



Artificially Selecting Dogs

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Overview: Students learn how artificial selection can be used to develop new dog breeds with characteristics that make the dogs capable of performing a desirable task. Students begin by examining canine features and their functions. They are then given a scenario that describes the type of task they need a new breed of dog to perform. They then select two existing breeds they feel will most likely produce a successful new breed and determine the resulting offspring's characteristics. This lesson emphasizes variation, inheritance, selection, and time (number of generations) to help students develop a clear understanding of artificial selection and, ultimately, natural selection.

Lesson Concepts:

- People selectively breed domesticated plants and animals to produce offspring with preferred characteristics.
- Artificial selection provides a model for natural selection.

National Standards Addressed:

- Species evolve over time.
- Evolution is the consequence of the interactions of (1) the potential of a species to increase in numbers, (2) the genetic variability of offspring due to mutation and recombination of genes.

Grade Span: 6–12

Materials:

I. Overheads

- *How to Get an American Foxhound and Why* ([pdf](#))
- *Dog Breeding Example* ([pdf](#))
- *Dog Traits* ([pdf](#))
- *Artificial Selection Overhead* ([pdf](#))

II. *Dog Traits teacher's sheet* ([pdf](#))

III. "Dog Packet" envelope (one per team) containing:

- *Dog Breeds handout* ([pdf](#))
- *Ownership Card* ([pdf](#))
- *Puppy Traits* ([pdf](#))

IV. Supplies

- 1 penny per team
- Blank paper for drawings
- Colored pencils

Advance Preparation:

- Make overheads.
- Prepare a "Dog Packet" envelope for each team of students (see Materials above).

Time: 60 to 100 minutes

Grouping: Two to four

Teacher Background:

Dogs belong to a single species, *Canis familiaris*, but that species is comprised of about 400 different breeds. Since they are a single species, they can mate and have viable offspring. Recognized dog breeds take generations to establish through selective breeding or artificial selection. Many of the breeds we have today are the result of people's desire to have dogs with specific features that make them suitable for performing particular tasks, such as retrieving, protection, assistance, hunting, and companionship, to name just a few. The process of breeding a new type of dog often involves identifying desired features,

finding dogs with those features, then performing a series of matings to produce offspring with the appropriate combination of traits. After a number of generations, a new breed may be established.

A good resource for additional information can be found at the [Dog Breed Info Center](#) website.

Teaching Tips:

Prior to this activity, students should know that organisms reproduce to form the next generation. Class discussion will help students understand that there may be an advantage to individual variation within populations and that scientists perform experiments to test their ideas.

Vocabulary: artificial selection, variation, inheritance, selection, time, natural selection, population, species, selective breeding

Procedure:

Introduction

- Put up the "*How to Get an American Foxhound and Why*" ([pdf](#)) overhead with Part A showing. Explain that over 400 years ago there was no such thing as an American Foxhound. Ask students to explain how American Foxhounds appeared. Uncover Part B. Explain the following:

The American Foxhound is half descended from the English Foxhounds that were brought to America in 1650. The English hounds were crossed with a French hound that George Washington received as a gift from Lafayette. The combination breed became an excellent hunter of wild animals. The American Foxhound has great speed and an excellent sense of smell. It can run at high speed for long periods and has a musical bay that is easy to follow. American Foxhounds are still used as hunting dogs today but are also used as companions and watchdogs.

- Ask students to describe the features or abilities of dogs for which humans might breed. Point out that it is possible to select dogs to breed for particular traits because all dogs are from the same species, *Canis familiaris*. The various breeds can mate with each other to produce offspring. Show Part C.
- Put up the "*Dog Breeding Example*" ([pdf](#)) overhead and ask the students to identify which traits would be most appropriate to match the example given. Tell them that this example only shows a few traits and ask what other traits might be important to consider when breeding dogs. Answers will vary, but pointed ears are good for hearing and a loud bark will travel a longer distance. Long fur will help the dogs stay warmer out in the cold. Ask students which traits are probably not very important? (eye color). Which breeds would probably be best to cross? (Breed 1 and Breed 3)
- Put up the "*Dog Traits*" ([pdf](#)) overhead. Explain to students that physical traits serve a very specific function for dogs. Each of these could play an important role, or have significance for humans when they need a dog to perform a particular function. In teams or as a class, have students brainstorm the significance of each trait then discuss (see the "*Dog Traits teacher's sheet*" [[pdf](#)]).
- Divide students into teams of 2-4. Pass out the "Dog Packet." Explain that each group will be trying to artificially select a new dog with certain traits by crossing two existing breeds. Direct students to take out the "*Ownership Card*" ([pdf](#)), which they will be filling in, and the "*Dog Breeds*" ([pdf](#)) handout, which contains the breeds they may use. Carefully review the descriptions of the breeds with your students. Briefly discuss the sorts of things one might want to consider in making decisions about breeding.
- Students fill in their names under "Breeders' Names" on the "*Ownership Card*" and read the Assignment directions.
- In their groups, students should discuss the types of features they think their new breed should have and circle the appropriate traits in "Part I: Desired Features of the New Breed." If the trait is unimportant for the breeding goal, then students should circle "any."
- Students should then look at the "*Dog Breed*" cards and select two dog breeds with the features most likely to produce a breed with the features they need. Students will have to prioritize the features since no two breeds will likely have the exact combination they desire. HINT: It's easiest to keep track of the traits if students put check marks next to the desirable traits for each breed. In Part II of the "*Ownership Card*," they should write the breed names and reasons for their selections. Encourage students to be detailed in their explanations.
- Have each group share with the class which parents they chose and why. Discuss similarities and differences between group choices and make predictions as to the likely outcome of each group's selections.
- Ask the teams to choose which dog will be the mother and which will be the father. Explain that each breeding pair will produce three puppies, but that each puppy may inherit features (traits) from the mother or from the father. For this exercise, we will determine this by a flip of a coin: Heads = the female's (mother's) feature, tails = the male's (father's) feature. Since there are three offspring, students will flip a coin three times for each trait to be inherited. Students will keep track of the results of their coin flips on the "*Puppy Traits*" ([pdf](#)) worksheet. Pass a penny to each team for the coin flips. Also pass a blank paper for each student to draw one of the resulting puppies and to explain which features were inherited from each adult. Be sure students label the significant features inherited.

11. Within each group, have students compare the three puppies. Are they identical? Why or why not? Discuss variation.
12. Have teams display all of their drawings of offspring, grouped according to parents (i.e., groups that selected the same parents are grouped together) and discuss the variation of the dogs portrayed, noting variation depending on *parents selected* and traits *randomly inherited*. Ask: *Which of the resulting dogs do you think will best serve the assigned task? Explain. Is there a single individual that is perfect for the task? If you were to conduct the dog breeding for another generation, which pups would you select to be the parents of the next generation?*
13. Put up the "Artificial Selection" ([pdf](#)) overhead. Discuss each of the terms associated with artificial selection; variation, inheritance, selection, time.

Assessment:

Write a paragraph describing the process of artificial selection in your own words, using dogs or another organism as your example. Be sure to use and underline the VIST terms (variation, inheritance, selection, time) in explanation.

Extensions and Follow-up:

1. Have students repeat the process with the following prompt, "You have been contacted by several farmers that want dogs that would be useful for controlling small rodents such as mice that tend to eat their stored crops in their granaries. These rodents often hide among the stacks of grain, invisible to those trying to find them. The granaries are often kept at very warm temperatures."
2. Look up artificial selection in your textbook, the Internet, or other resource to find another example of when artificial selection has been used. Explain the example, using the VIST terms.
3. Have teams come up with their own description of a desirable breed, then trade with other groups.

Suggested follow-up for introducing natural selection:

1. Write Artificial Selection on the board or overhead with V,I,S,T underneath. As a review, ask students to recall and describe each of the aspects that describe artificial selection.
2. Explain that a similar process occurs in nature called Natural Selection. Ask the class to describe what is meant by "natural" as opposed to "artificial."
3. Complete the [Clip Bird](#) activity.
4. Have students describe each of the VIST terms according to natural selection.

Bibliography

Dog Breed Info Center (2003). [Dog Breed Info Center](#). Retrieved September, 2004.

Natural History Museum (October 2002). [Dogs: Wolf, Myth, Hero & Friend](#). Retrieved September, 2004.

On Science (no date). [Evolution of the Family Dog](#). Retrieved September, 2004.

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