

Parrots, Penguins, and Parts

Homologous Structures

Teresa Randall
Published by *K20 Center*

This work is licensed under a Creative Commons CC BY-SA 4.0 License

Grade Level	8th Grade	**Time Frame**	3-4 class period(s)
Subject	Science	**Duration**	180 minutes

Essential Question

How do scientists determine relationships between today's organisms and their ancestors using their physical appearance and characteristics?

Summary

This lesson has students compare anatomical similarities and differences between organisms and explain the relationship between organisms based on homologous structures. Students first watch a video about a giant parrot and read an article about a giant penguin, then explore the ancient roots of modern-day birds in a game about evolutionary traits. Students will discuss how homologous structures are a source of evolution then examine x-rays of mammal bone structures. To summarize their learning, students will develop a Claim, Evidence, and Reasoning (CER) conclusion about evolutionary relationships.

Snapshot

Engage

Students evaluate their prior knowledge about parrots or penguins using a How I Know It handout then learn about recent research on parrots and penguins.

Explore

Students watch or play the science game "Flap to the Future" and draw a Cognitive Comic depicting an organism's evolutionary change.

Explain

Students analyze diagrams of similar mammalian bone structures and watch a video to deepen their understanding of homologous structures.

Extend

Students match x-rays of animal hands to the animal they belong to then develop a Claim, Evidence, Reasoning (CER) statement about the relationship between the animals based on their bone structures.

Evaluate

Students compare their previous knowledge of homologous structures to their new knowledge of homologous structures using the I Used to Think… But Now I Know strategy.

Standards

ACT College and Career Readiness Standards - Science (6-12)

EMI404: Identify similarities and differences between models
EMI503: Identify the strengths and weaknesses of models

Next Generation Science Standards (Grades 6, 7, 8)

MS-LS4-2: Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.

Oklahoma Academic Standards (8th Grade)

8.LS4.2 : Apply scientific ideas to construct an explanation for the patterns of anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer ancestral relationships.
8.LS4.2.1: Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record serve as evidence of ancestral relationships among organisms and changes in populations over time.

Attachments

- CER—Parrots, Penguins, and Parts - Spanish.docx
- CER—Parrots, Penguins, and Parts - Spanish.pdf
- CER—Parrots, Penguins, and Parts.docx
- CER—Parrots, Penguins, and Parts.pdf
- Cognitive Comics—Parrots, Penguins, and Parts - Spanish.docx
- Cognitive Comics—Parrots, Penguins, and Parts - Spanish.pdf
- Cognitive Comics—Parrots, Penguins, and Parts.docx
- Cognitive Comics—Parrots, Penguins, and Parts.pdf
- Hand It to the Animals—Parrots, Penguins, and Parts - Spanish.docx
- Hand It to the Animals—Parrots, Penguins, and Parts - Spanish.pdf
- Hand It to the Animals—Parrots, Penguins, and Parts.docx
- Hand It to the Animals—Parrots, Penguins, and Parts.pdf
- How I Know It—Parrots, Penguins, and Parts - Spanish.docx
- How I Know It—Parrots, Penguins, and Parts - Spanish.pdf
- How I Know It—Parrots, Penguins, and Parts.docx
- How I Know It—Parrots, Penguins, and Parts.pdf
- I Used to Think... But Now I Know—Parrots, Penguins, and Parts - Spanish.docx
- I Used to Think... But Now I Know—Parrots, Penguins, and Parts - Spanish.pdf
- I Used to Think... But Now I Know—Parrots, Penguins, and Parts.docx
- I Used to Think... But Now I Know—Parrots, Penguins, and Parts.pdf
- Lesson Slides—Parrots, Penguins, and Parts.pptx

Materials

- Lesson Slides (attached)
- How I Know It handout (attached; one per student)
- Cognitive Comics handout (attached; one per student)
- Hand It to the Animals handout (attached; one per student)
- Hand It to the Animals digital handout (linked; one per student)
- CER handout (attached; one per group of three students)
- I Used to Think... But Now I Know handout (attached; one per student)
- A Human-Sized Penguin Once Waddled Through New Zealand” article (linked; one per student)
- "Flap to the Future" online game (linked; optional)

- Markers
- Student devices with internet access (optional)

15 minutes

Engage

Use the attached **Lesson Slides** to guide the lesson. Introduce the title of the lesson using **slide 2**. Introduce the essential question on **slide 3** and ask students to consider possible responses to the question. Invite students to share out their responses and record them on the board or chart paper. Students will review these responses at the end of the lesson. Display **slide 4** and introduce the learning objectives.

Show **slide 5** and arrange students into small groups of three or four. Distribute one copy of the **How I Know It** handout to each group and have group members find two differently colored writing utensils. Use the How I Know It instructional strategy to have each group choose "parrot" or "penguin" then have them complete the handout using information about their chosen bird. Tell groups to record everything they know about their animal inside the circle. Have them record how they know that information outside the circle. This reasoning could include things they've read, movies they've seen, or visits to places like the zoo. Have them draw a line connecting what they know inside the circle to how they know it outside the circle.

Display **slide 6** and play the video, "Scientists Discover New Zealand's 'Squakzilla'." As students watch the video, have them add notes to their handout using a different color of writing utensil. Invite students to share out things they found interesting about the video.

Embedded video
https://youtube.com/watch?v=G4wbbxI9cLM

Teacher's Note: Article Access

This portion of the lesson has students read the article "A Human-Sized Penguin Once Waddled Through New Zealand." You may choose to either print off copies of the article and distribute paper copies to students, or have students navigate to the article online.

Display **slide 7** and divide students into groups of three. Have students read the article, "A Human-Sized Penguin Once Waddled Through New Zealand." Divide the article up among the students using the Jigsaw instructional strategy. Number students in each group from one to three. Have students assigned the number one read paragraphs 1–3, have students assigned the number two read paragraphs 4–6, and have students assigned the number three read paragraphs 7–9. As they read, have them add notes to their handouts using a different color of writing utensil. Have students share their notes with their group members after they finish reading.

After all groups are finished reading the article, invite students to share out what they found interesting about the article and the video.

10 minutes

Explore

"Flap to the Future" Alternative Activity

This phase of the lesson has students play a game individually on a student device. If you are short on time or students do not have access to individual devices, unhide **slide 9** and show students the video playthrough of "Flap to the Future" created using SafeShare. The video includes all four levels of the game. Students can then complete the Cognitive Comics activity while watching the video.

Pass out one copy of the **Cognitive Comics** handout to each student and display **slide 8**. Have students navigate to the "Flap to the Future" game using the link on the slide. Tell students that as they play the game, they should sketch the organism found in each level on their handouts. Remind students that their sketches do not need to be perfect, but they do have to illustrate the changes from one evolution to the next. Have students also record notes about body structures and movement.

After students have completed the game and their Cognitive Comics, show **slide 10**. Ask students the following questions present on the slide:

- Were there any differences between the organisms?
- Were there any similarities between the organisms?
- What did the game say about the relationship between the organisms?

Have students consider the questions individually then discuss their answers with an Elbow Partner. Invite a few volunteers to share out their answers. Lead a class discussion on student responses.

Student Responses

Students should arrive at the conclusion that modern-day birds have adapted over time and share many characteristics with dinosaurs.

15 minutes

Explain

Transition to **slide 11** and draw students' attention to the four images on the slide. Have students participate in Picture Deconstruction by describing what they see without interpreting it. **Do not** define or mention homologous structures or homology and **do not** describe the picture. Allow students to share out their descriptions. Ask students to then interpret the image and describe what they think it represents.

Display **slide 12** and show students the "Homologous Structures" video.

Embedded video

https://youtube.com/watch?v=VLi_PQ6-aK8

20 minutes

Extend

Hand It to the Animals Activity Alternatives

Alternative 1: This option has students access a Google Docs version of the activity. Unhide **slide 15** and have students navigate to the Hand It to the Animals Google Doc or post a copy to your LMS. A Spanish version of the Google Doc is also available. The link will have students make a copy of the document and edit it. Have students then complete the handout

Alternative 2: If you have limited technology access, print and distribute the **Hand It to the Animals** handout. Unhide **slide 16** and have students describe and identify the images on the slide using their handouts.

Show **slide 13** and ask students to imagine the nose of a pig, an elephant, and a human. Ask them to consider the questions present on the slide. Point out that these noses all have different functions and appearances, but they have similar structures and locations. Tell students that these are called homologous structures.

Display **slide 14** hand have students navigate to the Hand It to the Animals Sorting Cards activity using the URL on the slide. Have students complete the interactive Card Matching activity by matching animal names and functions to the correct x-ray image.

Teacher's Note: Activity Hints

To scaffold instruction, you may consider posing the following hints to students during the activity:

- The size of the x-ray isn't related to the size of the animal.
- Heavier animals have thicker bones because thicker bones can support more weight.
- Macaques and humans are both primates, but macaque hands have more padding because they move by swinging on branches.
- Bird bones are difficult to see in x-rays because they are very thin.
- The x-ray of a panda hand makes it look like it has five fingers and a thumb. The false thumb is a wrist bone extension that is used to strip leaves from bamboo.
- Sun bears are small in size. The x-ray shows a deformed front paw.

Student Answer Key

1. Human
2. Hyena
3. Lion
4. Macaque monkey
5. Sea lion
6. Sun bear
7. Owl
8. Zebra
9. Panda
10. Baboon

Transition to **slide 17** and invite students to respond to the following questions present on the slide:

- Which parts of this activity were easy?
- Which parts were difficult?
- What did you notice about the x-rays?

Discuss the challenges students faced with this activity. Ask students if there could have been more than one answer to any questions, particularly about function.

Display **slide 18**. Organize students into groups of three or less and give each group one copy of the attached **CER** handout. Invite each group to respond to the prompt, "What is the relationship between the animals? Base your claim on what you see in the x-rays," using the Claim, Evidence, Reasoning (CER) strategy. Have groups work together to complete the handout.

Invite volunteers to share their claims, evidence, and reasoning with the whole class.

10 minutes

Evaluate

Move to **slide 19** and give each student one copy of the attached **I Used to Think… But Now I Know** handout. Use the I Used to Think… But Now I Know instructional strategy to have students respond to the question on the slide and compare their thoughts prior to the lesson with their current thoughts. Encourage them to consider what they thought about the similarities, differences, and relationships between organisms before the lesson to what they know now. Have them record their thoughts prior to the lesson in the "I Used to Think" column and their current thoughts in the "But Now I Know" column. If they need help getting started, have them refer to their How I Know It handouts.

Additional Opportunities and Resources

The Museum of Osteology in Oklahoma City, OK and Sia: The Comanche Nation Ethno-Ornithological Initiative in Cyril, OK are additional resources you may consider exploring with your students.

Resources

- *Animal hand x-ray images*. (2021, February 21). 40two. https://40two.info/barge/ap/ip_images/Animal%20Hands%20X-ray%20Images/
- K20 Center. (n.d.). Card matching. Strategies. https://learn.k20center.ou.edu/strategy/1837
- K20 Center. (n.d.). Claim, evidence, reasoning (CER). Strategies. https://learn.k20center.ou.edu/strategy/156
- K20 Center. (n.d.). Cognitive comics. Strategies. https://learn.k20center.ou.edu/strategy/198
- K20 Center. (n.d.). Elbow partners. Strategies. https://learn.k20center.ou.edu/strategy/116
- K20 Center. (n.d.). How I know it. Strategies. https://learn.k20center.ou.edu/strategy/144
- K20 Center. (n.d.). I used to think . . . but now I know. Strategies. https://learn.k20center.ou.edu/strategy/137
- K20 Center. (n.d.). Jigsaw. Strategies. https://learn.k20center.ou.edu/strategy/179
- K20 Center. (n.d.). Photo or picture deconstruction. Strategies. https://learn.k20center.ou.edu/strategy/140
- K20 Center. (n.d.). SafeShare. Tech Tools. https://learn.k20center.ou.edu/tech-tool/4269
- K20 Center. (2019, October 17). *Flap to the future level 1* [Video]. YouTube. https://www.youtube.com/watch?v=w60cN5Spje4
- K20 Center. (2019, October 17). *Flap to the future level 2* [Video]. YouTube. https://www.youtube.com/watch?v=y7TTxlp5rHo
- K20 Center. (2019, October 17). *Flap to the future level 3* [Video]. YouTube. https://www.youtube.com/watch?v=9OHdPjLZwLE
- K20 Center. (2019, October 17). *Flap to the future level 4* [Video]. YouTube. https://www.youtube.com/watch?v=Kl17zFYRoaU
- Katz, B. (2019). A human-sized penguin once waddled through New Zealand. *Smithsonian Magazine*. https://www.smithsonianmag.com/smart-news/human-sized-penguin-once-waddled-through-new-zealand-180972904/
- MooMooMath and Science. (2023, November 1). *Homologous structures* [Video]. YouTube. https://www.youtube.com/watch?v=VLi_PQ6-aK8
- 1News. (2019, August 7). *Scientists discover New Zealand's 'Squakzilla', biggest parrot in history* [Video]. YouTube. https://www.youtube.com/watch?v=G4wbbxl9cLM
- Stewart, L. (2023, November 21). *Homologous structures: Definition, structure & characteristics*. Study.com. https://study-com.translate.goog/academy/lesson/homologous-structures-comparison-of-body-structures-across-species.html?_x_tr_sl=en&_x_tr_tl=es&_x_tr_hl=es&_x_tr_pto=wa
- The Cornell Lab of Ornithology. (n.d.). *Flap to the future—The flight adaptations game*. Bird Academy. https://academy.allaboutbirds.org/features/flaptothefuture/