

Exploring Research Tools

Have your students design an experiment in their “dream” lab and explore the real-life toolsets of research scientists.

Objective

Students will define a scientific question that impacts people or the natural environment, identify the research tools needed to plan an experiment, and carry out an investigation.

Time

60 minutes (plus time to complete experiments)

Materials

- ▶ Timer
- ▶ Equip Your Science Lab activity sheet
- ▶ Vocabulary list at scholastic.com/pathways/vocablist
- ▶ What Is Basic Science? video at scholastic.com/pathways

1 Set a timer for three minutes. Ask students to complete a quick drawing of a science lab. Have volunteers describe their pictures. What sorts of research tools have your students included in their sketches?

2 Lead a class brainstorm to build a list of tools and supplies scientists use in their research and experiments. Capture the list on the board. Encourage students to think beyond the typical beakers, test tubes, and microscopes that often come to mind and prompt for ideas such as: pipette, telescope, notebook, graduated cylinder, camera, ruler, goggles, autoclave, burner, thermometer, tongs, vortex mixer, gloves, computer and software, electric field for gel electrophoresis, centrifuge, vacuum, and colorimeter. Hand out the vocabulary list and instruct students to complete the following task.

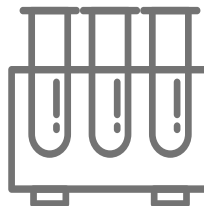
- a. For middle school students: Have students work in small groups to sort or categorize the tools. Suggest categories such as: observation tools, manipulation tools (for mixing, heating, or cooling), measurement tools, recording tools, safety tools (for protection). Invite groups to add more tools to their categories as they work.
- b. For high school students: In small groups, have students generate a list of some advantages and limitations of a few tools. Or, have students consider what substitute tools they could use if they don't have access to expensive, sophisticated tools, and how their experiment results would be similar or different (same but faster? less exact? etc.).

3 Show the What Is Basic Science? video. Reinforce with students that basic scientists ask a lot of questions and study a range of subjects. Distribute the Equip Your Science Lab activity sheet. Ask students to select one of the scientific research questions (or another of their choosing), design an experiment to find answers, and consider the tools they would use to conduct their experiment. They should use additional sheets of paper as necessary for their work.

4 Ask students to share their experiment designs and tool lists in small groups. Encourage them to build on each other's ideas and make suggestions for each other's experiment designs. Can groups think of possible practical applications that would arise from their experiments?

EXTENSION

Conduct an experiment in your class. Have students take notes on the tools they used and questions that evolved during the experiment. Instruct students to write a short description assessing how well the tools functioned, what tools they would use in the future, and what questions and/or next steps that arose from the experiments.



Name _____

Equip Your Science Lab

Design an experiment to answer one of the questions below. Then choose the research tools you'd need to conduct your experiment.

Research questions

- ▶ Which surfaces in the classroom have the most bacteria?
- ▶ Is there a way to slow the molding and decay of fruit?
- ▶ Is there a correlation between my body temperature and the time of day?



My question

Gather information What do you already know? What don't you know? Do some research into existing experiments.

Form a hypothesis Create an informed prediction. Use an if/then statement. Example: If I increase ambient temperature, then enzymes will work more quickly.

Design your experiment What procedure will you follow? How do you plan to measure, observe, and analyze outcomes?

Tools at school Which tools would you use if you were asked to conduct research at school? Example: Tools and materials that are readily available with low to no cost. How will each of the tools be used in your experiment?

Design your dream lab Which tools would you use if you were asked to conduct research in your "dream" lab? How would each of the tools be used in your experiment?