

Learning Set 2 Introduction

Learning Set 2: How Are Traits Passed from Generation to Generation? (Time?)

Students investigate how traits are inherited and expressed in offspring in order to develop recommendations for breeding hybrids with a favorable combination of traits.

Overview

Students build model plants using randomly selected genotypes to determine their traits. Through comparing the plants and noticing when traits are expressed and when they are not, students learn that some traits are recessive and some are dominant. They study Gregor Mendel's experiments into the inheritance of traits in pea plants and learn that there are two factors for each trait, one dominant and one recessive. To better understand the physical process by which plants pass on their traits, students then dissect a flower and study its reproductive parts, learning how pollination occurs. Students use what they have learned about inheritance to design a field experiment to determine how to breed hybrids with a certain combination of traits. Then they analyze the genotypes of the hybrids from the experiment, which reinforces their understanding of how dominant and recessive alleles interact to give a plant its phenotype. They simulate the combination of alleles from two parents by building more model plants, this time deriving the genotypes of the model plants from model parent plants. This allows students to see the variation in genotype and phenotype of the offspring of a single pair of organisms. Students then learn about a genetically inherited disease and see that the physical mechanisms behind inheritance can have consequences. Finally, they develop recommendations for developing a variety of rice that grows better and is more nutritious, using everything that they have learned in this *Learning Set*.

Looking Ahead

Before you lead the class through the activity in *Section 2.1*, read *Section 2.2* to learn about dominant, recessive, and co-dominant alleles. You won't teach this in *Section 2.1*, but it will be helpful to understand it in advance.

Targeted Skills, Concepts, and Nature of Science

Section

Scientists collaborate in their work and then share their findings. Sharing findings makes new information available and helps scientists refine their ideas and build on others' ideas.	2.1, 2.4, 2.5, 2.6
Genes are segments of DNA molecules that are passed from parents to offspring.	2.2, 2.6, 2.7
Hereditary information is passed from parents to offspring through DNA.	2.2, 2.3, 2.7

Studying the work of different scientists provides understanding of scientific inquiry and reminds students that science is a human endeavor.	2.2, 2.7
Every gene has at least two alleles. Genes usually have a dominant and recessive allele, though they may also have incompletely dominant alleles and co-dominant alleles. When an organism has a dominant form of a trait and a recessive form of a trait, the dominant form is expressed and the recessive form is not.	2.2, 2.6
Scientists must keep accurate and descriptive records of what they do so they can share their work with others and consider what they did, why they did it, and what they want to do next.	2.3, 2.5
Scientific knowledge is developed through observations, recording and analysis of data, and development of explanations based on evidence.	2.3, 2.5
The reproductive parts of flowering plants are in their flowers. The flowers produce eggs and sperm, which fuse and develop into seeds. Traits are passed from the parent or parents to the seeds through the DNA in the egg cells and sperm.	2.3
Criteria and constraints are important in determining effective scientific procedures and answering scientific questions.	2.4
Identifying variables is an important part of scientific investigation.	2.4
Meiosis allows for many possible combinations of genes in offspring.	2.6
Some traits are dominant and some are recessive. When an organism has a dominant form of a trait and a recessive form of a trait, the dominant form is expressed and the recessive form is not.	2.1, 2.5

Learning Set 2 Implementation (time?) (page 37 goes with this section)

Learning Set 2: How Are Traits Passed from Generation to Generation? (5 min.)

Introduce the question of the Learning Set.

Engage

Remind students that traits are characteristics that are inherited. The human traits they looked at earlier—attached or detached earlobes, the ability to roll the tongue, and the preference to put the right or left hand over the other—are all inherited. Ask students how they think this happens. What happens if one parent has an attached earlobe and the other has a detached earlobe?

(p/u page 38)

Guide

Tell students that they have an announcement from RBWI (on page 38) and have them read it.

Emphasize that the goal is to find a way to combine traits from two kinds of rice plant in one rice plant. To achieve this goal, students will first have to learn how traits are passed on from one generation to the next.