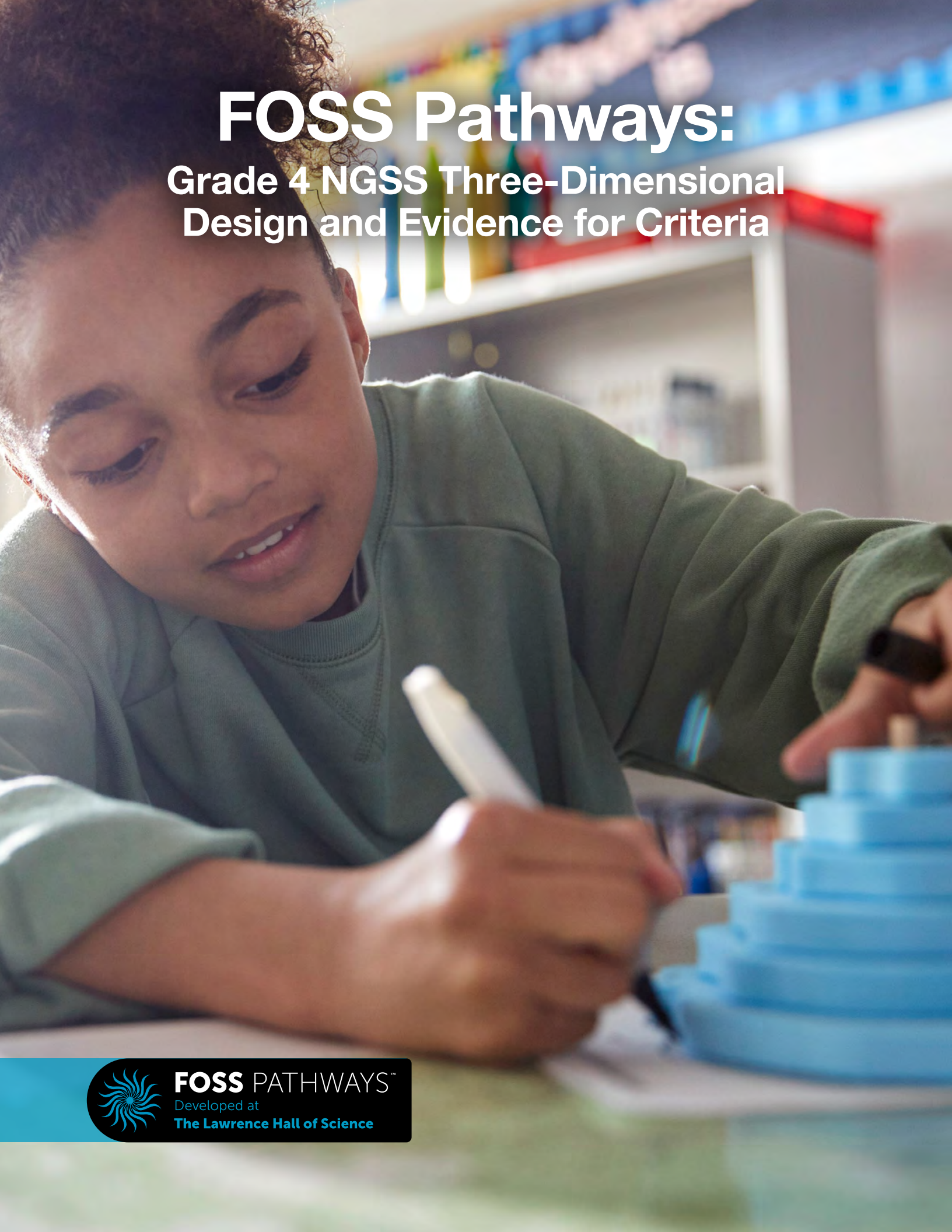
FOSS Pathways:

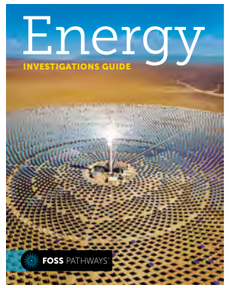
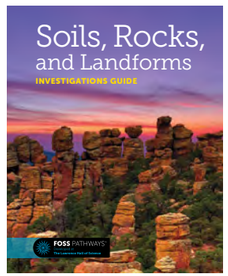
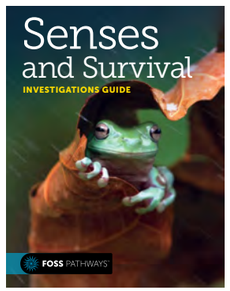
Grade 4 NGSS Three-Dimensional Design and Evidence for Criteria



FOSS PATHWAYS™
Developed at
The Lawrence Hall of Science

FOSS Pathways Modules Grade 4

Alignment to NGSS

FOSS Module	Module Overview/Bundled Performance Expectations	Disciplinary Core Ideas	Science and Engineering Practices	Crosscutting Concepts
 Physical Science	In the Energy Module, students investigate electricity and magnetism as related effects and engage in engineering design to convert energy from one form to another. They gather information about how energy is derived from natural resources and how that affects the environment and explore alternative sources of energy such as solar energy. Students interpret data to build explanations from evidence and make predictions of future events. They develop models to represent how energy moves from place to place in electric circuits and in waves. **NGSS PEs:** **Physical Sciences:** **4-PS3-1** **4-PS3-2** **4-PS3-3** **4-PS3-4** **4-PS4-1** **4-PS4-2** **4-PS4-3** **Earth and Space Sciences:** **4-ESS3-1** **ETAS:** **3-5-ETS1-1** **3-5-ETS1-2** **3-5-ETS1-3**	**PS3.A:** Definitions of energy **PS3.B:** Conservation of energy and energy transfer **PS3.C:** Relationship between energy and forces **PS3.D:** Energy in chemical processes and everyday life **PS4.A:** Wave properties **PS4.B:** Electromagnetic radiation **PS4.C:** Information technologies and instrumentation **ESS3.A:** Natural resources **ETS1.A, 1.B, and 1.C**	• Asking questions and defining problems • Developing and using models • Planning and carrying out investigations • Analyzing and interpreting data • Using mathematics and computational thinking • Constructing explanations and designing solutions • Engaging in argument from evidence • Obtaining, evaluating, and communicating information	• Patterns • Cause and effect • Systems and system models • Energy and matter
 Earth Science	In the Soils, Rocks, and Landforms module, students plan and carry out investigations by incrementally changing specific environmental conditions to determine the impact of changing the variables of slope and amount of water in stream tables. Students analyze and interpret data from diagrams and visual representations to build explanations from evidence and make predictions of future events. They develop model mountains and represent the landforms from different perspectives to look for change. Students gain experiences that will contribute to understanding of the crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; systems and system models; and stability and change. **NGSS PEs:** **Earth and Space Sciences:** **4-ESS1-1** **4-ESS2-1** **4-ESS2-2** **4-ESS3-2** **ETAS:** **3-5-ETS1-2**	**ESS1.C:** History of planet Earth **E:SS2.A:** Earth materials and systems **ESS2.B:** Plate tectonics and large-scale system interactions **ESS2.E:** Biogeology **ESS3.B:** Natural hazards **ETS1.B:** Developing possible solutions	• Asking questions and defining problems • Developing and using models • Planning and carrying out investigations • Analyzing and interpreting data • Using mathematics and computational thinking • Constructing explanations and designing solutions • Engaging in argument from evidence • Obtaining, evaluating, and communicating information	• Patterns • Cause and effect • Scale, proportion, and quantity • Systems and system models • Stability and change • Energy and matter
 Life Science	In the Senses and Survival Module, students plan and carry out investigations with stimulus and response to gather data to develop models and construct explanations. Students design physical models to understand how structures in a system function together to provide information and resources to organisms to support survival. Students gain experiences that will contribute to the understanding of these crosscutting concepts: cause and effect; systems and system models; and structure and function. **NGSS PEs:** **Life Sciences:** **4-LS1-1** **4-LS1-2** **ETAS:** **3–5-ETS1-1**	**LS1.A:** Structure and function **LS1.D:** Information processing	• Asking questions • Developing and using models • Planning and carrying out investigations • Analyzing and interpreting data • Using mathematics and computational thinking • Constructing explanations • Engaging in argument from evidence • Obtaining, evaluating, and communicating information	• Cause and effect • Systems and system models • Structure and function

NGSS 3-D Design Criteria

FOSS Pathways Evidence: Soils, Rocks, and Landforms

Instruction and Assessment

Use Phenomena/Problems

Materials provide relevant and authentic learning contexts through which students:

- engage as directly as possible with phenomena or problems to ask and answer their questions as well as questions from other sources
- have the potential to use the three dimensions to make sense of phenomena or design solutions to problems

Presence of Logical Sequence

Student learning across the three dimensions is:

- arranged in a logical sequence
- sufficient and appropriate for students to figure out the phenomena or problems

Anchor Phenomena 1
Pile of earth material on the schoolyard
Investigation 1, Parts 1-2

Inv. 1, Parts 1-2

Students observe, compare, and analyze four soil compositions to understand physical weathering of rocks.

Introduce the pile of earth material on the schoolyard phenomenon (pg. 40)

Students construct, revise, revisit and review the explanation of phenomenon (pgs. 45, 51, 62, 72)

Students have a sense-making discussion (pg. 60)

Soils and Weathering Module instructs on NGSS Performance Expectation: 4-ESS2-1, 4-ESS3-2, and 3-5-ETS1-2 (pgs. 2-5)

Conceptual Flow of Soils, Rocks, and Landforms Module (pgs. 6-7)

Developing the Phenomenon Storyline of pile of earth material on the schoolyard (pg. 31) through investigating

Part 1 - Soil Composition (pgs. 34-35)
Part 2 - Physical Weathering (pgs. 52-53)

Anchor Phenomenon 1
Revisiting pile of earth material on the schoolyard
Investigation 2, Parts 1-3

Inv. 2, Parts 1-3

Students use stream table investigations to understand erosion and deposition before using digital simulations to create evidence based flood mitigation observations.

Revisit the pile of earth materials phenomenon (pg. 88)

Students construct, revise, revisit and review the explanation of phenomenon (pgs. 94, 100, 108, 119 and 125)

Students have a sense-making discussion (pg. 94, 118 and 138)

Students finalize their explanation of revisiting material on the schoolyard phenomenon (pgs. 125 and 139)

Soils and Weathering Module instructs on NGSS Performance Expectation: 4-ESS2-1, 4-ESS3-2, and 3-5-ETS1-2 (pgs. 2-5)

Conceptual Flow of Soils, Rocks, and Landforms Module (pgs. 6-7)

Continuing the Phenomenon Storyline of pile of earth materials on the schoolyard (pg. 79) through investigating

Part 1 - Erosion and Deposition (pgs. 82-83)
Part 2 - Stream-Table Investigations (pgs. 102-103)
Part 3 - Reducing Erosion Impact (pgs. 126-127)

Anchor Phenomenon 2
Impact to Mount Saint Helens
Investigation 3, Parts 1-2

Inv. 3, Parts 1-2

Students build a topographic map to understand how to use USGS topographic maps to compare Mount St. Helens across time and discuss changes in stability to landforms.

Introduce the problem to be solved (pg. 152)

Students define the design problem (pgs.154, 160, 165 and 174)

Students have a sense-making discussion (pgs. 159 and 177)

Students finalize their explanation of impact of Mount St. Helens phenomenon (pg. 179)

Soils and Weathering Module instructs on NGSS Performance Expectation: 4-ESS2-1, 4-ESS3-2, and 3-5-ETS1-2 (pgs. 2-5)

Conceptual Flow of Soils, Rocks, and Landforms Module (pgs. 6-7)

Developing the Phenomenon Storyline of impact to Mount St. Helens (pg. 143) through investigating

Part 1 - Using Models and Topographic Maps (pgs. 146-147)
Part 2 - Mount St. Helens Case Study (pgs. 168-169)

Anchor Phenomenon 3
Earth-shaking events, Parts 1-2

Anchor Phenomenon 4
Rock layers, flat and tilted, Parts 1-2

Inv. 4, Parts 1-2

Students use latitude and longitude coordinates to analyze active volcanoes and large earthquake locations while gathering case study information to solve a rock-layer puzzle.

Introduce the anchor phenomenon-Earth-shaking events (pg. 190)

Students construct, revise, revisit and review the explanation of phenomenon and problem. (pg. 192, 194, 197, 204, 207, 211, 216 and 217)

Students finalize their explanation of earth-shaking events phenomenon (pg. 197)

Soils and Weathering Module instructs on NGSS Performance Expectation: 4-ESS2-1, 4-ESS3-2, and 3-5-ETS1-2 (pgs. 2-5)

Conceptual Flow of Soils, Rocks, and Landforms Module (pgs. 6-7)

Developing the Phenomenon Storylines of earth-shaking events (pg. 181) and rock layers, flat and tilted (pg. 181) through investigating

Part 1 - Mapping Earthquakes and Volcanoes (pgs. 184-185)
Part 2 - Interpreting Rock Layers (pgs. 198-199)

Purple = curricular embedded supports **Green = ongoing educator and student supports**

NGSS 3-D Design Criteria	FOSS Pathways Evidence: Soils, Rocks, and Landforms			
Instruction and Assessment	**Anchor Phenomena 1** **Pile of earth material on the schoolyard** **Investigation 1, Parts 1-2**	**Anchor Phenomenon 1** **Revisiting pile of earth material on the schoolyard** **Investigation 2, Parts 1-3**	**Anchor Phenomenon 2** **Impact to Mount Saint Helens** **Investigation 3, Parts 1-2**	**Anchor Phenomenon 3** **Earth-shaking events, Parts 1-2** **Anchor Phenomenon 4** **Rock layers, flat and tilted, Parts 1-2**
Students are Figuring Out Materials position students to make sense of phenomena and design solutions to problems by: • asking and answering questions that link learning over time • using the three dimensions to link prior knowledge and negotiate new understandings and abilities	**Elements of the FOSS Instructional Design Active Investigation - Figuring Out Phenomena (pgs. 12-13)** Materials position students to make sense of phenomena and design by eliciting metacognition on the following questions: • What evidence does the composition of soil provide about where it came from? (pg. 41) • What causes big rocks to break into smaller rocks? (pg. 58)	**Elements of the FOSS Instructional Design Active Investigation - Figuring Out Phenomena (pgs. 12-13)** Materials position students to make sense of phenomena and design by eliciting metacognition on the following questions: • What causes weathered rock pieces to move from one place to another? (pg. 88) • How does slope affect erosion and deposition? (pg. 114) • How do floods affect erosion and deposition? (pg. 114) • What solutions can we design to reduce the impact of erosion and deposition on human structures? (pg. 132)	**Elements of the FOSS Instructional Design Active Investigation - Figuring Out Phenomena (pgs. 12-13)** Materials position students to make sense of phenomena and design by eliciting metacognition on the following questions: • How can we represent the different elevations of a mountain? (pg. 153) • How did the mountain change and what caused the change? (pg. 175)	**Elements of the FOSS Instructional Design Active Investigation - Figuring Out Phenomena (pgs. 12-13)** Materials position students to make sense of phenomena and design by eliciting metacognition on the following questions: • Where do earthquakes and volcanoes occur around the world? (pg. 190) • What do rock layers and fossils tell us about the history of a place? (pg. 207)
Three-dimensional Performances Materials include assessments designed to: • match the targeted learning goals • elicit evidence of students' use of the three dimensions to make sense of phenomena and/or to design solutions to problems	Three-dimensional assessment of Performance Expectation ESS2.A: Earth materials and systems, ESS2.E: Biogeology • Part 1, Step 19 Assess progress: notebook entry (pg. 46) • Part 2, Step 14 Assess progress: response sheet (pg. 63) *I-Check 1-2* administered to assess student three-dimensions learning of Investigations 1 and 2 of Soils, Rocks, and Landforms Module (pg. 8)	Three-dimensional assessment of Performance Expectation ESS2.A: Earth materials and systems, ESS2.E: Biogeology, ESS3.B: Natural hazards, ETS1.B: Developing possible solutions • Part 1, Step 16 Assess progress: notebook entry (pg. 95) • Part 2, Step 18 Assess progress: response sheet (pg. 120) • Part 3, Step 12 Assess progress: performance assessment (pg. 136) *I-Check 1-2* administered to assess student three-dimensions learning of Investigation 1 and 2 of Reducing Erosion Impact Part 3, Step 21 Assess progress: I-Check (pg. 140) Next-step strategy for instruction (pg. 140)	Three-dimensional assessment of Performance Expectation ESS2.B: Plate tectonics and large-scale system interactions, ESS3.B: Natural hazards • Part 1, Step 21 Assess progress: response sheet (pg. 160) • Part 2, Step 2 Assess progress: performance assessment (pg. 174)	Three-dimensional assessment of Performance Expectation ESS2.B: Plate tectonics and large-scale system interactions, ESS3.B: Natural hazards, ESS1.C: History of planet Earth • Part 1, Step 18 Assess progress: notebook entry (pg. 195) • Part 2, Step 16 Assess progress: notebook entry (pg. 216) *Posttest* of Investigations 1-4 of Soils, Rocks, and Landforms administered prior to teaching the next Pathways Module, Part 2, Step 19 Assess progress: Posttest (pg. 218)

Purple = curricular embedded supports **Green = ongoing educator and student supports**

Recommended Scope and Sequence

FOSS Pathways

GRADE	PHYSICAL SCIENCE	EARTH SCIENCE	LIFE SCIENCE
PK		Observing Nature	
K	Materials and Forces	Trees and Weather	Animals Two by Two
1	Sound and Light	Changes in the Sky	Plants and Animals
2	Solids and Liquids	Water and Landforms	Insects and Plants
3	Motion	Water and Climate	Structures of Life
4	Energy	Soils, Rocks, and Landforms	Senses and Survival
5	Mixtures and Solutions	Earth and Sun	Living Systems

Learn more at **FOSSPathways.com**

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