



Classroom Teacher Preparation

Anatomy/Physiology 4: Phenotypes, Genotypes, & the Environment

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

Description:

This advanced module examines dominant and recessive genes, along with complete and incomplete dominance. Through the activity, students learn about genetic variation within a population by focusing on the genotype and phenotype of fish color. Students will investigate the impact of environmental changes on genetic variation and how favorable traits are passed down to future generations. Furthermore, students will evaluate whether dominant or recessive genes are more impacted by these environmental changes. **Students must have prior knowledge of Punnett squares.**

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

6th-8th

- Recognize the difference between dominant and recessive genes and their phenotypic expression
- Explain how unfavorable recessive and dominant genes will be affected differently by environmental changes, and the result of these disruptions on future generations

Disciplinary Core Idea (DCI)

LS4: Biological Evolution: Unity and Diversity

- (6th-8th) *LS4.B Natural Selection* – Both natural and artificial selection result from certain traits giving some individuals an advantage in surviving and reproducing, leading to predominance of certain traits in a population. MS-LS4B
- (6th-8th) *LS4.C Adaptation* – Species can change over time in response to changes in environmental conditions through adaptation by natural selection acting over generations. Traits that support successful survival and reproduction in the new environment become more common.

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)

Cause and Effect: Mechanism and Prediction

- (6th-8th) Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Preparation:

This is an advanced lesson and requires that students are learning about genetics and must also know how to calculate and use Punnett squares.

The ability to use Punnett squares implies that students are expected to have initial familiarity with the vocabulary and concepts of dominant and recessive genes, and individuals being homozygous and heterozygous for a given trait.



For a quick review of genetics you might consider showing a short video to your students such as “How Mendel’s Peas Helped Us Understand Genetics” (3:06): <https://www.youtube.com/watch?v=Mehz7tCxjSE>

Room Set Up for Activities:

The activity will be structured into groups of 4-5 students and will require tables, or a flat surface that each group can share. There can be a maximum of 6 groups.

Safety:

There are no safety precautions with this lesson.

Related Modules:

This lesson may be taught as part of a sequence or group of related modules on **Genetics**. Modules include:

Anatomy/Physiology 3: DNA is Everywhere – provides an overview of DNA’s role as the blueprints of life and is followed by an exciting hands-on activity designed to extract DNA from strawberries (or other plant matter).

Anatomy/Physiology 5: From Genes to Proteins – a more advanced DNA module, focusing on how DNA mutations effect genetic expression. In this lesson, students explore how three types of mutations on gene sequences contribute to diversity within a species. *This lesson can be taught before or after Inheritance, so that students understand that traits can “appear” in a population due to mutations. Whether these mutations are further expressed in future generations can be environmentally dependent.*

Anatomy/Physiology 6: Blood Composition and Compatibility – introduces the components of blood, while highlighting the process and importance of blood typing. *This lesson can be used as a follow up to focus on co-dominant genetic expression.*

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 using jellybeans to discover why we don’t look exactly like our parents!

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:

- Review of Inheritance: <http://www.yourgenome.org/facts/what-is-inheritance>
- Research papers, games, and interactive tutorials: http://geneed.nlm.nih.gov/topic_subtopic.php?tid=5
- More in depth information on inheritance (contains interactive activities): <http://learn.genetics.utah.edu/content/inheritance/>