

## Lesson 4. Why Do Piloses Have Skinnier Noses Nowadays?

The “Big Idea”	Depending on environmental conditions, a trait variant can be beneficial to an individual, harmful, or neither. A beneficial trait variant makes it more likely an individual will be healthy, survive, and have many offspring. That trait variant will become more common in the population over time.
Investigation Question	Why do piloses have skinnier noses nowadays?
Summary	Students read a storybook that describes a population of animals called piloses from many hundreds of years ago and nowadays. In this scenario the key trait variants are wider or thinner noses. Long ago there were more piloses with wider noses. Because food (millibugs) was abundant, nose size neither helped nor harmed individual piloses. But then an environmental change resulted in the millibugs permanently moving underground. Now, individuals with skinnier noses had an advantage getting food. Consequently, they were healthier and had more offspring. The offspring tended to have noses like their parents. Thus, over many generations, the number of individuals in the population with skinnier noses increased. After they read the storybook, students simulate (re-tell) the events of the piloses story: they fill out a data table and use it to create a graph that shows how the population changes over three generations.
Materials	For the class <ul style="list-style-type: none"><li>● Slide deck for this lesson</li><li>● Copy of <i>How the Piloses Evolved Skinny Noses</i></li></ul> For each small group <ul style="list-style-type: none"><li>● 12 piloses simulation activity cards</li></ul> For each student <ul style="list-style-type: none"><li>● Notebook pages 10-12</li></ul>

### Lesson Description and Rationale

In the last class, students learned that individuals in a population are not identical and thought about how certain trait variants might be helpful or harmful.

Today, students extend their understanding of variation through reading a storybook and simulate (re-tell) the events of the story. They meet a population of animals called piloses, learn what piloses eat, and zoom in on a trait – the shape of each pilosa’s nose. If you look at individual noses, some are wider or thinner than others. Many hundreds of years ago piloses’ noses tended to be wider than they are nowadays. The storybook explains how a skinnier nose became the dominant trait variant over time. Students then simulate this process.

Today's lesson highlights three important ideas: (1) whether or not a variant of a trait is beneficial to piloses' health depends on the environment, (2) a beneficial trait makes it more likely that an individual pilosa will survive, be healthy and have many offspring and (3) offspring tend to resemble their parents. We call this process "natural selection."

*Note: In the piloses scenario, natural selection is illustrated by focusing on one trait, the width of the nose. This is a simplification to help students connect survival and reproduction to individual trait variants. More than one nose trait can vary, for example, the length of the nose.*

By the end of this lesson, students will understand that some animals in a population survive and reproduce more successfully than others, so over time their traits become better represented in a population.

### Learning Targets in this Lesson

- A trait variant may be beneficial, harmful or neutral depending on the environmental conditions.
- Individuals with a beneficial trait variant are likely to be healthier and have many offspring.
- Offspring tend to have the same trait variant as their parents and so in future generations there will be more individuals with beneficial trait variants in populations.

Sequence of Experiences		
1. Introduction	All class	5 Minutes
2. Read Aloud <i>How the Piloses Evolved Skinny Noses</i>	All class	10 Minutes
3. Simulate the Piloses Story	Small groups	20 Minutes
4. Make Meaning	All class	5 Minutes
5. Wrap Up	All class	5 Minutes

### Preparation

- Watch the pointing guide to become familiar with how to read the storybook *How the Piloses Evolved Skinny Noses*: [https://youtu.be/ud1Q\\_q4f-hQ](https://youtu.be/ud1Q_q4f-hQ)
- Become familiar with the [Piloses Story Simulation activity](#).
- For each small group (5 groups), prepare a packet of 12 piloses cards.

## The Lesson

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### 1. Introduction (5 min)

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Explain that in the last class students looked at the “hairiness” trait in radishes and saw that the number of hairs varies – some individuals have no hairs, some have a lot, and others are in between. We saw that having many hairs was beneficial to an individual in an environment where caterpillars ate plants with fewer hairs. Today we will look at another organism (living thing) and see how a trait variation is beneficial or not to that organism.

*Today’s investigation question: How do we explain why more piloses have skinnier noses nowadays? To answer this question, you listen to a storybook about animals called piloses. Then you’ll get 12 cards with pictures of piloses and will get to re-tell the story. Then we’ll see if we have an explanation!*

*Note: Piloses are based on a combination of real species but they are not found in nature themselves. Even if you choose to mention it to students, it is best not to dwell on the real/fictional nature of the piloses because it can undermine a crucial take-home point: the natural process that they learn from the piloses story is real and universal.*

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### 2. Read *How the Piloses Evolved Skinny Noses* (10 min)

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Read the storybook aloud, using the suggested hand gestures to help students follow the story.

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### 3. Simulate the Piloses Story (20 min)

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To clarify and consolidate information presented in *How Piloses Evolved Skinny Noses*, students simulate the story of the piloses by filling out a data table and creating a graph that shows the population change over time. The data table will allow students to see how the number of babies born to each generation influences the pattern of trait variants in the next generation, and the summary graph allows them to see how the predominant trait variants change over time.

Please follow the instructions for the piloses simulation activity here:

[https://www.evolvingmindsproject.org/files/ugd/cc79a9\\_709e6caf55404e7fa85c78413da83224.pdf](https://www.evolvingmindsproject.org/files/ugd/cc79a9_709e6caf55404e7fa85c78413da83224.pdf)

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#### 4. Make Meaning (5 min)

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The purpose of this discussion is to highlight the role of variation as it impacts individuals in a population and, consequently, changes in the distribution of trait variants in three generations of the population.

Discussion question: *Why do piloses have skinnier noses nowadays?*

Listen for ideas such as:

- Long ago there was an environmental change that resulted in piloses' food becoming harder to get (millibugs went underground into tunnels).
- Piloses with wider noses couldn't reach down into the tunnels and had a hard time getting food, so they became sickly and didn't have many babies or some of them died before they reproduced.
- Piloses with skinnier noses could reach the millibugs so they had plenty of food and were healthy.
- The healthy adults had lots of babies, which looked like their parents (they tended to have skinnier noses).
- There were more and more piloses with skinnier noses and fewer with wider noses.

*Note: At this point, you can begin to label this whole process as "natural selection."*

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#### 5. Wrap Up (5 min)

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Reiterate that today the class has taken a close look at a scenario where an environmental change put a population of animals (piloses) in a stressful situation – their food source (millibugs) had gone underground. Some piloses had a trait variant (skinnier noses) that helped them obtain food easily so they survived and could reproduce more successfully than others, so over time, there were more animals in the population with this beneficial trait. What happened in this scenario is called natural selection.

*Note: Skinnier noses aren't intrinsically "good" or "bad." In fact, if the environment hadn't changed, the skinnier nose variant wouldn't have been beneficial. The advantage of one variant over another will depend on the environment.*