The Mystery of Twins: Teacher's Guide

Grade Level: 6-8	**Curriculum Focus:** Human Body	**Lesson Duration:** One class period

Program Description

At the moment of conception, twins begin a lifelong relationship of special intimacy, one that scientists think might answer some of life's profound questions. When twins who were separated at birth reunite, they prove to be identical not only in appearance, but also in personality and lifestyle. This video shows how scientists are using twin studies to answer the question: Are we formed by nature or nurture?

Onscreen Activities

- Pre-viewing questions:
    - Why are identical twins a unique resource for scientific study? (*Because identical twins have the same genes, scientists can try to determine the extent to which these genes influence development.*)
    - What determines the four different ways that identical twins can develop in the uterus? (*The four different ways that identical twins can develop in the uterus are dependent on when the egg splits after fertilization.*)
    - Discuss the results of the twin studies shown in this documentary. What do these studies reveal about the influence of environment and genes on our personalities?
- Activity: Pretend you have just learned that you have an identical twin you have never met. First, make a list of traits you and your twin might have in common. Then write a short story about your first meeting.

Lesson Plan

Student Objectives

Students will understand:

- Identical twins are genetically identical.
- For this reason, twins separated at birth and later reunited have been subjects for scientific researchers investigating the influence of heredity and environment on human personality.

Materials

- *The Mystery of Twins* video and VCR, or DVD and DVD player
- Research materials on genetics, particularly on twins
- Computer with Internet access

Procedures

1. Initiate a class discussion about the heredity-versus-environment issue. Do your students think that heredity is the primary influence over human personality development, or do they think that a child's experiences and associations are more influential?
2. Continue the discussion by asking students to come up with ways the question could be scientifically investigated.
3. If your students have not brought up twin studies, ask them why a pair of identical twins who had been separated at birth, raised in different environments, and reunited as adults could be excellent subjects for a study of the effects of heredity versus environment on personality development. (Make sure students understand that identical twins are genetically identical.)
4. Ask the class how they would interpret the following sets of data: (a) each identical twin in the pair has a very different personality and lifestyle; (b) the twins are unbelievably similar, not only in physical appearance, but also in personality and lifestyle.
5. Divide your class into groups. Challenge each group to devise a questionnaire with at least 10 questions they would ask each of the twins in a study designed to weigh the effects of heredity and those of environment on personality development.
6. Have students do research on the Internet to find the results of actual studies that have been done using separated identical twins as subjects.
7. Have students play the roles of the separated identical twins and fill in their own questionnaires based on findings from their research.

Discussion Questions

1. Explain what steps should be taken by scientists studying twins to avoid possible invasion of privacy.
2. What might explain the extraordinary similarities between identical twins separated soon after birth, reared in different environments, and reunited for the first time as adults?
3. What do twin studies indicate about the influence of the environment and the complex interaction of genes on our personality, intellectual ability and emotions such as happiness?
4. Although telepathic communication has not been proven to exist among twins, describe what consequences might arise if such communication were possible. Could telepathy be used responsibly? What are the ethical considerations associated with telepathic communication?
5. The environment before birth is critical to the development of the unborn child. Prenatal influences may lead to differences in size, appearance and psychological development. Describe

the function of the following structures: chorion, amniotic sac, placenta and umbilical cord. How might the functioning of these structures be compromised if there is more than one embryo developing?

6. Describe the four possible mechanisms in which identical twins could form. Why is there a point during pregnancy after which the developing twins' health may be in jeopardy?

Assessment

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

- 3 points: Student's questions are all thoughtfully designed; questions well phrased and unambiguous; at least 10 questions.
- 2 points: Student's questions are mostly thoughtfully designed; phrasing of some questions awkward or unclear; at least 10 questions.
- 1 point: Student's questions reflect little thought; phrasing of many questions awkward or unclear; fewer than 10 questions.

Vocabulary

behaviorism

Definition: A school of psychology that takes the objective evidence of behavior (as measured responses to stimuli) as the only concern of its research and the only basis of its theory, without reference to conscious experience.

Context: American psychology went through a reign of behaviorism.

genes

Definition: A specific sequence of nucleotides in DNA or RNA that is the functional unit of inheritance controlling the transmission and expression of one or more traits.

Context: Identical twins are a miracle of nature: two people with the same set of genes.

identical twins

Definition: Two persons closely resembling each other who share the same set of genes.

Context: Most identical twins have identical backgrounds.

telepathically

Definition: Communication from one mind to another by extrasensory means.

Context: It has been suggested that twins have the ability to communicate telepathically.

ultrasound

Definition: A technique involving the formation of a two-dimensional image used for the examination and measurement of internal body structures and the detection of bodily abnormalities; also known as sonography.

Context: These pictures are captured with ultrasound.

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: Diversity and adaptations of organisms; reproduction and heredity

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 Science: Understands the genetic basis for the transfer of biological characteristics from one generation to the next.
- Science—Life Science: Understands the basic concept of evolution of a species.
- Science—Nature of Science: Understands the nature of scientific knowledge.
- Science—Nature of Science: Understands the nature of scientific inquiry.
- Science—Nature of Science: Understands the scientific enterprise.
- Technology: Understands the interactions of science, technology and society.