

Module 8: Evolution and Natural Selection

Topic 3 Application: Natural Selection Scientific Investigation

Before you begin this assignment, make sure to download the *Natural Selection Scientific Investigation Report*. As you complete this scientific investigation, fill in any needed information on the report template. If you need more information about each section of the report, please visit the Developmental Module.

Introduction

In populations, there is variety in phenotypes, which causes some of the individuals within the population to have phenotypes that make them better suited for the environment in which they live. Because those individuals are better suited for the environment, they survive and have the ability to reproduce, which means that they pass on those traits that made them better suited for the environment. This is called natural selection.

Objectives

In this scientific investigation, you will:

- simulate genetic changes in a species;
- simulate the appearance of selection factors on a population; and
- explore the impact of natural selection on a population.

Hypothesis

Using the **Procedure and Data Collection** section below, read through the procedural information for this scientific investigation. Based on your understanding of the procedure, develop your own hypotheses which describe your expected results. Specifically, make a prediction on how selecting "Equator" as the *Environment*, "Brown Fur" as the *Mutation*, and "Wolves" as a *Selection Factor* will impact the rabbit population after several generations. Record this hypothesis in the **Hypothesis** section of your *Natural Selection Scientific Investigation Report*.

Required Simulation

[Natural Selection Simulation](#)

Provided by: PhET Interactive Simulations
University of Colorado

Procedure and Data Collection

Part 1: Explore the Simulation

Take a few minutes to explore the simulation:

1. Click the button to "Add a friend."
2. Select a mutation, or a combination of mutations, in the *Add Mutation* section. Select either "Wolves" or "Food" in the *Selection Factor* area.
3. Take a few moments to observe the results on the graph and the animation. Make note of the labels on the axes of the graph.
4. In the *Environment* area, change the environment to "Arctic" or "Equator."
5. Observe long-term changes by clicking the "Step" button at the bottom of simulation.
6. Examine a specific rabbit's family tree by clicking on the "Pedigree" button in the *Chart* area, and then clicking on a rabbit.

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7. Change whether certain mutations are “Dominant” or “Recessive” by changing the selections in the *Edit Genes* area.

Part 2: A Changing Population

Now, use the following directions to record data for the **Data Analysis** and **Conclusion** sections of your *Natural Selection Scientific Investigation Report*.

1. Click "Reset All" in the lower right corner of the simulation.
2. Click “Add a friend.”
3. In the *Environment* area, change the environment to “Equator.”
4. In the *Mutation* area, select “Brown Fur.”
5. In the *Selection Factor* area, select “Wolves.”
6. Observe the survivors for several generations, pausing the simulation to record what happens in the **Data** section of your *Natural Selection Scientific Investigation Report*.

Data

Using the **Data** section of the *Natural Selection Scientific Investigation Report*, make sure to complete all requested data on the report itself.

Data Analysis

In the **Data Analysis** section of your *Natural Selection Scientific Investigation Report*, provide responses to the following questions:

1. What characteristics helped with the survival of rabbits throughout generations? Why?
2. After the rabbits with the white fur were removed from the population, was there an increase in the number of rabbits with brown fur? Why do you think this occurred?
3. What factors would have to change to allow the rabbit population to grow?

Conclusion

Using the Conclusion section of your *Natural Selection Scientific Investigation Report*, compose three to four sentences describing an overall conclusion about the relationships between the selection factors, mutations, and populations of species that you examined in this scientific investigation. Was your hypothesis true or false, and how do you know? Use the data and notes that you collected from your simulation experience to form your conclusion. Make sure that you include information that you gained from data analysis to support your conclusion.

Experimental Sources of Error

On your *Natural Selection Scientific Investigation Report*, provide responses to the following questions: Are there any sources of error? If so, what are they, and what could be done to minimize error?



Once you have completed the Natural Selection Scientific Investigation Report, please submit your work to the dropbox.