevance to the assignment or task

(5) Digital citizenship. The student practices safe, responsible, legal, and ethical behavior while using digital tools and resources. The student is expected to:

(A) adhere to acceptable use policies reflecting positive social behavior in the digital environment

(B) respect the intellectual property of others

(C) abide by copyright law and the Fair Use Guidelines for Educational Multimedia

(D) protect and honor the individual privacy of oneself and others

(F) practice safe, legal, and responsible use of information and technology

(G) comply with fair use guidelines and digital safety rules

Organisms and Environments

GRADE 3

Response to Intervention/Tier 1 Differentiation

All science lessons support students in receiving quality Tier 1 Instruction. Using the 5E model, knowledge is taught in a variety of contexts, integrating math, science, and ELAR content, thus supporting the active engagement of the students with the content. Lesson-specific differentiation strategies for addressing diverse student needs can be found in sections titled “Differentiation Strategy.”

Differentiation should

- focus on skills students did not understand, and extend the lesson for advanced students;
- be conducted in small groups or embedded in whole group instruction; and
- provide students with a variety of strategies to process the information, such as
    - allowing for additional opportunities for verbal brainstorming of words associated with a topic (with teacher taking dictation);
    - making clear connections of new and more complex concepts to foundational aspects and prior knowledge;
    - participating in more tangible experiences, such as experiments, investigations, and active exploration;
    - sorting academic vocabulary words into categories by common attributes, such as process words or science content vocabulary;
    - organizing results of brainstorming into semantic maps or creating graphic organizers;
    - discussing the meaning of a graphic organizer with a partner; and
    - creating a visual representation to demonstrate understanding.

See the handout in the Instructional Resources section that addresses instructional strategies.

College and Career Readiness Standards—Science Standards

I.E.1 Effective communication of scientific information. Use several modes of expression to describe or characterize natural patterns and phenomena. These modes of expression include narrative, numerical, graphical, pictorial, symbolic, and kinesthetic.

VI.G.1 Ecology. Identify Earth’s major biomes, giving their locations, typical climate conditions, and characteristic organisms.

Organisms and Environments

Vocabulary Focus

characteristic

community

ecosystem

populations

5E Lesson Summary

Engage
Students identify characteristics of two different environments and describe how they support the organisms and populations that live there.

Explore
Students match the appropriate descriptors to each of several environments.

Explain, Part 1
Students explain why three of the environments visited by the Rabbit family did not meet their needs.

Explain, Part 2
Students demonstrate understanding of the vocabulary by playing a whole-group matching game.

Elaborate
Students design and create an environment of their choice, including the populations supported within that environment.

Evaluate
Students reflect on their work and discuss ways to improve the quality of their product.

GRADE 3

Engage

Content Builder

Humans are animals that live in environments that support their survival. Humans also share environments with other organisms in areas such as parks, backyards, and even inside their own homes. A family of humans can be considered a population, and a neighborhood can be considered a community. In ecology, a community is made up of different populations of species that interact with one another in various ways within an ecosystem.

Materials

For teacher

- RM 1

For each student

- science notebook

Teacher Note

You will display two images for students to describe and relate to the basic needs of living organisms. The first image, a house, represents our need for shelter, food, water, and rest. While there are many types of homes, most homes meet the basic needs of the humans that live there.

The second image, a park, helps students understand that more natural environments meet the needs of other types of organisms. Both homes and natural environments help humans maintain health.

Teacher Instruction

- Project the house environment from *RM 1: Supportive Environments* onto a screen or whiteboard for the whole class, or use printed images so students can work individually.
- Use the Facilitation Questions to ask students to identify and describe some of the physical characteristics of the house environment.
- Display the fill-in-the-blank summary sentence so students can write it down in their notebooks.
- Project the word bank on the screen to assist in word selection.
- Instruct students use the word bank to select the words that make sense to them.
- Ask for student volunteers to read their sentence aloud.

Organisms and Environments

- Answers may vary. Example:

The house has a ___*(kitchen)*___, ___*(bedroom)*___, and ___*(bathroom)*___ that support how we ___*(eat)*___, ___*(sleep)*___, and stay ___*(healthy)*___.

Facilitation Questions

- What do you observe in the picture of a house? *I observe a kitchen, a bathroom, a bedroom with a closet, and a living room in the picture.*
- What are some of the physical characteristics of the house? *Answers may vary but could include the following: There is a roof. All the rooms are shaped like boxes. Not all rooms are the same size. Each room is filled with its own special furniture and appliances.*
- How are the physical characteristics of the house important? *The physical characteristics of the house are important because it's where we live, eat, and sleep. The characteristics make our lives easier and more comfortable.*
- How does a home support you and your family? *A home supports us because it's easy to take care of our needs there. It helps us stay safe and healthy. For example, the refrigerator keeps our food cold, which helps prevent the food from spoiling.*

Teacher Instruction

- Project the park environment from *RM 1* onto a screen or whiteboard for the whole class.
- Use the Facilitation Questions to ask students to identify and describe some of the physical characteristics of the park environment.
- Display the fill-in-the-blank summary sentence so students can write it down in their science notebooks.
- Project the word bank on the screen to assist in word selection.
- Ask for student volunteers to read their sentences aloud.
- Answers may vary. Example:

The park has a ___*(garden)*___, ___*(trees)*___, and ___*(field)*___ that support how *(plants)*___ and ___*(animals)*___ live as they eat and ___*(grow)*___.

Organisms and Environments

Facilitation Questions

- What are the physical characteristics of the park environment? *The park environment has trees, pathways, shrubs/bushes, grass, and a garden.*
- What might you observe in the park if you watched it for a few hours? *You may observe people walking through or working in the garden. You might see birds flying and singing, or squirrels climbing trees.*
- How does the park help people in the neighborhood and the plants and animals that live there? *The garden in the park provides food for the people and some of the animals. The trees provide a place for birds to build their nests. The park is a place that is home to plants and animals.*

Teacher Instruction

- Debrief Engage using the following Facilitation Questions.

Facilitation Questions

- Would the park or house environment be more likely to support only one type of organism? *The house environment would be more likely to support only one type of organism.*
- What types of organisms does a house environment support? *A house environment supports humans and their pets.*
- Would the park or house environment be more likely to support more than one type of organism? *The park would be more likely to support more than one type of organism.*
- What types of organisms would the park support? *The park would support the plants and animals that live there, such as birds, squirrels, flowers, and trees.*
- Could the house environment support the same types of organisms as the park? *No, the house supports humans and their pets, but only the park can support all the birds, squirrels, and different types of plants.*
- How would you describe the relationship between the environments you have observed and the types of organisms there? *Different environments have characteristics that support different types of organisms.*

Organisms and Environments

Explore

Materials

For student groups

- RM 2
- RM 3
- RM 4
- paper clip
- pencil
- resealable plastic bag

Content Builder

There is a close connection between the physical aspects of an environment and how those characteristics help support not only a single population of organisms, but multiple populations within the community of organisms in an ecosystem. The concepts of biotic (living) and abiotic (nonliving) factors, biodiversity (variety of species populations in an ecosystem), niches, systems, and interdependence are all implied in the student expectation, though not required for instruction at this grade.

Advance Preparation

Print several sets of *RM 2: Environment Pictures*, *RM 3: Environment Characteristics*, and *RM 4: Environment Descriptors* on different colors of card stock. You can choose to print *RM 4* as a double-sided document or as a single-sided document, depending on your students' needs. Print enough to allow students to work in teams of 2–3. Laminate and cut out the pieces of *RM 2* and *RM 4*. Laminate but do not cut out *RM 3*. Put *RM 3*, a set of environment picture cards, a set of environment descriptor cards, a spinner, a paper clip, and a pencil into a resealable plastic bag. The paper clip and pencil are for the spinner.

Teacher Note

Students may be unfamiliar with the environment descriptors. Prior to beginning Explore, students may need to do a card sort in order to match the environment descriptors to the characteristics of the environment. Refer to the following key:

<u>Climate</u>
- Dry
- Moist
- Wet

<u>Plant Life</u>
- Little
- Some
- Lush

<u>Temperature</u>
- Hot
- Cold
- Mild

<u>Landscape</u>
- Rocky
- Flat
- Hilly
- Mountainous

<u>Soil</u>
- Sand
- Loam
- Silt
- Clay
- Permafrost

Organisms and Environments

GRADE 3

It is important that students describe characteristics of an environment and explain how the environment supports organisms. However, descriptions of soil, temperature, and climate can only be inferred. Therefore, student answers may vary. Example: A group decides the soil in a tundra environment contains sand and could support a cactus. A teacher could ask if the temperature also could support a cactus. Refer to the following key for possible answers:

Environment	Climate (Inferred)	Temperature (Inferred)	Landscape	Soil (Inferred)	Plant Life
1	Dry	Cold	Hilly/ Mountainous	Permafrost	Little
2	Wet	Hot	Hilly/Flat	Silt/Clay	Lush
3	Moist	Cold	Mountainous	Loam, Silt, Sand	Some
4	Dry	Hot	Rocky	Sand	Some/Little
5	Moist/Wet	Hot/Mild/ Cold	Hilly/Flat	Loam, Clay, Silt, Sand	Lush
6	Dry/Moist	Hot/Mild/ Cold	Hilly/Flat	Loam/Silt	Some
7	Wet	Mild	Flat	Sand	Little

Teacher Instruction

- Divide the class into groups of 2–3 students.
- Distribute one copy of *RM 3*, a spinner, a set of seven environment cards, and *RM 4* descriptor cards to each group. Note: You can adjust the number of environment cards used.
- Instruct students to sequence the environments in numerical order and arrange the descriptors on the desk so that they are easy to read.
- Instruct students to place the Environment 1 card in the rectangle at the top of *RM 3* and then spin the spinner.
- Model how to use the spinner with the pencil and paper clip. Place the paper clip in the center of the spinner. Position the tip of the pencil inside one end of the paper clip as you hold the pencil upright. With your free hand, flick the paper clip so that it spins around the pencil tip. The paper clip will land on a characteristic. Students will choose the appropriate descriptor card that describes the environmental characteristic.

Organisms and Environments

- Students will select the environment descriptor card that best describes the characteristic of the environment that the spinner landed on.
- Students should continue to spin until they have landed on all environment characteristics of the Environment 1 card.
- Ask student groups to share their descriptions. If answers vary, ask students to justify their choice.
- Allow students to continue the activity until all environment picture cards have been described.

Facilitation Questions

- What did you observe about each environment? *The environments had many characteristics in common, but the environmental conditions were different.*
- Which characteristics of the environments are nonliving? *Climate, temperature, landscape, and the amount of moisture are nonliving characteristics in the environment.*
- Which characteristics of the environments are living? *The plants in the environment are living.*
- Which characteristics might be present in the environment but are not pictured? *Animals, wind, and how the environment looks in different seasons are not pictured.*
- Select two environment cards. What types of animals would you expect to live there? Talk to your partner(s) and be prepared to share your thoughts. *Answers will vary based on the environments students choose. (Example: I would expect rattlesnakes and lizards to live in the desert, and I would expect squirrels and raccoons to live in the forest.)*
- Are the animals and plants in each environment different? *Student answers may vary depending on the environments they choose.*
- Why are the plant and animal populations different in each environment? *Plants and animals are different in each environment because the conditions in each environment are different.*
- Would the animals and plants from one environment survive in another environment? Why or why not? *Student answers will vary based on the environments they compare, but students should be able to justify their answers.*

Organisms and Environments

Differentiation Strategy

Display each of the images on a screen for the whole class and have paired students select the descriptors using the cards from *RM 4*. Check for understanding by observing the selected descriptors. Ask appropriate questions to clarify and/or extend student thinking.

GRADE 3

Organisms and Environments

Explain, Part 1

Materials

For teacher

- *Home Sweet Home* book

Content Builder

Interdependence in any environment is a concept that can be scaled down to the organisms in a single population or scaled up to include the populations in communities that comprise an ecosystem. One inference is that all species have a niche, a special function in a specific habitat. Another inference is connectedness, whether direct or indirect. A community is connected simply by depending on the physical resources in a common environment. It is also connected through relationships between and among the populations of living organisms. An ecosystem provides the resources to support specific populations in a community.

Teacher Instruction

- Read the book to your students.
- While reading, pause and take a moment to discuss the italicized words in the story as you read them. Ask students to define the words based on context clues and prior knowledge.

  thirst-quenching: *describes a drink that stops you from feeling thirsty*

  parched: *dried out*

  thriving: *healthy and successful*

  crevices: *deep cracks or openings, especially in rock*

  barren: *not producing plant life*

- After you have read the story completely, use the Facilitation Questions to check for understanding.

Facilitation Questions

- What is the main idea of the story? *The main idea of the story is that environments support the populations that live there.*
- Why didn't some of the environments support the Rabbit family? *Each environment offered something to support the Rabbit family but also had characteristics that did not meet the needs of the Rabbit family, such as climate and plant life. The meadow was the only environment that met all the Rabbit family's needs.*

Organisms and Environments

- How can the other plant and animal populations live in different ecosystems? *Plants and animals have ways to handle the environmental conditions. The environment supports them, or they would not live there.*
- How does the meadow environment meet the needs of all the populations of organisms that live there? *The meadow has room to live and grow and plenty to eat and drink. Each organism's basic needs are met.*

Differentiation Strategy

If the appropriate technology is available, create an audio file of someone reading the Explain book and speaking as each character within the story. Allow students to use a headset to listen to the story as they read along. An alternative would be to use a text-to-speech app on a computer or tablet.

GRADE 3

Organisms and Environments

Explain, Part 2

Materials

For each student

- science notebook

For student groups

- RM 5
- resealable plastic bag

Content Builder

Single organisms are part of larger populations of one species. Several populations of different species can occupy an environment. An environment can include a variety of habitats that support different types of populations. For example, a pond can support fish, frogs, insects, water plants, and water fowl. A pond has its own community. This is similar to a wooded habitat. A wooded habitat supports different populations of birds, insects, mammals, and various plants. It is a community. A meadow habitat may include rabbits, grasses, flowering plants, insect populations, and mice. It is also a community. Communities are connected as an ecosystem because of the interdependence the organisms have on the resources and because habitats share the same abiotic characteristics.

Advance Preparation

Print *RM 5: Vocabulary Match-Up* cards on card stock. Laminate, cut out, and package them in a resealable plastic bag.

Teacher Note

The Explain, Part 2 activity is designed for 24 students. Please adjust the materials for your class size. For example, if you use one corresponding picture and vocabulary card set as an example for students, you will then have 22 cards remaining for a class of 22 students.

Teacher Instruction

- Distribute one card to each student. Be sure there is a picture for each corresponding vocabulary term.
- Instruct students with the vocabulary terms to place themselves on one side of the classroom. Students with picture cards should go to the other side of the classroom.
- Inform students that the goal of the activity is to match the picture cards to the vocabulary word cards.
- Instruct students with picture cards to carefully and silently move toward and stand by the person with the corresponding vocabulary card.

- Once students are in place, use the Facilitation Questions to check for student understanding.
- After the activity, allow students time to write their vocabulary terms and definitions in their science notebooks.

Facilitation Questions

- If you have a card with the term *organism* on it, hold it up. Now, hold up your picture card if you matched it to a card with *organism* on it. What do these cards have in common? *The picture cards show one living thing by itself, such as one duck, frog, hawk, oak tree, or rabbit.*
- What is an organism? *An organism is one living thing.*
- If you have a card with the term *population* on it, hold it up. Now, hold up your picture card if you matched it to a card with *population* on it. What do these cards have in common? *The picture cards that match the term* population *show a group of one type of organism such as a group of rabbits, ducks, oak trees, or frogs.*
- What is a population? *A population is more than one living organism of the same kind living together.*
- If you have a card with the term *community* on it, hold it up. Now, hold up your picture card if you matched it to a card with *community* on it. What do these cards have in common? *The picture cards that match the term* community *show several populations of living organisms that live in the same area.*
- What is a community? *A community is a group of several populations of organisms that live in the same area.*
- If you have a card with the term *ecosystem* on it, hold it up. Now, hold up your picture card if you matched it to a card with *ecosystem* on it. What do these cards have in common? *The pictures that match the term* ecosystem *show several populations of organisms that live in the same environment.*
- What is an ecosystem? *An ecosystem is the combination of living and nonliving things in an environment.*

Organisms and Environments

Differentiation Strategy

Set up the classroom in 4–5 centers.

First Center: Use a set of *RM 5* cards as a matching activity.

Second Center: Provide art supplies and instruct students to make a graphic representation of each vocabulary term from *RM 5* in their science notebooks.

Third Center: Create sentence starter strips and instruct students to use the vocabulary terms to complete the sentences.

Fourth Center: Provide four or five tablets or computers for students to use to review examples of ecosystems and environments.

Suggested websites:

https://tpwd.texas.gov/kids/about_texas/regions/

http://kids.nceas.ucsb.edu/biomes/

Fifth Center: The teacher works with a small group of students to check for understanding, provide support, and clarify misconceptions.

Elaborate

Advance Preparation

Make copies of *RM 6: Environment Project Selection Grid* and *RM 7: Environment Project Rubric* for each student. Read *RM 6* ahead of time to become familiar with the options.

Materials

For each student

- RM 6
- RM 7
- science notebook

Teacher Instruction

- Supply each student with a copy of *RM 6*.
- Offer students options to create an environment and depict the populations that are supported by the environment.
- Allow students time to choose partners and make project selections.
- Instruct students to write down their selections in their science notebooks and to turn in *RM 6*.
- Review *RM 7* and discuss expectations for the content and quality of work.
- Ask students to save *RM 7* in their science notebooks.
- Set the due date for the project. If time permits, schedule class time for research, collaboration, creation, and presentation practice.
- Schedule a time for presentations.
- Use the Facilitation Questions to debrief the students after their presentations.

Facilitation Questions

- Describe the physical characteristics of the environment you created. *Answers will vary depending on the type of environment the student created but could include words that describe climate, landscape, soil type, amount of rainfall, and amount of plant life.*
- What populations of organisms live in the environment you created? *Answers will vary depending on the type of environment. (Example: The populations of organisms that live in my environment include rattlesnakes, lizards, cactus, coyotes, jackrabbits, tarantulas, and vultures.)*

Organisms and Environments

- How does the environment you created support the community of organisms that live there? *Answers will vary depending on the type of environment created. (Example: The rocks in the environment shelter the rattlesnakes when it's hot and keep them warm in the evening. The animals and plants have special ways they manage the low water supply. The cactus stores water in its stem. Some of the animals, like the coyotes, eat the jackrabbits, so the coyotes depend on the jackrabbits for food.)*
- What other populations could be supported in your environment? *Answers will vary depending on the type of environment. (Example: My environment supports only those organisms that can tolerate high heat, sandy soil, little rain, and little shade. The organisms have to be able to eat the organisms that already live there.)*

Evaluate

Advance Preparation

Use *RM 6* to inform the evaluation session. Run off additional copies of *RM 7* for evaluation purposes.

Ensure that all the projects are on display or available for evaluation.

Materials

For teacher

- RM 6
- RM 7

For each student

- RM 7
- science notebook

Teacher Instruction

- Inform students that they are going to evaluate their own work.
- Ask students to retrieve *RM 7* from their science notebooks. Distribute additional copies to students if necessary.
- Inform students that they will use *RM 7* to assess their own project.
- Instruct students to write their names and the title of the project on the form. Tell them that they can examine their work closely as long as they maintain silence while completing the evaluation form.
- Model the proper behavior for evaluating a project.
- Inform students that you also will evaluate the projects.
- Allow class time for the evaluation process.
- When everyone is finished, collect the evaluation forms.

Facilitation Questions

- What is it like to evaluate your own work? *Answers may vary but could include "When I evaluate my own work, I feel proud."*
- Do you often take the time to evaluate your work? *Accept all answers.*
- Why is it a good idea to evaluate your work? *Answers may vary but could include "It's a good idea to evaluate my work so I can improve the next time I do a project."*
- As you were looking at your work, did you think of something you would have done differently? *Accept all answers.*

Organisms and Environments

- When is a good time to evaluate your work so that you can improve the quality, before you turn it in or after you get your grade? *A good time to evaluate my work is before I turn it in.*
- Now think about this whole project. What changes would you suggest for the next time we do a project? *Accept all answers.*

Grade 3

RM 1: Supportive Environments

House Summary Sentence

The house has a ______________, _________________, and ______________ that support how we

_____________, ___________, and stay ____________.

House Word Bank

bathe	kitchen
bathroom	living room
bedroom	sleep
eat	smooth floor
healthy	talk

RM 1: Supportive Environments continued

Park Summary Sentence

The park has a____________, ______________, and ____________ that support how _______ and _________ live as they eat and _________.

Park Word Bank

animals	hiking paths
garden	plants
grow	sidewalk
field	trees

RM 2: Environment Pictures

Environment 1

Environment 2

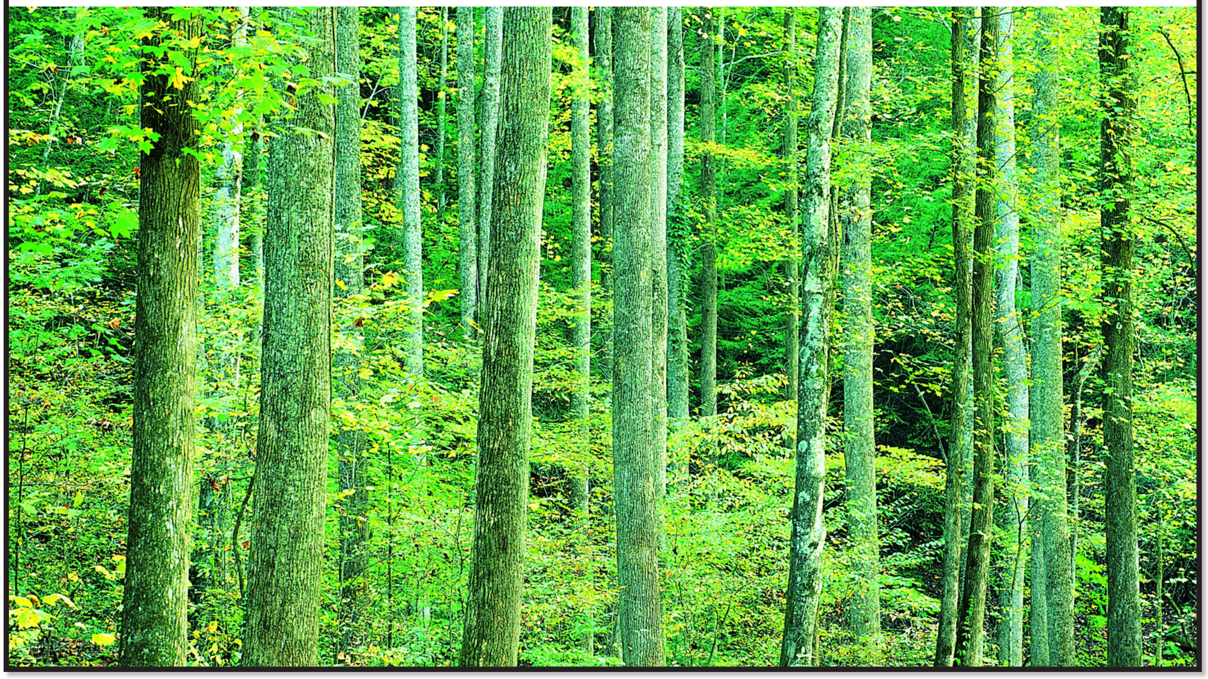
RM 2: Environment Pictures continued

Environment 3

Environment 4

RM 2: Environment Pictures continued

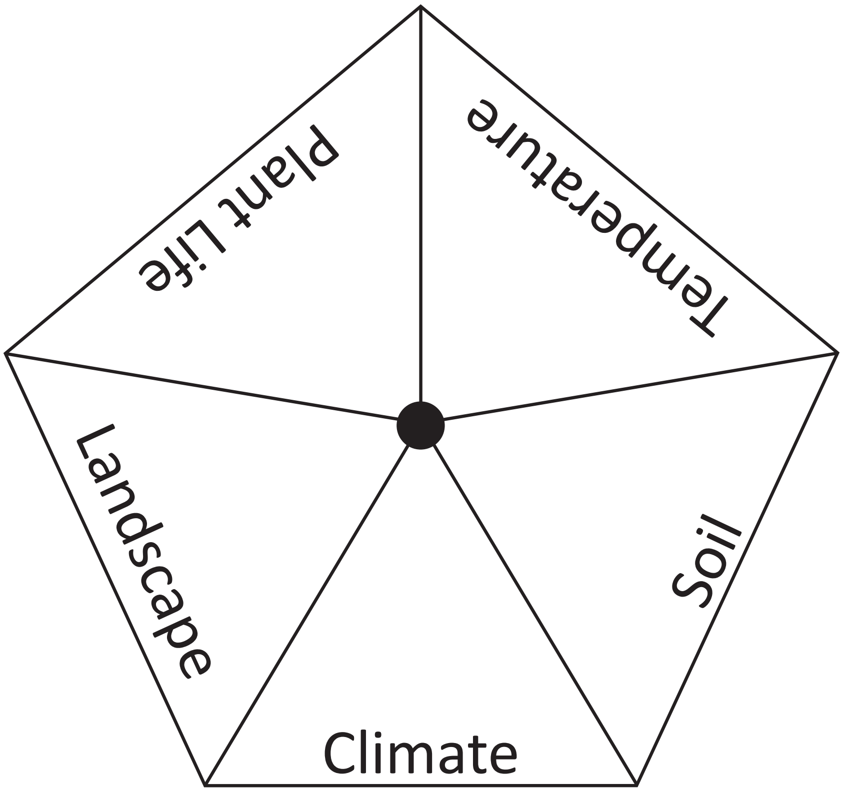
Environment 5



Environment 6

RM 2: Environment Pictures continued

Environment 7



Grade 3

RM 3: Environment Descriptors (Do not cut this page.)

Place environment picture here.

Climate Place descriptor here.	**Temperature** Place descriptor here.
Landscape Place descriptor here.	**Plant Life** Place descriptor here.

Soil Place descriptor here.

Grade 3

RM 4: Environment Descriptors

Descriptors

Dry	Moist	Wet
Rocky	Flat	Hilly
Mountainous	Little	Some
Lush	Hot	Cold
Mild	Sand	Loam
Silt	Clay	Permafrost

Grade 3

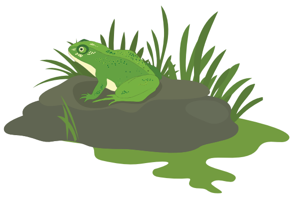
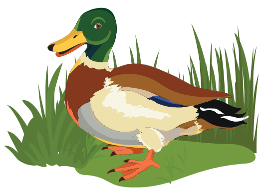
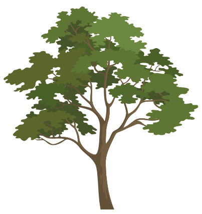
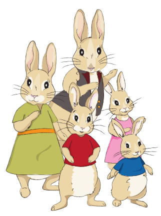
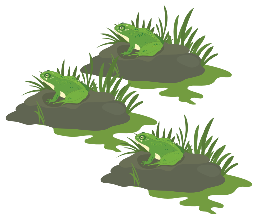
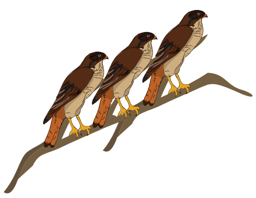
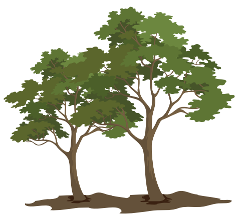
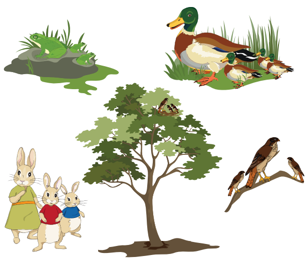
RM 4: Environment Descriptors continued

Definitions

Wet—lots of moisture in the air	Moist—some moisture in the air	Dry—little moisture in the air
Hilly—land looks bumpy	Flat—land looks like a table top	Rocky—land has lots of boulders
Some—plants are present but not too crowded	Little—hardly any plants	Mountainous—land has pointed peaks
Cold—feels icy	Hot—feels like an oven	Lush—lots of plants
Loam—sand, clay and organic matter	Sand–tiny rocks	Mild—feels just right
Permafrost—frozen earth	Clay—earth that can be shaped with your hands	Silt—mud deposited by water

Grade 3

RM 5: Vocabulary Match-Up

Organism	Organism	Organism	Organism
Organism	Population	Population	Population
Population	Population	Community	Ecosystem
			
			
			

Grade 3

RM 6: Environment Project Selection Grid

Name:	**Date:**	**Teacher:**
How will you work? Check one. ☐ I will work by myself. ☐ I will work with a partner. Name of Partner ________________________ ☐ I will work with two partners. Name of Partner ________________________ Name of Partner ________________________	<u>Research Requirements</u> • Select a type of environment to research, or create an imaginary environment. • Include descriptive information about the physical characteristics of the environment. • Describe the types of plants and animals that make up the community. • Explain how the environment supports the community. • Include a minimum of three sources. <u>Cite your sources in a text document</u> • Record the title and author of any books you use in your research. • Copy and paste the website addresses from the web pages you use. • Title the document "Works Cited."	My project is a (Check one) ☐ Diorama Build a 3-dimensional model of an environment that represents the physical characteristics and populations that live in the ecosystem. Include an explanation about how the environment supports the community. ☐ Brochure Design a trifold brochure that includes images and descriptive text about the physical characteristics of an environment and representative populations in the community. ☐ Digital or 2-Dimensional Poster Create a poster that includes images of an environment and the populations of organisms that are supported by the environment.

Grade 3

RM 7: Environment Project Rubric

Name: ______________________________ **Date:** _______________

Circle the appropriate squares for each of the three grading categories and assign points. Total the score using the last column.

Descriptor	1 Point	2 Points	3 Points	Score
Academic Vocabulary	Some academic vocabulary is used correctly.	Most of the academic vocabulary is used correctly.	All academic vocabulary is used correctly.	
Description or Representation of Physical Characteristics of Environments	The description or representation of the environment is adequate.	The description or representation of the environment is accurate.	The description or representation of the environment is detailed and accurate.	
Correct Populations That Match the Environment	One to two animal and plant populations each in the community are represented correctly.	Three animal and plant populations each in the community are represented correctly.	Four animal and plant populations each in the community are represented correctly.	

Comments:

Total Score: _______________

SCIENCE:

GRADE 4—ORGANISMS AND ENVIRONMENTS

GRADE 4

Organisms and Environments

Food Make and Take

Science Concept

4(9) Organisms and environments. The student knows and understands that living organisms within an ecosystem interact with one another and with their environment. The student is expected to:

(A) investigate that most producers need sunlight, water, and carbon dioxide to make their own food, while consumers are dependent on other organisms for food

Content Objective

I can investigate that producers need nonliving factors to make their own food and that consumers depend on other organisms for food.

Science Process Skills

4(1) Scientific investigation and reasoning. The student conducts classroom and outdoor investigations, following home and school safety procedures and environmentally appropriate and ethical practices. The student is expected to:

(A) demonstrate safe practices and the use of safety equipment as described in the Texas Safety Standards during classroom and outdoor investigations

4(2) Scientific investigation and reasoning. The student uses scientific inquiry methods during laboratory and outdoor investigations. The student is expected to:

(B) collect and record data by observing and measuring, using the metric system, and using descriptive words and numerals such as labeled drawings, writing, and concept maps

(C) construct simple tables, charts, bar graphs, and maps using tools and current technology to organize, examine, and evaluate data

(D) analyze data and interpret patterns to construct reasonable explanations from data that can be observed and measured

(F) communicate valid, oral, and written results supported by data

4(4) Scientific investigation and reasoning. The student knows how to use a variety of tools, materials, equipment, and models to conduct science inquiry. The student is expected to:

(A) collect, record, and analyze information using tools, including calculators, microscopes, cameras, computers, hand lenses, metric rulers, Celsius thermometers, mirrors, spring scales, pan balances, triple beam balances, graduated cylinders, beakers, hot plates, meter sticks, compasses, magnets, collecting nets, and notebooks; timing devices, including clocks and stopwatches; and materials to support observation of habitats of organisms such as terrariums and aquariums

Mathematics

4(1) Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace

English Language Arts and Reading

4(11) Reading/Comprehension of Informational Text/Expository Text. Students analyze, make inferences and draw conclusions about expository text and provide evidence from text to support their understanding. Students are expected to:

(A) summarize the main idea and supporting details in text in ways that maintain meaning

(C) describe explicit and implicit relationships among ideas in texts organized by cause-and-effect, sequence, or comparison

Figure 19

Reading/Comprehension Skills. Students use a flexible range of metacognitive reading skills in both assigned and independent reading to understand an author's message. Students will continue to apply earlier standards with greater depth in increasingly more complex texts as they become self-directed, critical readers. The student is expected to:

(A) establish purposes for reading selected texts based upon own or others' desired outcome to enhance comprehension

(B) ask literal, interpretive, and evaluative questions of text

(C) monitor and adjust comprehension (e.g., using background knowledge, creating sensory images, re-reading a portion aloud, generating questions)

(D) make inferences about text and use textual evidence to support understanding

(E) summarize information in text, maintaining meaning and logical order

GRADE 4

Organisms and Environments

Technology Applications—Grades 3–5

(2) Communication and collaboration. The student collaborates and communicates both locally and globally using digital tools and resources to reinforce and promote learning. The student is expected to:

(C) collaborate effectively through personal learning communities and social environments

(F) perform basic software application functions, including opening applications and creating, modifying, printing, and saving files

(5) Digital citizenship. The student practices safe, responsible, legal, and ethical behavior while using digital tools and resources. The student is expected to:

(A) adhere to acceptable use policies reflecting positive social behavior in the digital environment

(B) respect the intellectual property of others

(C) abide by copyright law and the Fair Use Guidelines for Educational Multimedia

(F) practice safe, legal, and responsible use of information and technology

(G) comply with fair use guidelines and digital safety rules

English Language Proficiency Standards

(5) Cross-curricular second language acquisition/writing. The ELL writes in a variety of forms with increasing accuracy to effectively address a specific purpose and audience in all content areas. ELLs may be at the beginning, intermediate, advanced, or advanced high stage of English language acquisition in writing. In order for the ELL to meet grade-level learning expectations across foundation and enrichment curriculum, all instruction delivered in English must be linguistically accommodated (communicated, sequenced, and scaffolded) commensurate with the student's level of English language proficiency. For Kindergarten and Grade 1, certain of these student expectations do not apply until the student has reached the stage of generating original written text using a standard writing system. The student is expected to:

(G) narrate, describe, and explain with increasing specificity and detail to fulfill content area writing needs as more English is acquired

Language Objective

I am able to write a summary report about how organisms obtain food using words such as producer, consumer, and carbon dioxide in a way that demonstrates mastery of science concepts.

Organisms and Environments

GRADE 4

Response to Intervention/Tier 1 Differentiation

All science lessons support students in receiving quality Tier 1 Instruction. Using the 5E model, knowledge is taught in a variety of contexts, integrating math, science, and ELAR content, thus supporting the active engagement of the students with the content. Lesson-specific differentiation strategies for addressing diverse student needs can be found in sections titled "Differentiation Strategy."

Differentiation should

- focus on skills students did not understand, and extend the lesson for advanced students;
- be conducted in small groups or embedded in whole-group instruction; and
- provide students with a variety of strategies to process the information, such as
    - allowing for additional opportunities for verbal brainstorming of words associated with a topic (with teacher taking dictation);
    - making clear connections of new and more complex concepts to foundational aspects and prior knowledge;
    - participating in more tangible experiences, such as experiments, investigations, and active exploration;
    - sorting academic vocabulary words into categories by common attributes, such as process words or science content vocabulary;
    - organizing results of brainstorming into semantic maps or creating graphic organizers;
    - discussing the meaning of a graphic organizer with a partner; and
    - creating a visual representation to demonstrate understanding.

See the handout in the Instructional Resources section that addresses instructional strategies.

College and Career Readiness Standards—Science Standards

I.B.1 Scientific inquiry. Design and conduct scientific investigations in which hypotheses are formulated and tested.

I.E.1 Effective communication of scientific information. Use several modes of expression to describe or characterize natural patterns and phenomena. These modes of expression include narrative, numerical, graphical, pictorial, symbolic, and kinesthetic.

II.F.1 Scientific measurement. Select and use appropriate Standard International (SI) units and prefixes to express measurements for real world problems.

Organisms and Environments

III.A.1 Scientific writing. Use correct applications of writing practices in scientific communication.

VI.B.3 Biochemistry. Describe the major features and chemical events of photosynthesis.

VI.G.2 Ecology. Know patterns of energy flow and material cycling in Earth's ecosystems.

Vocabulary Focus

carbon dioxide

consumer

producer

5E Lesson Summary

Engage
Students compare images to determine similarities and differences in the processes that support growth and life of organisms.

Explore, Part 1
Students investigate the effects of light, water, and carbon dioxide on plant growth and analyze whole-class data.

Explore, Part 2
Students create a mini poster after researching diets of consumers and then discuss how consumers are dependent on other organisms after participating in a gallery walk of mini posters.

Explain
Students read or listen to *Food News* and engage in a class discussion about producers and consumers.

Elaborate
Students select a role as a news writer, blogger, or TV reporter in order to explain how a producer or consumer acquires food.

Evaluate
Students answer an open-ended question about how producers and consumers acquire food.

Organisms and Environments

GRADE 4

Engage

Content Builder

All organisms have basic needs such as a need for water. Satisfying those needs allows us to survive and grow. The need for food is one of the basic needs. Food provides both matter and energy to make life possible. Producers such as plants make their own food using water, carbon dioxide, and light energy from the Sun. Both producers and consumers must break food down to use the matter and energy for life.

Materials

For teacher

- RM 1

For each student

- science notebook

Teacher Note

Students should know the difference between living and nonliving things and that plants and animals have basic needs such as food, air, water, and shelter. Students may or may not know that plants are producers that can make their own food using carbon dioxide, water, and sunlight. Food for consumers includes organisms or parts of organisms that are alive or were alive at one time. Food is required for all organisms to sustain life processes.

Differentiation Strategy

Create a word bank of substances that represent food for both types of organisms in *RM 1: Food for Thought* and instruct students to sort the substances according to what each organism uses for food. (Note: Plants use plant sap made of glucose (sugar) for food.)

Teacher Instruction

- Project *RM 1* for the class.
- Instruct students to analyze and compare the images to identify life processes represented by both organisms.

Facilitation Questions

- What organisms are represented in these images? *The organisms represented in these images are humans (people) and plants.*
- What do these organisms have in common? *Plants and humans are living organisms.*

GRADE 4

Organisms and Environments

- What do these living organisms need to help them stay alive? *These organisms need space to live, food, water, and air to stay alive.*
- What life process is the main idea in both these images? *The main life process in these images is growth.*
- What do these organisms need to grow? *These organisms need food to grow.*
- Do plants and humans get their food the same way? *No, plants and humans do not get their food the same way.*
- What is the difference between how humans get food and how plants get food? *Humans have to eat other organisms to get food, and plants make their own food.*

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Explore, Part 1

Content Builder

Producers such as plants are organisms that use the energy from sunlight and matter from water and carbon dioxide to make their own food. Nutrients, such as nitrogen, phosphorus, and trace minerals that are necessary for plant health are absorbed through their roots. Energy from the Sun starts a chain reaction of chemical processes that reassembles water and carbon dioxide molecules to create glucose and oxygen. Glucose is the food made by producers. Producers break down the food and use the matter and energy to grow and live. Please note that plants respire and use oxygen for cellular respiration. Students at this grade level do not need to know the details of these cellular processes, but it is important that teachers understand these concepts.

Teacher Note

Students participate in investigations about how plants use carbon dioxide, water, and light to make food. Carbon dioxide is investigated through a video that shows how a plant absorbs carbon dioxide through its leaves. Bromothymol Blue (BtB) is used to indicate the presence or absence of the gas. For example, when a person exhales into a test tube of dilute BtB, the solution turns from blue to yellow. Conversely, you can observe the absence of carbon dioxide in BtB when a plant absorbs it, turning the solution from yellow to blue. In earlier grades, carbon dioxide is not specifically identified as the component of air necessary for food production in plants; however, students should understand the phases of matter and properties of matter (4(5)(A)) and should know that another word for air is gas. They might also be familiar with gases such as helium (balloons), oxygen (breathing), and/or carbon dioxide (breathing or carbonated beverages).

For the light and water investigations, set up a plant (the control) to provide a baseline standard to which students can compare their plants (experimental groups). All the conditions of the control plant stay the same, or remain constant. For example, the teacher or student waters the plant with 15 mL of water every other day, and the lamp is 25 cm from the plant throughout the investigation. All conditions that stay the same are referred to as constants because they are not changed. Constants, such as the type of plant and amount of time of light exposure, should apply to all plants in the investigation. Conditions that change, also known as variables, would include the frequency of when plants receive water or how much light the plants receive. Terms such as *variables* are introduced in 5(2)(A).

Materials

For the teacher

- "Carbon Dioxide Investigation" video
- 1 bedding plant
- RM 2
- bowl or resealable plastic bag
- chart paper
- markers

For student groups

- 1 bedding plant
- 1 lamp
- graduated cylinder
- water
- metric ruler
- hand lenses (optional)

For each student

- RM 3
- RM 4
- science notebooks

Organisms and Environments

You may need to provide support for the process skills by scaffolding practice of measurement techniques or discussing what counts as evidence that plants use water, carbon dioxide, and sunlight to make food. Examples of evidence of food production might include an increase in number of leaves or plant height. Plants that wilt, turn yellow, lose leaves, or do not get bigger indicate that the plant is unable to make enough food.

The light and water investigations could run for as long as 2 weeks but should run at least 1 week, with time allowed for students to monitor their investigations daily. While the investigations are underway, proceed to Explore, Part 2.

Advance Preparation

Search for the "Carbon Dioxide Investigation" in Texas Education on iTunesU®. Download or play the video ahead of time to know when to pause or stop for students. Copy *RM 2: Plant Investigation* and cut the squares apart. Fold them to hide the text and place them into a container such as a bowl or resealable plastic bag. Make enough copies of *RM 3: Investigation Plan* and *RM 4: Investigation Report* for each student to use as they plan and implement their investigations. Purchase bedding plants such as pansies, begonias, or geraniums. An alternative would be to sprout or plant beans or rye grass in advance so that they are well established. All plants in the investigations should be the same. Research and follow the recommended light and water conditions for the plants used for the teacher's investigation. Prepare space to house the investigations. Make sure enough equipment and materials are available for six groups of students and yourself.

Differentiation Strategy

Allow students to take video and/or pictures in order to document their investigations.

Teacher Instruction

- Inform students that they will begin investigations about the substances producers need in order to make food.
- Explain that the first investigation will test to see if a producer, such as a plant, needs air.
- Ask students to write their predictions in their science notebooks.

- Instruct students to record their observations as they watch the "Carbon Dioxide Investigation" video.
- Play the carbon dioxide investigation video, allowing time to pause or stop so students have time to write in their science notebooks.
- Use the Facilitation Questions to debrief the investigation in the video.

Facilitation Questions

- What materials were used in the investigation? *The materials used in the investigation included a plant, a test tube and rack, a stopper, water, blue liquid, a straw, and a lamp.*
- What steps did the scientist take to set up the investigation? *The scientist cut the stopper in half and poured water and blue liquid into a test tube. The scientist used the straw to blow bubbles of air into the blue water. After that, a leaf was sandwiched in between the stopper halves and placed in the end of the test tube. The test tube was propped up, and the lamp was turned on.*
- What color did the blue solution turn when the air was bubbled into it? *The solution changed from blue to yellow.*
- What did the color change show? *The color change showed that air was added to the solution.*
- Would any type of air make the solution change color? *No, because there was air in the test tube before the scientist blew bubbles into the liquid and it didn't change color.*
- What state of matter is air? *Air is a gas.*
- Can you name any gases? *Answers may vary but could include oxygen, helium, or carbon dioxide.*
- What gas do you think was bubbled into the blue solution? *Answers may vary but should include carbon dioxide.*
- What do you predict will happen next? *Answers may vary but could include that nothing will happen or that the yellow solution will change back to blue.*
- What did you observe in the video? *We observed that the liquid changed from yellow to blue.*

Organisms and Environments

- What made the liquid turn yellow in the first part of the video? *The scientist bubbled carbon dioxide gas into the liquid.*
- After the investigation started, what made the liquid turn from yellow back to blue? *Carbon dioxide gas was no longer in the liquid.*
- Where did the carbon dioxide gas go? *Answers may vary but should include that the carbon dioxide was absorbed into the plant's leaf.*
- Why do you think the plant absorbed the carbon dioxide gas? *Answers may vary but should include that the plant uses it in some way.*

Teacher Instruction

- Introduce the light and water investigations to your students.
- Ask students to randomly select an investigation card out of the bowl or resealable plastic bag to determine the investigation focus. Students with matching investigation cards will group themselves together.
- Seat students in groups according to their investigation assignments.
- Distribute *RM 3* and *RM 4*. Inform students that they will use *RM 3* to plan their investigation and *RM 4* for their final report. During the investigation, all data and observations will be entered into their science notebooks.
- Allow time for student groups to formulate their investigation plans. Give students access to equipment and materials so that they can identify what they need for their investigations.
- Monitor lab groups as students complete *RM 3*.
- Meet with each student group as they complete *RM 3* in order to discuss, modify, and approve the plan. Discussion points to consider are safety guidelines, process skills for data collection and measurement, and what students will cite as evidence that plants need light and water to make food.
- Monitor lab groups as students implement investigations.
- Have students present their investigation results after a 1–2 week period.
- On chart paper, create one data chart for water and a second chart for light data, similar to the charts on *RM 4*, in order to collect/record data from each group.

- Instruct students to be active listeners, to copy group data into each data chart or on their copy of RM 4, and to write down questions they would like to ask the group that is presenting.
- After all groups have presented, allow time for each group to analyze the whole-group data and record their conclusions.

Facilitation Questions

- What observations could you make that helped you see how healthy the plant is? *If the plant stayed green, or sprouted more leaves, it grew or stayed healthy. If the plant wilted, turned yellow, or dropped leaves, it became unhealthy or started dying.*
- What could these observations also be called? *These observations are called evidence.*
- What happened to the plants that received no water or no light? *The plants that did not receive water or light became sick or died.* Why? *The plants did not do well because they could not make food.*
- What conclusion did you make from the investigation results? *The plant should receive certain amounts of water and light to grow and make food.*
- Why do scientists test only one variable, or difference, at a time? *Scientists test only one variable at a time to measure the effect a particular change has on a subject. In this investigation, we wanted to know the impact that varying amounts of light and varying amounts of water had on the growth of a plant.*
- What other questions came up during the presentation? *Answers will vary and may include whether groups kept their plants in the same location to receive the same or different amounts of light or whether groups only allowed their plants to receive sunlight versus artificial light.*
- If you could conduct the investigation over again, what would you do differently? *Answers will vary and may include that students wanted more time or a different plant.*

Organisms and Environments

Explore, Part 2

Materials

For teacher

- RM 5
- bowl or resealable plastic bag

For student groups

- Computer lab or library
- RM 6

For each student

- science notebook

Content Builder

Consumers depend on other organisms for food. Some organisms, such as koalas (herbivore), might depend on only one type of food, such as eucalyptus leaves. However, many organisms have a variety of food sources on which to depend. For example, a lion (carnivore) may eat only meat, but the meat may come from a variety of organisms such as antelope, zebras, or wildebeests. A bear (omnivore) depends on both meat and plants from a wide variety of sources for food. Dependence on a wide variety of food sources is advantageous to consumers, especially during times when some resources may be more limited than others. Students do not need to understand the different categories of consumers, but by the end of this lesson, students should know that most consumers depend on a variety of organisms for food. This understanding reinforces the concept of dependence through food chains (3(9)(B)) and lays a foundation for the concept of interdependence represented by food webs (4(9)(B)).

Advance Preparation

Schedule time in the library or computer lab for students to complete their research. Print one copy of *RM 5: Consumers* and cut out each card. Fold each card in half, and place all cards into a container such as a bowl or resealable plastic bag. Make enough copies of *RM 6: What's for Lunch* for each lab group.

Teacher Note

Each lab group of students randomly selects one consumer card from the bowl or resealable plastic bag and researches what organisms their consumer depends on for food. Students can represent their consumer and the organisms their consumer eats by printing images or drawing pictures of them. Make sure students cite sources for their research and for the images they print. You may choose to provide *RM 6* as an example of the product, or you can print it out as a template for students to use.

Differentiation Strategy

Students can use a brainstorming, whiteboard, or screencasting digital application to create a digital product.

Texas Education Agency

Organisms and Environments

Teacher Instruction

- Have one student from each lab group select a consumer card from the bowl or resealable plastic bag.
- Provide each lab group a copy of *RM 6*.
- Explain that they will research and then create a small poster of images on *RM 6* that represents the organisms the consumer could eat for lunch.
- Remind students that they should record their sources of information and images in their science notebooks.
- Provide time for student groups to complete their research and *RM 6*.
- Display students' work on a wall or bulletin board for a class gallery walk. In a gallery walk, students quietly move from one poster to the next, pausing at each one to silently take in the information and images.
- Use the Facilitation Questions to hold a discussion about how consumers depend on other organisms for food.

Facilitation Questions

- What is a consumer? *A consumer is an organism that does not make its own food.*
- How do consumers get food? *Some consumers get food by hunting and capturing other consumers. Other consumers eat plants. Some consumers eat organisms that are already dead.*
- How do consumers depend on other organisms for food? *Consumers have to eat other organisms to stay alive.*
- Which consumer do you think has a greater advantage for finding and eating food, the consumer that depends on only one food source or the consumer that depends on several organisms for food? *Consumers that depend on multiple organisms for food have a better chance of survival because if one resource is not available, they can find another organism to eat.*

Organisms and Environments

Explain

Materials

For teacher

- *Food News* book

Content Builder

Plants are categorized as producers because they make their own food. Plants use the Sun's energy, water, and carbon dioxide to make food. The food that plants make has mass and stores energy. In order to grow and maintain life processes, producers have to break down the food they make. By breaking down the food, producers can access the energy and matter it takes to live and grow. Consumers, on the other hand, cannot make their own food and depend on other organisms for food. However, they also break food down to carry on life processes.

Differentiation Strategy

Make an audio recording of the book for students who may need to hear the story more than once.

Teacher Instruction

- Read *Food News* to the class.
- Use the Facilitation Questions to check student understanding.

Facilitation Questions

- What is a producer? *A producer is an organism that makes its own food.*
- What three things do producers use to make their own food? *Producers use sunlight, water, and carbon dioxide to make their own food.*
- Are these three substances living or nonliving? *These substances are nonliving.*
- How do we know that plants need these three substances? *We know that plants need these three substances because our investigations showed that changing the amounts of the substances affected how the plants grew.*
- How do plants get light, water, and carbon dioxide? *Plants receive light from the Sun or through fluorescent lighting. Plants receive water from rain, a water sprinkler, or a watering can. Plants receive carbon dioxide from the air.*

Organisms and Environments

- Where does food production take place in a plant? *Food production takes place in the leaves of plants.*
- Do all producers require the exact same conditions to make their own food? *No. Some producers need sunny conditions while others may need less Sun. Some producers may need more water while others need less.*
- What are consumers? *Consumers are organisms that depend on other organisms for food.*
- What is an example of a consumer in *Food News*? *Examples of consumers in the story include a mouse, a snake, and an owl.*
- What organisms or parts of organisms did the mouse depend on for food? *The mouse depended on plant seeds and berries, insects, and earthworms for food.*
- Are the substances the mouse depended on living or nonliving? *The substances the mouse depended on were living.*
- What do the producers and consumers have in common when it comes to food? *The producers and consumers both need food to grow and live.*
- What are things that producers and consumers do not have in common when it comes to food? *Producers make their food out of nonliving things, and consumers have to get food by eating living organisms such as plants or animals.*

Elaborate

Materials

For each student

- RM 7 or RM 8

Advance Preparation

Procure hand held devices with video recording capabilities.

Teacher Instruction

- Explain to students that they will take on the role of a news reporter for a newspaper or television station or a blogger for a website. Their assignment is to report or write about how a producer or consumer of their choice acquires food.
- Discuss the presentation options with students and use *RM 7* and *RM 8* as examples. Allow them to choose whether they would like to work independently, in pairs, or as groups of three.
- Instruct students to choose a presentation option, and provide each of them the corresponding *RM*.
- Allow students time to complete the assignment.
- For students who decide to take on the role of a television news reporter, record the news reports using video recording equipment.

Evaluate

Teacher Instruction

Instruct students to use their knowledge of how producers and consumers acquire food to complete *RM 9: Food Make and Take Assessment*.

Materials

For the student

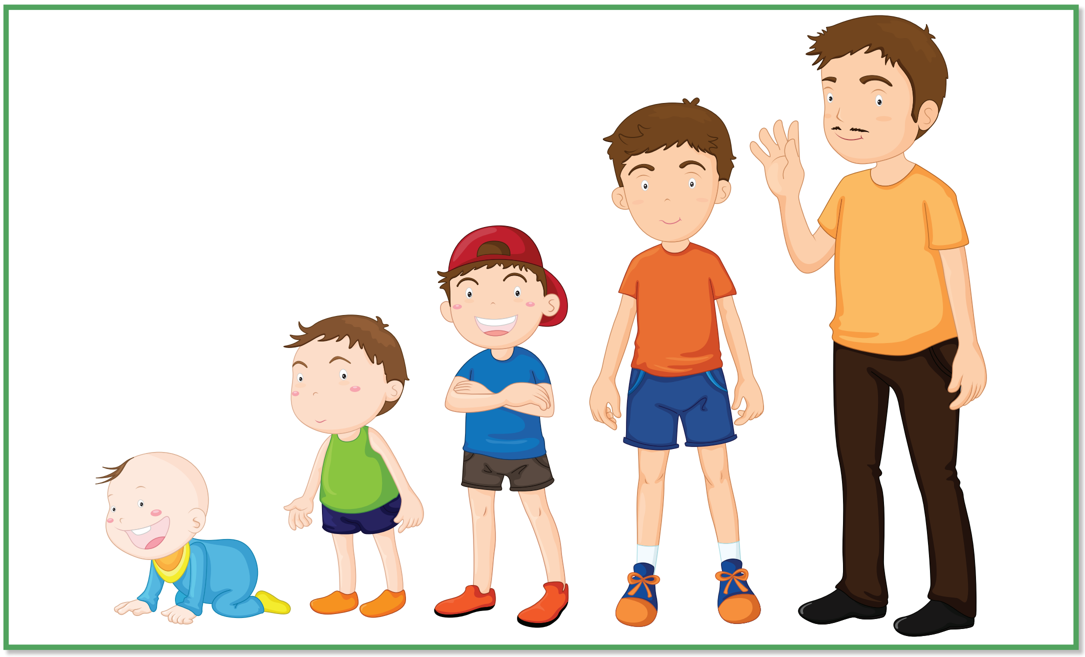
- RM 9

Student Sample

Producers and consumers are organisms that get their food in different ways. Producers make their own food and consumers have to hunt other organisms to eat. An example of a producer is a plant. Sunlight helps plants use water and carbon dioxide to make food. An example of a consumer is a mouse. A mouse eats insects, seeds, and berries for food. Producers and consumers depend on food to live and grow.

Grade 4

RM 1: Food for Thought



Grade 4

RM 2: Plant Investigation

Distance from Light Source		Amount of Water	
• Distance from light: no light • Amount of water: 15 mL every other day	• Distance from light: no light • Amount of water: 15 mL every other day	• Amount of water: no water • Distance from light: 25 cm	• Amount of water: no water • Distance from light: 25 cm
• Distance from light: no light • Amount of water: 15 mL every other day	• Distance from light: 20 cm • Amount of water: 15 mL every other day	• Amount of water: no water • Distance from light: 25 cm	• Amount of water: 10 mL every other day • Distance from light: 25 cm
• Distance from light: 20 cm • Amount of water: 15 mL every other day	• Distance from light: 20 cm • Amount of water: 15 mL every other day	• Amount of water: 10 mL every other day • Distance from light: 25 cm	• Amount of water: 10 mL every other day • Distance from light: 25 cm
• Distance from light: 30 cm • Amount of water: 15 mL every other day	• Distance from light: 30 cm • Amount of water: 15 mL every other day	• Amount of water: 20 mL every other day • Distance from light: 25 cm	• Amount of water: 20 mL every other day • Distance from light: 25 cm
• Distance from light: 30 cm • Amount of water: 15 mL every other day	• Distance from light: 40 cm • Amount of water: 15 mL every other day	• Amount of water: 20 mL every other day • Distance from light: 25 cm	• Amount of water: 30 mL every other day • Distance from light: 25 cm
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Grade 4

RM 3: Investigation Plan

Lab Group: ____

Date: ____________________ Circle One: Distance from Light Source Amount of Water

Investigation Question: ____

Prediction: ____

Investigation Materials Checklist

- ☐ plant
- ☐ light source
- ☐ graduated cylinder
- ☐ metric ruler
- ☐ water
- ☐ hand lens
- ☐ other___________________

Conditions that remain the same during the investigation. Check all that apply.

- ☐ distance from the light source
- ☐ amount of water
- ☐ watering schedule (______/week)
- ☐ other________________________

(Carbon dioxide and the type of plant will be the same for these investigations and not included in the investigation plan.)

Investigation Steps:

____

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____

Investigation Sketch with Labels

Evidence we will use to support our prediction.

____

____

____

____

Grade 4

RM 4: Investigation Report

Date:________________

Names of Group Members:____

Investigation Question: Which conditions are best for a plant to make its food?

Prediction: ____

Investigation Design—Describe the investigation with text.

Distance from Light Source	Height of plant before	Height of plant after	Number of leaves before	Number of leaves after
No light				
20 cm				
30 cm				
40 cm				

Amount of Water	Height of plant before	Height of plant after	Number of leaves before	Number of leaves after
No water				
10 mL				
20 mL				
30 mL				

Observations—Include descriptions of changes to your plant.

Analysis of Whole-Class Data—What does it mean? How do you know?

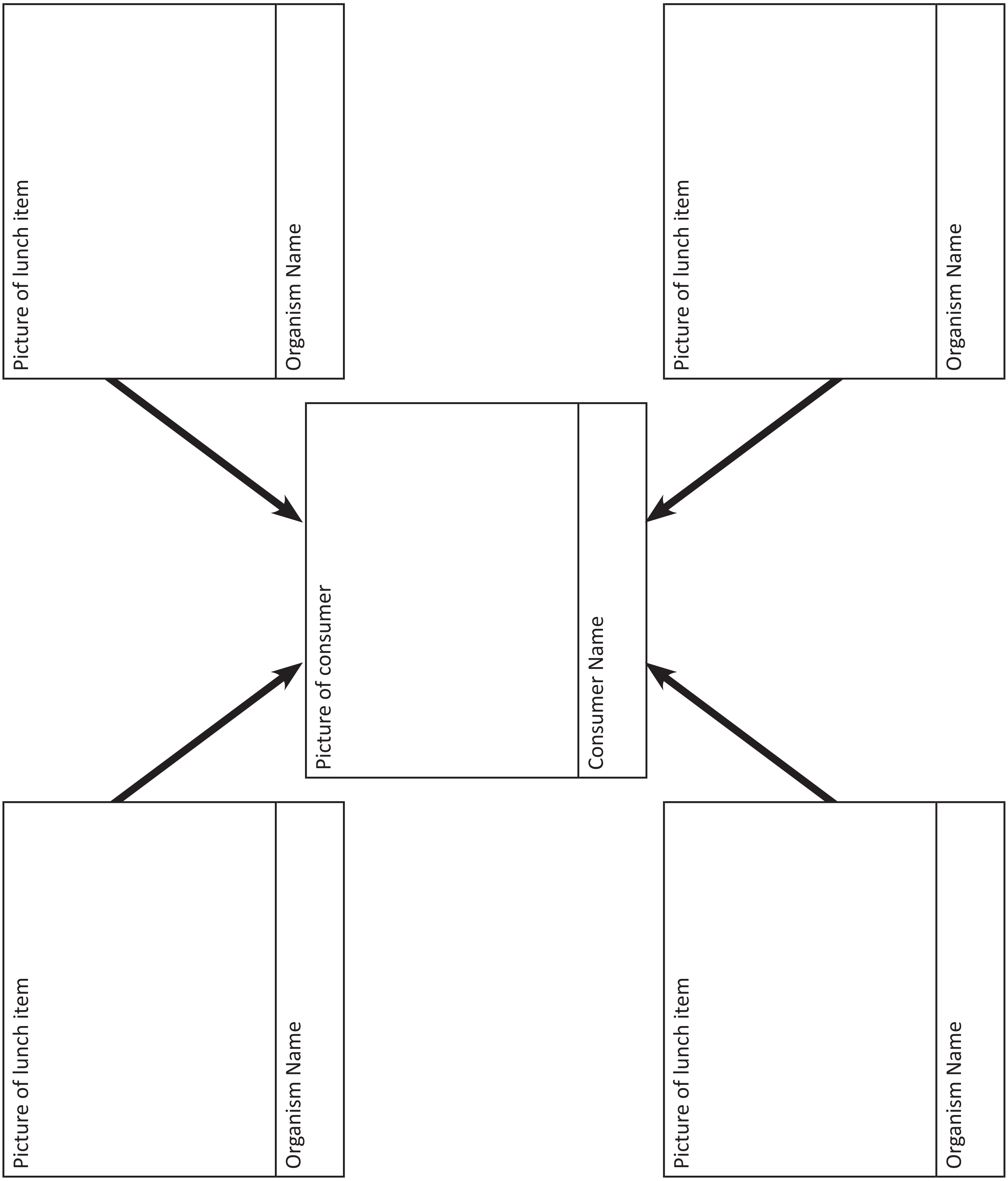
Grade 4

RM 5: Consumers

Arctic fox	black bear
blue whale	koala
Komodo dragon	praying mantis
turkey vulture	white-tailed deer

Grade 4

RM 6: What's for Lunch?



Grade 4

RM 7: Report Template

Pretend you work as a blogger or reporter for a television station, website, magazine, or newspaper. Use this template to organize a rough draft of your report.

Headline: Write a 1–5 word summary.	
Introduction: Write three sentences about the main idea of the information you have learned. Write in a way that captures the reader's attention.	
Use the next section to provide information that you will include in your news report.	
Conclusion: Write two or three sentences that summarize the main idea of the news report. Focus on what you want the audience to remember.	

RM 8: Interview Template

Pretend you are a reporter for a television or radio station and you have been assigned to interview producers and consumers. Use the template to create a rough draft of the interview. Some text is provided for you, but you will need to create some of your own interview questions. You also will provide the answers for the producers and consumers.

Interviewer Questions	Organism Answers
Hello. This is ______________, reporting to you live from ______________. Today we are reporting about the dependence ___________ has on __________ for food. Ms./Mr.____________, thank you for speaking with us today.	
I have a few questions to ask about the organisms you depend on for food. Can you shed a little light on that for us?	
Your question here.	
Your question here.	
Your question here.	
Your question here.	
You heard it first here, folks, _________ depends on _________________ for food. Thanks for speaking with us today, Ms./Mr._________ This is ___________________, signing off.	

Grade 4

RM 9: Food Make and Take Assessment

Name: ____

Date: ____________________

Explain how producers and consumers acquire food. Include observations you have made in investigations and information from research to provide examples. Sketches can be included but are not mandatory. Use all of the words in the Word Bank in your explanation.

Word Bank

carbon dioxide	producer
consumer	sunlight
depend or dependence	water
organisms	

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