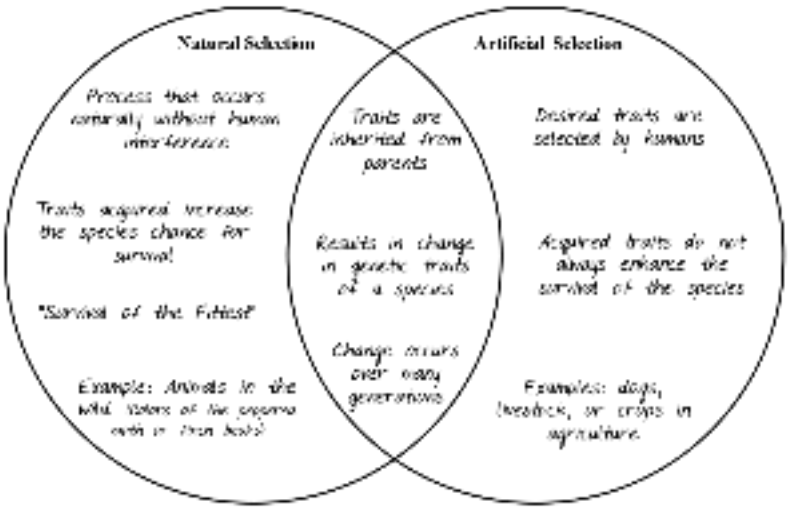
Evolution of Food Training Guide

Overview

Domestication is a form of artificial selection. Humans have domesticated many animals, selectively breeding organisms for traits that we see as desirable. In nature, organisms become better adapted to their environment through natural selection. Variation of traits exist in populations, and some are more advantageous in specific environments by allowing for increased survival and reproduction. Species adapt to their environment through natural selection; individuals with advantageous traits survive, reproduce, and pass on these adaptive traits.



Source: National Agricultural Literacy Curriculum Matrix

Artificial and natural selection are not the same, however, both show how traits can be selected for and passed down generations. The Evolution of Food allows participants to observe artificial selection through wild and domestic organisms. Participants can also explore how to make inferences on the past based on fossils and artifacts in the sedimentary record.

Wolf Domestication Card Game

Learning Goals

1. To demonstrate the evolution of wolves into modern-day dogs, and that the mechanism for this evolution is based largely on behaviors rather than physical traits

Materials

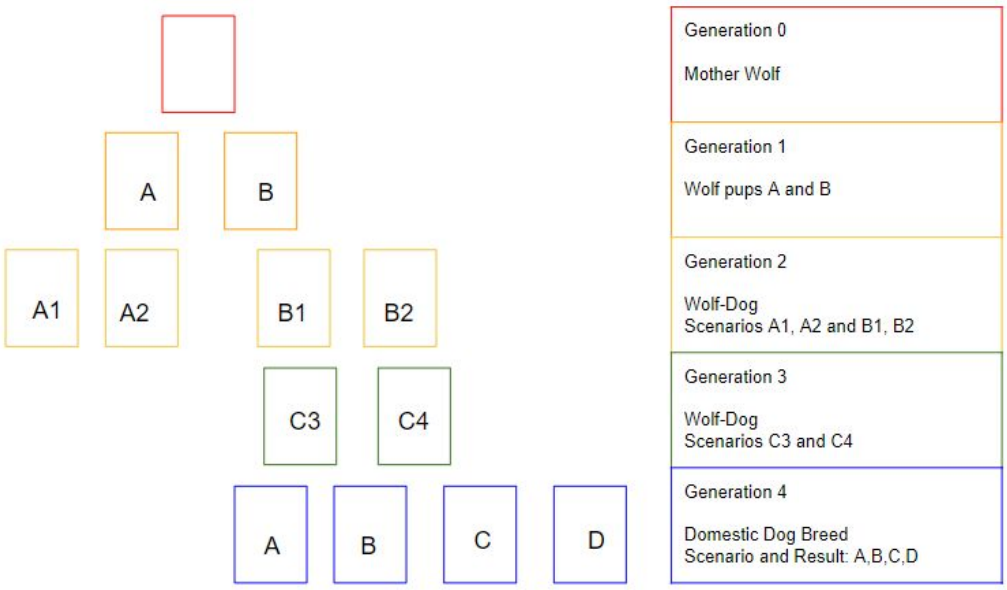
- Wolf Domestication card game

Set-up

1. This is a choose your own adventure type of game. Each new color border on a set of cards represents a successive generation of wolves. This game does not take place over a single lifetime, but hundreds of years.
2. There is the narrator, who is responsible for prompting the player with choices and consequences of those choices. And there is the player themselves. Players sit next to or across from each other at a table with a flat surface. The deck of cards should be in rainbow order (red at the top, then orange, yellow, green, blue, etc.) The narrator is responsible for holding the deck of unused cards throughout the game.

Procedure

1. Begin the game with a single red card on the table, with the picture of the female wolf facing up. The player will then flip over the card and read the scenario.
2. The narrator places two orange cards (wolf pup A and B) underneath the red card with pictures facing up. The player then chooses a wolf pup, flips over the card and reads the scenario and makes a choice. (Chooses either Scenario A1/A2 or Scenario B1/B2).
3. The narrator then places both scenario cards (A1/2 or B1/2) out on the table with a wolf picture facing up. The player makes their choice, and flips over the card, following the prompt. Both Scenarios A and B have yellow borders.
4. If a player chooses A1 this results in a GAME OVER card. The player is then invited to make a different decision and continue the game.
5. If a player chooses A2, they continue following the prompts on the playing cards. Ultimately, both results of A1 and A2 end in a game over for the player.
6. Players that choose B1 or B2 (yellow border) will be able to complete the domestication of the wolf and produce a dog.
7. Players then follow prompts through scenario C3 and C4 (green border), which then leads them to their final decision and production of a domesticated dog species (blue border).



Definition of Success

- All players are deemed successful if they finish the game and produce a domesticated dog species. If players get a GAME OVER card, they are encouraged to make a different choice until they reach successful dog domestication. Younger kids can be rewarded with small prizes upon completion of the game.

Organism Matching Game

Learning Goals

1. To demonstrate that humans play a large role in the selection and evolution of food products
2. To demonstrate physical differences (and other traits) between organisms that are domestic versus wild

Materials

- Wild vs. Domestic organism matching game

Set-up

1. Shuffle the stack of organism cards and lay them out on a flat surface with pictures facing down.

Procedure

1. Invite the players to flip over two cards at a time. If they match the wild and domestic organism pair correctly, they can flip over two more cards. Correct pairs of cards should be pulled off the board.
2. Once they flip over cards that do not match, their turn is over. A pair of cards that do not match are turned back over and the player's turn is over.
3. The player with the most pairs at the end of the game wins.

Definition of Success

- With young kids (8 and under), if they correctly match all pairs of cards and can have a short discussion with you, this is a success. Participation is rewarded with a small prize.
- With a general audience, success is defined as matching all pairs of cards, identifying the domestic and wild organisms within each pair and having a discussion about the similarities and differences between the organisms. Participants can be rewarded with a small prize.

Discussion and Guiding Questions

- With mixed age participants (general audiences, kids and adults) an identification of which organism is domestic vs. wild is appropriate. In addition to this, have the participant identify similarities and differences between the two organisms.
    - Some general observations comparing the organisms may include:
        - Animals:
            - Domestic: Adult species have juvenile traits (neoteny), lack defensive body parts (no horns, tusks, etc.), coloration is more muted, bodies are larger/fatter in size (meat yield for human consumption)
            - Wild: Adult species do not have juvenile traits, have defensive body parts (horns, tusks, etc.), coloration is more vibrant (to attract mates), bodies are more muscular
        - Plants:
            - Domestic: Have vibrant color, perfectly symmetrical, fruits or flowers are larger in size, taste better, more pungent smell, higher yield, etc.
            - Wild: Dull in color, asymmetrical, fruits or flowers are smaller in size, smaller yield, less pungent, not as tasty, etc.
- With young kids (8 or younger) a simple discussion and identification of which organism is wild versus domestic are sufficient. Prompt them with questions such as:
    - Which plant/animal do you think a farmer might have on their farm?
    - Do you recognize any of these animals/plants?
    - Which one do you think might be found out in nature?

Organism Matching Game

Learning Goals

1. To expose participants to archaeology, and to participate in a dig
2. To develop critical thinking skills
3. To practice producing hypotheses/educated guesses that are rooted in evidence-based claims

Materials

- Black Tupperware with lid
- 4-6 toothbrushes
- Pony Beads
- 8 artifacts (These can vary based on materials at hand)
    - 2 human vertebra
    - 1 ax head
    - 1 shovel
    - 1 pitchfork
    - 3 miscellaneous bones

Set-up

1. Take your Pony Beads and fill Tupperware so it is about ¾ full. Bury artifacts at varying depths within the Tupperware. Make sure all artifacts are covered by beads to some degree.

Procedure

1. You are the narrator of this activity and it is your job to set the scene for the players. The premise is as follows: You and the participants are all archaeologists who are currently investigating a dig site for evidence of humans, non-human animals, and past societies. It is your job to have participants literally dig for clues, using the toothbrushes to find the buried artifacts and come up with possible hypotheses and explanations for what you find at the site.
2. There is no right answer to this activity. The point is to expose participants to what an actual archaeological dig might be like and to develop their critical thinking skills. This activity is based largely within a discussion format, and constantly asking questions and seeking evidence is encouraged. Kids can come up with some strange hypotheses and ideas, but as long as they're grounded in evidence and reality, go with it! Aliens and extraterrestrial claims are not allowed.

Definition of Success

- Success is achieved when any participant completes some level of discussion with you. Obviously, with younger kids, you may have to prompt them with your own questions. But if they participate, they should be rewarded.

Discussion and Guiding Questions

This is not an exhaustive list. However, some potential discussion questions to prompt conversation can be used below:

- What sort of artifact did you find?
- Does it look like something you have seen before?
- Is it a tool? What kind? What was it used for? Why do you think that? Does it look similar/different to other tools we have already found?
- Is it a bone? Is it from an animal or a human? What part of the body is it from? Why do you think that? Does it look similar/different to other bones we have already found?
- Can you compare and contrast the bones and/or tools here? What are some similarities and differences you notice?
- How do you think that artifact got here?
- What do you think this artifact was used for?
- What is your evidence for your statement? How do you know that? Can you be more specific?
- What other information is missing? Or what other information would you like to know in order to confirm or deny your hypothesis?
- How could we test your claim?

Further Resources

- How did dogs become our best friends?
- From wild animals to domestic pets, an evolutionary view of domestication
- What do Archaeologists do?

NGSS Standards

K-ESS2-2 Earth's Systems

Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.

3-LS3-1 Heredity: Inheritance and Variation of Traits

Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

MS-LS4-5 Biological Evolution: Unity and Diversity

Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

MS-LS4-1 Biological Evolution: Unity and Diversity

Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.