

Animal Classification

Subject: Life Science

Grade Levels: High School

Lesson Objective: Students will develop a classification scheme. Students will use information to determine how closely organisms are related to each other.

South Carolina Standard Correlation:

I: B-12: Communicate and defend the scientific thinking that resulted in conclusions.

I: F-1: Develop a set of laboratory instructions that someone else can follow.

I: F-2: Develop a presentation to communicate the process and conclusion of a scientific investigation.

I: G-1-b-5: Understand that scientific explanations must be logical, supported by evidence, and open to revision.

II: C-3-a: Investigate the modern kingdom classification system based on fossil record interpretation and similarities in structural and chemical makeup.

II: C-3-b: Analyze the complexity of classifying organisms based on structural adaptations, physiology, nutritional strategies, biochemical similarities, embryological similarities, and methods of reproduction.

Required Materials: Handouts of materials (Student Instructions, Organism Characteristics, Pictures, and Student Response Form), sample rubric, research materials (books, encyclopedias, Internet access)

Good Classification Websites:

- www.york.biosis.org/zrdocs/zoolinfo/gp_index.htm#vertebrates
- animaldiversity.ummz.umich.edu/chordata/mammalia/cetacea.html
- www.ncbi.nlm.nih.gov/Genbank/GenbankSearch.html (For gene sequences)

Grouping: 2-4 students per group

Duration: 2-3 class periods

Assessment: Assessment is ongoing. See sample rubric for scoring of specific steps. Students should have access to rubric and/or be a part of the decision making in its formation. By the end of the lesson, students should be able to name two organisms that look similar, but are not closely related (i.e.- dolphin and shark). Students should understand that classification is more complex than simply looking at an organism's physical characteristics.

ASSESSMENT RUBRIC

Step Number and Process	Excellent	Good	Fair/Parts Missing	Poor/Incomplete	Very poor/Incomplete	Absent
(1) Prediction & reasoning for relation present.	5	4	3	2	1	0
(3) Classification scheme includes characteristics.	10	8	6	4	2	0
(3) Classification scheme includes names for each organism.	5	4	3	2	1	0
(4) Description written for each animal.	10	8	6	4	2	0
(5) Identification of another group's organism accomplished.	5	4	3	2	1	0
(5) Group's Key works.	5	4	3	2	1	0
(6) Answers which organisms are most closely related.	5	4	3	2	1	0
(7) Reasons for relations between bats, doves, and mice listed (example: mammals, warm-blooded, live birth, structures, etc).	10	8	6	4	2	0
(8) Example of similar, but unrelated animals.	5	4	3	2	1	0
(8) Adaptive Value of structures/Reasons for classification.	10	8	6	4	2	0
Worked well in group (behavior appropriate).	5	4	3	2	1	0
Well-written (proper grammar, complete sentences, references documented).	5	4	3	2	1	0
Total possible - 75 points						

Classification - Teacher Instructions

Engagement

Put students in groups of two to four. Distribute the pictures of seven organisms.

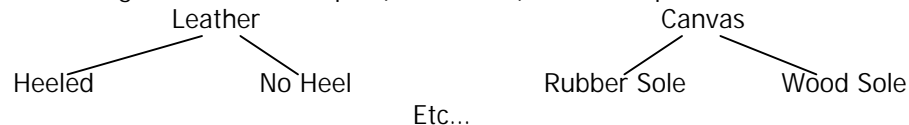
1. Ask students to look at the pictures. Using qualitative observations, ask students to determine which organisms are closely related. Why? Discuss groups' answers and reasons.

Exploration

Distribute Student Instruction and Response Sheets, and Organism Characteristics.

2. Students will compare the characteristics of each organism.
3. Develop a classification scheme using all information provided (including pictures).

Teacher may model using a different example (i.e. - shoes). For example:



Note: A dichotomous key is a list of observable properties that eventually leads to the name of an organism. The observations are presented as choices.

- a. Using your own criteria, select a starting point for arranging organisms into two distinct groups. One group may have only one specimen; another may have many examples.
 - b. Divide each group into two more groups (if necessary) according to major likenesses and differences of specimen characteristics.
 - c. Continue dividing the groups until only one specimen remains.
 - d. If a specimen terminates a division, give it a name for identification (the name can be real or imaginary). Continue to divide groups of specimens until each one has a name.
-

Note: Monitor student progress to ensure that they are on the right track. If students are having trouble, use guiding questions to help them understand how to create the key

4. Write a brief description of each terminal specimen found in the key. Include many of the same terms you used in constructing the key. Each description should be specific to the specimen. Although other descriptions will be similar, they should be different from the description of any other species in at least one detail.
5. Exchange your classification scheme with another group to see if they can correctly identify the names of the organisms. Keys that do not work should be revised.

Explanation

6. Like the animals of earth, these organisms are the result of millions of years of evolution. Which types seem to be most closely related? Explain your reasoning, using at least four characteristics. Discuss ideas and reasons as a class.

Elaboration

7. Using research materials, determine which two of the following are most closely related: Bats, Doves, Mice. Justify your answer and explain your reasons using at least four examples.
-

Note: Accept all possible answers - use "incorrect" ideas as a lead-in for a discussion on the importance of using genetics, chemistry, fossils, and embryology in classifying organisms.

Evaluation

8. Give an example of two organisms that look similar (other than those used today), but are not closely related (or vice versa). Explain why they look similar (what adaptive value similar structures may have) and why the two organisms are not classified in the same group.

See Rubric.

This can be done as a presentation or a written assignment - assess accordingly.

Organism identification key (see picture sheet in student version)

1. Bony Fish
2. Whale
3. Snake
4. Skate
5. Dolphin
6. Shark
7. Eel

Classification - Student Instructions

Lesson includes: Procedure, Organism Description Sheet, Student Response Sheet, and Organism Picture Sheet

Procedure

1. Look at the pictures. Using qualitative observations, which do you think are closely related? Why? Be prepared to share your answers with the class.
2. Using the characteristics and pictures given, compare the characteristics of each organism.
3. Develop a classification scheme (in tree or chart) using all the information given. Record your scheme on your Student Response Sheet.
 - a. Using your own criteria, select a starting point for arranging the organisms into two distinct groups. One group may have only one specimen; another may have many examples. You may use the specimen numbers to represent each organism.
 - b. Divide each group into two more groups (if necessary) according to major likenesses and differences of specimen characteristics.
 - c. Continue dividing the groups until only one specimen remains (terminal species).
 - d. When a specimen terminates a division, give it a name for identification (use a real or imaginative name). Continue to divide groups of specimens until each one has a name.
4. On a separate page, write a brief description of each terminal specimen found. Include many of the same terms you used in constructing the key. Each description should be specific to the specimen. Although other descriptions will be similar, they should be different from the description of any other species in at least one detail. Again, these descriptions go on a separate page.
5. Exchange your classification scheme with another group to see if they can correctly identify the names of your organisms. Those schemes that do not work should be revised until other groups can correctly identify all organisms.
6. Like the animals of earth, these organisms are the result of millions of years of evolution. Which types seem to be most closely related? Explain your reasoning using at least four characteristics. Be prepared to discuss ideas/reasons as a class.
7. Using research materials, determine which of the following are most closely related: Bats, Doves, Mice. Justify your answer/explain your reasoning using at least four examples.
8. Give an example of two organisms that look similar, but are not closely related. Explain why they look similar (what adaptive value similar structures may have) and why the two organisms are not classified in the same group.

Description of Organisms

Organism 1:

Releases eggs, external fertilization, cold-blooded, two chambered heart, bony skeleton, evaluation of 16s rRNA gene reveals the following first bases: AACGCAGT

Organism 2:

Live birth of young, internal fertilization, endothermic, four chambered heart, bony skeleton, evaluation of 16s rRNA gene reveals the following first bases: AACAAAGA

Organism 3:

Internal fertilization, three chambered heart, cold-blooded, lays eggs, bony skeleton, evaluation of 16s rRNA gene reveals the following first bases: AACCTAAA

Organism 4:

Internal fertilization, cold-blooded, two chambered heart, skeleton made of cartilage, lays eggs, evaluation of 16s rRNA gene reveals the following first bases: AACCTACC

Organism 5:

Internal fertilization, live birth of young, endothermic, bony skeleton, four chambered heart, evaluation of 16s rRNA gene reveals the following first bases: AACAAAGC

Organism 6:

Releases eggs that are internally fertilized, cold-blooded, skeleton made of cartilage, two chambered heart, evaluation of 16s rRNA gene reveals the following first bases: AACAAAAT

Organism 7:

Releases eggs, external fertilization, cold-blooded, two chambered heart, bony skeleton, evaluation of 16s rRNA gene reveals the following first bases: AACCCAAC

Student Response Sheet

Numbers correspond to steps on Procedure Sheet.

3. Classification scheme:

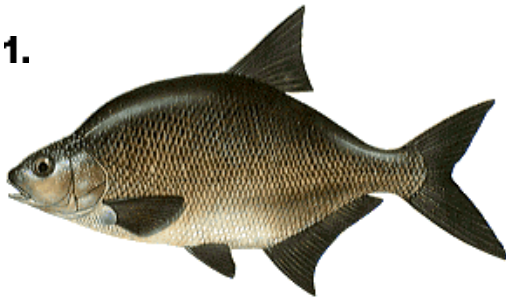
9. Which of your organisms do you believe are more closely related? Explain your reasoning.

10. Of Bats, Doves, and Mice, which organisms do you believe are more closely related? Explain your reasoning.

11. Name two organisms (other than those reviewed today) that look similar, but are not closely related. Justify your answer.
Explain why they look similar (what adaptive value similar structures may have) and why the two organisms are not classified in the same group.

Organism Pictures

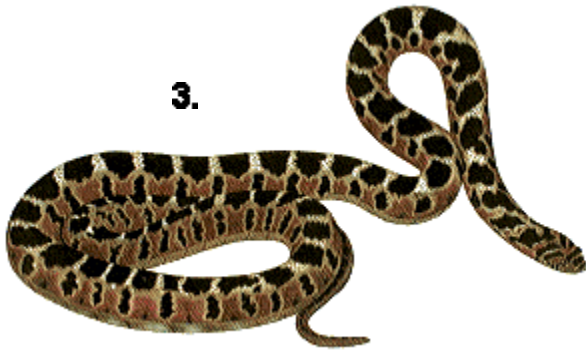
1.



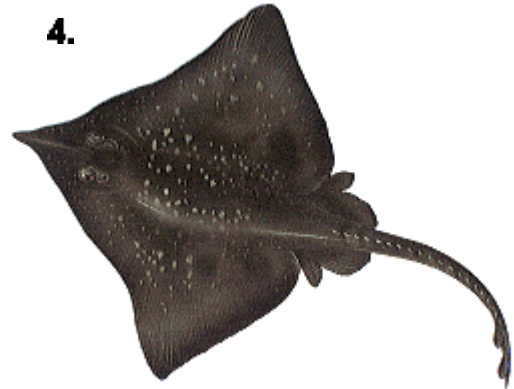
2.



3.



4.



5.



6.



7.

