What Do You Have in Common with Your Dog?

Mammalian Characteristics and Adaptations for Survival

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Grade Level	10th – 12th Grade
Subject	Science
Course	Biology, Environmental Science, Life Science

Essential Question

How do mammalian body systems coordinate to maintain homeostasis and ensure survival in various environments? In what ways have evolutionary adaptations facilitated the ability of mammals to thrive in diverse ecosystems?

Summary

How have mammals adapted to unique environments, thereby ensuring their survival? How do mammalian body systems work together to maintain stability in response to environmental changes? In this lesson, students will investigate mammalian characteristics and adaptations to diverse habitats and traits that enhance survival. Students will engage in a card sort to categorize physical and behavioral adaptations, review their previous knowledge of homeostasis in response to environmental changes, and conduct research on specific mammals. Through a natural selection simulation, students will demonstrate understanding and collaborate to create poster models that explain key mammalian traits and their evolutionary significance. Posters will be shared and collaboratively improved in a gallery walk.

Snapshot

Engage

Students analyze two types of mammalian adaptations using a Card Sort and create a poster draft.

Explore

Students take part in a Fist to Five strategy to review homeostasis and research select mammals to interpret how unique environments may drive evolutionary adaptation.

Explain

Students use the Categorical Highlighting structure to interpret and apply mammalian characteristics and adaptations to structured questions and to their posters.

Extend

Students complete a natural selection simulation, further refine their posters, and complete *3 Stray, 1*

Stay Gallery Walk to generate new ideas and assess their peers' posters.

Evaluate

Students complete a second Exit Ticket by comparing their researched mammal to another.

Standards

Oklahoma Academic Standards (Biology)

B.LS1.2: Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
B.LS1.2.1: Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
B.LS4.4.1: Natural selection leads to adaptation, that is, to a population dominated by organisms that are anatomically, behaviorally, and physiologically well suited to survive and reproduce in a specific environment.

Attachments

- Card Sort–What Do You Have in Common with Your Dog.docx
- Card Sort–What Do You Have in Common with Your Dog.pdf
- Explain–Exit Ticket–What Do You Have in Common with Your Dog.docx
- Explain–Exit Ticket–What Do You Have in Common with Your Dog.pdf
- Lesson Slides–What Do You Have in Common with Your Dog.pptx
- Mammalian Characteristics and Adaptations–What Do You Have in Common with Your Dog.docx
- Mammalian Characteristics and Adaptations–What Do You Have in Common with Your Dog.pdf
- Rubric–What Do You Have in Common with Your Dog.docx
- Rubric–What Do You Have in Common with Your Dog.pdf
- Thriving on the Edge–What Do You Have in Common with Your Dog.docx
- Thriving on the Edge–What Do You Have in Common with Your Dog.pdf

Materials

- Lesson Slides (attached)
- Card Sort cards (attached)
- Explain–Exit Ticket (attached; one per student)
- Mammalian Characteristics and Adaptations reading (attached; one per student)
- Rubric (attached; one per student)
- Thriving on the Edge handout (attached; one per student)
- highlighting markers
- poster or chart paper
- markers or colored pencils
- glue sticks or tape

Lesson Preparation

Print the Card Sort pictures in color and at a fairly high resolution and laminate them for use in future lessons. Print and cut as many Card Sort 1 cards as you need for groups of three, and enough animal cards for each student to have at least one animal for Card Sort 2.

20 minutes

Engage

Introduce the lesson's title by displaying **slide 2** from the attached **Lesson Slides**.

Share the lesson's essential question and learning objectives on **slides 3 and 4** to the extent you feel necessary.

Move to **slide 5** and explain the Card Sort strategy. Pair students together, hand out the **Card Sort cards** (attached) for *Physical Adaptations* and *Behavioral Adaptations.* Have students sort the cards into the two categories.

When students have finished their first sort task, display **slide 6**, have them form groups of three, and hand out chart paper and three animal cards to each group.

Teacher's Note:

When grouping students for the second card sort, three students per group is ideal. Four is useful if there are uneven numbers or low-ability individuals.

Students will begin a second card sort using their three animals as column headers. Monitor student progress with sorting cards, asking questions that guide students in sorting. If necessary, use the photo of the Ibex as an example for students. It's OK if students don't get every card in the right spot; they'll have time to make corrections in the Explore. When complete, temporarily secure the sorted animal card headers and the physical and behavioral adaptations to the chart paper using tape or glue. Hang the charts or store them for later use.

25 minutes

Explore

Ask students to recall the concept of **homeostasis**. Conduct a quick Fist to Five to indicate their level of understanding of homeostasis by holding up the number of fingers which indicate their ability to explain this concept accurately, then choose students who can describe homeostasis in their own words. If you feel students need a refresher, unhide **Slide 7** and play the linked video:

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

Move to **slide 9**. Explain to students they will individually research one of the animals they sorted for in the Engage. Take some time now to handout the **"Rubric"** (attached) and explain criteria for the final group poster project.

Allow students about 10 minutes to research their assigned animal's adaptations, taking notes so their posters can be revised. Conduct a review of natural selection within the context of a discussion which addresses the question, "How does the environment drive adaptation?" Have student groups share how habitats may have affected the adaptations of their assigned animals.

Teacher's Note:

If you would like to display timers for students, you can access the K20 Timers at https://www.youtube.com/playlist?list=PL-aUhEQeaZXLMF3fltNDxiuSkEr0pq0c2.

50 minutes

Explain

Display **slide 10** and using the I Notice, I Wonder strategy, think about how the dog's anatomy can affect its behavior and adaptation to its environment.

Move to **slide 11** and explain the Categorical Highlighting strategy. Give each student two different colored highlighters. Pass out the **"Mammalian Characteristics and Adaptations" handout** (attached). Have students read silently for 10 to 15 minutes, marking the "Characteristics of Mammals" with one color marker and "Mammalian Adaptations" with the second color.

Teacher's Note:

In Categorical Highlighting, students are sometimes prone to marking much more than is necessary. Encourage them to look for the most salient ideas and be judicious with their ink.

Have students form groups and discuss their takeaways from the reading activity. Hand out **"Thriving on the Edge" handout** (attached) and allow students time to complete the activities. Then conduct an all-class discussion in which you fill in what is not yet clear. When you are satisfied with the direction of the discussion, show **slide 12** and have students respond to one of the two prompts, or, alternatively, pass out the **Explain–Exit Tickets** (attached). Collect their responses, using their answers to sort students into groups for the Extend activity to come.

45 minutes

Extend

Play the video on **slide 13** and briefly discuss variations in rabbit populations.

Embedded video

https://youtube.com/watch?v=6nBs_yRqg4w

Group students according to their level of understanding based on the previous day's exit tickets, then explain the PhET Interactive Simulation on **slide 14**. At your shared screen or in pairs at individual computers, introduce the simulation for Natural Selection and have students run through a simulation first in which rabbits take over the world to show them how the simulation works. Allow about ten minutes for students to run simulations and take notes.

Teacher's Note:

The simulation generates a graph between generations, but because it runs quickly students won't have time to copy it down. Instead, they should take notes on the **trends** in the graphs, especially when variables are changed. For instance, they might note trends such as "Population was in continual decline for variables *x* and *y*", or "Population rose and fell at regular intervals."

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Talk students through different scenarios; which adaptations are better; what limits the population, how animals maintain homeostasis, etc. Finish with a class discussion and allow students to revise and modify their posters with any new information gleaned from this research.

When students have finished their poster revisions, display **slide 15** and explain the Three Stray, One Stays Gallery Walk strategy. Explain that, for this activity, one student will stay to explain their poster, and two or three will "stray." Those who stray should take brief notes and, if you like, pass out stickies so they can write peer review comments including objective criticism and praise that they can affix to peers' posters; allow about 15 minutes for this activity. Conclude with a class discussion that addresses homeostasis and how mammals have adapted to their environments through natural selection.

40 minutes

Evaluate

Display **slide 16** and briefly explain the unit's closing Exit Ticket: Have students think about an animal they examined on the Gallery Walk and compare it to their own mammal or compare their researched animal to themselves, describing how the organization of systems in an organism contributes to its survival and adaptation.

Use the rubric to grade final poster projects.

Resources

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