

Lesson 9: How Are Different Species Related to One Another?

Overview:

Purpose:

The purpose of this activity is to construct an argument based on evidence of the evolutionary relationship between organisms that share common ancestors in the distant past.

Connection to previous activities:

Students refer to the mechanisms of evolution learned in the course of the unit to develop the explanation in this activity.

Learning Performances

- Analyze data and make inferences about evolutionary relationships of four canid species based on data about physical traits, pack behavior, mating and hunting behavior, chromosome number, food sources, geographic distribution and habitat.
- Construct a scientific explanation, based on evidence for which species is most closely related to gray wolves (African wild dog, Maned wolf, or Coyote), and which is most distantly related.

Description of the Lesson

The class revisits the definition of a species and the mechanisms that can account for why new species emerge. The class revisits the different species on the Case Study board, and make predictions about which of these species is most closely related and which is most distantly related to gray wolves.

Students are assigned to groups of 3 to research one topic area to compare these species (African wild dog, Maned wolf, or Coyote). They summarize the similarities and differences of this species compared to the gray wolf. They report out their findings to their topic group of three and record the other members' findings. They create a ranking for which species is most closely and most distantly related to gray wolves based on this information.

Then students are reassigned (jig-sawed) to join a group of 4 students, where they are the topic experts for the area their old group researched. Each member reports out their rankings, and supporting evidences and all group members summarize each other's rankings. Then, as a group they analyze the ranking for each topic area to determine their summative claim for which species is most closely related and which is mostly distantly related to wolves. They add this information to an evolutionary tree diagram and provide written summaries of the evidence that supports their claim, and an explanation of the evolutionary mechanisms that may have been responsible for the formation of these species.

Optional: You might find it productive to have students may present and defend their final arguments to their classmates.

Lesson Details:

Time: 60-75 minutes

Materials

Per Student

- 1 Case Study 3 student activity sheet found in the zip file for Case Study 3 handout and printouts.
- 1 color print of Case Study 3 data packet A found in the zip file for Case Study 3 handout and printouts.
- 1 color print of either Case Study 3 data packet B, C, or D (print one of each of these per group of 3 students) found in the zip file for Case Study 3 handout and printouts.

For Teacher

- The driving question board
- 1 piece of butcher paper or poster paper or space on the wall for students to stick the post it notes on.
- Copy of Case Study 3 Transparency- Range of tigers and lions to project for presentation and discussion.

Lesson Outline and Timing

Launch

- Review definition of species and mechanisms of evolution that lead to speciation (5 min.)
- Read page 1 of the student activity sheet together and have students make predictions and complete step 1 of the procedure on page 2 (5 min.)

Explore

- Teacher assigns topic groups (3 students to a group) – following steps 2 and 3 in the Procedure-Part 1 on page 2 of the student activity guide. (2 min).
- Groups work on research for their species and report out and record their findings for their topic group and complete the Making Sense of Your Data With Your Group questions on the top of page 3 of the student activity sheet. (20-23 min).

Summarize

- Teacher assigns new jigsaw groups (4 students to a group), one topic expert per group (2 min).
- Groups work on reporting out and record their findings for their topic group with other topic group members - step 4. (10 min).
- Group completes Claim on bottom of page 3 and evolutionary tree diagram on page 4 of the student activity sheet, based on their shared rankings (3 min).

Explanation:

- Groups summarize the evidence that supports their claim on page 5 of the student activity sheet (10 min).
- Assign students to individually complete the last page of the student activity sheet (the reasoning portion of the explanation). (0 to 15 minutes)

Lesson Enactment Details

Launch:

Remind students that scientists try to explain what they mean when they say “a different type of animal” is to introduce the idea of a **species**. Write and refer to the scientific definition of species on the board:

A species is a group of organisms belong that is capable of interbreeding to produce fertile offspring.

Ask students whether, based on their reading, this change to the definition would affect whether lions and tigers should be considered different species. *Accept all answers.*

Tell students that scientists have occasionally revised this definition of species over time. More recently they have added to it to say:

A species is a group of organisms belong that is capable of interbreeding to produce fertile offspring and does so in its natural environment.

Show students the map of the territories that lions and tigers are naturally found in the wild (Transparency – Lion and Tigers range).

Point out that in the past, there historically was some overlap in their ranges. But these days, there is not. Because of that, the two groups have no opportunities to interbreed in the wild. This is one reason they are considered different species, even though they have mated and produced offspring in confined and artificial settings, such as zoos.

Refer to the example of domestic dogs and wild gray wolves. Tell students that these animals do sometimes interbreed where dogs are left outdoors and have been intentionally interbred by breeders in the past. And, they should recall that domestic dogs originally had descended from breeding wild wolves for specific trait variations. These are considered the same species.

Review the mechanism of evolution that lead to new species with students on the Driving Question Board from the previous activity.

Read page 1 of the student activity sheet together and have students make predictions and complete step 1 of the procedure on page 2

Explore:

Assign 3 students to one topic group. Assign the next 3 students to the next topic group. Repeat this for all four topic groups and then repeat the process until all students are assigned to a 3 person topic group. Topic groups:

- Physical traits (weight, height, length, fur color, etc...)
- Food sources and Hunting behaviors
- Chromosome number and Reproductive behaviors
- Habitats and geographical distribution

Give every student a color printout copy of Case Study data packet A (on gray wolves). Give each person in a topic group a different species packet (printed in color) to compare to the gray wolf packet:

Have students follow steps 2 and 3 in the Procedure-Part 1 on page 2 of the student activity guide. Then have these groups work on research for their species and report out and record their findings for their topic group and complete the Making Sense of Your Data With Your Group questions on the top of page 3 of the student activity sheet.

Summarize:

Assign new jigsaw groups (4 students to a group), so that one topic expert per group is in this new group.

Have these groups work on reporting out and record their findings for each of the four topic groups with other topic group members. The group should complete the claim on bottom of page 3 and evolutionary tree diagram on page 4 of the student activity sheet, based on their shared rankings.

Explanation:

Tell groups to summarize the evidence that supports their claim on page 5 of the student activity sheet. If time runs out, this can be assigned be completed individually as a summative assessment.

Either have groups complete the last page of the student activity sheet (if time permits this may take about 15 minutes) or assign this to be completed individually as a summative assessment.