Lesson A1–1

Research in Agriculture

Unit A. Research

Problem Area 1. Scientific Investigation in Agriculture

Lesson 1. Research in Agriculture

New Mexico Content Standard:

Pathway Strand: Problem Solving and Critical Thinking

Standard: IV: Solve problems using critical thinking skills (e.g., analyze, synthesize and evaluate) independently and in teams.


Performance Standard: 1. Formulate ideas and proposals to solve problems. 2. Analyze and evaluate ideas, proposals, and solutions to manage a variety of problems.

Student Learning Objectives. Instruction in this lesson should result in students achieving the following objectives:

1. Explain how the science of agriculture helped develop civilization.
2. Identify and define the various areas of science and agriscience.
3. Discuss advancements made through agriscience.
List of Resources. The following resources may be useful in teaching this lesson:

Recommended Resources. One of the following resources should be selected to accompany the lesson:


Other Resources. The following resources will be useful to students and teachers:


List of Equipment, Tools, Supplies, and Facilities

- Writing surface
- Overhead projector
- Transparencies from attached masters

Terms. The following terms are presented in this lesson (shown in bold italics):

- Agronomy
- Animal science
- Applied research
- Aquaculture
- Arithmetic
- Basic research
- Botany
- Chemistry
- Earth science
- Entomology
- Environmental science
- Forestry
- Geology
- Geometry
- Horticulture
- Life science
- Mathematics
**Interest Approach.** Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

On the board in front of the class, write “Is history important?” Discuss with the students why history is studied in school. Lead discussion to talk about the history of agriculture and the role research has played in that history and development.

**Summary of Content and Teaching Strategies**

**Objective 1:** Explain how the science of agriculture helped develop civilization.

**Anticipated Problem:** How has the science of agriculture helped develop civilization?

I. The science of agriculture is the basis on which all of civilization is built. Before humans began to devise ways to produce their own food, most of their lives were devoted to finding enough to eat. The only available food was the plants and animals that grew wild in the area. Hunting and gathering food was a process that was not only time consuming but also prevented early humans from settling in one place. If a group stayed in one area too long, most of the wild game and wild plants that provided food would be exhausted. Because gathering food took so much time, these early humans had no time for such endeavors as building homes and cities or even in developing inventions that might make their lives better.

A. The very first science was agriculture. **Science** is knowledge obtained through a systematic study of naturally occurring phenomena. The first systematic study by humans was probably devising ways to obtain food, clothing, and shelter. Most anthropologists agree that agriculture began about 10,000 years ago in what is now known as the Middle East. When humans began to grow their own food, they no longer needed to wander about in search of edible plants and animals. This allowed them to settle down in one place and to develop villages where they could live together as one society.
B. Humans began to search for better ways to produce food. These ways were discovered through trial and error and passed down from parents to children. All modern agricultural crops and livestock were developed from the plants and animals tamed and cultured by early humans. As more efficient ways of growing food developed it resulted in less time needed to produce food. As soon as people had enough food to feed themselves and their family, the surplus food was traded to other people. Because food could be obtained through trading, time was spent developing skills in building, engineering, literature, and art that led to the great civilizations.

C. As people began to raise their own food, the necessity arose to invent implements to till the soil. The first tools were very crude and made of wood or stone. These tools later evolved into metal implements. As tools made growing crops and animals more efficient, the more time people had to work on inventing and making more tools.

D. Some scientists also believe that counting and writing developed from agriculture. As people began to harvest crops and had surplus left over, bins and storage areas had to be built. To indicate ownership, contents, and the amount in the containers, a system of markings had to be developed. As more and more containers had to be marked, a system of written language developed. This allowed the expansion of trade and barter so that the excess food could be traded to other people.

There are many techniques that can be used to assist students in mastering this material. Students need text material to aid in understanding how the science of agriculture helped develop civilization. Chapter 1 in The Science of Agriculture: A Biological Approach is recommended.

Objective 2: Identify and define the various areas of science and agriscience.

Anticipated Problem: What are the various areas of science and agriscience?

II. Today scientific research is classified into two broad areas, basic research and applied research. Basic research investigates why or how processes occur in plants and animals. Applied research uses the discoveries made in basic research to help in practical ways. Both types of research take place in all aspects of science. To better understand science, it can be broken down into several different areas.

A. The four major areas of science are mathematics, physical science, life science, and social science. Each has many divisions. Differences between them are not always clearly defined. Most areas of science overlap.

1. Mathematics is the science of numbers. It is important because it involves making and using observations. Mathematics deals with how numbers can be measured and changed. Two branches that are used often in agriscience are:

   a. Arithmetic—This is the study of numbers and methods of calculating.

   b. Geometry—This is a practical area of mathematics. It involves showing mathematical relationships of points, lines, angles, surfaces, and solids.
c. Mathematics has several other branches. Some of these include: logic, algebra, calculus, probability, and statistics.

2. **Physical science** is the study of nonliving matter around us. Physical science has three important areas for agriscience:
   a. **Earth science** is the study of the environment in which plants and animals grow. This includes soil, water, and the atmosphere. Earth science also has several major sections.
   b. **Geology** is the study of the earth’s composition, structure, and history. Study of the soil is a part of geology that is important in agriscience.
   c. **Meteorology** is the study of the earth’s atmosphere. It includes studying the weather and making predictions.
   d. Other important areas of physical science are: hydrology, oceanography, and astronomy.

3. **Chemistry** is the study of the makeup of materials or matter. **Matter** is anything that occupies space and has mass.

4. **Physics** is the study of the physical nature of objects. Areas of physics include the study of heat, light, electricity, and mechanics.

5. **Life science** is the study of living things. It is sometimes called the biological science of biology. Major areas of life science are:
   a. **Botany** is the study of plants.
   b. **Zoology** is the study of animals.

6. **Social science** deals with human society. It is sometimes known as behavioral science. Anthropology, psychology, sociology, and education are areas of social science.

B. Agriscience is made up of several areas of applied science. These relate to the organization of the agricultural industry and the crops and livestock that are produced. Some areas deal with plants; others with animals. In most cases, plant and animal areas overlap. Several important areas of agriscience included:

1. **Agronomy** deals with the study of plants and how they relate to the soil. Its purpose is to improve crop production and conserve natural resources.

2. **Horticulture** is the science of growing plants for food, comfort, and beauty. The divisions of horticulture are:
   a. **Ornamental horticulture** is growing and using plants for their beauty.
   b. **Olericulture** deals with growing vegetables.
   c. **Pomology** includes fruit and nut production, harvesting, and marketing.

3. **Forestry** is the science of growing and using forests.

4. **Entomology** is the branch of zoology that deals with insects and related small animals.

5. **Animal science** is the area dealing with the production of animals for food.

6. **Poultry science** is concerned with raising chickens and related fowl.

7. **Aquaculture** is the science of water farming.
8. *Environmental science* involves ways of wisely using and protecting the things around us.

9. *Mechanical technology* is the use of machines and equipment to do work.

There are many techniques that can be used to assist students in mastering this material. Use TM: A1–1A and TM: A1–1B to aid in class discussion. Students need text material to aid in understanding the various areas of science and agriscience. Chapter 5 in *Introduction to World AgriScience and Technology* is recommended.

**Objective 3:** Discuss advancements made through agriscience.

**Anticipated Problem:** What advancements have been made through agriscience?

III. There have been several important discoveries made through agriscience research. Each has impacted people in a very significant way. Some of these discoveries are:

A. Genetically engineered tomato—Calgene, an agricultural biotechnology firm in Davis, CA., developed a bio-engineered tomato that resists rotting. The new tomato was developed by turning off the gene that caused the tomato to soften and rot. The new tomato lasts longer on the shelf at the grocery store, retains its flavor longer, and tastes like a tomato should taste.

B. Bio-diesel from animal fat—Excess animal fat that is trimmed from the carcasses of meat animals is a low-value by-product of the meat processing industry. A process has been developed that converts fat to bio-diesel, a product very much like the diesel fuel extracted from crude oil.

C. Fire-ant control—Fire ants infest 230 million acres in the southern areas of the United States. Their presence in the warmer climates of the world is a constant threat to the well-being of humans and livestock. A new synthetic control for fire ants increases the ratio of nonproductive drone ants to worker ants. This ratio change gradually weakens the colony and causes it to die.

There are many techniques that can be used to assist students in mastering this material. Students need text material to aid in understanding the advancements made through agriscience. Chapter 2 in *Agriscience: Fundamentals & Applications* is recommended.

**Review/Summary.** Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. Questions at end of chapters in the textbook may also be used in the review/summary.

**Evaluation.** Focus the evaluation of student achievement on mastery of the objectives stated in the lesson. Measure student performance on classroom participation, laboratory assignments, and written tests or quizzes.
Answers to Sample Test:

**Part One: Matching**

1 = b, 2 = f, 3 = e, 4 = a, 5 = h, 6 = g, 7 = d, 8 = c

**Part Two: Completion**

1. nonproductive drone
2. counting, writing
3. 10,000, Middle East

**Part Three: Short Answer**

See Objective 3 in lesson.
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Part One: Matching

Instructions. Match the term with the correct response. Write the letter of the term by the definition.

a. Geology b. Pomology c. Olericulture
d. Agronomy e. Botany f. Basic research
g. Applied research h. Zoology

_____ 1. Includes fruit and nut production, harvesting, and marketing.
_____ 2. Investigates why or how processes occur in plants and animals.
_____ 3. The study of plants.
_____ 4. The study of the earth’s composition, structure, and history.
_____ 5. The study of animals.
_____ 6. Uses discoveries made in basic research to help in practical ways.
_____ 7. Deals with the study of plants and how they relate to the soil.
_____ 8. Deals with growing vegetables.

Part Two: Completion

Instructions. Provide the word or words to complete the following statements.

1. A new synthetic control for fire ants increases the ratio of ___________ ___________ ants to worker ants.
2. Some scientists also believe that ___________ and ___________ developed from agriculture.
3. Most anthropologists agree that agriculture began about ___________ years ago in what is now known as the ___________ ___________.

Part Three: Short Answer

Instructions. Provide information to answer the following question.

Identify three major breakthroughs discovered through agriscience. Explain how each of them has benefitted society.
FOUR MAJOR AREAS OF SCIENCE

Mathematics

Physical Science

Life Science

Social Science
IMPORTANT AREAS OF AGRISCIENCE

• Agronomy
• Horticulture
• Forestry
• Entomology
• Animal science
• Poultry science
• Aquaculture
• Environmental science
• Mechanical technology