The Grade 3–4

Variations and Adaptations kit components:

Materials and equipment—Each kit contains a set of high-quality materials and equipment for a class of 32 students. Consumable items are provided for two classes. Refill packages are available.

Teacher’s Guide—A comprehensive teacher’s guide provides easy-to-use, step-by-step instructions for presenting the unit. The guide includes a number of optional presentation approaches to meet the unique needs of your students.

Student Books—Eighteen copies of each of four student books are included with the kit.

Summative Assessment Booklet—Contains a set of pre-post assessments designed to enable teachers to measure student gains over the course of a unit.

Investigation Notebook—The Investigation Notebook can be duplicated, or additional copies may be purchased separately and provided to each student.

Copymaster Booklet—A copymaster booklet is provided in each kit with full-size copymasters, including transparencies, and student handouts.
What's in the Variation and Adaptation Unit?

*Variation and Adaptation* is 20 sessions in length. It immerses students in learning about foundational, standards-based life science concepts: variation, adaptation, heredity, relatedness, extinct organisms, and the fossil record. The unit has two investigations, each with 10 sessions. Firsthand activities and four original student books engage students in doing, talking, reading, and writing about key science concepts, inquiry abilities, and literacy skills. Students work to distinguish observations from inferences, master the reading comprehension skill of making inferences, gather evidence from observations and from text, and make scientific explanations using evidence. They also learn to write comparisons.

**Investigation 1: Comparing Living Things.** Students begin by reading *Blue Whales and Buttercups*, in which they learn about the variation among living things on Earth and about groups of related organisms with shared characteristics. Students investigate variation and relatedness in four-limbed animals and in birds by observing photographs and sound recordings. They write comparisons of different species and then compare and write about identical twins. As they read *The Code*, students practice making inferences based on observations and gather evidence from illustrations and captions. Students read about genes and inherited and acquired characteristics. They make observations and inferences about inherited characteristics in families of fruit flies. They identify inherited and acquired characteristics in others and themselves. The class is introduced to scientific explanations and makes and revises a scientific explanation about which species are closely related, based on evidence of shared characteristics and shared genes.

**Investigation 2: Evidence of Adaptation.** Students read *Mystery Mouths*, a book about how the mouths of different animals are adaptations that help them survive in their habitats. The class lists what living things need to survive and identifies adaptations of a living animal and a living plant that the teacher brings to class. Students make inferences about how animals’ mouth parts and limbs might be adaptations to help the animals survive. Students record observations of DVD segments showing different animals’ adaptations that help the animals avoid being eaten. Students then write a comparison of the adaptations of two of these animals. Students make scientific explanations about how an animal of their choice has many adaptations that help it survive. Students observe fossil replicas and make inferences about the organisms that left the fossils. They investigate photographs of trilobite fossils and make inferences about their habitats and then make scientific explanations about the trilobite's adaptations. They compare an extinct species with a related living species and write a paragraph comparing their adaptations. They read *Evidence from the Past*, about how paleontologists make inferences and explanations about extinct organisms by investigating fossils. To end the unit, students revisit materials from their previous investigations and discuss the unit’s guiding questions.
What Students Do

**Investigation 1: Comparing Living Things**
Students begin by reading *Blue Whales and Buttercups*. They observe photographs of animals and discuss the variation, then watch DVD segments showing how some of those animals use their limbs to move in different ways. Students observe photographs and audio recordings of birds and identify bird species that are related to one another. The class writes a comparison of two closely related species pictured in *Blue Whales and Buttercups*. They participate in a vocabulary routine, practice distinguishing observations from inferences, and make inferences based on observations of photographs. They activate their prior knowledge about heredity, then read the first half of *The Code*. The class observes a poster of a fruit fly family and discusses the variation and inherited traits they observe. Students then make inferences and draw what fruit fly young might look like given the characteristics of a set of parents. Students read the second half of *The Code* and make a Venn diagram showing the similarities (inherited characteristics) and differences (acquired characteristics) between identical twins. Students write comparisons of two identical twins. Then the class makes and revises a scientific explanation to answer the question “Are dolphins more closely related to tigers or to sharks?”

**Investigation 2: Evidence of Adaptation**
Students read *Mystery Mouths*, a book about how different animals’ mouths are adaptations for survival. Students observe a living animal and a plant, and the class lists characteristics of each that may be adaptations to help each species survive. Students then examine Mystery Feet cards and make inferences about how the different feet may help animals survive. Students record observations of DVD segments showing how different animals avoid being eaten. They write a comparison of two of the animals’ adaptations. Students search for evidence to support the claim that one species has many adaptations that help it survive. Students make inferences based on their observations of a variety of fossil replicas. Students read *Evidence from the Past*, about paleontologist Rodolfo Coria. They observe photographs of fossils of two different trilobite species and make inferences about their habitats. Students make a scientific explanation about the possible function of one of the trilobite species’ spines. Students write a comparison about the adaptations of an extinct species and a related living species. Each group of students examines a reminder artifact related to an activity from earlier in the unit and presents to the class, using unit vocabulary, about what they did and what they learned during the activity.
What Students Learn

**Investigation 1: Comparing Living Things**

Students learn that there is great variation among living things on Earth, but that living things share some characteristics. They learn that shared characteristics among living things are evidence of relatedness, and that all living things are made of cells—evidence that all living things are related. Scientists make comparisons to better understand living things, and there are specific ways to structure a written comparison. Scientists make inferences based on observations and on what they already know. Students learn that genes are a code that give instructions for making a living thing. People look different from each other because they inherit different genes, but shared genes are evidence of relatedness. All living things get their genes from their birth parents, so living things look like their parents in many ways. Variation exists among members of the same species, but members of a species all share some characteristics. Students learn that genes are in the cells of all living things, and that a living thing's characteristics are determined by its genes and by what happens during its life. Acquired characteristics are not passed on in genes. A scientific explanation consists of a claim, and evidence that supports the claim, and scientists sometimes revise their explanations based on new evidence.

**Investigation 2: Evidence of Adaptation**

Students learn that all living things have body parts and behaviors called adaptations that help them survive in their habitats, and that animal mouths are adaptations to eat certain kinds of food. Readers use evidence from reading, photos, captions, and illustrations to make inferences. Students learn that all living things need air, food, water, shelter, and space in order to survive, and adaptations can include behaviors as well as structures. They learn that different living things meet the same needs with very different adaptations, and similar body parts in different related species can be adapted to meet different needs. Because each species’ habitat is different, each species has different adaptations, and these adaptations help the species survive. Scientists share their written explanations with each other. Students learn that fossils are evidence of living things that lived long ago. Scientists make inferences about the plants and animals that left the fossils. Students learn that living species are related to extinct species, and that scientists compare related extinct and living species in order to learn more about both species. Paleontologists ask questions about life in the past, use fossils as evidence, make inferences about extinct species’ adaptations, and work within the scientific community to share ideas and knowledge.
About the Student Books

Below are short descriptions of the four full-color *Variation and Adaptation* student science books.

**Blue Whales and Buttercups** invites students to consider the diversity of life on Earth. The photographs and informative captions in the book show many examples of ways in which organisms are different; the text explains that living things can differ in size, how they move, and how they protect themselves. At the same time, living things also share many characteristics, and these similarities help scientists classify organisms into groups. The book provides context for the unit through a virtual tour of some of the amazing living things on Earth. It provides many examples of characteristics for students to draw upon in order to understand that living things are different in many ways and the same in others.

**The Code** introduces students to the science of genetics in an accessible way. The book explains that individual characteristics are the result of the combined DNA “code” that people get from their birth parents. The book discusses the difference between *inherited* and *acquired* characteristics, providing several familiar examples. One example is that of identical twins who have the same genetic code but are distinguishable because of their different life experiences. The theme of variation and relatedness is extended throughout this book as students consider what characteristics all humans have and which characteristics make each of us unique. This book provides students with important science information about cells and genes that is hard to observe firsthand in the classroom.
Mystery Mouths introduces students to the concept of adaptations by providing them with the opportunity to examine the characteristics of various animal mouths. First the students are shown a mouth and asked to examine it. They then turn the page and learn what kind of animal has such a mouth, and what these mouth adaptations allow the animal to do. The students also examine skulls and animals with similar mouth structures and compare how they are similar and different. The structure of this book makes it an ideal text for students to practice and use the science and comprehension skills they’ve been learning thus far—examining the visual evidence offered by the skulls in the book and making inferences based on this evidence.

Evidence from the Past introduces students to the work of the Argentinean paleontologist Rodolfo Coria. By reading about Professor Coria and his work, students get a glimpse of what an actual paleontologist does and how paleontologists use evidence to make inferences that help to explain how species lived long ago. The book follows Coria as he makes a series of discoveries about two important dinosaurs found in Argentina. It focuses on Coria’s evidence collecting through his fossil discoveries and the scientific explanations he constructs along the way as he reviews his evidence and revises his explanations based on new fossil evidence he finds. This book models both the nature and practices of science through following Professor Coria and his work.
### INVESTIGATION 1
Comparing Living Things

#### At-a-Glance Chart

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<td><strong>WEEK 1</strong></td>
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<td>1.1</td>
<td>Blue Whales and Buttercups</td>
<td><strong>Science</strong>&lt;br&gt;- there is great variation among living things on Earth&lt;br&gt;- shared characteristics among living things show evidence of relatedness&lt;br&gt;- all living things are made of cells, which is evidence that all living things are related&lt;br&gt;- all four-limbed animals are related and share some characteristics&lt;br&gt;- there is also variation among four-limbed animals&lt;br&gt;- the variation of characteristics in animals makes it possible for them to move around in different ways&lt;br&gt;- there is variation among birds&lt;br&gt;- all birds are related and share some characteristics&lt;br&gt;- some birds are more closely related to each other than to other birds&lt;br&gt;- an inference is something you figure out based on evidence&lt;br&gt;- shared characteristics among living things show evidence of relatedness&lt;br&gt;- making inferences is an important comprehension strategy&lt;br&gt;- some characteristics can be difficult to classify as inherited or acquired&lt;br&gt;- a living thing’s characteristics are determined by its genes&lt;br&gt;- people look different from each other because they inherit characteristics—from their parents&lt;br&gt;- scientists observe the characteristics of organisms using the sense of touching as well as the sense of sight&lt;br&gt;- scientists learn about living things by observing and comparing them&lt;br&gt;- scientists make comparisons to better understand living things&lt;br&gt;- scientists make inferences based on observations</td>
<td><strong>Unit-specific</strong>&lt;br&gt;- characteristic&lt;br&gt;- related&lt;br&gt;- species&lt;br&gt;- variation</td>
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<td>1.2</td>
<td>Observing Variation and Relatedness</td>
<td><strong>Science Inquiry</strong>&lt;br&gt;- compare evidence&lt;br&gt;- make inferences&lt;br&gt;- explain something or answer a question&lt;br&gt;- scientists learn about living things by observing and comparing them&lt;br&gt;- scientists sometimes revise their explanations based on new evidence</td>
<td><strong>Session</strong>&lt;br&gt;- investigating scientific questions&lt;br&gt;- using features of informational text to locate information&lt;br&gt;- comparing and contrasting&lt;br&gt;- making observations&lt;br&gt;- searching for evidence&lt;br&gt;- sorting and classifying based on evidence&lt;br&gt;- accessing and applying prior information&lt;br&gt;- making inferences</td>
<td><strong>Making connections</strong>&lt;br&gt;- making inferences&lt;br&gt;- accessing and applying prior knowledge&lt;br&gt;- discussing words and their meanings&lt;br&gt;- recognizing text genres&lt;br&gt;- making inferences</td>
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| **WEEK 2** | | | | |
| 1.6 | The Code: Part 1 | **Science**<br>- there is great variation among living things on Earth<br>- shared characteristics among living things show evidence of relatedness<br>- all living things are made of cells, which is evidence that all living things are related<br>- all four-limbed animals are related and share some characteristics<br>- there is also variation among four-limbed animals<br>- the variation of characteristics in animals makes it possible for them to move around in different ways<br>- there is variation among birds<br>- all birds are related and share some characteristics<br>- some birds are more closely related to each other than to other birds<br>- an inference is something you figure out based on evidence<br>- shared characteristics among living things show evidence of relatedness<br>- making inferences is an important comprehension strategy<br>- some characteristics can be difficult to classify as inherited or acquired<br>- a living thing’s characteristics are determined by its genes<br>- people look different from each other because they inherit characteristics—from their parents<br>- scientists observe the characteristics of organisms using the sense of touching as well as the sense of sight<br>- scientists learn about living things by observing and comparing them<br>- scientists make comparisons to better understand living things<br>- scientists make inferences based on observations | **Unit-specific**<br>- characteristic<br>- related<br>- species<br>- variation | **Session**<br>- investigating scientific questions<br>- using features of informational text to locate information<br>- comparing and contrasting<br>- making observations<br>- searching for evidence<br>- sorting and classifying based on evidence<br>- accessing and applying prior information<br>- making inferences | **Making connections**<br>- making inferences<br>- accessing and applying prior knowledge<br>- discussing words and their meanings<br>- recognizing text genres<br>- making inferences | **Making connections**<br>- comparing and contrasting<br>- gathering information<br>- using science vocabulary<br>- drawing conclusions<br>- making connections<br>- participating in discussions<br>- recording information<br>- consulting multiple sources<br>- supporting claims with evidence<br>- building on others’ ideas<br>- organizing information<br>- listening actively<br>- writing to communicate |
| 1.7 | Inherited Characteristics in Fruit Flies | **Science Inquiry**<br>- compare evidence<br>- make inferences<br>- explain something or answer a question<br>- scientists learn about living things by observing and comparing them<br>- scientists sometimes revise their explanations based on new evidence | **Session**<br>- investigating scientific questions<br>- using features of informational text to locate information<br>- comparing and contrasting<br>- making observations<br>- searching for evidence<br>- sorting and classifying based on evidence<br>- accessing and applying prior information<br>- making inferences | **Making connections**<br>- making inferences<br>- accessing and applying prior knowledge<br>- discussing words and their meanings<br>- recognizing text genres<br>- making inferences | **Making connections**<br>- comparing and contrasting<br>- gathering information<br>- using science vocabulary<br>- drawing conclusions<br>- making connections<br>- participating in discussions<br>- recording information<br>- consulting multiple sources<br>- supporting claims with evidence<br>- building on others’ ideas<br>- organizing information<br>- listening actively<br>- writing to communicate | **Making connections**<br>- comparing and contrasting<br>- gathering information<br>- using science vocabulary<br>- drawing conclusions<br>- making connections<br>- participating in discussions<br>- recording information<br>- consulting multiple sources<br>- supporting claims with evidence<br>- building on others’ ideas<br>- organizing information<br>- listening actively<br>- writing to communicate |
### Science Knowledge/Conceptual Vocabulary

#### Session 2.1
- **Science**
  - all living things have body parts and behaviors called adaptations that help them survive in their habitat
  - animal mouths are adapted to eat certain kinds of food
  - all living things need air, food, water, shelter, and space in order to survive
  - adaptations can include behaviors as well as structures
  - different living things meet the same needs with different adaptations
  - similar body parts in related species, such as the feet of four-limbed animals, can be adapted to meet different needs
  - different species have different adaptations that help them avoid being eaten
  - a species’ habitat includes other species, some of which may be dangerous to the species
  - because each species’ habitat is different, each species has different adaptations
  - one species has many adaptations, each of which helps it meet a different survival need

#### Session 2.2
- **Science**
  - extinct species are related to living species
  - most of the species of living things that have ever lived are species that are extinct no longer live on Earth

#### Session 2.3
- **Science**
  - adaptations can include behaviors as well as structures
  - different living things meet the same needs with different adaptations
  - similar body parts in related species, such as the feet of four-limbed animals, can be adapted to meet different needs
  - different species have different adaptations that help them avoid being eaten
  - a species’ habitat includes other species, some of which may be dangerous to the species
  - because each species’ habitat is different, each species has different adaptations
  - one species has many adaptations, each of which helps it meet a different survival need

#### Session 2.4
- **Science**
  - comparing similar words is a way to better understand both words
  - comparing similar words is a way to better understand both meanings

#### Session 2.5
- **Science**
  - comparing similar words is a way to better understand both words
  - comparing similar words is a way to better understand both meanings

### Science Inquiry/Reading Comprehension

#### Inquiry
- investigating scientific questions
- making observations
- accessing and applying prior knowledge
- making explanations from evidence
- making inferences
- summarizing findings
- making predictions
- recording data
- organizing and representing data
- communicating information orally

#### Reading
- interpreting visual representations
- making inferences
- accessing and applying prior knowledge
- making connections
- discussing words and their meanings

### Nature and Practices of Science/Oral and Written Discourse

#### How Science Works, What Scientists Do
- scientists identify body parts and behaviors of living things that help living things survive
- scientists organize comparisons using a predictable format that is clear, focused, and organized
- scientists write comparisons in order to share ideas, spark discussion, and get feedback from others to revise their thinking
- scientists work within a scientific community to share knowledge and ideas
- scientists share their explanations with one another

#### Writing, Listening/Speaking
- recording information
- using science vocabulary
- making connections
- drawing conclusions
- participating in discussions
- gathering information
- summarizing
- writing to communicate
- organizing information
- comparing and contrasting
- listening actively
- supporting claims with evidence
- presenting information

### WEEK 3

#### 2.1 Mystery Mounds
- Science Inquiry, Page 164

#### 2.2 Investigating Adaptations for Survival
- Science Inquiry, Page 178

#### 2.3 Observing Adaptations
- Science Inquiry, Page 194

#### 2.4 Comparing Adaptations
- Literacy Development, Page 206

#### 2.5 Making Sense of Adaptation
- Science/Literacy, Page 218

### WEEK 4

#### 2.6 Investigating Fossils
- Science Inquiry, Page 228

#### 2.7 Making Explorations with Fossil Evidence
- Science Inquiry, Page 240

#### 2.8 Evidence from the Past
- Reading, Page 254

#### 2.9 Comparing Living and Extinct Species
- Literacy Development, Page 266

#### 2.10 Reflecting on Variation and Adaptation
- Science/Literacy, Page 280