

Lesson C2–2

Identifying Agriscience Lab Tools

Unit C. Basic Principles of Agricultural/Horticultural Science

Problem Area 2. Identifying and Using Agriscience Tools and Equipment

Lesson 2. Identifying Agriscience Lab Tools

New Mexico Content Standard:

Pathway Strand: Power, Structural & Technical Systems

Standard: VII: Develop skills required to use construction/fabrication equipment and tools.

Benchmark: VII-A: Use tools in the workplace to demonstrate safe and proper skills with construction/fabrication hand tools.

Performance Standard: 1. Demonstrate proper use of measurement and layout tools. 2. Apply proper use of measurement and layout tools in construction/fabrication of an actual project. 3. Demonstrate safe and proper techniques in using hand and power tools in construction/fabrication. 4. Demonstrate hand and power tools use to construct/fabricate an actual project according to blueprints or plans. 5. Identify and demonstrate proper hand and power tool maintenance procedures.

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

1. Explain the importance of tools and equipment in agriscience.
2. Identify common agriscience equipment.
3. Describe important activities in maintaining agriscience equipment.

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:

Lee, Jasper S. and Diana L. Turner. Activity Manual — *AgriScience*, Third Edition. Danville, Illinois: Interstate Publishers, Inc., 2003. (Pages vi and 5–6)

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

Carolina Catalog for Science and Math. Burlington, North Carolina: Carolina Biological Supply Company, latest edition.

Catalog for Forestry, Engineering, and Environmental Science. Jackson, Mississippi: Forestry Suppliers, Inc., latest edition.

Catalog for Educational Products. Jackson, Mississippi: Forestry Suppliers, Inc., latest edition.

Lee, Jasper S. *Program Planning Guide for AgriScience and Technology Education*, Second Edition. Danville, Illinois: Interstate Publishers, Inc., 2000.

List of Equipment, Tools, Supplies, and Facilities

Writing surface
Overhead projector
Transparencies from attached masters
Copies of student lab sheets
Examples of tools and equipment used in the school agriscience classes
Personal protective equipment needed when tools are used

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

Agriscience equipment
Apparatus
Autoclave
Balance
Cleaning equipment
Dissection equipment
Glassware
Heating equipment
Linear measurement
Maintenance
Measuring equipment
Observation equipment
Safety equipment

Scale
Thermometer
Tool

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:

Ask students to explain the meaning of the word, name. A name is a word or phrase that designates a thing or person. Explain that all people have names. You might use a couple of examples in the class and have students indicate the sources of their names. Explain that people like to be called by their names and not by “hey you.” Show a petri dish and a test tube to the class. Ask students the names of the two items. Indicate that in laboratory work it is important to use the correct names for tools and equipment. Ask how using the wrong name can influence work. For example, ask what happens if a person wants a petri dish but asks for a test tube. They get the wrong tool or equipment! Move into the objectives and content of the lesson.

Summary of Content and Teaching Strategies

Objective 1: Explain the importance of tools and equipment in agriscience.

Anticipated Problem: Why are tools and equipment used in agriscience?

- I. Tools and equipment are used to carry out experiments and perform jobs in agriscience. The distinction between tools and equipment is not precise.
 - A. A **tool** is any instrument that is used to do work. Tools are often known as equipment in agriscience. All of the tools and equipment used in agriscience are often known as apparatus. **Apparatus** typically refers to all of the tools and equipment used together to perform a particular function. For example, all of the devices used in setting up a simple water distillation demonstration in a lab are the apparatus for water distillation.
 1. **Agriscience equipment** includes all of the implements used in agriscience work. The equipment may be unique to agriscience or also used in science work.
 2. The focus in this lesson is on tools used to perform science-based activities.
 - B. Agriscience equipment allows an individual to do things they could not do with their bare hands.
 1. In some cases, bare hands would be injured by the materials or activities that are involved in the work. An example is the use of caustic chemicals that would injure human tissues.
 2. Agriscience equipment is strong and durable in doing work.
 3. Agriscience equipment allows for precise measurements. An example is using scales to weigh materials.

4. Agriscience equipment makes it possible to use temperature to alter the state of material or cause a reaction to occur.
- C. Tools and equipment allow an individual to do more work than could be done without them.

Achieving this objective should focus on clarifying the meaning of tools and equipment and listing reasons why they are used. Students may be called on to explain the meaning of the terms, “tool” and “equipment.” The information may be summarized on the writing surface or presented using TM: C2–2A. Some discussion may focus on tools used in other kinds of work, such as how hammers are used to drive nails or saws used to cut wood.

Objective 2: Identify common agriscience equipment.

Anticipated Problem: What equipment is used in agriscience?

- II. Agriscience experiments and research involve using a number of different pieces of equipment.
 - A. Agriscience equipment may be classified by its use or materials used to manufacture it.
 - B. **Glassware** is agriscience equipment that is made from glass. Examples include beakers, test tubes, and graduated cylinders. Glassware is available in different grades, with the best grades being used in research laboratories. The grades used in school laboratories are designed for student and teacher use and may lack some of the precision of the finer grades. Some glassware is heat-resistant and can be used where materials must be heated. Other glassware cannot be heated.
 1. Some glassware is made out of plastic materials. This material resists breaking but often cannot be used with heat. If glassware is to be heated or placed in an autoclave, grades appropriate for this use should be selected.
 2. Safety is important with glass. Broken glass can result in cuts and injury.
 3. Common glassware items include: test tubes, beakers, graduated cylinders, flasks, funnels, sampling bottles, vials, jars, tubing, dropping bottles and droppers, and microscope slides and slide covers. Stoppers, lids, and other covering devices may go with glassware containers. Racks and stands may be used to position glassware when it is in use or while being stored.
 - C. **Measuring equipment** is apparatus used to determine the quantity or dimensions of something. Most measuring equipment in agriscience uses the metric system though the English system is widely used in agriculture. Some measuring devices report measurements in both the metric and English systems.
 1. Thermometers are used in agriscience. A **thermometer** is an instrument for measuring temperature. The measurement is typically made using the Fahrenheit (F) scale or the Celsius (C) scale. Thermometers are used to measure the temperature of the air, liquids, soil, and other materials and environments.
 2. Balances and weighing scales are used in agriscience. A **balance** is an instrument for determining weight that uses an equilibrium system. Balances are often used in

agriscience for precise measurements. Electronic balances are replacing pan and manual types of weighing devices. A **scale** is a device used to weigh materials without the use of an equilibrium system. Systems of springs and dials are often used with scales to report weight in the metric or English system.

3. Linear measurement is made with tapes, rulers, calipers, meter sticks, and electronic measurers that use light beams to determine distances to a target or location. **Linear measurement** is the distance between two points when measured in a straight line.
 4. Containers are used to measure the volume of a material. Graduated cylinders are often used for this purpose. Linear measurements can be used to determine the volume within a container such as a box.
- D. **Dissection equipment** is the variety of devices used in dissecting organisms or their parts. Dissection equipment may be in a kit which contains dissecting scissors, dissecting forceps, scalpels, teasing needles, “T” pins, ruler, and dropping pipette. Dissection equipment also includes a dissecting pan with a pad or wax. (The trend is toward dissecting pads which can be removed from trays for washing after use. Wax must be heated to restore a smooth surface and leaves deposits on “T” pins.)
- E. **Heating equipment** includes devices that use electricity and a fuel of some type to provide heat. Hot plates are heated with electrical elements. Fuel sources of heat include alcohol lamps, Bunsen burners, stoves, and other sources. Heating equipment also includes autoclaves. An **autoclave** is equipment that sterilizes devices used to perform agriscience work to assure that the devices do not harbor microbes that could contaminate work. (Caution: Use care with any device that produces heat to avoid burns and fires.)
- F. **Observation equipment** is equipment used to magnify or otherwise prepare materials for observation. Microscopes, hand lens, and other devices may be needed. (Lesson C2–3 covers the use of microscopes.)
- G. **Safety equipment** is essential in any laboratory. It is used to prevent injury and respond to accidents that may occur. Safety equipment includes personal protective equipment as well as fire blankets, fire extinguishers, eye wash stations, and fume hoods. (Lesson C2–1 covers the use of personal protective equipment.)
- H. **Cleaning equipment** is used to routinely clean the laboratory area as well as to clean up following spills of toxic or flammable materials and the breakage of glassware.
- I. Miscellaneous equipment is needed to complete a laboratory and allow work to be done by students and teachers. The equipment ranges from pH and oxygen meters to increment borers, buckets, spatulas, dispensing bottles, and refrigerators and freezers.

The overall goal of this objective is to provide background information on the identification of the equipment used in agriscience work. Examples of items used in the local school lab should be on display and properly named. A tour of the lab and observation of storage areas may be used in teaching this area. Have students refer to the suggested pages in the recommended resource. The writing surface or TM: C2–2B can be used to summarize the general areas of the objective. Students can refer to catalogs from suppliers of apparatus for grades, prices, and other details. One activity is to have students prepare posters

depicting lab equipment. Out-of-date catalogs from suppliers may be cut apart to provide pictures of lab equipment. Place the names of equipment on the writing surface and have students keep notes to learn correct spelling. The identification and use of equipment will occur in learning activities throughout the duration of the class.

Objective 3: Describe important activities in maintaining equipment.

Anticipated Problem: How is equipment maintained?

- III. Properly maintaining agriscience equipment will assure that it lasts and performs as it is supposed to perform.
 - A. **Maintenance** is keeping equipment in good condition. It includes using equipment properly, cleaning equipment, and storing equipment when not in use. In some cases, proper installation is needed such as fume hood or flow hood.
 1. The proper and safe technique should be used with agriscience equipment. Using equipment incorrectly may create safety risks, damage to the equipment, and result in incorrect findings from experiments and work. Never use equipment in an unsafe manner.
 2. Equipment that comes into contact with materials should be cleaned after use. In some cases, heat or cleaning solutions may be needed such as alcohol or chlorine solutions. In many cases, washing with tap water and allowing equipment to dry is appropriate. Some equipment should be used so that it does not get contaminated, with balances being an example.
 3. All equipment should have an appropriate storage facility. This varies with the equipment. Some equipment may need special racks, safety storage cabinets or rooms, or temperature controls to prevent deterioration.
 - B. Installation is needed with some equipment. This is to assure that it is set up and operates properly. Autoclaves, centrifuges, flow hoods, stoves, refrigerators, and similar larger equipment may need to be installed by a qualified installer.

This objective introduces agriscience equipment maintenance. The coverage is general in nature. Use the equipment in the school lab as the basis for this lesson. Additional and detailed instruction will be needed as students prepare to carry out individual experiments and demonstrations. Student activities should be carefully observed to assure that correct procedures are being used. Use the writing surface or TM: C2–2C to outline the major content of the objective.

Review/Summary. Use the objectives of the lesson as the bases for reviewing and summarizing the content. Involve students in explaining and demonstrating their mastery of the objectives. Place twenty examples of equipment on tables in the room with a number attached and have students write the names of the various items of equipment using LS: C2–2A. Use student responses as the basis for reteaching areas where students need additional instruction.

Application. The content of this lesson can be applied throughout the class in the conduct of demonstrations and experiments by students. The content may also be applied in science classes such as biology or chemistry.

Evaluation. Evaluation should include observation of student performance in class and using a written test. A sample written test is attached.

Answers to Sample Test:

Part One: Matching

1=e, 2=f, 3=d, 4=a, 5=b, 6=c, 7=g, 8=h, 9=j, 10=i

Part Two: Completion

1=kit, 2=autoclave, 3=Fahrenheit, Celsius, 4=Safety

Part Three: Short Answer

1. The answer should contain at least two examples such as a hot plate, alcohol lamp, Bunsen burner, and stove.
2. The items typically in a dissection kit include one of the following dissecting scissors and forceps, scalpels, teasing needles, "T" pins, ruler, and dropping pipette.

Test

Lesson C2–2: Identifying Agriscience Lab Tools

Part One: Matching

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

- | | |
|--------------------------|-------------------------|
| a. apparatus | f. scale |
| b. agriscience equipment | g. dissection equipment |
| c. glassware | h. maintenance |
| d. thermometer | i. measuring equipment |
| e. balance | j. linear measurement |

- _____ 1. An instrument for determining weight that uses an equilibrium system.
- _____ 2. A device for determining the weight of materials without the use of an equilibrium system.
- _____ 3. An instrument for measuring temperature.
- _____ 4. All of the tools and equipment used together to perform a particular function.
- _____ 5. All of the implements used in agriscience work.
- _____ 6. Agriscience equipment made out of glass, though sometimes made of plastic.
- _____ 7. A variety of devices used in dissecting organisms or their parts.
- _____ 8. Keeping equipment in good condition.
- _____ 9. The straight line distance between two points.
- _____ 10. Devices used to determine the quantity or dimensions of something.

Part Two: Completion

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

1. Dissection equipment is usually made available in a _____ that contains the commonly used tools.
2. An _____ is a device used to sterilize equipment using heat and steam.
3. Thermometers typically measure temperature using the _____ and _____ scales.
4. _____ equipment is used to prevent injury and respond to an accident.

TOOLS AND EQUIPMENT IN AGRISCIENCE

Tool—any instrument used to do work

Apparatus—the tools and equipment used together to perform a particular job

Agriscience equipment—all implements used in agriscience experiments and demonstrations

AGRISCIENCE EQUIPMENT

Glassware—equipment made out of glass (in some cases, plastic)

Examples: test tubes, beakers, graduated cylinders, jars, flask, slides and slide covers

Measuring equipment—apparatus used to determine the quantity or dimensions of something

Examples: thermometers, balances, tapes and calipers, and containers

Dissection equipment—devices used in dissecting organisms

Examples: dissecting scissors and forceps, scalpels, teasing needles, “T: pins, and trays

Heating equipment—devices used to provide heat

Examples: hot plates, alcohol lamps, Bunsen burners, and stoves

(Continued)

Observation equipment—devices that magnify objects for viewing

Examples: microscopes and hand lenses

Safety equipment—devices that protect from injury and property damage

Examples: goggles, fire extinguishers, eye wash stations, and fume hoods

Cleaning equipment—devices used to clean equipment and the facility

Examples: test tube brushes, spill cleaning kits, and broken glass clean-up

Miscellaneous equipment—an assortment of equipment needed in a lab

Examples: meters, buckets, bottles, refrigerators, and increment borers

EQUIPMENT MAINTENANCE

Maintenance—keeping equipment in good condition

Includes:

- **proper use to prevent damage**
- **keeping equipment clean**
- **storing properly**
- **installing properly**

Lab Sheet

Identifying Agriscience Lab Tools

Instructions: Observe the agriscience equipment that has been set up in the classroom. Write the correct name in the space below by the number on the equipment. Be sure to spell correctly and provide a complete name.

- | | |
|-----------|-----------|
| 1. _____ | 11. _____ |
| 2. _____ | 12. _____ |
| 3. _____ | 13. _____ |
| 4. _____ | 14. _____ |
| 5. _____ | 15. _____ |
| 6. _____ | 16. _____ |
| 7. _____ | 17. _____ |
| 8. _____ | 18. _____ |
| 9. _____ | 19. _____ |
| 10. _____ | 20. _____ |