



Classroom Teacher Preparation

Life Science 42: Mechanisms of Biodiversity in Populations

Please use the following to prepare for the next SfS lesson.

Description:

This module explores the mechanisms by which biodiversity (genetic variation) is created within populations. It explains the concepts of mutation, gene flow, genetic drift, and natural selection, and how these mechanisms work in different ways to create genetic variation in a population. In the activity, students will use beads and event cards to simulate how a population of beetles changes over time. This lesson is intended for older (6th-8th grade) students. Students should be familiar with DNA, genes, and heritable traits before this lesson is taught.

Lesson Objectives – SWBAT (“Students Will Be Able To...”):

6th-8th

- Name and describe the four main mechanisms of creating genetic biodiversity in populations
- Distinguish between the effects of different mechanisms on a population

Disciplinary Core Idea (DCI)

LS2. Ecosystems: Interactions, Energy, and Dynamics - LS2.C Ecosystem Dynamics, Functioning, and Resilience

- (6th-8th) Ecosystem characteristics vary over time. Disruptions to any part of an ecosystem can lead to shifts in all of its populations. The completeness or integrity of an ecosystem's biodiversity is often used as a measure of its health.

Science & Engineering Practice (SEP)

Constructing Explanations and Designing Solutions

- (6th-8th) Construct an explanation using models or representations.
- (6th-8th) Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real world phenomena, examples, or events

Crosscutting Concept (CCC)

Stability and Change

- (6th-8th) Explanations of stability and change in natural or designed systems can be constructed by examining the changes over time and forces at different scales, including the atomic scale.
- (6th-8th) Stability might be disturbed either by sudden events or gradual changes that accumulate over time.

Preparation:

This lesson is intended for older students. Students should be familiar with the idea that populations change over time and with the concepts of DNA, genes, and heritable traits. The few terms below are very important for students to be familiar with before the lesson in order to better understand the concepts that we will further explore.

- Mutation – a permanent change to the gene sequence of an organism that may result in noticeable changes
- Gene – unit of heredity
- Heritable – can be passed from parent to offspring through genes



Room Set Up for Activities:

Students will work in up to 8 groups (~3-4 students) at tables.

Safety:

There are no safety precautions for this lesson.

Related Modules:

This lesson may be taught as part of a sequence or group of related modules on **Heredity/Biodiversity**. Other modules in this sequence include:

Anatomy/Physiology 3: DNA is Everywhere – An overview of DNA's importance as the blueprint of life is followed by an exciting DNA extraction from foods such as strawberries or peas.

Anatomy/Physiology 4: Phenotypes, Genotypes, & the Environment – This module covers dominant and recessive genes, along with complete and incomplete dominance. Through the activity, students delve more into genetic variation within a population by focusing on the genotype and phenotype of fish color.

Anatomy/Physiology 5: From Genes to Proteins – This module is a hands-on simulation of how DNA ultimately creates the proteins in our bodies. Students are provided with DNA gene sequences, which they must first transcribe into mRNA and then translate into a protein (amino acid sequence) to build a new species, called the Scimon.

For other module sequences and groups, look here: www.sciencefromscientists.org/sequences

Standards Covered:

Please click the following link to our website to review the standards covered by this lesson, listed by state:

www.sciencefromscientists.org/standards/

Lessons are matched to both national NGSS and local state standards.

After Our Visit:

Extend this lesson by creating their own imaginary breed of a common species (e.g. cat, dog, horse) that has been selectively breed for certain desired traits.

Access this Extension activity by visiting the Classroom Post found on our website at sciencefromscientists.org/cohorts. Use the name of your school/cohort and password to log in.

To help Evaluate, check out our Open Response questions online at sciencefromscientists.org/open-response-questions. They are freely available for all of our lessons for current teachers. Use the password supplied by your instructor to log in.

Additional Resources:

- One of the best comprehensive and understandable sites about this topic from the UC Museum of Paleontology: <http://evolution.berkeley.edu/>
- Relevant background for this lesson:
 - Crash Course Biology, "Natural Selection" (12:44): https://www.youtube.com/watch?v=aTftyFboC_M
 - Crash Course Biology, "Population Genetics – When Darwin Met Mendel" (11:03): <https://www.youtube.com/watch?v=WhFKPaRnTdQ> [First five minutes are most relevant]

