

Inheritance and Traits: Variation in Wolves

Problem students work to solve

What is the origin of the traits of Wolf 44—a wolf that appears different from the rest of its pack?

Chapter 1 Question

Why are wolves different even though they are all the same species? (introduced in 1.4)

Investigation Questions

What are some ways that organisms can be similar or different? (1.1-1.4)

How can we describe the traits of organisms in a species? (1.5-1.6)

Evidence sources and reflection opportunities

- Read *Blue Whales and Buttercups* (1.2)
- Reflect on relatedness (1.2)
- Observe similarities and differences between animals (1.3)
- Observe bird traits (1.3)
- Observe bird sounds (1.4)
- Observe bear traits (1.4)

- Look for patterns in the wolf pack (1.5)
- Construct bar graphs to analyze similarity and variation in students' traits (1.5)
- Read *Handbook of Traits* to gather info about how traits vary within a species (1.6)
- Use Word Relationships routine to reflect on learning across the chapter (1.6)
- Create digital models of trait variation (1.6)

Key concepts

Organisms have observable traits. (1.3)

Organisms in a species have many similar traits, but for each trait there can be variation. (1.6)

Application of key concepts to problem

- Review wolf data and reflect on variation of traits within the wolf pack (1.7)
- Write class explanation to answer the Chapter 1 Question (1.7)

Explanation that students can make to answer the Chapter 1 Question

Even though all wolves are the same species, some wolves are different from others due to variation of traits within a species. This means that even though wolves can have similarities in their traits, there can also be variations in each trait. For example, wolves have different colors of fur: some wolves have a trait for gray fur, others have a trait for black fur.

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What is the origin of the traits of Wolf 44—a wolf that appears different from the rest of its pack?

Why is Wolf 44's color similar to one pack but different from the other?

Why do only some organisms of the same species have similar traits? (2.1-2.2)

- Review additional wolf data (2.1)
- Examine data about fruit fly families (2.1)
- Ask questions about fruit fly families and investigate by comparing traits of offspring from different families (2.1)
- Read about patterns between parents and offspring in *Handbook of Traits* (2.2)
- Create digital models of patterns of traits between parents and offspring (2.2)

- Scientists ask questions they can investigate by making observations. (2.1)
- Organisms can have traits that are similar to their parents' traits. (2.2)

- Ask questions about wolf data (2.5)
- Discuss and look for patterns in wolf data (2.5)
- Write explanations to answer the Chapter 2 Question (2.6)

Wolf 44's color is similar to the wolves in the Bison Valley Pack because its parents are in the Bison Valley Pack. Offspring inherit instructions for each trait from both parents. This means that the trait of fur color comes from Wolf 44's parents.

Why do offspring have similar traits to their parents but not always to each other? (2.3- 2.5)

- Read *The Code* (2.3)
- Make creature offspring by following instructions for traits from creature parents and look for patterns (2.4)
- Apply new ideas to explain traits in a fruit fly family (2.4)
- Create digital models to show thinking about how organisms inherit traits (2.5)
- Use Word Relationships routine to reflect on learning across the chapter (2.5)

- Offspring inherit instructions for each trait from both their parents. (2.5)
- Offspring can inherit different instructions from their parents, so offspring may have different traits. (2.5)

Problem students work to solve

Chapter 2 Question

Investigation Questions

Evidence sources and reflection opportunities

Key concepts

Application of key concepts to problem

Explanation that students can make to answer the Chapter 2 Question

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Problem students work to solve

What is the origin of the traits of Wolf 44—a wolf that appears different from the rest of its pack?

Chapter 3 Question

Why isn't Wolf 44 like the Bison Valley Pack in hunting style and size?

Investigation Questions

Class-generated Investigation Question (e.g. How else can an organism get traits besides from its parents?) (3.1-3.2)

Evidence sources and reflection opportunities

- Review additional wolf data (3.1)
- Review, ask questions about, and analyze data about flamingo families (3.1)
- Reflect on observations and with the class, generate an Investigation Question (3.1)
- Read *How the Sparrow Learned Its Song* (3.2)
- Reflect on the role of environment in determining traits (3.2)

Key concepts

- Some traits result from the environment. (3.2)
- Organisms stay in groups in order to obtain food and meet their needs. The number of organisms in a group varies. (3.2)

Application of key concepts to problem

- Write explanations about why Wolf 44 does not hunt like its parents (3.3)*
- Review wolf data (3.5)
- Revisit data about wolf size (3.6)
- Write explanations about how Wolf 44's size was determined (3.6)

Explanation that students can make to answer the Chapter 3 Question

Wolf 44 doesn't hunt like the Bison Valley Pack because it learned to hunt from the wolves in the Elk Mountain Pack. Learning to hunt is a trait that is determined by a wolf's environment. Wolf 44 is medium sized because of both inherited instructions (size) and the environment it lives in (access to diet). This means that Wolf 44 can grow bigger than its parents, but it can't grow as big as the wolves in the Elk Mountain Pack.

Can the environment affect inherited traits? (3.3-3.5)

- Revisit class traits to share ideas about factors that determined those traits (3.3)
- Set up celery investigation and make sense of results (3.3-3.4)
- Read about the origin of traits (inheritance and interaction with the environment) in *Handbook of Traits* (3.4)
- Revisit *How the Sparrow Learned Its Song* to discuss evidence for origin of traits (3.4)
- Create digital models to show understanding of inherited and environmental traits (3.5)

- Some traits result from both inheritance and interaction with the environment. (3.4)

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Problem students work to solve in Chapter 4

Chapter 4 Question

Evidence sources and reflection opportunities

Key concept

Opportunities to engage in practices and apply key concepts

Practice that students can do in response to the Chapter 4 Question

What traits is a White-Crowned Sparrow offspring likely to have?

How can scientists investigate questions about traits?

- Read *Scorpion Scientist* (4.1)
- Discuss patterns of data that helped the scientist answer her questions in *Scorpion Scientist* (4.1)

• Scientists can investigate questions by looking for patterns in data. (4.1)

- Review sparrow data (4.2)
- Ask and answer questions about sparrows using data (4.2)
- Determine traits that sparrow offspring might have (4.3)

Students can ask investigable questions about the traits of the White-Crowned Sparrow, taking into account the available data, and using that data to answer their questions.