

Studying Nature vs. Nurture; Designing a Genetic Experiment

Lesson Plan

Grade Level: 6-8

Curriculum Focus: Genetics; Scientific Inquiry

Lesson Duration: Two class periods

Student Objectives

- Discover that physical traits are determined by genetics but some personality traits may be determined by events in a person's life.
- Understand that because they have the same genetic makeup, identical twins raised separately are ideal subjects for experiments on the effects of genes versus environment.
- Design an experiment to test nature vs. nurture.

Materials

- Video on *unitedstreaming: Discover Magazine: Genetics*

Search for this video by using the video title (or a portion of it) as the keyword.

Selected clips that support this lesson plan:

1. Double Take: The Genetics of Twins
2. Riddle of Life: DNA: The Double Helix

- Paper and pencils

Procedures

1. Begin a conversation with your students by asking, "Which is a more important factor in how personality develops: nature or nurture?" Explain that "nature" is a person's hereditary, genetic makeup and "nurture" is the events in a person's life, including treatment by parents, peers, community, and society. Let students know that nature vs. nurture is also known as heredity vs. environment. Encourage students to express their views and give reasons to support them.
2. Ask students to think of a way to conduct a scientifically valid experiment that will shed light on the issue of nature vs. nurture. Guide the discussion toward studies of identical twins who have been raised separately.
3. Ask students to explain why identical twins raised apart would be ideal subjects for an experiment. Make sure students understand that identical twins have the same genetic makeup, so all inherited physical traits are exactly the same. When raised separately, these twins have different environmental influences.

4. Divide the class into groups, and have each group brainstorm an experiment designed to cast light on nature vs. nurture. Students' experiments should involve a set of identical twins raised separately.
5. Before groups meet, review the requirements for a scientifically valid experiment:
 - The experiment should begin with a question. (Example: Is musical ability determined by nature or nurture?)
 - The experiment should include a hypothesis, or educated guess, based on knowledge or experience. (Example: Musical ability is determined by nature.)
 - The experiment should be set up with one variable only; all conditions must be the same except for the variable being tested. (In the case of twins, we know that each twin has the exact same genetic makeup, so the only variable is environment.)
 - The experiment should have a control. (In the case of a twin study, the experiment might be a musically gifted twin who was raised by musical parents; the control might be the twin raised by parents who have no musical talent.)
6. Tell the class that the results of one experiment are rarely considered sufficient. An experiment must be repeated many times before the results can be taken seriously.
7. Allow sufficient class time for groups to design their experiments.
8. Have each group present its experiment to the class.
9. Invite class members to critique each experiment, considering the scientific validity of its design.

Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- **3 points:** Students met all requirements of a scientifically valid experiment that tests nature vs. nurture; wrote a clear, well-organized, grammatical, and error-free description.
- **2 points:** Students met most of the requirements of a scientifically valid experiment that tests nature vs. nurture; wrote an adequate, organized description with several grammatical errors.
- **1 point:** Students did not meet the requirements of a scientifically valid experiment that tests nature vs. nurture; produced a disorganized description with numerous grammatical errors.

Vocabulary

gene

Definition: A specific sequence of nucleotides that makes up a piece of DNA on a chromosome and that controls a specific trait

Context: The gene that can give a fly a photographic memory may one day provide a therapy for people with Alzheimer's disease.



genetic

Definition: Relating to, or produced by, the genes

Context: Cystic fibrosis is a genetic disease; a defective gene produces thick mucus that clogs the lungs.

genetic engineering

Definition: The artificial manipulation of one gene or a group of genes in order to change genetic processes

Context: Genetic engineering has been used to create insect-resistant plants and to change how animals grow.

homeosis

Definition: The process by which one body part grows in place of another; homeosis can be caused by environmental factors or genetic mutation.

Context: Homeosis led to the growth of a second pair of wings where the legs should be.

identical twins

Definition: Two persons produced from a single fertilized egg who have identical DNA

Context: It's often difficult to distinguish physical characteristics of identical twins.

Academic Standards

National Academy of Sciences

The National Science Education Standards provide guidelines for teaching science as well as a coherent vision of what it means to be scientifically literate for students in grades K-12. To view the standards, visit <http://books.nap.edu>.

This lesson plan addresses the following science standards:

- Life Science: Reproduction and heredity; Diversity and adaptations of organisms
- Science as Inquiry: Abilities necessary to do scientific inquiry

Mid-continent Research for Education and Learning (McREL)

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education addresses 14 content areas. To view the standards and benchmarks, visit <http://www.mcrel.org/>.

This lesson plan addresses the following national standards:

- Science—Life Sciences: Understands the principles of heredity and related concepts
- Understands the nature of scientific inquiry
- Language Arts—Viewing: Uses viewing skills and strategies to understand and interpret visual media



Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the Discoveryschool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- <http://school.discovery.com/teachingtools/teachingtools.html>

