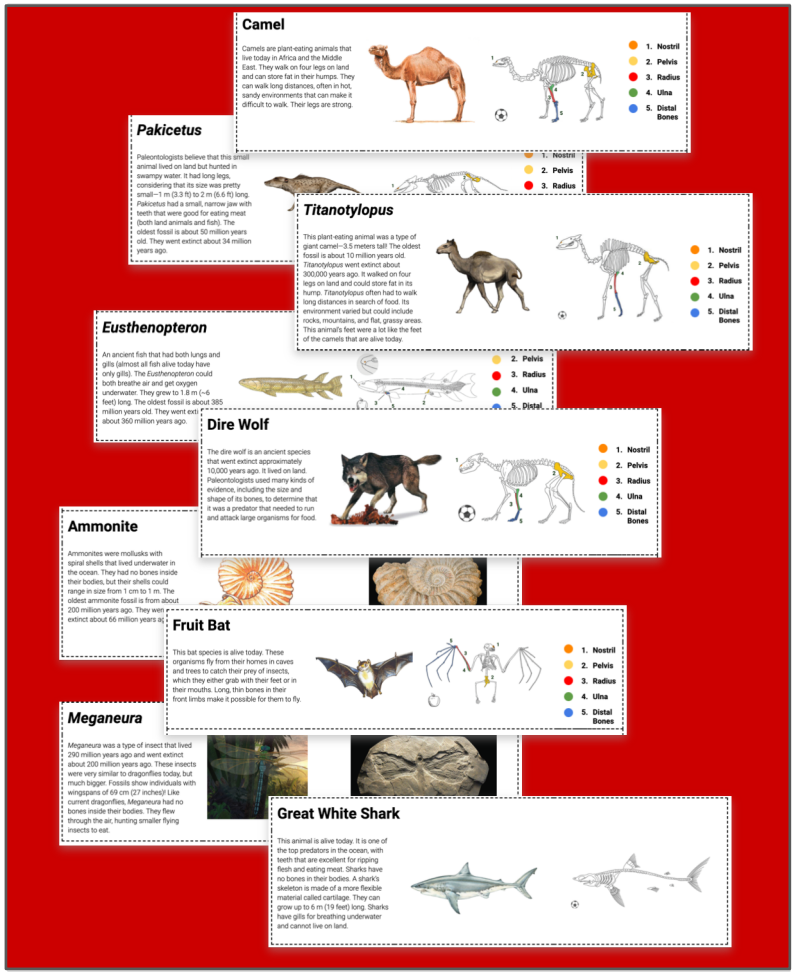
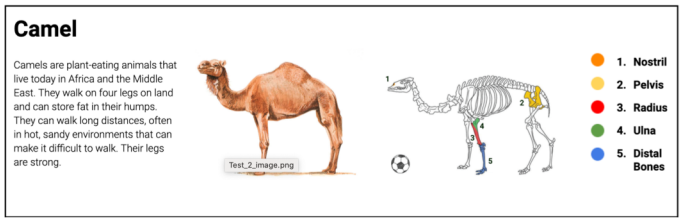


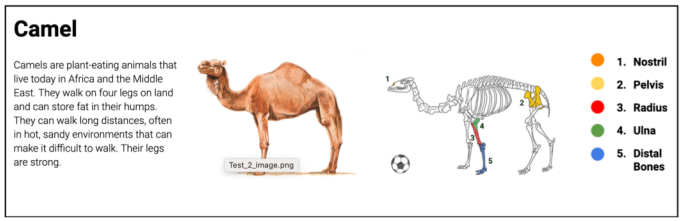
Find the Species cards. You should have nine cards total.

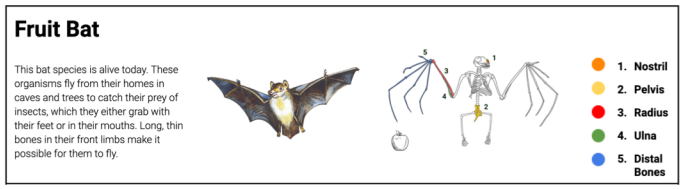
Cut out the species cards and briefly look at them.

Species Cards

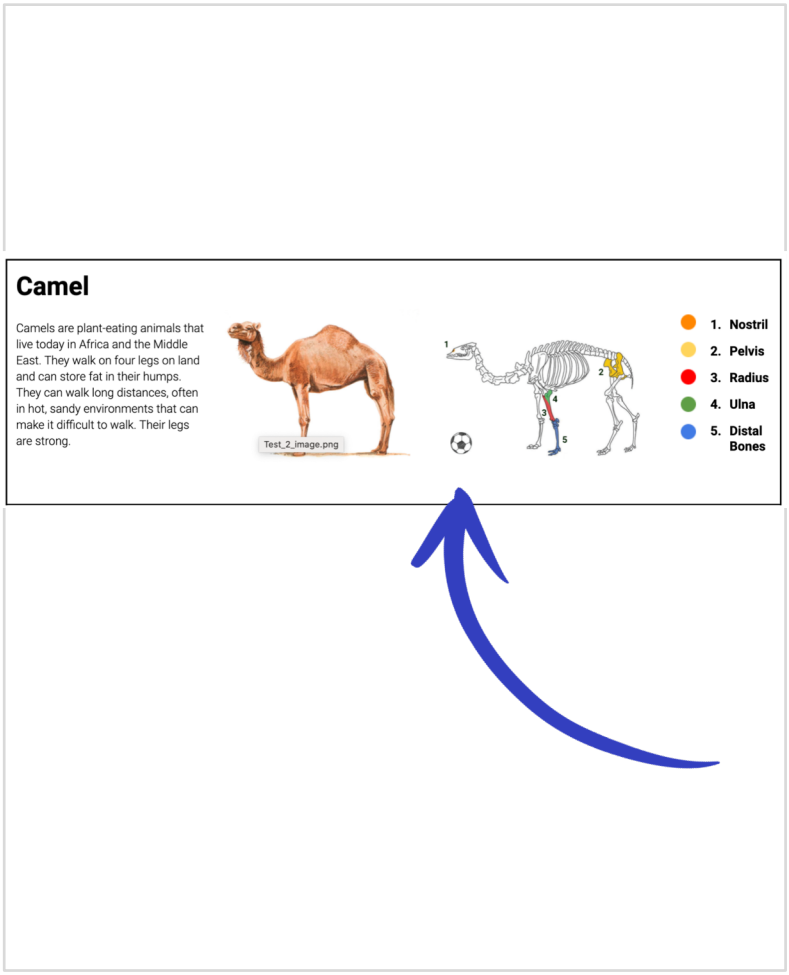


As you look through the cards you will notice that each one has a picture or drawing of a particular species and information about that species.

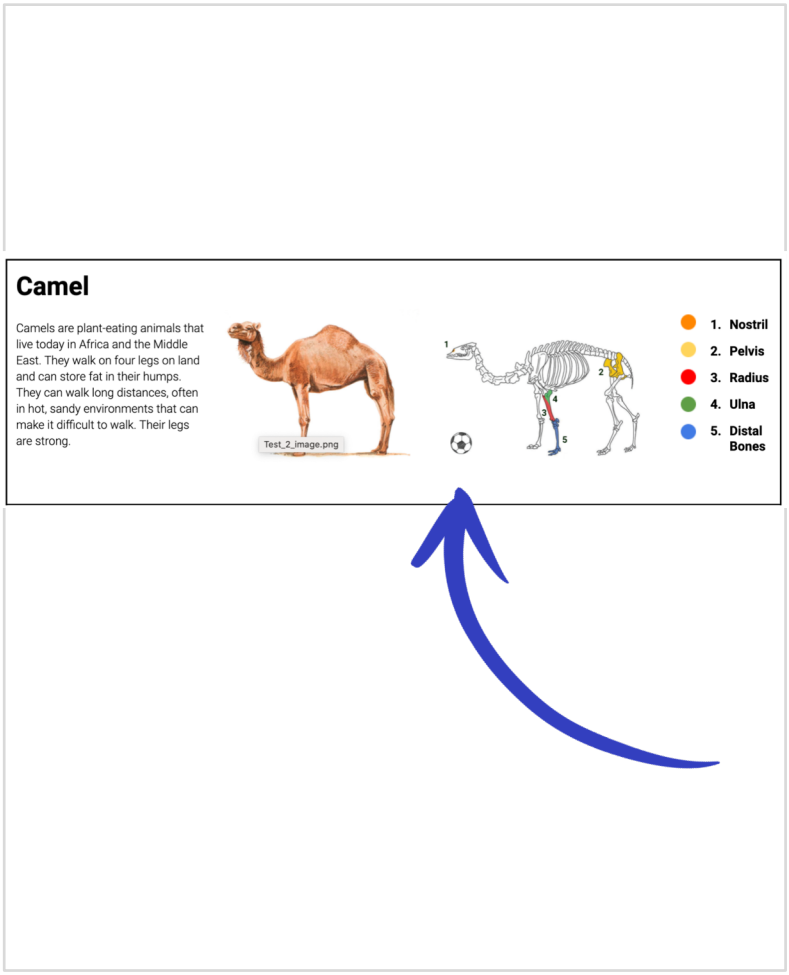




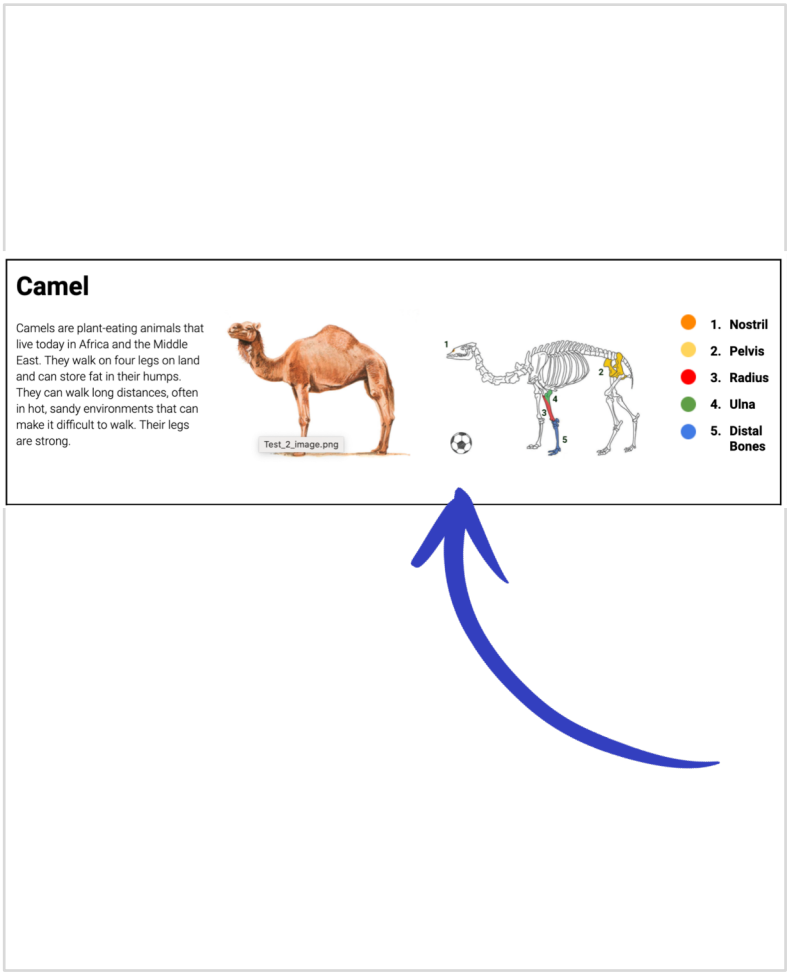
In some cases, there is more than one species that uses that name. For example, there are actually over a hundred species of fruit bat. There are also a few different species of camels alive today.



As you work with each card, note that there is also a second image that shows the **skeleton** of the organism, along with an everyday object (like a soccer ball or an apple).



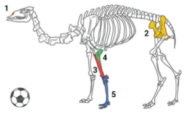
These everyday objects, like the soccer ball shown here, is there to help show the size of the organism and its body parts.



These objects are familiar and they can help you to think about how big the organism is, or how big parts of its body are. For example, you could use this soccer ball to estimate that the camel's leg is about the same size as 4–5 soccer balls piled on top of each other.

Camel

Camels are plant-eating animals that live today in Africa and the Middle East. They walk on four legs on land and can store fat in their humps. They can walk long distances, often in hot, sandy environments that can make it difficult to walk. Their legs are strong.



1. Nostril
2. Pelvis
3. Radius
4. Ulna
5. Distal Bones

Pakicetus

Paleontologists believe that this small animal lived on land but hunted in swampy water. It had long legs, considering that its size was pretty small—1 m (3.3 ft) to 2 m (6.6 ft) long. *Pakicetus* had a small, narrow jaw with teeth that were good for eating meat (both land animals and fish). The oldest fossil is about 50 million years old. They went extinct about 34 million years ago.

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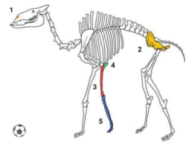
This plant-eating animal was a type of giant camel—3.5 meters tall! The oldest fossil is about 10 million years old. *Titanotylopus* went extinct about 300,000 years ago. It walked on four legs on land and could store fat in its hump. *Titanotylopus* often had to walk long distances in search of food. Its environment varied but could include rocks, mountains, and flat, grassy areas. This animal's feet were a lot like the feet of the camels that are alive today.



1. Nostril
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3. Radius
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Let's practice thinking about how we might make groups with these cards. We will use these three cards as an example.We can think about ways these organisms could be grouped together based on similarities.

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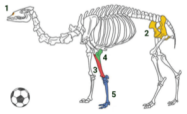

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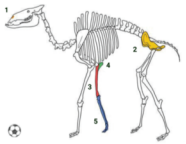

1. Nostril
2. Pelvis
3. Radius
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Read the Camel, *Pakicetus,* and *Titanotylopus* cards and discuss the following with your partner.

What are some things these species seem to have in common?

Species Cards

Camel

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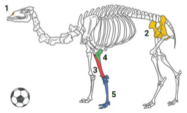

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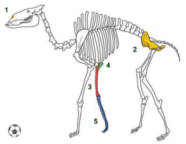

1. Nostril
2. Pelvis
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There are many answers to this question, but one thing they have in common is that they all have **four legs**. This is one way you could choose to **group them together**.

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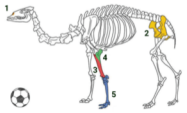

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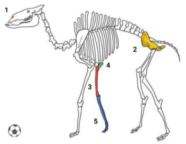

1. Nostril
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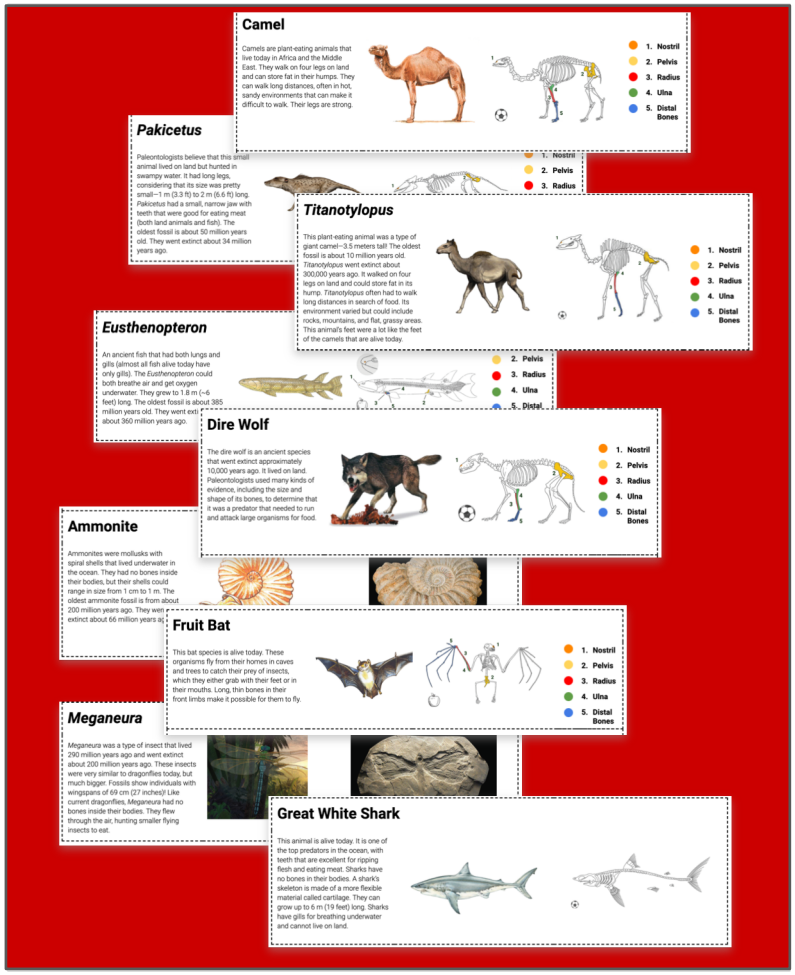
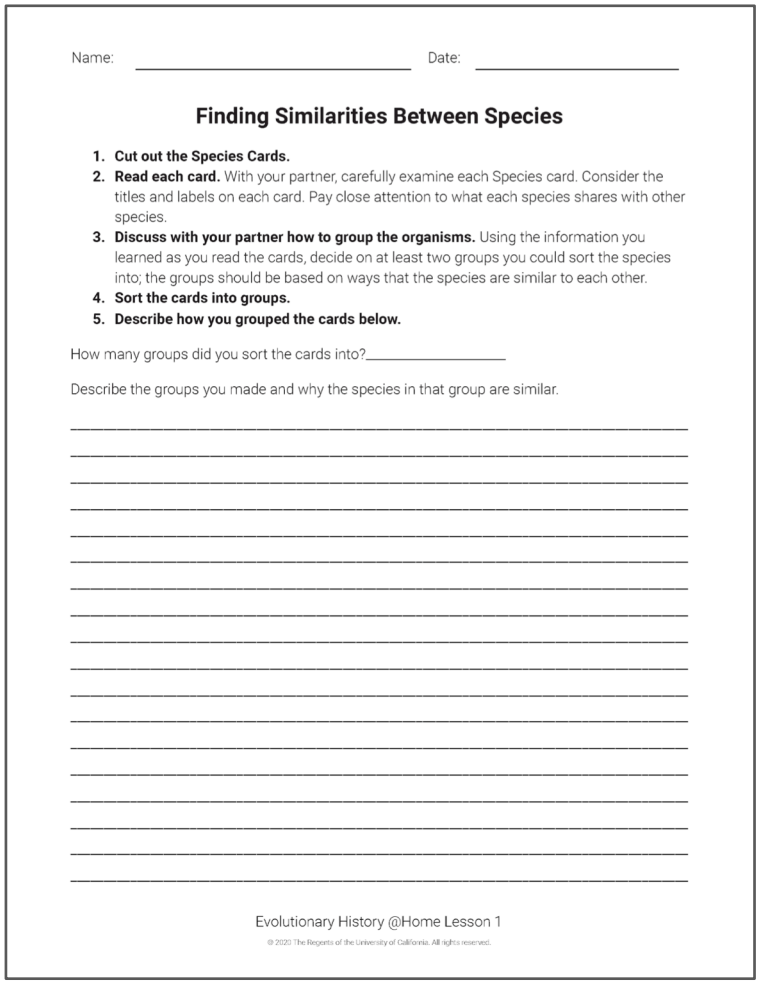
You might instead choose to put the camel in a group with species that are alive today and group the *Titanotylopus* and *Pakicetus* in a group with extinct organisms.



Next, you will figure out your own groups, using all of the cards.

The cards are also shown in the slides for reference.



Name: _____ Date: _____

Finding Similarities Between Species

1. **Cut out the Species Cards.**
2. **Read each card.** With your partner, carefully examine each Species card. Consider the titles and labels on each card. Pay close attention to what each species shares with other species.
3. **Discuss with your partner how to group the organisms.** Using the information you learned as you read the cards, decide on at least two groups you could sort the species into; the groups should be based on ways that the species are similar to each other.
4. **Sort the cards into groups.**
5. **Describe how you grouped the cards below.**

How many groups did you sort the cards into?_____

Describe the groups you made and why the species in that group are similar.

Evolutionary History @Home Lesson 1

Find the Finding Similarities Between Species page.

Work with your partner to sort the species into two or more groups. Then, describe these groups.

Finding Similarities Between Species page

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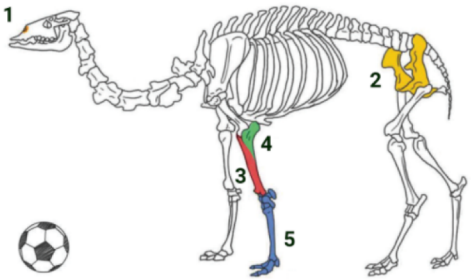

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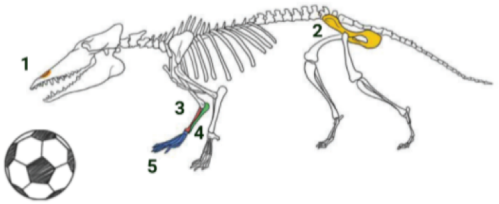

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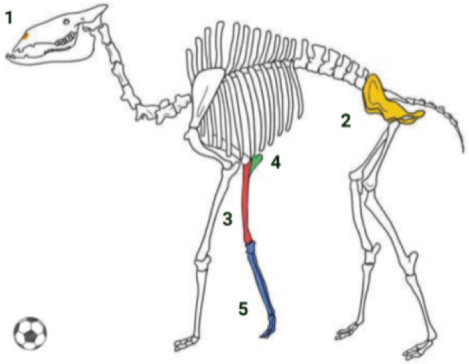

1. **Nostril**
2. **Pelvis**
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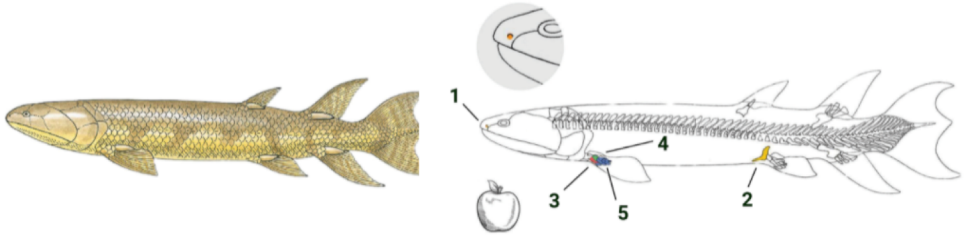
Eusthenopteron

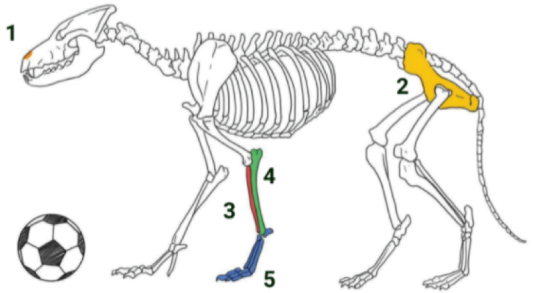
An ancient fish that had both lungs and gills (almost all fish alive today have only gills). The *Eusthenopteron* could both breathe air and get oxygen underwater. They grew to 1.8 m (~6 feet) long. The oldest fossil is about 385 million years old. They went extinct about 360 million years ago.



1. **Nostril**
2. **Pelvis**
3. **Radius**
4. **Ulna**
5. **Distal Bones**

Dire Wolf

The dire wolf is an ancient species that went extinct approximately 10,000 years ago. It lived on land. Paleontologists used many kinds of evidence, including the size and shape of its bones, to determine that it was a predator that needed to run and attack large organisms for food.



1. **Nostril**
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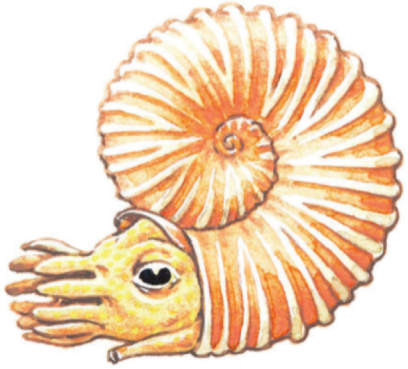
5. **Distal Bones**

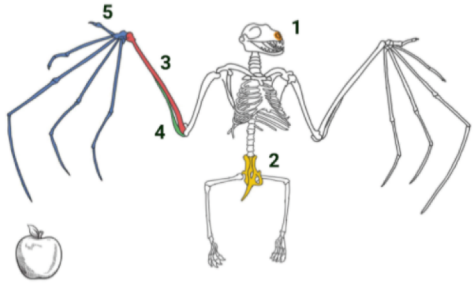
Ammonite

Ammonites were mollusks with spiral shells that lived underwater in the ocean. They had no bones inside their bodies, but their shells could range in size from 1 cm to 1 m. The oldest ammonite fossil is from about 200 million years ago. They went extinct about 66 million years ago.



Fruit Bat

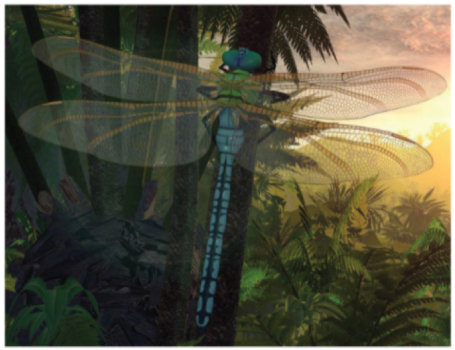
This bat species is alive today. These organisms fly from their homes in caves and trees to catch their prey of insects, which they either grab with their feet or in their mouths. Long, thin bones in their front limbs make it possible for them to fly.



1. **Nostril**
2. **Pelvis**
3. **Radius**
4. **Ulna**
5. **Distal Bones**

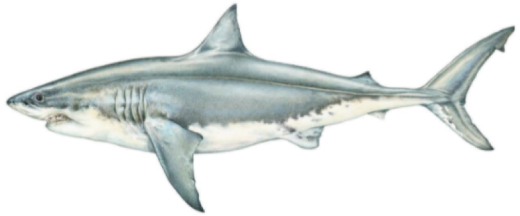
Meganeura

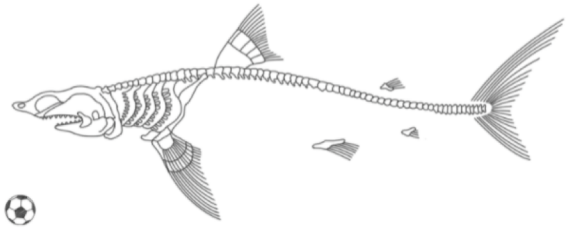
Meganeura was a type of insect that lived 290 million years ago and went extinct about 200 million years ago. These insects were very similar to dragonflies today, but much bigger. Fossils show individuals with wingspans of 69 cm (27 inches)! Like current dragonflies, *Meganeura* had no bones inside their bodies. They flew through the air, hunting smaller flying insects to eat.



Great White Shark

This animal is alive today. It is one of the top predators in the ocean, with teeth that are excellent for ripping flesh and eating meat. Sharks have no bones in their bodies. A shark's skeleton is made of a more flexible material called cartilage. They can grow up to 6 m (19 feet) long. Sharks have gills for breathing underwater and cannot live on land.





Read the message from Andre Mosley, the Natural History Museum Director, on the next slide.

To: Student Paleontologists
From: Andre Mosley, Natural History Museum Director
Subject: First Thoughts About Mystery Fossil

We want to make sure to place the Mystery Fossil in the museum with a group of other species that it makes the most sense for the fossil to be with. To make this decision, you will need to do the work of making careful observations and spending time comparing the bones of the Mystery Fossil to the bones and body structures of other organisms.

We asked our intern paleontologists at the museum to quickly examine the Mystery Fossil bones and give us some initial ideas about what species in the museum the Mystery Fossil might be most similar to. Their first examination of the Mystery Fossil tells us that there are three main types of organisms that the Mystery Fossil could be grouped with:

- whales
- wolves
- crocodiles

Where in the museum does this new fossil belong?

Claim 1: The Mystery Fossil belongs with the whales, in the Whale (Cetacea) exhibit.

Claim 2: The Mystery Fossil belongs with the wolves, in the Carnivore (Carnivora) exhibit.

Claim 3: The Mystery Fossil belongs with the crocodiles, in the Reptile (Reptilia) exhibit.

Next, let's consider these three claims about where to place the Mystery Fossil. Read the claims, then talk to your partner about the question, below.

What are some ways you could figure out whether the Mystery Fossil is more like whales, wolves, or crocodiles?

This is the end of the partner work in this lesson.

Where in the museum does this new fossil belong?

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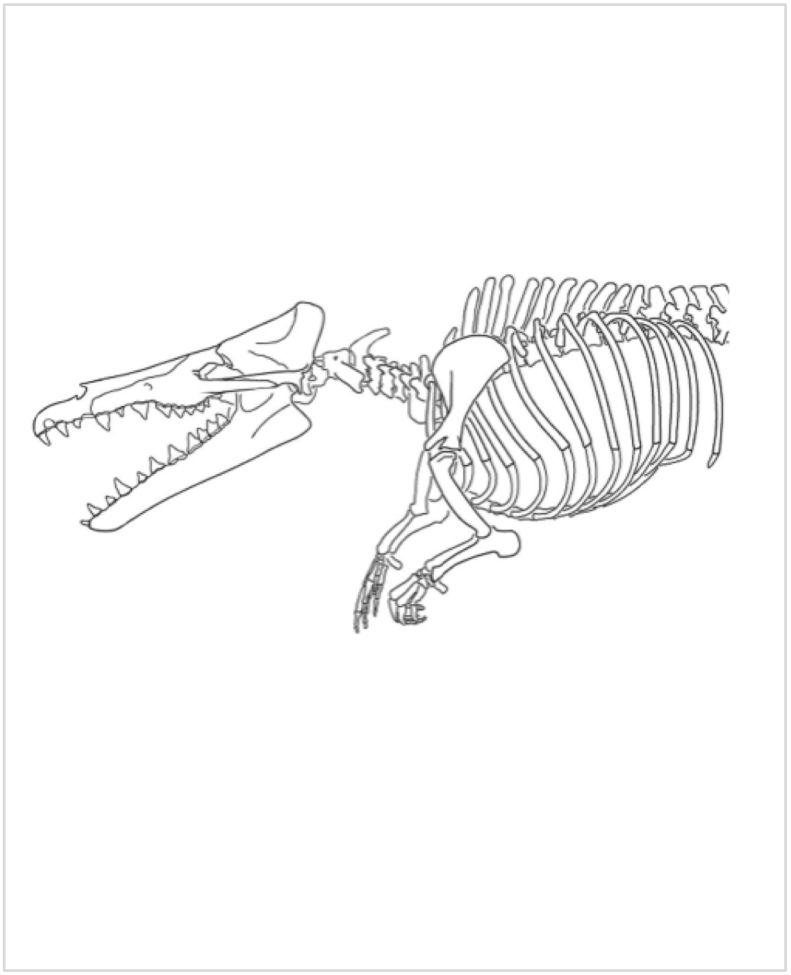
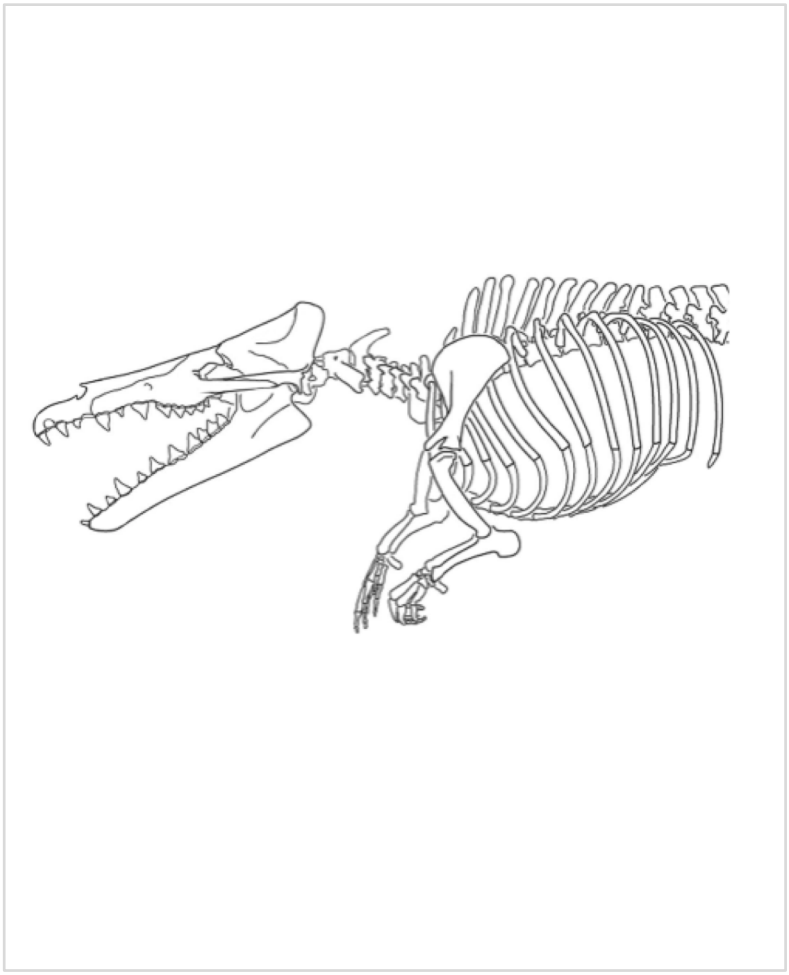
Claim 2: The Mystery Fossil belongs with the wolves, in the Carnivore (Carnivora) exhibit.

Claim 3: The Mystery Fossil belongs with the crocodiles, in the Reptile (Reptilia) exhibit.

Your job will be to group the Mystery Fossil with other fossil exhibits somewhere in the museum, and these three claims describe possible sections of the museum where it could be placed.



In this unit, we will often be examining body structures from organisms that are extinct, or no longer living anywhere on Earth, such as the body structures of the Mystery Fossil.



All we have left of these organisms are their fossilized bones. Because of this, we will mostly be comparing bone structures of different species.

This term will be important as we think about the mystery fossil.

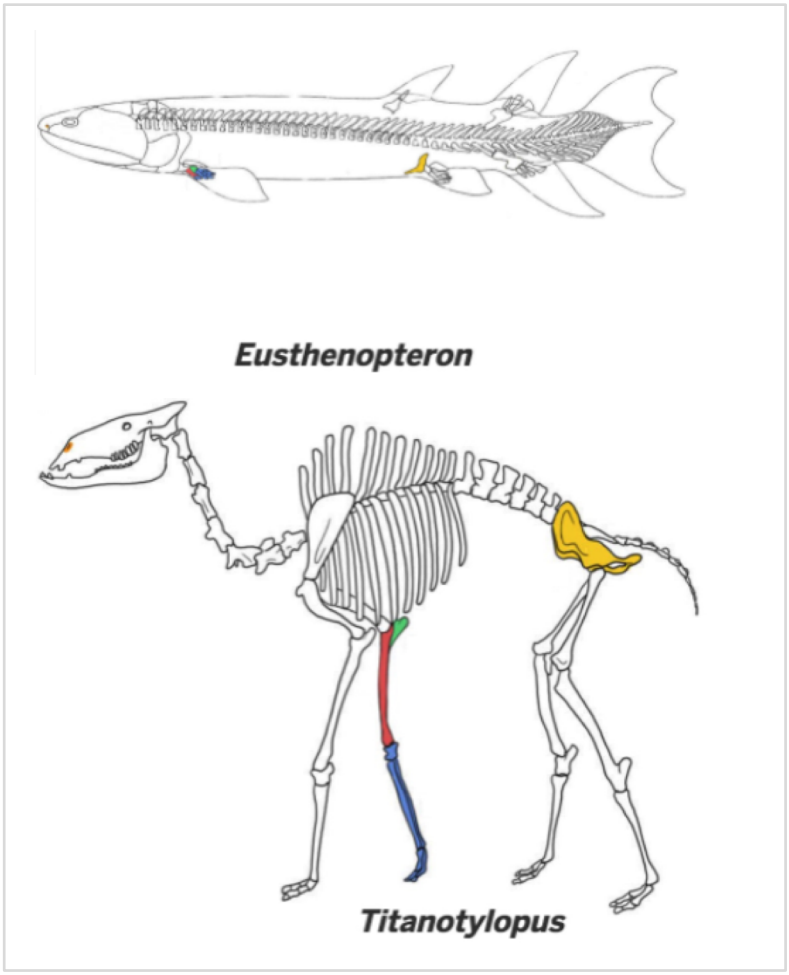
body structure

a part of an organism (for example, one or more bones)

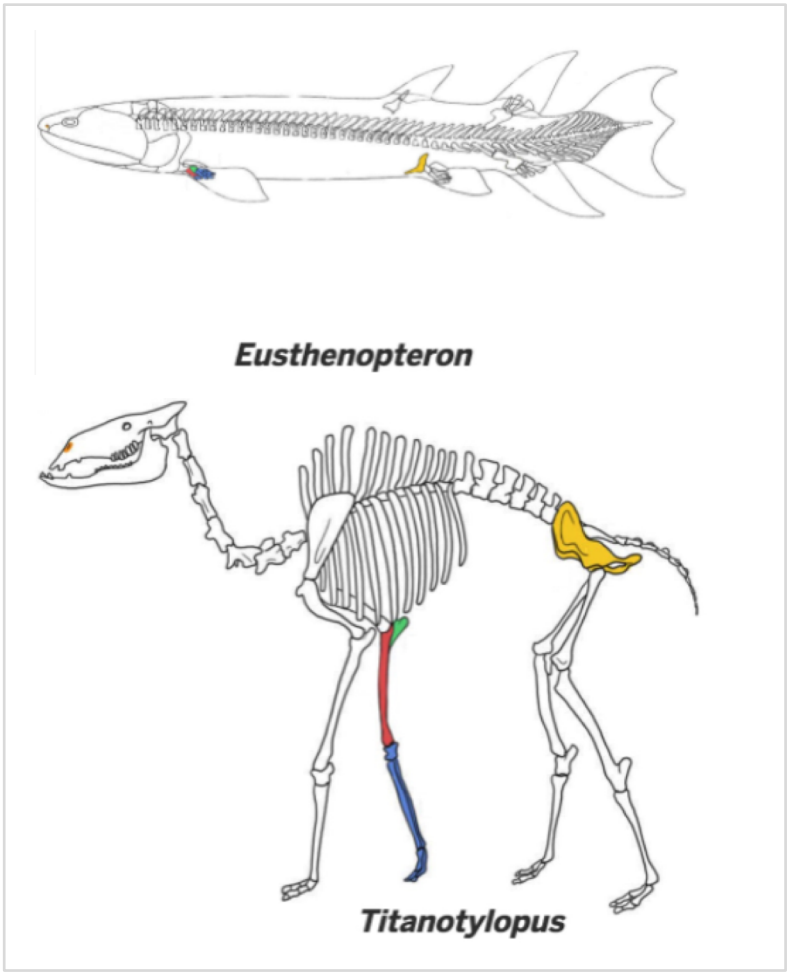
Adapted from: Amplify Science *Evolutionary History*Lesson 1.2

Key activities

- **Introducing the Mystery Fossil and the Natural History Museum:** Students are introduced to the unit problem and their role as student paleontologists.
- **Observe:** Students gain experience noticing similarities between species by examining images that show the body structures of many different species, living and extinct, and considering how to group these species.
- **Introduction to how paleontologists make careful observations.** Students compare two organisms in order to learn about the importance of making careful observations when examining body structures.

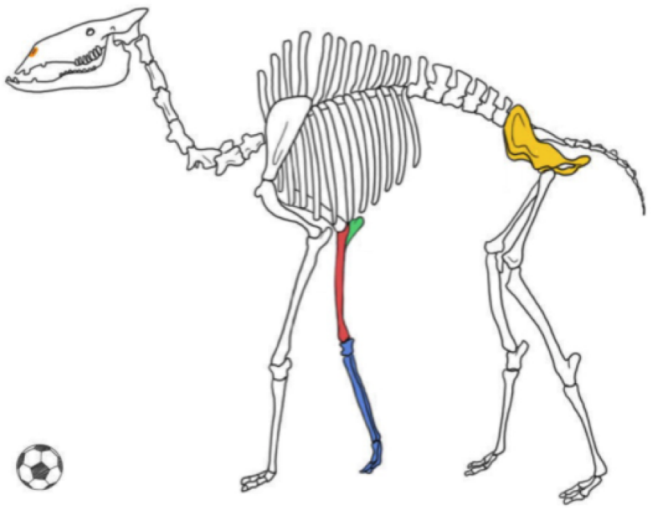


For example, these organisms look very different, but they do have some obvious bone structures that are similar and that we can easily identify. The backbone is one of those bone structures.

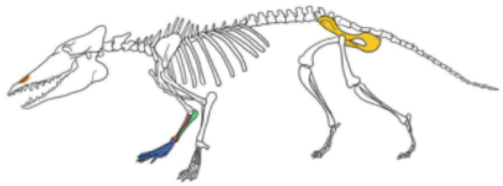


To figure out that these organisms both have backbones, we needed to carefully observe both of them.

Carefully observing and then describing your observations is an important skill for a paleontologist, and one we will practice in this unit.



Titanotylopus

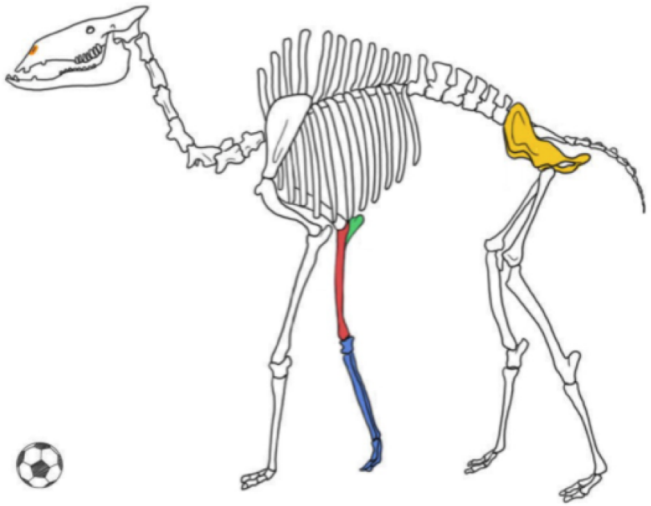


Pakicetus

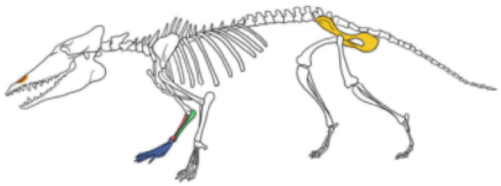
For example, read this observation.

Observation 1: “It has legs.”

Which organism is Observation 1 about?



Titanotylopus



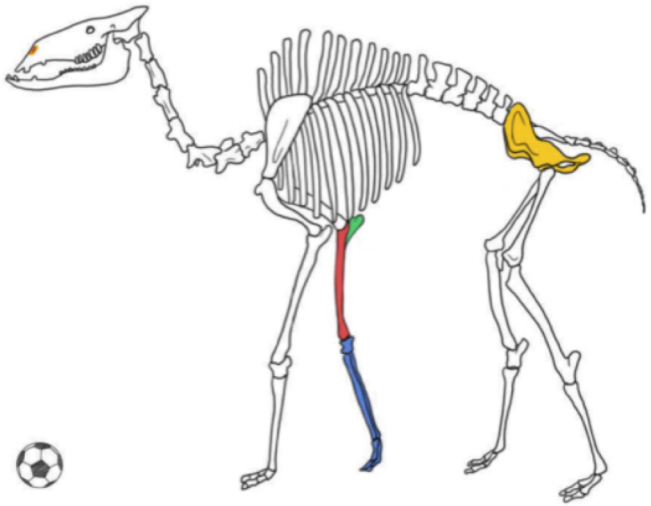
Pakicetus

It is impossible to tell for sure which organism Observation 1 (“It has legs”) is about, because both organisms have legs.

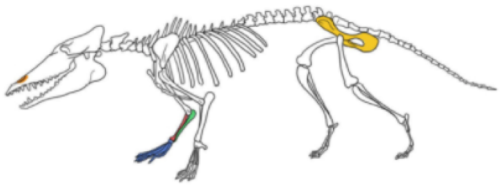
Read Observation 2 on the next slide.

Observation 2

“It has four legs. Each leg has at least two long bones in it. Compared to a soccer ball, the legs seem to be about the same length as 6–8 soccer balls on top of one another.”

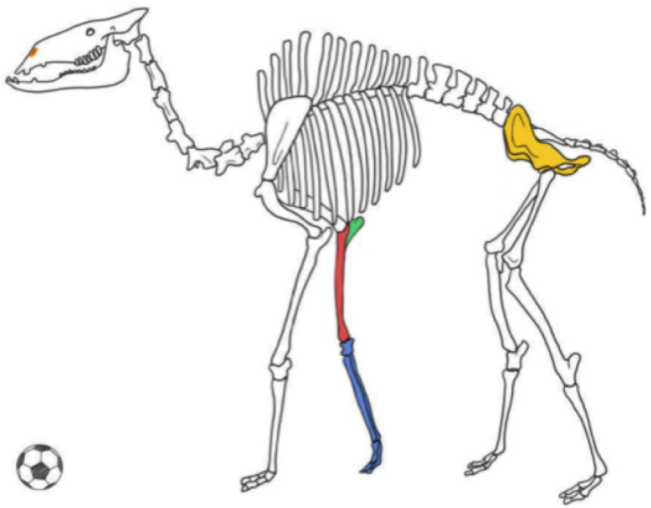


Titanotylopus

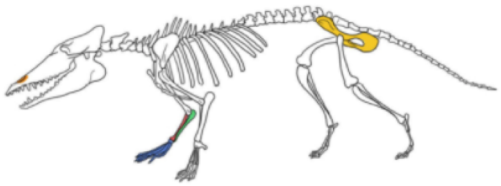


Pakicetus

Which organism is Observation 2 about?



Titanotylopus



Pakicetus

Observation 2 is clearly about *Titanotylopus*.

The more precise language in Observation 2 helps us to know exactly which organism the observation is about. We will try to make precise observations like these in this unit.

Paleontologist's Observation Guidelines

Pay careful attention to body structures, especially how bones are grouped together.

- Observe the size (thickness and length) of bones within body structures.
- Observe the position of body structures.
- Observe the same fossil evidence several times to see what you've missed.

Count the number of bones.

Use observations of fossil evidence to make careful comparisons to other fossils and living species.

These Observation Guidelines will be helpful later in the unit whenever you need to make or think about observations.

We will learn more about similarities between species, especially similarities in bone structures, and how paleontologists use these similarities to think about living and extinct species, in the next lesson.

End of @Home Lesson

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UNIVERSITY OF CALIFORNIA, BERKELEY

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Key activities

- **Introducing the Mystery Fossil and the Natural History Museum:** Students are introduced to the unit problem and their role as student paleontologists.
- **Observe:** Students gain experience noticing similarities between species by examining images that show the body structures of many different species, living and extinct, and considering how to group these species.
- **Introduction to how paleontologists make careful observations.** Students compare two organisms in order to learn about the importance of making careful observations when examining body structures.

Ideas for synchronous or in-person instruction

While meeting, introduce students to the problem of the Mystery Fossil and the role they will play as student paleontologists. Provide students with the Species Cards so they can examine and sort them (as in Lesson 1.2, Activity 3) then introduce them to how paleontologists make careful observations (as in Lesson 1.2, Activity 4).

Suggestions for Online Synchronous Time

Online synchronous time
Online discussions: It's worthwhile to establish norms and routines for online discussions in science to ensure equity of voice, turn-taking, etc.
Digital tool demonstrations: You can share your screen and demonstrate, or invite your students to share their screen and think-aloud as they use a Simulation or other digital tool.
Interactive read-alouds: Screen share a digital book or article, and pause to ask questions and invite discussion as you would in the classroom.
Shared Writing: This is a great opportunity for a collaborative document that all your students can contribute to.
Co-constructed class charts: You can create digital charts, or create physical charts in your home with student input.

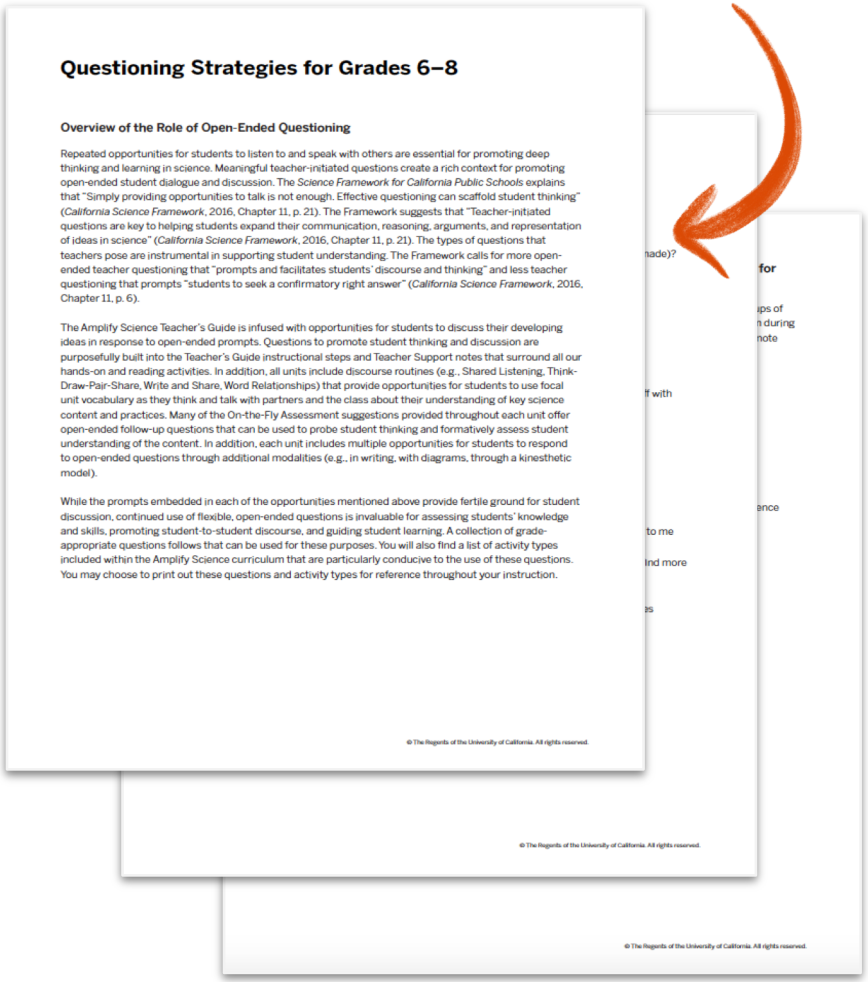
page 18

Questioning Strategies

Open-Ended Questions to Facilitate Student Thinking & Discourse

- Questions to assess students' knowledge and skills
- Questions to promote student-to-student discourse
- Questions to guide student learning

Pages 19-21



Questioning Strategies for Grades 6–8

Overview of the Role of Open-Ended Questioning

Repeated opportunities for students to listen to and speak with others are essential for promoting deep thinking and learning in science. Meaningful teacher-initiated questions create a rich context for promoting open-ended student dialogue and discussion. The *Science Framework for California Public Schools* explains that "Simply providing opportunities to talk is not enough. Effective questioning can scaffold student thinking" (*California Science Framework*, 2016, Chapter 11, p. 21). The Framework suggests that "Teacher-initiated questions are key to helping students expand their communication, reasoning, arguments, and representation of ideas in science" (*California Science Framework*, 2016, Chapter 11, p. 21). The types of questions that teachers pose are instrumental in supporting student understanding. The Framework calls for more open-ended teacher questioning that "prompts and facilitates students' discourse and thinking" and less teacher questioning that prompts "students to seek a confirmatory right answer" (*California Science Framework*, 2016, Chapter 11, p. 6).

The Amplify Science Teacher's Guide is infused with opportunities for students to discuss their developing ideas in response to open-ended prompts. Questions to promote student thinking and discussion are purposefully built into the Teacher's Guide instructional steps and Teacher Support notes that surround all our hands-on and reading activities. In addition, all units include discourse routines (e.g., Shared Listening, Think-Draw-Pair-Share, Write and Share, Word Relationships) that provide opportunities for students to use focal unit vocabulary as they think and talk with partners and the class about their understanding of key science content and practices. Many of the On-the-Fly Assessment suggestions provided throughout each unit offer open-ended follow-up questions that can be used to probe student thinking and formatively assess student understanding of the content. In addition, each unit includes multiple opportunities for students to respond to open-ended questions through additional modalities (e.g., in writing, with diagrams, through a kinesthetic model).

While the prompts embedded in each of the opportunities mentioned above provide fertile ground for student discussion, continued use of flexible, open-ended questions is invaluable for assessing students' knowledge and skills, promoting student-to-student discourse, and guiding student learning. A collection of grade-appropriate questions follows that can be used for these purposes. You will also find a list of activity types included within the Amplify Science curriculum that are particularly conducive to the use of these questions. You may choose to print out these questions and activity types for reference throughout your instruction.

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Reflection: Teaching @Home Lesson 1

How would you teach this lesson?

How might you include suggestions for online synchronous time and/or questioning strategies?

Multi-day planning, including planning for differentiation and evidence of student work

Day @Home Lesson 1	
Minutes for science: 15 min.	**Minutes for science:** _____
Instructional format: ☒ Asynchronous ☐ Synchronous	**Instructional format:** ☐ Asynchronous ☒ Synchronous
Lesson or part of lesson: Introducing the mystery fossil & the Natural History Museum (slides 1-12)	**Lesson or part of lesson:**
Mode of instruction: ☒ Preview ☐ Review ☐ Teach full lesson live ☒ Teach using synchronous suggestions ☒ Students work independently using: ☐ Printed @Home Slides ☒ Digital @Home Slides ☐ @Home Videos	**Mode of instruction:** ☐ Preview ☐ Review ☐ Teach full lesson live ☐ Teach using synchronous suggestions ☐ Students work independently using: ☐ Printed @Home Slides ☐ Digital @Home Slides ☐ @Home Videos

Students will...	Teacher will...	Students will...	Teacher will...
View slides and the video that introduces students to the unit. Jot down initial ideas about their reactions to the video.	Assign slides 1-12 in Schoology and provide direction for students to jot down their ideas about the unit problem to share when the class meets together.		

Multi-day planning, including planning for differentiation and evidence of student work

Day @Home Lesson 1

Minutes for science: 15 min.

Instructional format:
- [x] Asynchronous
- [ ] Synchronous

Lesson or part of lesson:
Introducing the mystery fossil & the Natural History Museum (slides 1-12)

Mode of instruction:
- [x] Preview
- [ ] Review
- [ ] Teach full lesson live
- [x] Teach using synchronous suggestions
- [x] Students work independently using:
  - [ ] Printed @Home Slides
  - [x] Digital @Home Slides
  - [ ] @Home Videos

Students will...	Teacher will...
View slides and the video that introduces students to the unit. Jot down initial ideas about their reactions to the video.	Assign slides 1-12 in Schoology and provide direction for students to jot down their ideas about the unit problem to share when the class meets together.

Minutes for science: 30 min

Instructional format:
- [ ] Asynchronous
- [x] Synchronous

Lesson or part of lesson:
Examine images of body structures, group species & compare two organisms

Mode of instruction:
- [ ] Preview
- [ ] Review
- [ ] Teach full lesson live
- [x] Teach using synchronous suggestions
- [ ] Students work independently using:
  - [ ] Printed @Home Slides
  - [ ] Digital @Home Slides
  - [ ] @Home Videos

Students will...	Teacher will...
Examine images of body structures of different species Consider how to group these species Compare two organisms to learn more about the importance of careful observations	Lead students through the lesson activities using slides 13-60 allowing students time to collaborate as they discuss their observations of the images of body structures & the two organisms

Look at the *Students will* columns. What are students working in the lesson(s) that you could collect, review, or provide feedback on?
See Some Types of Written Work in Amplify Science to the right for guidance.

If there isn't a work product listed above, do you want to add one? Make notes below.

Asynchronous: students jot down their initial ideas

Synchronous: record observations of body structures

Some Types of Written Work in Amplify Science

- Daily written reflections
- Homework tasks
- Investigation notebook pages
- Written explanations (typically at the end of Chapter)
- Diagrams
- Recording pages for Sim uses, investigations, etc

How will students submit this work product to you?
See the Completing and Submitting Written Work tables to the right for guidance on how students can complete and submit work.

Asynchronous: students jot initial ideas on paper or digitally to bring with them to the asynchronous lesson

Synchronous: Students will use the student sheets to record their observations of the body structures and submit through Schoology

Completing Written Work	Submitting Written Work
• Plain paper and pencil (videos include prompts for setup) • (6-8) Student platform • Investigation Notebook • Record video or audio file describing work/answering prompt • Teacher-created digital format (Google Classroom, etc)	• Take a picture with a smartphone and email or text to teacher • Through teacher-created digital format • During in-school time (hybrid model) or lunch/materials pick-up times • (6-8) Hand-in button on student platform

How will you differentiate this lesson for diverse learners? (Navigate to the lesson level on the standard Amplify Science platform and click on differentiation in the left menu.)

English-Chinese Glossary

adaptive trait: a trait that makes it more likely that an individual will survive in a specific environment
适应性性状: 使个体在特定环境中存活率更高的性状

ancestor: a related organism from a previous generation
祖先: 具有亲缘关系的上代生物体

body structure: a part of an organism (for example, one or more bones)
身体结构: 生物体的一部分（例如，一个或多个骨骼）

common ancestor population: an older population from which two or more newer species descended
共同祖先种群: 孕育了两个或多个新物种的古老种群

descendant species: a more recent species that evolved from an ancestor population
后代物种: 从祖先种群演化而来的较新的物种

diagnose: to classify based on scientific examination
诊断: 根据科学检查进行分类

environment: everything (living and nonliving) that surrounds an organism
环境: 生物体周围的所有（有生命和无生命的）事物

evolution: the process by which species adapt to environmental changes over a very long time
进化: 物种在相当长时间内适应环境变化的过程

evolutionary time: the very long time that spans the history of life on Earth, from the first cellular life to the present
进化时间: 贯穿整个地球生命史的漫长时期，从第一个单细胞生物到现在直至现在

extinct: having died out completely and no longer alive anywhere on Earth
灭绝: 已经完全消失，地球上任何地方均无存活个体

fossil: evidence of life from the past, such as fossilized bones, footprints, or leaf prints
化石: 古老生命存在的证据，如成为化石的骨骼、脚印或树叶印痕

generation: a group of individuals born and living at about the same time
代: 大约在相同时间出生和生活的成群个体

4 Evolutionary History—Multi-Language Glossary

. What are students working in the lesson(s)
provide feedback on?
lify Science to the right for guidance.

ove, do you want to add one? Make notes below.

t do

vat

rk p
ten W

- I notice/observe . . .
- I think this is important because . . .
- I wonder . . .

t initial ideas on paper or digitally
asynchronous lesson

l use the student sheets to record
ody structures and submit through

Some Types of Written Work in Amplify Science

- Daily written reflections
- Homework tasks
- Investigation notebook pages
- Written explanations (typically at the end of Chapter)

for Sim uses, investigations, etc

n Work	Submitting Written Work
pencil rompts for setup) • (6-8) Student platform • Investigation Notebook • Record video or audio file describing work/answering prompt • Teacher-created digital format (Google Classroom, etc)	• Take a picture with a smartphone and email or text to teacher • Through teacher-created digital format • During in-school time (hybrid model) or lunch/materials pick-up times • (6-8) Hand-in button on student platform

How will you differentiate this lesson for diverse learners? (Navigate to the lesson level on the standard Amplify Science platform and click on differentiation in the left menu.)

Supports:
- Provide students with the Multi-Language Glossary where appropriate
- Provide sentence starters
- Leverage primary language for discussions

Extension:
- Have students write questions about the unit phenomenon.

Teacher Overview - Chapter 1

Overview of @Home Lessons 2-5

@Home Lesson 2: GROUP 1

- Students consider shared structures in seemingly dissimilar species. Students read and annotate the article, “How You Are Like a Blue Whale,” to learn about how the similarities between whale and human body structures provide evidence that whales and humans share a common ancestor. Students share their questions and ideas about the article, “How You Are Like a Blue Whale.”

@Home Lesson 3: GROUP 2

- Students use what they have learned about examining body structures to practice identifying the shared body structures in two imaginary species. Students return to the "How You Are Like a Blue Whale" article to practice reading and interpreting evolutionary trees and to collect more evidence about why species share similarities. Students use the *Evolutionary History* Sim and use shared structures to study relationships between descendant species.

@Home Lesson 4: GROUP 3

- Students learn that the Mystery Fossil was pregnant, and take live birth into account as they weigh claims that the Mystery Fossil shares a common ancestor respectively with whales, wolves, or crocodiles. Students find structural similarities among the Mystery Fossil, the whale, and the wolf, then consider what a common ancestor might have looked like. Students make a model that shows a likely common ancestor based on structures shared between two new, imaginary species.

@Home Lesson 5: GROUP 4

- Students practice making careful observations by looking for differences in the bone structures of human and cat front limbs. Students observe organisms’ front limb structures, then read and record information about the organisms’ environments and behaviors. Students discuss observations and think about the differences between the structures of three organisms.

Breakout groups

Discussion prompts

Planning:

- Dig into the @Home Resources for your assigned lesson.

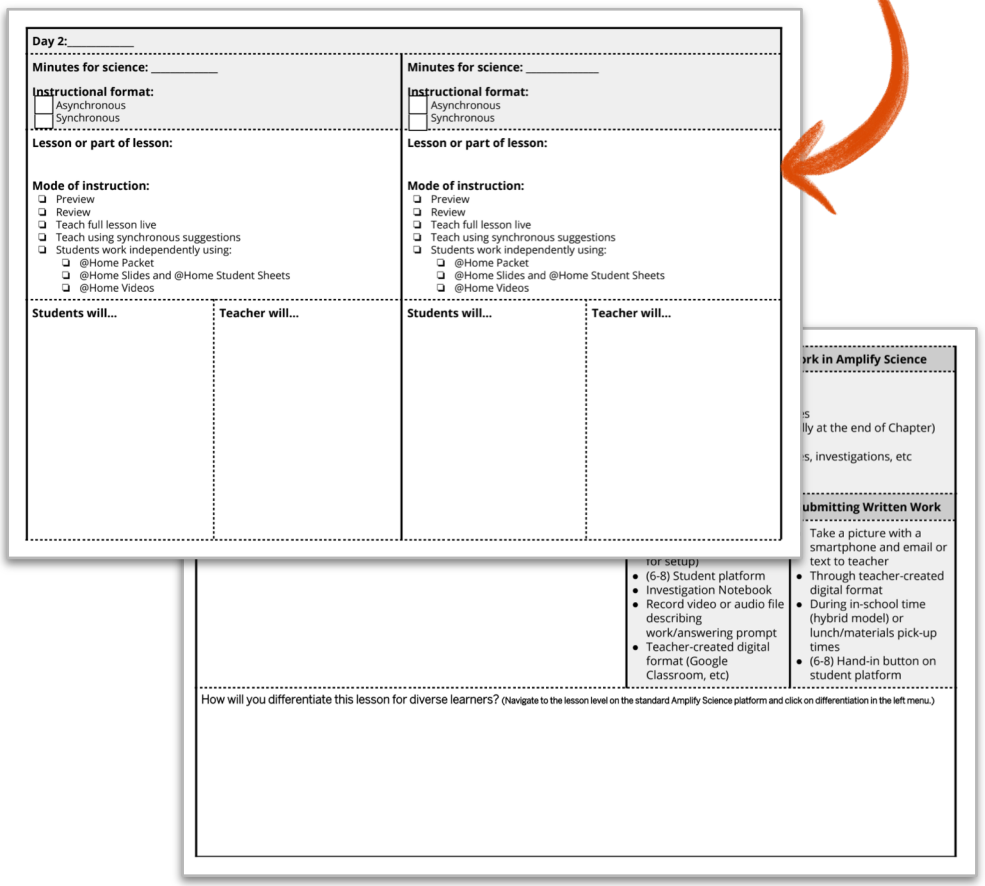
Student work:

- Discuss how you can collect evidence of student work

Differentiation:

- Consider how you might differentiate your lesson

pages 13-14



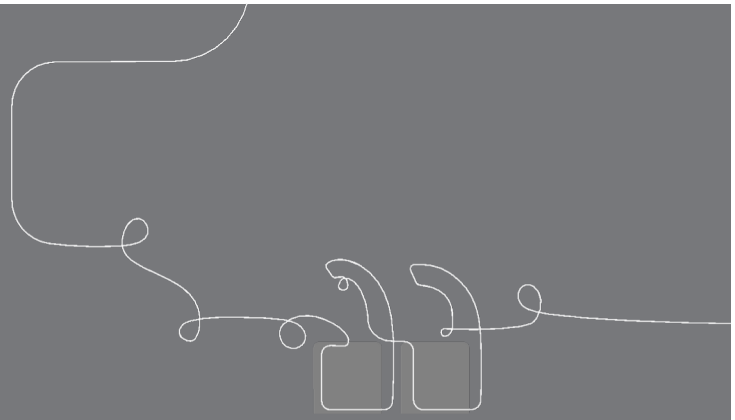
Planning Share Out

- What are your key takeaways from planning?
- Which lesson parts did you plan for synchronous vs. asynchronous time?

Breakout Room 1 - Planning @Home Lesson 2

Multi-day planning, including planning for differentiation and evidence of student work

Day _____			
Minutes for science: _____ **Instructional format:** ❑ Asynchronous ❑ Synchronous		**Minutes for science:** _____ **Instructional format:** ❑ Asynchronous ❑ Synchronous	
Lesson or part of lesson: **Mode of instruction:** ❑ Preview ❑ Review ❑ Teach full lesson live ❑ Teach using synchronous suggestions ❑ Students work independently using: ❑ Printed @Home Slides ❑ Digital @Home Slides ❑ @Home Videos		**Lesson or part of lesson:** **Mode of instruction:** ❑ Preview ❑ Review ❑ Teach full lesson live ❑ Teach using synchronous suggestions ❑ Students work independently using: ❑ Printed @Home Slides ❑ Digital @Home Slides ❑ @Home Videos	
Students will...	**Teacher will...**	**Students will...**	**Teacher will...**



Questions?

Plan for the day

- Framing the day
  - Welcome
  - Instructional Materials
- Unit Internalization
- Planning to teach
  - Collecting evidence of student learning to meet diverse learner needs
- **Reflection and closing**