Teaching

Science Gets It Wrong

Interest Level: Grades 4–6
Reading Level: Grade 4

LERNER SOURCE™

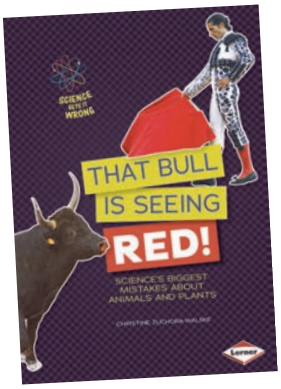
Titles in this series:

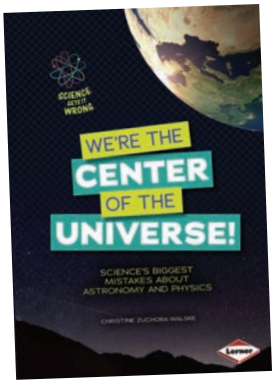
Let's Make Some Gold! Science's Biggest Mistakes about Geology and Ecology

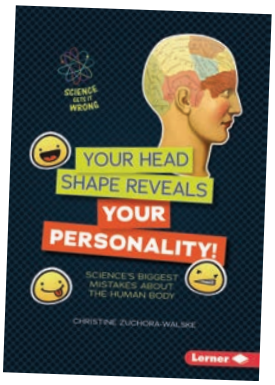
That Bull Is Seeing Red! Science's Biggest Mistakes about Animals and Plants

We're the Center of the Universe! Science's Biggest Mistakes about Astronomy and Physics

Your Head Shape Reveals Your Personality! Science's Biggest Mistakes about the Human Body







Standards

Next Generation Science Standards

4-ESS1-1: Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.

4-PS4-2: Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.

LS1.A: Structure and Function—Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

LS1.D: Information Processing—Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.

Common Core State Standards

W.4.3 Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.

Multiple Intelligences Utilized

Bodily-kinesthetic, Interpersonal, intrapersonal, linguistic, visual-spatial

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Lesson 1
Personal Narrative

Purpose
Students will write personal narratives.

Materials
- Science Gets It Wrong series
- writing paper

Prepare
- Think of a notable time you learned or discovered something new. Perhaps you recall the first time you realized Earth is round, when you discovered an unknown hideaway in your home or local park, or when you realized not everyone in the world speaks the same language. Choose a memory that has stuck with you through the years. Then prepare to share this memory with your students.

Pretest
- How can you tell you're reading a story?
- What have you learned this year?
- What kinds of things have you learned outside of school?
- What have you discovered this year?
- Who have you told about the things you've learned and discovered?

Introduction
- Tell students a story about a time you learned or discovered something new. Give students as much detail about the experience as possible. Where were you? How old were you? Did you make the discovery on your own? If so, what led to your discovery? Did someone else teach you about something new? If so, who was it? What did it feel like to learn something new?
- Explain to students that in this unit, they will be learning about people who made discoveries that have shaped the way humans see the world.

Read
- Choose a book from the Science Gets It Wrong series. Read three or four spreads aloud to students.
- After reading each spread, ask students the following questions:
  - What were these pages about?
  - What did scientists once believe?
  - Who (or what) changed people's minds?
  - What discovery changed the way people understood this topic?
  - How long did it take for other people to accept the discovery?

Model
- Tell students that they will be writing about a time that they made a discovery or learned something new.
- Write or display these questions on the board:
  - Where were you when you made your discovery/learned something new? Describe the scene.
  - When did you make your discovery? How old were you?
  - Did you make the discovery on your own?
  - If so, what led to your discovery?
  - Did someone else teach you about something new? If so, who was it?
  - What did it feel like to learn something new?
- Tell students that their writing should answer all of these questions. They should give as much detail as they can.
- Next, write the story you shared during the introduction on the board. As you write, model using the questions as a guide for your writing.

Practice
- Ask students to turn to a partner to brainstorm a time that they've discovered or learned something new.
- Then pass out writing paper.
- Ask students to write personal narratives about their discoveries. Their narratives should answer the questions displayed on the board.

Discuss
- What discoveries did you write about?
- How do you think the scientists felt when they made their discoveries or learned new things?
- Why is it important to learn about our world?

Evaluate
- Review student writing. Evaluate based on students' responses to the displayed questions. Consider students' grammar, phrasing, and use of descriptive language as well.

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Lesson 2
Modeling an Eye

Purpose
Students will create a model of an eyeball to support their understanding of human sight.

Materials
- *That Bull Is Seeing Red! Science's Biggest Mistakes about Animals and Plants*
- mirrors (one per student)
- Styrofoam balls (one per student)
- pipe cleaners (one per student)
- black, brown, gray, blue, green, and red markers

Pretest
- What is an eye?
- What does an eye do?
- What does an eye look like?
- How does an eye work?

Read/Model
- From *That Bull Is Seeing Red! Science's Biggest Mistakes about Animals and Plants,* read "Blind as a Bat" (pp. 18–19) and "Seeing Red" (pp. 24–25).

Discuss
- What did scientists think about bats?
- What do we now know about how bats see?
- What did people once believe about bulls?
- What do we now know about the eyesight of bulls?
- What do these two stories have in common?

Activity
- Explain to students that most animals have eyes. Eyes all work in a similar way.
- Tell students that they will be making models of eyeballs to learn about how eyes help us see.
- Give each student the following:
  - one mirror
  - one Styrofoam ball
  - one pipe cleaner
  - one black marker and one red marker
  - one brown, gray, blue, or green marker
- Then lead students in completing the following tasks:
  1. First, look at your eye in the mirror. Find the black dot in the middle of your eye. This is called the pupil. A pupil is a small hole in your eye that lets in light. Use the black marker to draw a black pupil on the Styrofoam ball.
  2. Next, look in the mirror to find the color around your pupil. This is called the iris. The iris opens and closes to change the amount of light that goes into your eye. When it is dark, the iris opens to make your pupil larger so that it can take in more light. When it is bright, the iris closes to limit the amount of light that comes in. Use your colored marker to draw an iris around the pupil on the foam ball.
  3. When you finish, look to your left, then to your right and then up and down. Muscles around your eyeball help your eye move. These muscles are inside your head. You can't see them! Use the red marker to draw red muscle lines on the sides of your foam ball.
  4. When light goes through your pupil and into your eye, your retina focuses the light. The retina sends this information through a nerve that connects to your brain. Then your brain makes sense of the light information, helping us to see! Push a pipe cleaner through the back of the foam ball. This is the optic nerve. You've made a model of a working eye.

Discuss
- Which part of the eye lets in light?
- Which part of the eye changes how much light goes into the eye?
- Which part of the eye helps us look all around?
- Which part of the eye sends information to our brains?
- Why is it important to know how our eyes work?

Evaluate
- Review students' eye models for accuracy and completion.

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Lesson 3
A Changing World

Purpose
Students will use sedimentary rocks to learn about the past.

Materials
- snacks, such as crackers, nuts, granola bars, chocolate, and so on
- wax paper
- heavy objects such as textbooks
- a plastic bag or container
- *Let's Make Some Gold! Sciences' Biggest Mistakes about Geology and Ecology*
- 5 or more sedimentary rocks

Prepare
- The day before, collect a few foods you might snack on during the day such as crackers, chocolate, and a granola bar. Place some of these items in a small pile on a piece of wax paper. Cover the pile with another sheet of wax paper and then stack several heavy objects on top. Press down on the objects to mush the snacks together into one mass. Store the mass in a plastic bag or container until the lesson.

Pretest
- What is a rock?
- How are rocks made?
- What is a sedimentary rock?
- What can we learn from rocks?

Read
- From *Let's Make Some Gold! Sciences' Biggest Mistakes about Geology and Ecology,* read "Earth Is Old—No, It's Young—No, It's Old!" (pp. 18–19) and "Watery World" (pp. 20–21).

Discuss
- What did scientists learn from rocks?
- What clues did the rocks give?
- What is sediment?
- What is a sedimentary rock?

Model
- Explain to students that rocks can tell us about the history of a location. In this lesson, students will be learning about sedimentary rocks.

1. Show students a collection of snacks you might eat in a given day. For example, you might have a few crackers, some nuts, and a bit of chocolate.
2. Ask students to imagine that after you had your snack, you threw away the leftover food.
3. Place the food on a piece of wax paper.
4. Explain that after you threw away the leftovers, other things were thrown into the trash can on top of the food. The other things in the trash can started pushing down on your leftovers.
5. Cover the leftovers with another piece of wax paper. Then place several heavy objects, such as heavy textbooks, on top of the paper. Press down on the heavy objects.
6. Explain to students that pressure from other objects pushed your leftovers together into one solid mass.
7. Remove the heavy objects and the top layer of wax paper. Show students the crushed snacks, which should be crumbled and stuck to one another.
8. Next, reveal the crushed snacks you prepared before the lesson. Tell students that this was made from yesterday's snack leftovers. Ask students to make guesses about what you had for a snack yesterday. They should refer to the crumbled mass for clues. Write students' guesses on the board.
9. Ask students how they were able to figure out what snacks you had yesterday. Explain that just like your mass of leftovers, sedimentary rocks are made when things (shells, dirt, and dead plants) pile up and then get pressed together.

Activity
- Break students into small groups.
- Give each group one sedimentary rock to examine.
- What do they see in their rocks? What clues about the past does each rock have?
- Allow students time to examine and make inferences about their rocks.

Discuss
- What is a sedimentary rock?
- How are sedimentary rocks made?
- What can we learn from sedimentary rocks?
- Why is it important to know about sedimentary rocks?

Evaluate
- Gather informal data from class discussions to measure engagement and understanding.

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Lesson 4
All Living Things

Purpose
Students will find similarities between humans and other animals.

Materials
- *Your Head Shape Reveals Your Personality! Science's Biggest Mistakes about the Human Body*
- Internet access or access to a school library
- Comparing Animals p. 7

Pretest/Review
- What is an animal?
- What animals do you see every day?
- What do all animals have in common?
- How are humans similar to one another?
- How are humans similar to dogs?
- How are humans similar to lizards?
- How are humans similar to birds?

Read/Review
- From *Your Head Shape Reveals Your Personality! Science's Biggest Mistakes about the Human Body,* read "Your Eyes Are Headlights" (pp. 12–13) and "Humans Evolved from the Apes You See at the Zoo" (pp. 28–29).

Discuss
- Remind students that humans are animals. Because we are animals, we have a lot in common with other animals.
- What animals did we learn about in this book?
- What are a few other examples of animals?
- How are humans similar to each of these animals?

Model
- Display Comparing Animals p. 7 on the board.
- Pass out two copies of Comparing Animals p. 7 to each student.
- Draw a picture of yourself in the box labeled Human. Then write the name of an animal above the other box.
- Out loud, think of a few ways humans are similar to this animal. You might begin by focusing on senses they both share, such as sight, or shared physical features, such as having two legs. Lead students in writing these similarities on the sheet.
- Then ask students to volunteer their own ideas about how humans are similar to the animal. Lead students in writing these similarities on the sheet as well.
- Finally, give students a few minutes to write down any of their own ideas to complete the Comparing Animals page.
- When students finish, collect their completed pages.

Independent Practice
- On the second Comparing Animals p. 7 sheet, have students draw pictures of themselves in the box labeled Human. Then ask students to think of an animal they like or are very familiar with. Students should write the type of animal above the other box.
- Give students time to find at least five similarities between themselves and their chosen animals. If students would like to learn more about the animal to aid their comparisons, allow them to search online or browse books in the library.
- When students finish, collect their completed pages.

Discuss
- What animals did you compare to humans?
- What similarities did you find?
- Why do you think it's important to know how humans are similar to other animals?

Evaluate
- Review the Comparing Animals p. 7 sheets completed during Independent Practice for accuracy and completion. Check that students have found at least five unique similarities.

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Lesson 5
Learning about Planets

Purpose
Students will choose and research a planet in our solar system.

Materials
- *We're the Center of the Universe! Science's Biggest Mistakes about Astronomy and Physics*
- Planet Project p. 8

Prepare
- Print copies of Planet Project p. 8.
- Write students' names on the top of the project sheets as well as the name of a planet in our solar system. Assign planets evenly so that each planet is well-represented during student presentations.

Pretest/Review
- What is a planet?
- What are the planets in our solar system?
- What planet do we live on?
- What do you know about each of the planets?

Read/Review
- From *We're the Center of the Universe! Science's Biggest Mistakes about Astronomy and Physics,* read "We're the Center of the Universe!" (pp. 6–7), "Those Goofy Wandering Stars" (pp. 8–9), "Beware the Martian Hordes!" (pp. 12–13), and "Poor Little Pluto" (pp. 14–15).

Discuss
- What do these pages have in common? What do they all talk about?
- What is a solar system?
- How many planets are in our solar system?
- What planets are in our solar system?

Project
- Explain to students that they will each research a planet in our solar system.
- Pass out the assignment sheets.
- Review project requirements, expectations, and the presentation due date with students.

Presentation
- On the day of the presentations, allow each student three to five minutes to share planet information with students.

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Name _____ Date _____

Comparing Animals

Studying other animals can help us learn more about humans. Draw a picture of yourself in the box labeled Human. Then choose an animal. Label the right-hand box and draw a picture of this animal in the box. On the lines below, write at least five ways that this animal is similar to humans. Be creative!

Human	_____

_____

_____

_____

_____

_____

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Name _____ Date _____

Planet Project

Name of Assigned Planet: _____

Research your assigned planet. Then prepare a three- to five-minute presentation that answers the following questions:

- What is the name of your planet?
- When did scientists first discover this planet?
- How far is this planet from the sun?
- How far is this planet from Earth?
- How big is this planet?
- Does this planet have any moons? If so, how many moons? What are their names?
- What does this planet look like?
- What is the atmosphere of this planet like?
- What myths or stories have been told about this planet?
- What are three interesting facts about your planet?

Students should have at least one visual aid for their presentation. A PowerPoint presentation or model is recommended.

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