

## Introduction to Agriculture, Food, and Natural Resources Detailed Course Outline

### Unit 1 The Circles of Agricultural Education

#### Lesson 1.1 Agriculture Everyday

1. Agriculture and natural resource systems provide the three basic human needs of food, clothing, and shelter.
  - Determine if their basic needs are met after simulating the collection of resources during different situations.
2. Organization and record keeping are important to the success of an agricultural business.
  - Develop and keep an Agriscience Notebook to record and store information.
3. Agriculture is a broad field of study that includes agriculture systems, natural resource management, science, business, communication, and leadership.
  - Interpret types of activities associated with agriculture from a case study about an agricultural entrepreneur.
4. Production of agricultural commodities occurs within specific regions of the United States.
  - Research top commodities produced in the United States and determine costs of food to consumers.

#### Lesson 1.2 Preparing for Your Future

1. Employability skills, such as work ethic, timeliness, communication, and self-direction, are essential attributes for a successful career.
  - Develop and maintain a career portfolio following a specific format.
2. Agriculture is a broad field that encompasses many employment areas and offers a wide array of career opportunities.
  - Investigate the career opportunities available in agriculture.
  - Classify careers according to categories in agriculture.
  - Evaluate personal interests related to career pathways.
3. Supervised Agricultural Experiences (SAE) programs provide opportunities to explore potential career choices and develop professional career goals.
  - Complete an exploratory Supervised Agricultural Experience.
4. The National FFA Organization offers members many opportunities to build necessary employment and life skills, such as leadership, personal character, and career options.
  - Select FFA educational and personal growth opportunities meeting career interests
5. Career Development Events (CDE) expose students to numerous opportunities for academic application in agriculture.
  - Complete components of ten Career Development Events.

### Unit 2 Communicating Today

#### Lesson 2.1 Listen to Me

1. People utilize multiple forms of verbal and nonverbal communication.

- Demonstrate verbal and non-verbal forms of communication in a charades-like game.
  - Identify and select appropriate attire for different activities.
  - Prepare a formal introduction.
2. Voice, presence, and expression are used in communicating effectively.
    - Present a formal introduction.
    - Practice effective public speaking characteristics.
  3. Speeches may be informative, persuasive, or special occasion.
    - Develop and present an informative speech.

### **Lesson 2.2 Let's Get Together**

1. People utilize multiple forms of communication in their daily lives.
  - Work collaboratively to complete team building challenges.
2. Parliamentary procedures are used to conduct orderly meetings.
  - Use proper parliamentary procedures to voice an opinion.
  - Demonstrate the proper procedures for making a main motion and an amendment.
3. Teamwork is essential when solving many problems and completing group tasks.
  - Use group norming and teamwork skills while working in a group

## **Unit 3 The Science of Agriculture**

### **Lesson 3.1 Agriscience Safety and Measurement**

1. Laboratory equipment has specific uses in scientific experiments.
  - Identify and describe the uses of common laboratory equipment. (Activity 3.1.1)
  - Use equipment to collect data for an experiment. (Activity 3.1.1)
2. Emergency equipment is available and has specific uses.
  - Locate and determine the purpose of emergency equipment items located in the classroom, laboratory, and shop facilities. (Activity 3.1.2)
3. Understanding and following procedures and rules are essential to maintaining a safe work environment.
  - Work with their classmates to develop a list of ten safety rules to follow. (Activity 3.1.3)
4. Reading and understanding laboratory procedures are essential to conducting a laboratory experiment safely.
  - Follow written procedures to complete a laboratory exercise. (Activity 3.1.4)
5. Mass, volume, temperature, and density are common laboratory measurements.
  - Measure distance, volume, mass, temperature, and density using the appropriate tools and scale. (Activity 3.1.4)

### **Lesson 3.2 Agriscience Investigators**

1. Classification of people, places, and things is a basic skill used in daily life, scientific research, and the agricultural industry.
  - Classify objects based on their physical characteristics. (Activity 3.2.1)
  - Categorize animals using physical characteristics. (Activity 3.2.1)
2. Proper and accurate data measurement and analysis is important for laboratory investigation.

- Use a LabQuest2 and temperature sensor to collect data for an experiment. (Activity 3.2.2)
3. The pH scale is 0-14 where 0 is extremely acidic, 7 is neutral, and 14 is extremely basic.
    - Determine if a substance is an acid or a base using LabQuest2® and a pH sensor. (Activity 3.2.3)
  4. Scientific method is a systematic process used to solve a problem.
    - Use a minimum of four science processes to design an experiment. (Project 3.2.4)
    - Perform a skit to demonstrate the science processes used in the experiment, laboratory safety, and group communication skills. (Project 3.2.4)

## Unit 4 Natural Resources

### Lesson 4.1. Starting from the Ground Up

1. Mineral matter, air, water, and organic matter are found in different proportions within a soil and define soil quality.
  - Conduct a sediment test to determine the particle sizes of the mineral matter and the presence of organic matter in a sample of soil. (Activity 4.1.1)
2. Geographical features and environmental factors influence the formation process of soils and impact soil quality.
  - Investigate the effects organic matter has on soil porosity and soil air holding capacity. (Activity 4.1.2)
  - Observe how slope of the land causes water to erode away soil. (Activity 4.1.3)
3. Soil erosion results in the loss of quality top soil and is a concern in the study of mineral soils.
  - Conduct an investigation of soil deposition caused by water. (Activity 4.1.3)

### Lesson 4.2 The Whole Soil

1. Sand, silt, and clay are three sizes of mineral particles that comprise soil texture.
  - Conduct tests to determine soil texture by feel. (Activity 4.2.1)
2. Soil structure and soil texture are elements that affect soil function.
  - Test soil permeability to understand the relationship between soil particle size and rate of water filtration. (Activity 4.2.2)
3. The pH of a soil is affected by its buffering capacity.
  - Design an experiment to test the buffering capacity of different soil textures. (Project 4.2.3)
4. The texture, structure, and color of each layer of soil within a profile are used to identify specific horizons.
  - Determine the texture, structure, and color of each horizon within a soil profile. (Activity 4.2.4)
5. Soils form in layers that have distinguishing characteristics from other layers in a soil profile.

### Lesson 4.3 Water World

1. The water cycle is an example of a naturally occurring system in which the substance can change form and location.
  - Play a game to simulate the journey of a drop of water through the water cycle. (Project 4.3.1)
  - Write and illustrate a story about what they learned regarding the journey a drop of water takes through the water cycle. (Project 4.3.1)
2. Land topography influences the distribution of water and pollutants.

- Conduct an experiment that models the flow of water over a landform. (Activity 4.3.2)
3. Water pollution is caused by point and non-point sources.
    - Determine the spread of pollution from point and nonpoint sources. (Activity 4.3.3)
  4. The quality of water sources, such as streams and drinking water, can be determined by measuring factors such as temperature, pH, turbidity, dissolved oxygen, and total dissolved solids.
    - Perform tests to determine water quality using the factors of temperature, pH, turbidity, dissolved oxygen, and total dissolved solids. (Activity 4.4.3)
    - Design an experiment determining the quality of drinking water and conduct the experiment to determine its validity. (Project 4.3.5)
    - Write a lab report regarding their experimental findings. (Project 4.3.5)

### Lesson 4.4 Living in Harmony

1. Energy flows from producers (plants) to consumers (animals).
  - Simulate the flow of energy in an ecosystem. (Activity 4.4.1)
2. Plants and animals depend on each other for survival.
  - Conduct an experiment to determine the interdependence of plants and animals. (Activity 4.4.2)
3. Ecosystems are an interaction between organisms and the environment in which the organisms live.
  - Complete a WebQuest researching an ecosystem. (Project 4.4.3)
  - Develop a model and poster depicting the ecosystem they studied. (Project 4.4.3)
  - Record key points of ecosystems presented by classmates. (Activity 4.4.4)

## Unit 5 Plants and Animals

### Lesson 5.1 Totally Cellular

1. Animal and plant cells have many similarities, especially in regards to cell function; however, there are important structural differences between the two cell types.
  - Identify and label the parts of a cell including each cell organelle function. (Activity 5.1.1)
  - Determine structural differences between an animal and plant cell. (Activity 5.1.1)
2. The nucleus of an animal and a plant cell is important for several life sustaining processes, such as cell division and protein synthesis.
  - Describe the structure and function of a cell's nucleus. (Activity 5.1.1)
3. Microscopes are used to examine cells and cellular features.
  - Demonstrate the correct use of a microscope and prepare a microscope slide to identify the nucleus of an onion cell. (Activity 5.1.2)
4. DNA is genetic material that combined with protein comprises the chromosomes found inside animal and plant cell nuclei.
  - Extract the DNA bundles from strawberry tissue for observation. (Activity 5.1.3)
  - Construct a DNA model and demonstrate how DNA replication happens in a cell. (Activity 5.1.4)
5. Genes are a combination of DNA segments that define animal and plant physical appearance.
  - Identify differences in physical features of people and trace their family traits. (Activity 5.1.5)
6. Offspring of animals and plants derive their genetic traits from both parents.
  - Identify similarities in characteristics to trace family traits. (Project 5.1.6)
  - Use concept mapping software to organize thoughts. (Project 5.1.6)

### Lesson 5.2 All About Plants

1. Plants have roots, stems, leaves, and flowers, which are all vital to survival.
  - Identify and sketch the four basic plant parts. (Activity 5.2.1)
  - Describe the functions of plant parts. (Activity 5.2.1)
2. Flowers, consisting of four main parts, produce seeds for reproduction.
  - Construct a model depicting the parts of a complete flower. (Project 5.2.2)
3. Seeds require moisture and warmth for germination.
  - Conduct a germination trial to determine the germination rate of bean seeds. (Activity 5.2.3)
4. Plants convert raw materials using the energy of the sun into sugar and oxygen.
  - Determine the presence of starch in plants that have received different light treatments. (Activity 5.2.4)
5. Plant cells use water, oxygen, and glucose to produce energy and metabolic by-products of carbon dioxide and water.
  - Collect data on the rate of respiration and photosynthesis of plant leaves. (Activity 5.2.5)

### Lesson 5.3 Plant Needs

1. Plants require adequate amounts of water for survival, growth, and development.
  - Determine the relationship between water availability and turgor pressure. (Activity 5.3.1)
2. Production and management of plants are based upon environmental conditions, such as temperature.
  - Calculate growing degree units for two locations to determine crop maturity. (Activity 5.3.2)
  - Design and conduct an inquiry experiment on one environmental factor to investigate the optimal growth range for a plant. (Project 5.3.5)
  - Write a lab report and develop a poster to report their findings on environmental conditions and plant growth. (Project 5.3.5)
3. The three primary nutrients, nitrogen, phosphorus, and potassium, are necessary for the healthy growth of plants.
  - Research plant macronutrients and record the functions in plants, deficiency symptoms, and sources for each. (Activity 5.3.3)
4. The level of pH affects the health and well-being of plants.
  - Conduct an inquiry lab on the effect of pH on plant health. (Activity 5.3.4)

### Lesson 5.4 Animals in Ag

1. Animals are classified by species, gender, age, and purpose.
  - Categorize animals by gender and species. (Activity 5.4.1)
2. Animals have a complex set of systems that must work together.
  - Develop a concept map of the internal body systems and their relationships. (Activity 5.4.2)
3. Body parts of animals vary among different species.
  - Study and learn the basic anatomical parts of an animal. (Project 5.4.2)
  - Develop a poster of the external anatomy of an animal that will be used to teach others. (Project 5.4.3)
4. Animals are selected based upon the quality and correctness of anatomical structure and productive potential.
  - Make decisions based on given priorities and criteria, and analyze objects as they compare ideal criteria. (Activity 5.4.4)

- Evaluate a class of market hogs based on specific priorities. (Activity 5.4.4)

### Lesson 5.5 Animal Care

1. Animals require food, shelter, and water for survival.
  - Research and identify the six essential nutrients and the functions of each. (Activity 5.5.1)
  - Conduct an experiment to demonstrate the effect of insulation on maintaining body heat. (Activity 5.5.2)
2. The nutrients needed by animals include protein, carbohydrates, fats, vitamins, minerals, and water and are found in many feed sources.
  - Research and identify the six essential nutrients and the functions of each. (Activity 5.5.1)
  - Classify feedstuffs according to their nutrient value. (Activity 5.5.1)
3. Shelter helps animals control body temperature.
  - Conduct an experiment to demonstrate the effect of insulation on maintaining body heat. (Activity 5.5.2)
4. Animals perceive potential dangers differently than humans.
  - Draw conclusions on the perceptions of stimuli based on observations of optical illusions. (Activity 5.5.3)
5. Production and management of animals are based on anatomical and physiological characteristics.
  - Match characteristics of various animals to specialized practices related to animals. (Activity 5.5.4)
6. The production of food, fiber, and fuel sometimes creates ethical dilemmas for producers and consumers.
  - Determine ethical options to form an opinion on the use of meat for human consumption and related environmental impact issues. (Problem 5.5.5)

### Lesson 5.6 Edible Agriculture

1. Food is derived from animal and plant products.
  - Document the plant and animal food products consumed in a twenty-four-hour period. (Activity 5.6.1)
2. Food must be produced, transported, processed, and stored in a safe way.
  - Conduct an experiment to determine bacterial levels of meat samples when refrigerated, stored at room temperature, and cooked. (Activity 5.6.2)
  - Research the path a prepared food item takes from production to processing and present their findings to the class. (Project 5.6.3)
3. Food may be contaminated at many points while in route to the consumer.
  - Observe and record growth of bacterial cultures. (Activity 5.6.2)
  - Solve a problem related to foodborne illness outbreak. (Problem 5.6.4)

## Unit 6 Agricultural Power and Technology

### Lesson 6.1 Energy in Agriculture

1. Renewable and non-renewable energy sources, such as wind, solar, and biofuels, are currently being used in the United States.
2. Agricultural commodities can be converted to alternative energy sources.

- Develop an educational display describing an energy source and the impact agriculture has on that source. (Project 6.1.1)
3. People depend on consumable forms of energy, such as fuel and electricity, which are used in everyday life.
    - Measure electrical power used to power a light and motor. (Activity 6.1.2)
    - Compare fuel consumption costs for agricultural production. (Activity 6.1.4)
  4. The efficiency of energy and the amount of energy produced varies among sources.
    - Construct a solar energy system and compare the production of electricity under different light conditions. (Activity 6.1.3)
    - Compare the energy content of two common fuels used for energy production. (Activity 6.1.5)

### **Lesson 6.2 This is My Land**

1. All property is legally defined and recorded based on a standardized regulatory system.
  - Describe parcels of land using the rectangular survey system and the metes and bounds system. (Activity 6.2.1)
2. Global Positioning System (GPS) is a method used to determine an exact location of a point on the earth using a coordinate system based on longitude and latitude readings.
  - Use three points to triangulate a location. (Activity 6.2.2)
  - Determine latitude, longitude, and altitude using a GPS unit. (Activity 6.2.3)
3. Applications of Global Positioning Systems and Geographic Information Systems are used in all disciplines of agriculture and natural resource systems to improve agricultural production efficiencies and environmental quality.
  - Collect soil data and record the GPS coordinates of each soil location. (Activity 6.2.4)
  - Use the Soil Web Survey to research information on each soil location. (Activity 6.2.4)
4. Federal, state, county, and local laws govern how land can be used.
  - Discuss issues pertaining to zoning and land use and present a persuasive debate at a mock town hall meeting. (Activity 6.2.5)

### **Lesson 6.3 How It's Made**

1. English and metric linear measurement systems are two useful forms of measurement used every day.
  - Use English and metric measurement systems to determine the length of objects. (Activity 6.3.1)
  - Convert fractions and decimals. (Activity 6.3.1)
2. The proper use of scale is important when drafting and designing project plans.
  - Use proportions to solve problems and determine dimensions of objects drawn to scale. (Activity 6.3.2)
  - Draw three-view plans of three-dimensional objects. (Activity 6.3.3)
3. Mechanical shop tools and materials have specific purposes.
  - Develop a flowchart to classify 20 different tools. (Project 6.3.5)
4. Agricultural projects involve planning, design, construction, implementation, and evaluation.
  - Write step-by-step directions for a coast-to-coast trip and calculate mileage and fuel cost. (Project 6.3.4)
  - Develop complete project plans for a birdhouse including researching the needs of the bird, designing, sketching, drawing, writing directions, and estimating a bill of materials. (Project 6.3.6)

## Unit 7 Looking Ahead

### Lesson 7.1 Your Future in Agriscience

1. Agriculture plays an essential role in society and feeding the world.
  - Write a brief outlining a plan to be proposed at a hearing on solving world hunger. (Problem 7.1.1)
2. People develop goals in order to achieve their dreams.
  - Write a vision statement and develop personal goals. (Activity 7.1.2)
3. Accurate record keeping is important to the success of an agricultural enterprise.
  - Review their work from the year and complete their Career Portfolio. (Project 1.2.1)