Course	Agricultural Science II
Unit	Plant Science
Lesson	Plant Genetics
Estimated Time	50 minutes

Student Outcome

The student will be able to describe how genetics influence plant growth.

Learning Objectives

1. Explain what is meant by the term inheritance.
2. Explain how genetics influence plant growth.
3. Define a gene.
4. Explain why DNA is important.
5. Define genetic engineering.
6. Explain how crop production benefits from biotechnology.
7. Identify some ethical considerations in genetic engineering.

Grade Level Expectations

SC/LO/2/E/09-11/a SC/LO/3/B/09-11/e

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. *Plant Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991.
2. *Plant Science Curriculum Enhancement.* University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplies & Equipment

- ❑ Large world map

Supplemental Information

1. Internet Sites
   - ❑ Genetically Modified Foods and Organisms. Human Genome Project, Oak Ridge National Laboratory, Tennessee. Accessed January 24, 2008, from http://www.ornl.gov/sci/techresources/Human_Genome/elsi/gmfood.shtml.
   - ❑ Genetically Modified Foods: Harmful or Helpful? CSA, Bethesda, Maryland. Accessed January 24, 2008, from http://www.csa.com/discoveryguides/gmfood/overview.php.
2. Print
   - ❑ Parker, Rick. *Introduction to Plant Science,* rev. ed. Clifton Park, NY: Delmar Learning, 2003.

Interest Approach

Using a large world map in front of the class, point out every body of water that is considered salt water. Then explain how some plants can survive salt water while most cannot. Easter lilies, for example, are fairly salt tolerant. Ask students what benefit it would be if other plants (e.g., corn and wheat) could be grown using salt water for irrigation. Ask students if plants could be produced that were not hurt by salt water, how would this affect world food production.

Communicate the Learning Objectives

1. Explain what is meant by the term inheritance.
2. Explain how genetics influence plant growth.
3. Define a gene.
4. Explain why DNA is important.
5. Define genetic engineering.
6. Explain how crop production benefits from biotechnology.
7. Identify some ethical considerations in genetic engineering.

Instructor Directions	Content Outline
Objective 1 *Children inherit specific characteristics such as hair and eye color from their parents. Plants also inherit characteristics from parent plants.*	**Explain what is meant by the term inheritance.** Inheritance is the transmission of genes (i.e., traits, characteristics) from one generation to the next.
Objective 2 *Research conducted in the area of inheritance of specific traits involves the study of genetics (the biology of heredity). Researchers have begun to manipulate the genetic makeup of plants to develop improved varieties.*	**Explain how genetics influence plant growth.** The genetic makeup of a plant determines the expression of traits (e.g., yield potential, flower color, size of plant, resistance to disease, etc.).
Objective 3 *The nucleus of each plant cell contains chromosomes. Chromosomes are a sequence of DNA (deoxyribonucleic acid) molecules which contain genetic information (genes).*	**Define a gene.** Genes are the parts of a chromosome that determine the individual plant characteristics. Genes are the smallest unit of inheritance.

Instructor Directions	Content Outline
Objective 4 *Each plant species has specific characteristics. These characteristics are directly related to the plant's DNA (deoxyribonucleic acid).*	**Explain why DNA is important.** 1. It serves as the coding mechanism for heredity (genes). 2. It contains information to control the synthesis of enzymes and other proteins that control the basic metabolic processes of all cells.
Objective 5 *Research in plant genetics provides a clearer understanding of the transmission of specific characteristics. These characteristics can be altered through the process of genetic engineering.*	**Define genetic engineering.** Genetic engineering is the process of transferring genes from one organism to another.
Objective 6 *Discuss with the class what biotechnology means and what biotechnology has done in the area of crop production.*	**Explain how crop production benefits from biotechnology.** 1. Increase of production levels (yields) 2. New plant development (somatic hybrids) 3. Possible increase of specific beneficial characteristics (salt tolerance, disease resistance, etc.)
Objective 7 *Public perception about biotechnology and the use of genetic engineering may be a result of a combination of factors. The average U.S. citizen may not understand all the scientific terminology, but they still desire to be informed as to what the scientific community is doing.*	**Identify some ethical considerations in genetic engineering.** 1. Motives for research 2. Safety 3. Application of findings 4. Social and consumer acceptability 5. Environmental impact 6. Costs versus benefits
Application	Other activities 1. Have students do written reports in the area of genes, DNA, genetic engineering related to plants, and how research in this area has benefitted the world's population. 2. Take a field trip to Monsanto in St. Louis or another agribusiness that is involved with biotechnology. 3. Have students read and report on magazine or newspaper articles on genetic engineering.

Instructor Directions	Content Outline
Closure/Summary	Plant genetics involves many areas of research. Studies on the inheritance of traits, DNA, genes, and genetic engineering continue to open new doors into the plant world to provide better ways to produce food for a growing world population.
Evaluation: Quiz	Answers: 1. b 2. c 3. a 4. d 5. a 6. c