

EMS Lesson 1: Variety is the Spice of Life

(Pre-Exhibit Visit)

Objective:

After completing this lesson, students will have an understanding that dominant and recessive traits occur in a variety of combinations in any given group of people.

Curriculum Link:

This lesson is designed to reinforce the concepts that 1) human traits are controlled by dominant and recessive genes, and 2) some traits are learned, not inherited. It would work well after an introduction to Gregor Mendel's pea experiments. Students should be familiar with the process of conducting a survey with a random population. This lesson will help build the foundation students will need to work with Punnett squares and to understand the role of probability in heredity.

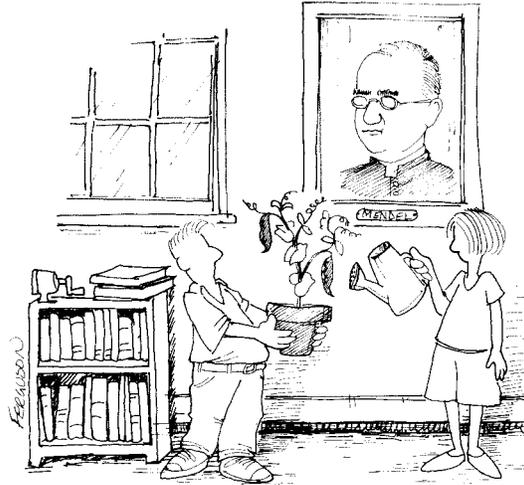


Exhibit Link:

Heredity: Which of these inherited traits do you have? **Heredity Slots** – Inheritance: A game of chance.

This portion of the exhibit explains how common single-gene traits such as a widow's peak and attached ear lobes are passed from parent to child through the laws of probability.

Time Required:

Teacher Preparation: 30 minutes **Class Time:** 30-45 minutes (allow three days to a week for student surveys outside of class)

Materials Needed:

- A working copy and final copy of the following table for each student.

Trait Survey Data Table				
Total Number of Interviewees:				
	Trait 1	Number	Trait 2	Number
A	Free Ear Lobes		Attached Ear Lobes	
B	Hair on Fingers		No Hair on Fingers	
C	Widow's Peak		No Widow's Peak	
D	Naturally Curly Hair		Straight Hair	
E	Cleft Chin		Smooth Chin	
F	Drive Car		Not Drive Car	
G	Play Gameboy		Not Play Gameboy	

- Small mirror for each student or groups of students
- Generic pictures or simple drawings depicting the traits used in this lesson

Lesson Steps/Activity:

1. Introduce or review Mendel's studies with the class, based on students' abilities. At minimum, students should know that certain visible traits are passed on to offspring and that some traits are dominant and others are recessive.
2. List on the board or an overhead the dominant and recessive traits from the chart that will be used in the survey, and show pictures or describe what each looks like.
Emphasize that neither a dominant nor recessive trait is more desirable than the other and that different combinations of

- both dominant and recessive traits contribute to each person's uniqueness.
3. Divide the class into small groups if you wish. Instruct students to use the mirror to examine their earlobes, hairline, and chin. Call out the traits one at a time and have students stand if they have that trait. You can also call out different combinations of two or more of the traits, so students can see if they share combinations of traits.
 4. Distribute the data sheets, and tell students they will each survey 20 people to gather data about certain common traits. Before they begin the survey, have students predict (hypothesize) whether they think there will be more dominant than recessive traits in their sampling, or if the traits will be evenly distributed. (Note: In the general population, the dominant trait of free earlobes is more common, while the recessive traits that are usually more common include smooth chin, straight hair, no widow's peak, and no hair on fingers.)
 5. After students have collected their data, have them share results with the whole class. Have a whole class discussion, which can include the "Discussion Questions" listed below. Use a transparency of the student data sheet to compile class totals.

Extensions & Modifications:

Elementary:

- Depending on grade level, you may want to reduce the number of traits in the survey, or the number of persons to be surveyed.
- Have shy students or those with limited access to a sample population work with a partner.
- Arrange with another teacher to allow her class to serve as survey samples.

Middle:

- Expand the discussion of Mendel's work to include purebreds and hybrids.
- Using the class totals, have students calculate what percent of the total sampling had each of the traits. Discuss how these results compare to the common trends mentioned in step #4 above.

Important terms: widow's peak, cleft chin, dominant trait, recessive trait, survey

Additional Middle School terms: hypothesis, hybrids, purebreds

Writing Prompts/Discussion Questions:

1. Were there any traits that you had that you had not noticed before?
2. Describe how your data does or does not support your prediction (hypothesis).
3. Why do you think recessive traits are more common in some cases?
4. How do you think doubling the sample would affect the survey?
5. What factors affected the results of traits F and G?

Additional Resources:

DNA from the Beginning — <http://www.dnafb.org/dnafb/>

A wonderful educational website containing basic information on DNA and genetics. Contains video clips, animations, and great links.

Textbook — Biology: The Dynamics of Life. Glencoe, 2002

National Standards Addressed:

K-4 Content Standard C – Life Cycles of Organisms

- Plants and animals closely resemble their parents.
- Many characteristics of an organism are inherited from the parents of the organism, but other characteristics result from an individual's interactions with the environment. Inherited characteristics include the color of flowers and the number of limbs of an animal. Other features, such as the ability to ride a bicycle, are learned through interactions with the environment and cannot be passed on to the next generation.

5-8 Content Standard C – The Molecular Basis of Heredity

- Every organism requires a set of instructions for specifying its traits. Heredity is the passage of these instructions from one generation to another.
- Hereditary information is contained in genes, located in the chromosomes of each cell. Each gene carries a single unit of information. An inherited trait of an individual can be determined by one or by many genes, and a single gene can influence more than one trait. A human cell contains many thousands of different genes.
- The characteristics of an organism can be described in terms of a combination of traits. Some traits are inherited and others result from interactions with the environment.