Science Learning Packet

Grade 8:

Evolutionary History, Lesson 3

science learning activities for SPS students during the COVID-19 school closure.

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While Seattle Public Schools endeavors to only post documents optimized for accessibility, due to the nature and complexity of some documents, an accessible version of the document may not be available. In these limited circumstances, the District will provide equally effective alternate access.

Due to the COVID-19 closure, teachers were asked to provide packets of home activities. This is not intended to take the place of regular classroom instruction but will help supplement student learning and provide opportunities for student learning while they are absent from school. Assignments are not required or graded. Because of the unprecedented nature of this health crisis and the District’s swift closure, some home activities may not be accessible.

If you have difficulty accessing the material or have any questions, please contact your student’s teacher.
If you have access to an internet device at home, you can also watch the accompanying lesson video at https://youtu.be/zEkNJSGNsFM
Hello Families,

We hope you and your family are well and safe during this time. During this unprecedented out-of-school time, the SPS middle school science team will be offering instructional opportunities for students that align with the district’s adopted middle school science instructional materials.

This investigation packet is part of a series of district-aligned lessons for middle school science developed by AmplifyScience and adopted by SPS in 2019. While Amplify Science lessons are designed to be done in the classroom with peers, there are some activities that students can complete at home. In this packet you will find activities to accompany lessons in the unit. **Accompanying lesson videos are posted on the SPS Science webpage under their corresponding grade level.** These lesson videos, developed in collaboration between SPS teachers, Denver Public Schools teachers, and Amplify Science, feature teachers going through the information in the lessons. **The work in this packet is intended to be completed alongside the viewing of the video of the corresponding videos. To find the correct lesson videos go to SPS Science webpage,** scroll to your grade level, find the unit you are looking for, and select the video that matches the lesson you are completing that day.

For students who have access to the internet and the following devices and browsers **may wish to log-in to their AmplifyScience account from home are welcome to do so.** Chrome and Safari are the recommended browsers to use for full functionality of the Amplify digital tools and features.

Sincerely,

The Seattle Public Schools Science Department
Unit Question: Why do species, both living and extinct, share similarities and have differences?

Chapter 1 Question: Where in the museum does this fossil belong?

Lesson 3 Investigation Question: What body structures do humans share with blue whales?

Warm-Up:

Use what you have learned about examining body structures in order to practice identifying the shared body structures in two imaginary species.

Look at the body structures for both species, then select which body structures these two species share.

Shared structures are body structures that feature the same parts (for example, bones) in the same pattern and relative position in more than one organism.

1. Which body structures do these two species share?

   ____ backbone   ____ skull   ____ tail   ____ front limb   ____ back limb

2. Do you think the two species from the Warm-Up have any ancestors in common? Explain your thinking:

   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________

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New Vocabulary Words

descendant species: a more recent species that evolved from an ancestor population

common ancestor population: an older population from which two or more newer species descended

In Lesson 2, you read the article “How Are You Like a Blue Whale”. Below is a diagram of an Evolutionary Tree from this article. As you read through the diagram below, think about this question: Why do different species share similar structures?

Use this Evolutionary Tree to help you answer the questions below:

1. What are the descendants in this diagram?
   a. ______________________  
   b. ______________________

2. What body structures did the common ancestor have?
   a. ______________________  
   b. ______________________  
   c. ______________________  
   d. ______________________
3. What are the body structures that both descendants share with the common ancestor?
   a. __________________________
   b. __________________________
   c. __________________________
   d. __________________________

4. Why do paleontologists make diagrams like this? What are they trying to show?
__________________________________________________________________________________________
__________________________________________________________________________________________
__________________________________________________________________________________________

Humans and blue whales have many shared structures. Based on this information, paleontologists know that these species descended from a common ancestor population that also had those body structures.

Simulation: Tracing Structures in an Evolutionary Tree

If you have access to an internet device you can log-in to the Evolutionary History Sim in your Amplify account or follow along with Evolutionary History device, do this activity in the SIM.

Part 1: Tracing a Shared Body Structure

Goals:
• Explore Tree View of the Sim to answer the Investigation Question: Why do different species share similar structures?
• Find two different species with a shared body structure.

A. What body structure will you explore? (check one)
   □ c vertebral column (backbone)  
   □ jaws
   □ humerus/radius/ulna
   □ neck
   □ limbs with digits (toes, for example)

B. What two living species did you find that have this same body structure?
   Species 1: ________________________
   Species 2: ________________________

Do:
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1. Open the Sim in Free Explore mode and press TREE to open Tree View.
2. Navigate through the evolutionary tree and press each of the “i” icons on the tree branches as you go.
3. Read the text from each icon until you find the “i” icon that has the body structure you are exploring.
4. Follow the tree branches to the right of this icon to **find two living species that have this body structure.**
5. Try to find species that are very different from one another by expanding branches of the evolutionary tree at the bottom of the screen.

**If you don’t have access to a device, look at the image below to answer questions on the next page.**

Example: Trait – **jaws**

**Questions:**
1. List two different species that both have jaws (*teeth*).
   - Species 1 - ______________________________
   - Species 2 - ______________________________
2. Use words from the word bank to fill in the sentences below.

| Word Bank: | body structures | descendants | ancestors | a common ancestor population |

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Species inherit _____________________________ from ______________________________. If two living species have some of the same ______________________________, this means they are probably ___________________________ of _______________________________ that also had those _______________________________.

**Wrap-Up:** Let’s return to the two species they compared in the Warm-Up and attempt to determine what their common ancestor might have looked like.

**Compare body structures of these two *living* species.**

1. Which body structures do these two species share?

   ___ backbone   ___ skull     ____ tail       ___ front limb          back limb ___

2. Explain your answer choices. Describe the shared structures between the two living species and the fossil species that you chose. Be sure to say which fossil species you are describing.

   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
Many people know that humans and monkeys have many similarities. For example, monkeys and humans have similar arms, hands, feet, and skulls. Have you ever thought about how other animals might be like us, too?

Today, you will consider an organism that you may be surprised to find shares many similar body structures with humans: the blue whale. You will think about why humans could have shared body structures with another organism and about which specific body structures make you and blue whales a lot alike.
Warm-Up: Similar Structures in Different Species Compare the illustrations of bones in the two limbs below: the human arm and the cat front leg. Your teacher will also project an image where the bones are color coded to help you see similarities.

Describe all the ways in which the human arm and the cat’s front leg are similar.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

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________________________________________________________________________
1. Read and annotate the article “How You Are Like a Blue Whale.”

2. Choose and mark annotations to discuss with your partner. Once you have discussed these annotations, mark them as discussed.

3. Now, choose and mark a question or connection, either one you already discussed or a different one you still want to discuss with the class.

4. Answer the reflection question at the end of the article.

Active Reading Guidelines:
- Think carefully about what you read. Pay attention to your own understanding.
- As you read, annotate the text to make a record of your thinking. Highlight challenging words and add notes to record questions and make connections to your own experience.
- Examine all visual representations carefully. Consider how they go together with the text.
- After you read, discuss what you have read with others to help you better understand the text.

Blue whales are mammals and must come to the ocean’s surface to breathe.
How You Are Like a Blue Whale

If anybody tells you blue whales are the largest fish on Earth, they don’t know what they’re talking about. Blue whales may live in the ocean with fish, but they aren’t fish at all. There are many important differences between the body structures of whales and fish. Fish are covered in shiny scales, while whales have smooth skin. Fish lay eggs, while whales give birth to live young. Fish fins are made of many tiny bones, but whale flippers are supported by just a few bones. In fact, whales are mammals, just like dogs, elephants, and humans. Blue whales share many more body structures with you than they do with fish!

Just as whales and fish look similar but are actually very different, humans and blue whales look different but have a surprising amount in common. Mother whales produce milk for their babies, just as human mothers do. Like humans, whales have lungs instead of gills. Whales can’t breathe underwater: they must come to the surface to breathe.

And if you look at the bones in a human arm and the bones in a blue whale flipper, you can see that they fit together in similar ways. Blue whales even have leg bones, just like humans. However, in whales, these bones are so tiny that the skin, fat, and muscles of the whale’s body hide them. You might not call them real legs, but they are leftovers from a time when whales’ ancestors had legs and walked on land.

To figure out how two species are connected, scientists can study the skeletons of both species. Scientists studying present-day animals can use x-rays of living animals or sets of bones from animals that have died recently. Paleontologists studying species that are now extinct use fossils to compare species. Comparing skeletons tells us about how species are connected because organisms get their body structures the same way they get all their other traits. Body structures are determined by the code of DNA and are passed down from generation to generation over millions of years. By comparing the skeletons of different species, scientists can see patterns of how traits have been passed down. When two species’ body structures are made from bones that are in the same pattern and roughly the same position in the body, scientists consider them to be shared body structures. Shared body structures in two very different species can be evidence that both species evolved from a common ancestor population that had those body structures long ago.

The shared body structures found in a common ancestor population didn’t necessarily look very much like they do now. They may not even have been used for the same function! To see how two descendant species are connected, paleontologists examine the fossil record. In the case of whales and humans, they look for evidence of a species that had front limbs with the same pattern of bones, structures for producing milk, and lungs for breathing air. All of these things are true of both whales and humans today.

Paleontologists have used evidence from fossils, DNA, and other sources to conclude that the common ancestor of whales, humans, and all other mammals was a tiny animal that lived about 65 million years ago. Fossils from that time show evidence of mouse-like creatures that had four legs with claws, long tails, and long noses good for sniffing out insects. Similarities in body structures allow paleontologists to infer that whales, humans, and all other mammals evolved from a common ancestor similar to this tiny animal, even though it looked very little like blue whales or humans do today.
Interpreting Evolutionary Trees

Humans and blue whales have many shared structures. Based on this information, paleontologists know that these species descended from a common ancestor population that also had those body structures.

Whales, humans, and other mammals alive today are all descendants of a common ancestor population that lived about 65 million years ago. Paleontological artists use what they know about the skeletons of these animals to...
Just as whales have lost the function of their back legs, but still have remnants of the bones, you also have old structures that have lost one or more of their functions. For example, our ancestors had tails, and we still have short tailbones in the place where tails would be. The bone structures and other traits we share with whales provide evidence of our shared evolutionary history: the ancestor population we have in common, from which we both evolved.

If you think about it, you can come up with structures that we share not only with whales, but with a lot of other animals, too. Can you think of all the animals that have a skull, eyes, teeth, and a backbone? All living things are related and share some basic traits like cell structure and DNA. By looking at evidence in the fossil record, scientists have learned that all living things inherited cell structure from the very first single-celled organisms on Earth.

That population of single-celled organisms is a common ancestor we share with all other cellular life on the planet! Humans, whales, fish, and billions of different species all evolved from a common ancestor population that was made of just one tiny cell and lived about 4 billion years ago. The family of living things is much greater than we could have imagined, connecting us not only to close relatives such as whales and other mammals, but also to fish, worms, plants, bacteria, and all other life on Earth. We all share a common evolutionary history.

Reading Questions:

1. What is something about the text you thought is important?

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________

2. What bone structures are similar between both blue whales and humans?

____________________________________________________________________________
____________________________________________________________________________

3. Describe the common ancestor of most mammals on Earth. What evidence did scientists use to figure this out?

____________________________________________________________________________
____________________________________________________________________________
____________________________________________________________________________
Body Structures and Common Ancestors

Two students are analyzing the bones of a human, a cat, a whale, and a bat.

Student 1 said, “Each arm is used for different tasks: lifting, running, swimming, and flying, so they don’t have a common ancestor.”

Student 2 responded: “I disagree, it doesn’t matter that they are used for different tasks, I think they actually have a common ancestor because they have similar body structures.”

1. Which student has a stronger claim?

2. Explain why their claim is stronger using the knowledge we learned in today’s article about Blue Whales.
Exploration:

**If you have access to a device and the internet, please explore the SIM. Answer the questions below.

Exploring the *Evolutionary History* Simulation

Open the *Evolutionary History* Sim in Free Explore mode and complete the scavenger hunt questions below.

1. In Map View, what happens when you press one of the orange markers? (check one)
   - □ You see a particular fossil discovery at that location.
   - □ You see what city is located in that part of the world.
   - □ You see what museum is located in that area.
   - □ You go to the evolutionary tree.

2. In Map View, how can you add a fossil to the Fossil Collection? (check one)
   - □ By dragging fossils into the Fossil Collection.
   - □ By pressing ADD TO COLLECTION in the fossil’s popup window.
   - □ By pressing the “+” button at the bottom of the screen.
   - □ By doing any of the above.

3. Add one or two fossils to your collection, then go to Tree View. What happens when you select rows in the Tree Navigation window on the bottom left of Tree View? (check one)
   - □ You go to a new fossil discovery on the Map.
   - □ You can read about one of the living species on the tree.
   - □ You can read about one of the fossil species on the tree.
   - □ You explore one branch of the evolutionary tree in more detail.
4. Take one fossil from the Fossil Collection and drag it onto the Tree to figure out where it belongs. Which fossil did you choose? __________________________________________________________

Where did your fossil belong? (check one)

☐ In All Life
☐ In Animals
☐ In Vertebrates
☐ In Laurasiatheria
☐ In Artiodactyls
☐ In Cetaceans

5. Select a few of the orange and white “i” icons on the tree branches. What happens when you select these? (check one)

☐ You see pictures of a particular living species.
☐ You see pictures of a particular fossil species.
☐ You learn about specific body structures that evolved at different points on the tree.
☐ You go to a new fossil discovery on the Map.

6. What happens when you press STUDY next to a species on the right side of Tree View? (check one)

☐ That species is added to the Fossil Collection.
☐ You see images and a description of that species.
☐ That species is placed on the Tree.
☐ That species is placed on the Map.

7. Press STUDY for any species on the Tree and read about it. What species did you read about?

________________________________________________________________________________

Evolutionary History, Lesson 2 Student Packet, SPS Science w/ contributions from S. Weigle, 4-2020
**Vocabulary:**

**paleontologist:** a scientist who studies fossils in order to understand the ancient history of life on Earth

**fossil:** evidence of life from the past, such as fossilized bones, footprints, or leaf prints

**shared structure:** a body structure in two or more species that features the same parts (for example, the same bones)

**body structure:** a part of an organism (for example, one or more bones)

**limb:** an organism's arm, leg, or wing

**related:** sharing a common ancestor population

**descendant species:** a more recent species that evolved from an ancestor population

**evolution:** the process by which species adapt to environmental changes over a very long time