RED BUTTE GARDEN BOTANY BINS

PATTERNS & PARTNERSHIPS: UTAH MOUNTAIN ECOLOGY

Lesson 2: The Canine Conundrum
Types of Traits

Core Alignment: 5th Grade – Standard 5 – Objective 1
d. Contrast inherited traits with traits and behaviors that are not inherited but may be learned or induced by environmental factors.
Intended Learning Outcomes:
• Observe simple objects, patterns, and events and report their observations. • Compare things, processes, and events. • Describe or explain observations carefully and report with pictures, sentences, and models. • Use classification systems. • Cite examples of how science affects life. • Science is a way of knowing that is used by many people, not just scientists.
Vocabulary:
organism, traits, parent organism, offspring, inherited, learned behavior, acquired, instincts, species Optional: taxonomy, selective breeding, hybridize
Time Commitment: These lessons are designed to provide flexibility in both length and depth. Plain text in black contains the middle-of-the-road option, while text in red contains time-saving options and text in purple contains options to dive deeper into the subject matter.
30–60 minutes, 20–35 minutes, and 60+ minutes.

Lesson Summary

With a basic knowledge of traits in hand, we focus in on an animal species that is famous for its varied (and highly manipulated) traits, the Canines. *Canis lupus* * (wolves and dogs) offers a great opportunity to observe not only the variation of traits within a species, but also the different sources of those traits. Inherited traits and instincts, or acquired traits and learned behaviors, are on full display with the canines. Students continue working on their pattern finding powers as they delve deeper into the world of traits. Canines also offer a fun and intuitive way to discuss how even early humans were excellent at finding patterns and scientific thought. They utilized their knowledge of inherited traits to breed wild wolves into domesticated dogs. Modern humans continued that legacy and created the incredible variety of dogs we have today. Much of this lesson follows the same template as the previous lesson.

Essential Questions

- What are the possible sources of an organism's traits?
- How can knowledge of an organism's traits and their sources be utilized?

Enduring Understanding

- An organism's traits can come from different sources, some of which can be passed from parent to offspring and some that cannot.
- Identifying traits is an exercise in recognizing patterns. The more you familiarize yourself with an organism, the easier it is to distinguish those patterns.
- Knowledge of an organism's traits, and those traits sources, can be utilized for humankind's benefit.

Previous Knowledge

Your students' predisposition to patterns is again one of their greatest tools in this lesson. They have observed the world around themselves from birth and have unknowingly noticed patterns of inheritance along the way. Connecting that knowledge to the vocabulary of inherited, acquired, instincts, and learned behavior is further facilitated with their likely familiarity with one of the world's favorite pets and one of its more feared wild animals.

Background Information

Your exploration of the Utah Mountain Ecosystem continues with a more in-depth look at a specific organism's traits and their sources. Canines (*Canis lupus**) have captured the hearts and imaginations of humans for thousands of years. The familiarity and natural curiosity that humans have with canines makes them an engaging choice for studying the types of traits an organism can possess.

Clementine hunting chukars

The Canine Photos have a wide variety of traits that can be focused on in each picture. Take a look at the canine photo of Clementine the dog to the left. Inherited traits include the size, fur color, and breed features. Instincts include predatory behaviors that lead to the ability to capture the chukar (bird). Acquired traits include a docked tail. Learned behaviors include general obedience to her human, including the acceptance of the vest and the return and relinquishment of the chukar, as opposed to eating it herself. The Canine Photos include pictures that clearly highlight each of the four traits, but with creativity you can find most, if not all four traits, in each of the pictures. The canines also present an opportunity to discuss the potentially blurred lines between inherited and acquired traits. For example a dog's instinct to hunt lends itself to the learned behavior of hunting for a human.

Humans took their first foray into utilizing their knowledge of inherited traits with breeding around 12,500 – 15,000 years ago. There is debate on how and where the first wolves began to

be domesticated by humans, but the current results are staggering. With over 190 breeds recognized by the American Kennel Association that range from 250-pound Mastiffs to 3-pound Chihuahuas, from docile Shih Tzus to the frenetic energy of an Australian Shepherd. For nearly every need and want there is a canine that has been tailored in size, shape, personality, energy level, and ability. And humans didn't stop with canines! After canines, humans went on to breed a myriad of other organisms. ~10,500 years ago, we began to breed wild oxen into cows and wild boars into domestic pigs.   ~7,500 years ago, 5 different types of wildcats were bred into domesticated cats. ~9,000 years ago, humans began their biggest adventure in breeding with plants! Most modern humans would not be able to match most modern fruits and vegetables with their original wild ancestors. We've made seeds smaller, fruit sweeter and juicier, and vegetables more robust. We've removed bitter and sour tastes in some plant foods and added them in others. And we've massively increased the amount of food a plant can produce while lowering the growing time. And this is only a small sampling. Humans have drastically altered the world by utilizing their ability to observe patterns and harness that knowledge to better their lives.

  *The concept of a species can be a little confusing. Is it an organism that can't interbreed? Then what about lions and tigers (ligers) or yaks and buffalo, or the many species of plants like the prickly pear cactus? Classification of organisms into neat categories can be an incredibly powerful tool for understanding the world around us and accessing information, but nature rarely fits into such nice and neat little boxes. *Canis lupus* is used in this lesson as the scientific name for both dogs and wolves, but there has been an ongoing scientific debate on whether dogs should be considered a subspecies of wolves, namely *Canis lupus familiaris*. If you are so inclined this could offer an opportunity to discuss scientific debate and how much variety can exist within a single type (or species) of organism.

Lesson Plan: The Canine Conundrum – Types of Traits

Materials	Location
Canine Photos	Addendum Folder – L2 Photos Tab
Blackline: L2 The Canine Conundrum	Addendum Folder – Tab L2 OR USB – L2 folder
Teacher Hint Sheet: Canine Traits	Addendum Folder – Tab L2 OR USB – L2 folder
Pencils or Pens	Classroom supplies
White/Smart Board for group discussion	Classroom supplies
Optional:	
Rosa nutkana (Nootka Rose) specimen	Botany Bin
Blackline: Inherited Traits & Plant Breeding	Addendum Folder – Tab L2 OR USB – L2 folder

Set-up

- To make this activity more phenomenon-based it is written to have the <u>vocabulary of inherited, acquired, instinct, and learn behavior revealed after the activity.</u>

- Explain that students will look at photos of a specific organism found in Utah's Mountain Ecosystems that is famous for its diversity of traits (the canines) and investigate where those traits may have come from.

   - Define canine (A member of the family Canidae, carnivores that include dogs, wolves, coyotes, foxes, etc...) and explain that they will be looking at *Canis lupus**, otherwise known as wolves and dogs. If you are planning on further discussing how breeders, including early humans, took advantage of inherited traits to breed wolves into dogs this would be a good time to ask the students if they know how dogs and wolves are related and why they might be considered to be the same species.

   - Reinforce the idea that traits can be either the physical or behavioral characteristics of an organism.

- It can be helpful to remind students that there is more than one right answer. Practicing scientific thought processes and logic are more important than the "right" answer.

- Break the students into teams (3 to 5 teams works best)

   - This activity can be done as a class to save time, preselect a few canine photos to display and discuss as a class.

   - To practice the scientific skills of Engaging in Argument from Evidence and Communicating Information; we suggest breaking the teams into roles, namely; Facilitator, Spokesperson, Timekeeper, and Devil's Advocate as outlined in the USB addendum folder document "Suggested Group Discussion Roles."

      - If you have the same student teams as the previous lesson, we suggest shuffling the roles among the students.

- Divide the Canine Photos among the teams.

   - Teacher Tip: This activity works best if the students have a variety of canine trait types so pay attention to trait types as you distribute them. As long as there is discussion after the investigation, you will be able to cover all four trait types even if one is missing from a team's images or observations.

- o Allow the students time to look at the photos as individuals to search for traits and theorize on where they came from. This can help them to form their own conclusions. We suggest approximately 2 minutes.

Activity

- Give the teams a set amount of time to complete the activity. We suggest 5-7 minutes as the canine photos offer more options of traits per picture and typically inspire more discussion than the previous lesson.
    - o If your students need guidance, encourage them to look at the behaviors the canines are displaying as well as their physical features. You can also instruct them to focus on one canine instead of generalizing a trait that all of them are displaying.
    - o If you would like some hints refer to the Teacher Hint Sheet: Canine Traits

- Ask the students to decide on one trait per Canine Photo as a team.
    - o Some of the canine photos have multiple canines, and some have only one. Tell the students that they can focus in on one canine or look for a trait that all of them share.
    - o Encourage students to find both behavioral and physical traits. The activity works best if they work to have approximately half of the observed traits as behavioral.
    - o The goal is to have students identify one trait per canine photo regardless of what trait they choose (inherited or acquired, instinct or learned behaviors), so there are no "wrong" answers.

- Have students record their observations in first two columns of the worksheet "The Canine Conundrum – Types of Traits".
    - o The Canine Name is found on the back of the photo. Only one canine name is listed on each photo even if there are multiple canines.
    - o The Trait Observed should be a single word or short description.

- Explain that there are 4 main types of traits based on how the organism got the trait and whether it is physical or behavioral. Ask the students to use the third column of the worksheet "The Canine Conundrum – Types of Traits" to record how they think each canine got the trait previously recorded.

Discussion

- Have each team share the traits they identified in the Canine Photos and list those traits on your white or smart board.

  - We suggest formatting your board to resemble the "The Canine Conundrum – Types of Traits" worksheet.

  - **Streamline this step by merging it with displaying the preselected canines. As a class, identify traits and how they were obtained. Ask the students to voice their agreement or disagreement and reasons why.**

  - You can use this time as an exercise in Engaging in Argument from Evidence when students have conflicting ideas on how traits were obtained. If you had a Devil's Advocate, this would be a time for them to help assemble and voice their team's objections. The worksheet can help students record the results of that discussion.

- Introduce the vocabulary terms of <u>inherited trait</u> and <u>acquired trait</u> (inherited traits are traits that are passed from a <u>parent organism</u> to their <u>offspring</u>, acquired traits are traits that an organism obtains over the course of their life and cannot be passed down to offspring).

  - As a class, have students assign the term inherited or acquired to each of the traits/trait origins recorded on the board. Record the answer on the board chart.

  - Have students complete the "Trait Vocabulary" column on their worksheet with their new vocabulary terms.

- Explain that there are more specific terms when discussing the behavioral traits or actions of an organism. Introduce the vocabulary terms of <u>instinct</u> and <u>learned behavior</u> (instincts are behavioral traits that are inherited, and do not need to be taught, learned behaviors are behavioral traits or actions that are acquired through trial and error or due to the environment.

  - As a class, have the students determine if each trait listed is behavioral or physical. Highlight the behavioral traits on the board.

  - As a class, have the students determine if each behavioral trait listed is an instinct or learned behavior.

- Ask students to highlight or circle all the behavioral traits on their worksheet. Next, have students fill in the last, "Behavioral Trait Vocabulary," row of their worksheets chart with either instinct or learned behavior for those behavioral traits.

- **The second page of the "The Canine Conundrum – Types of Traits" worksheet can be used either as an in-class or a take-home assignment to reinforce the terminology and concepts learned above.**

Inherited Traits and Breeding Extension

Canines present an engaging opportunity to discuss not only how inherited traits can be utilized by humans, but also how early humans were able to identify and take advantage of those traits.

o   Referring back to the earlier discussion of wolves and dogs suggested in the Set-up section, ask your students what they know about the relationship between wolves and dogs. They are likely familiar with dogs being the result of humans breeding wolves, but if not introduce this concept.

o   Ask the students what types of traits early humans may have been looking for when choosing wolves to breed. If the students confuse inherited and acquired traits, this is a great opportunity for adjustments in their understanding.

   • This can also be an opportunity to discuss the potential overlap between inherited and acquired traits for example, a dog with an inherited trait of being more curious and calm can allow for the learned behavior of fetching a ball or acting as a service dog.

o   Introduce the vocabulary term of breeder. (A breeder is a person who identifies and selects parent organisms with desirable inherited traits, either physical or behavioral, to breed together to create offspring with those traits).

o   Discuss what other organism's humans have utilized their knowledge of inherited traits on through breeding. Some great examples include domesticated cats, cows, and most of the plants we use as food crops or garden plants.

o   Ask the students to close their eyes and picture a rose. Then ask them to describe what they pictured. Pass around the *Rosa nutkana* (Nootka Rose) specimen and explain that before humans bred or hybridized roses, this specimen is what the majority of wild roses looked like.

   • If you'd like to further challenge your students, have them complete the worksheet "Inherited Traits and Plant Breeding" researching one of the many plants that humans have selectively bred.

Assessment

   Students should demonstrate an understanding that both physical and behavioral traits exist and can come from different sources (inherited or acquired, instinct or learned behavior.) Students should also demonstrate an understanding that humans have had an understanding of traits, and their sources, for a long time and have used them to their advantage. Informal observations can be made as students are working; observe how they fill in the charts, if they are engaged, etc. Make anecdotal notes of students' verbal responses during discussions. The worksheets can also be used as either a note of participation, understanding, or critical thinking.

Extensions

- **The University of Utah has a fun and free computer game that allows students to use their new knowledge of inherited traits to act as a pigeon breeder! Pigeonetics can be found on their website https://learn.genetics.utah.edu/content/pigeons/pigeonetics/ along with a wealth of genetics-based background and activities.**

- **If you are discussing dominant and recessive traits you can design your own dog with a quick worksheet found at https://www.filamentlearning.com/sites/default/files/crazy-plant-shop-lesson-3-reporduction-and-selective-breeding.pdf**

- **Your students can breed their own plant in this relatively simple game: http://www.thesciencezone.org/uploads/1/0/7/2/10722737/plant_inherited_traits.pdf**

Canis lupus is used in this lesson as the scientific name for both dogs and wolves. There has been an ongoing scientific debate on whether dogs should be considered a subspecies of wolves, namely *Canis lupus familiaris*. If you are so inclined this could offer an opportunity to discuss scientific debate and how much variety can exist within what a single type (or species) of organism.

The Canine Conundrum – Types of Traits

Name(s): _____ **Date:** _____

For each canine photo, list the canines; name, the trait observed, and how you think the canine got that trait. Wait to fill out the grey, 4th and 5th columns until after the class discussion.

Canine Name *Look on the back of the photo*	Trait Observed *Record one trait only*	Trait Source *How do you think the canine got this trait?*	Trait Source Vocabulary *Fill out after discussion*	Behavioral/Action Trait Vocabulary *Fill out after discussion*

The Canine Conundrum – Types of Traits

Name(s): _____ **Date:** _____

What type of trait can be passed from a parent organism to its offspring? _____

   Give an example of this type of trait from the class discussion: _____

_____

What type of trait is obtained over the course of an organism's life, and is not passed from a parent organism to offspring? _____

   Give an example of this type of trait from the class discussion: _____

_____

What type of trait is an instinct? _____

   Give an example of this type of trait from the class discussion: _____

_____

What type of trait is a learned behavior? _____

   Give an example of this type of trait from the class discussion: _____

_____

From the class discussion, list one trait and trait source that was discussed that you disagreed with or thought didn't make sense. Explain why you disagreed. _____

_____

_____

_____

List the four types of traits below, then think of a canine you are familiar with and list at least one example of each type of trait in the chart below.

Type of Trait	Example(s)

The Canine Conundrum – Teacher Trait Hint Table

Canine Name	Inherited Trait	Instinct	Acquired Trait	Learned Behavior
Ana	pointy ears, caramel coat	nurturing and cleaning pup		
Apollo	size, color	jumping, playful	slobber on self, athleticism	fetching, obedience wearing collar
Bandit	Colored Fur Patterns, Size	Laying down from weariness or comfort near human	Wet feet from running in grass	Wearing/Accepting Collar Obedience to Human Obedience in bringing back discs
Bellatrix	Short fur ,large breed, colored fur with some spots	sitting down and resting in the sun, tongue out for cooling down	muscle toned from running in the woods	Wearing/Accepting Collar Obedience to Human- sitting and staying
Blue	long red fur, floppy ears, long legs	Gentle demeanor	interacting with kitten	obedience to human- laying and not injuring the cat
Buster	short nose, stout body, short legs, and heavy set, short fur	curiosity with new objects	balance standing on board	obedience to human, ridding skateboard
Champion	Smaller, Short fur, colored fur		front legs strong, possible loss of use of hind legs	Obedience in wearing collar, obedience wearing walking device
Clementine	Wired Haired/Longer Fur Proclivity for Hunting Brown and Gray Fur Medium Size	Curiosity (watching human) for commands Predatory behaviors that led to ability to capture the Chukar (bird)	Wet Slobbery Fur What appears to be a bobbed tail	Wearing/Accepting Harness and Collar Collect Bird for Hunting and Leaving it for Owner Obedience to Human
Cupun	pointed ears, thick fur, color, eye color, big paws	pack mentality, tongues out for cooling body	muscle tone from playing, damp fur around feet from playing outside	Social structure in pack

The Canine Conundrum – Teacher Trait Hint Table

Canine Name	Inherited Trait	Instinct	Acquired Trait	Learned Behavior
Dahab	long golden fur, long legs, one black short haired	social pack mentality	muscle tone from running	Obedience to human Wearing/Accepting Collar
Dakota	thick fur, pointed ears, sharp teeth and claws, fur color	defensive of food, staying low	toned from hunting	pack working together
Dundee	color and pattern of fur, long fur, proclivity for running	herding breed, curiosity watching human for next move	muscle toned from jumping,	Obedience to human - learning to do obstacle course
Ernie	Underbite White Fur Small Size Short Muzzle	Curiosity (watching human) Eye Contact	Groomed/Trimmed Fur Stained Fur on Face	Wearing/Accepting Collar Obedience to Human
Fang	Light White/Gray Fur Thick Coat of Fur Large Size Sharp Canine Teeth	Howling	Damp fur around feet from traveling outside	
Hank	spots, curly fur, short fur, pointed ears, floppy ears, short muzzle,	howling, pack mentality	interacting with different breeds of dog,	obedience to human- sitting
Hauʻoli	golden short fur, floppy ears,	playfulness	social dog, muscle toned from playing with other pups	Obedience to human Wearing/Accepting Collar
Jack	short fur, long legs, long muzzle, floppy pointed ears	curiosity- sitting and watching human	one eye, fixed	Obedience to human Wearing/Accepting Collar,
Jasper	Thick fur, colored coat, shape and size	laying down to rest	Dirt on fur and paws	
Kaiwhai	Water resistant fur, long legs, long muzzle, wired hair,	swimming, hunting, curiosity	groomed- tail bobbed for better hunting ability	obedience to human- sitting, retrieving

The Canine Conundrum – Teacher Trait Hint Table

RED BUTTE GARDEN BOTANY BINS

Canine Name	Inherited Trait	Instinct	Acquired Trait	Learned Behavior
Lobo	thick fur, pointed ears, sharp teeth and claws, fur color	pack mentality, hunting ability, predatory behavior	muscle toned from hunting/running, protecting each other while some sleep	social structure in pack
Lucille	white curly short fur, long legs, long muzzle	Curiosity (watching human) Eye Contact , taking in surroundings	groomed/trimmed fur, dyed fur, cut nails, wears jewelry	Wearing/Accepting Collar Obedience to Human, getting groomed
Luna	Blue Eyes Thick Fur White and Red Fur Pointy Ears	Curiosity (watching human) Eye Contact	Feet slightly damp from snow	Obedience to human Wearing/Accepting Collar
Lupo	thick fur, pointed ears, sharp teeth and claws, fur color	hunting and predatory behavior	muscle toned from hunting, a taste for magpie	how to catch and eat birds
Majstro	thick fur, pointed ears, sharp teeth and claws, fur color	pack mentality, hunting ability, predatory behavior	feet damp from snow, muscle toned	social structure in pack
Otso	thick fur, pointed ears, sharp teeth and claws, fur color	hunting, pack mentality	muscle toned from hunting/running	dominate/submissive wolves-facial expressions
Pablo	fluffy long fur, color, eye color, pointed fluffy ears	motherly instinct and puppy staying with mother	muscle toned from playing, damp fur around feet from playing outside	socialization and basic dog behaviors mamma to puppy
Pete	pointed ears, short fur, long legs, long muzzle	laying down to rest	muscle tone from digging, affinity for gardens	digging a hole to lay in makes itself cool down
Pinto	pointed ears, curled tail, short white fur	Curiosity (watching human) Eye Contact	three-legged mobility	Obedience to human Wearing/Accepting Collar
Rodger	short fur, long legs, long muzzle, ears	predatory behavior that helps capture prey	damp fur around feet from traveling outside	Obedience to human Wearing/Accepting Collar- leaving what to retrieve

The Canine Conundrum – Teacher Trait Hint Table

Canine Name	Inherited Trait	Instinct	Acquired Trait	Learned Behavior
Rosebud	short legs, short fur, longer muzzle, big ears	playfulness, hunting	muscle toned from running and playing fetch	fetching stick, obedience to human wearing/accepting collar, playing fetch with human
Stella	short ears, fur color, wrinkly face, has nipples	peaceful nature around pups	having prominent nipples from feeding pups, possible gray hair from stresses as a mother dog	
Zázvor	long legs, long muzzle, floppy ears, red fur	feeding puppies,	bite marks from feeding	Obedience to human Wearing/Accepting Collar

The Canine Conundrum – Types of Traits

RED BUTTE GARDEN BOTANY BINS

Name(s): _____TEACHER GUIDE_____ Date: _____

For each canine photo, list the canines; name, the trait observed, and how you think the canine got that trait. Wait to fill out the grey, 4th and 5th columns until after the class discussion.

Canine Name *Look on the back of the photo*	Trait Observed *Record one trait only*	Trait Source *How do you think the canine got this trait?*	Trait Source Vocabulary *Fill out after discussion*	Behavioral/Action Trait Vocabulary *Fill out after discussion*
Ernie	Underbite	He was born with it.	Inherited Trait	
Fang	Howling	From his parents	Acquired Trait	Learned behavior

Inherited Traits & Plant Breeding

RED BUTTE GARDEN BOTANY BINS

Name(s): _____ **Date:** _____

Choose one of the following plants that humans have radically altered though selective breeding to better fit their needs and preferences: tomatoes, peaches, watermelons, corn, apples, broccoli, strawberries, or roses.

Research that plant and fill out the following chart to reflect the differences humans were able to create by harnessing their knowledge of inherited traits.

Which plant did you research?	
When did humans start breeding this plant?	
What traits did humans choose to breed for in this plant?	
What traits did humans try to remove from this plant through breeding?	
If you were to breed this plant, what traits would you breed for?	
If you were to breed this plant, what traits would you breed to remove?	

RED BUTTE GARDEN
BOTANY BINS

Canine Photos Inventory Checklist

31 photos total

	Canine Name
	Ana
	Apollo
	Bandit
	Bellatrix
	Blue
	Buster
	Champion
	Cupun
	Dahab
	Dakota
	Dundee
	Ernie
	Fang
	Hank
	Hauʻoli
	Jack
	Jasper
	Kaiwhai
	Lobo
	Lucille
	Luna
	Lupo
	Majstro
	Otso
	Pablo
	Pete
	Pinto
	Rodger
	Rosebud
	Stella
	Zázvor