

# Explore the Relationship Between Technology and Science and Mathematics

**Unit.** Technology

**Problem Area.** History of Technology

**Lesson.** Explore the Relationship Between Technology and Science and Mathematics

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

- 1 Understand the relationship between technology and other fields of study such as science and mathematics.**
- 2 Understand that technological progress promotes the advancement of science and mathematics.**

■ **List of Resources.** The following resources may be useful in teaching this lesson:

Fauvel, John, and Jeremy Gray. *A History of Mathematics: A Reader*. Washington: Mathematical Association of America, 1996.

*Mathematics, Science, and Technology Connections*. Teachers Helping Teachers Series. Mississauga, Ontario, Canada: Peel Board of Education Teachers, 1996.

*President's Council of Advisors on Science and Technology (PCAST)*.  
<<http://www.ostp.gov/PCAST/pcast.html>>.



*Science Friday Kids' Connection Archives: History of Science and Technology.*  
Science Friday, Inc.  
<<http://www.kidsnet.org/sfkc/sfkc-history.html>>.

*A Science Odyssey: People and Discoveries.* WGBH, Boston.  
<<http://www.pbs.org/wgbh/aso/>>.

Trefil, James S., ed. *The Encyclopedia of Science and Technology.* New York: Routledge, 2001.

## ■ **List of Equipment, Tools, Supplies, and Facilities**

- ✓ Overhead or PowerPoint projector
- ✓ Visual(s) from accompanying master(s)
- ✓ Copies of sample test, lab sheet(s), and/or other items designed for duplication
- ✓ Materials listed on duplicated items
- ✓ Computers with printers and Internet access
- ✓ Classroom resource and reference materials

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

- ▶ mathematics
- ▶ science
- ▶ technology

## ■ **Interest Approach.** Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situation. A possible approach is included here.

*Ask the students this question: "Who advises the President of the United States on issues related to science and technology?" After the students have offered their thoughts on this question, ask them to think about the attributes and qualifications that are needed to become an advisor to the President on science and technology.*

# SUMMARY OF CONTENT AND TEACHING STRATEGIES

**Objective 1:** Understand the relationship between technology and other fields of study such as science and mathematics.

**Anticipated Problem:** How do science, mathematics, and technology relate to one another?

- I. Science, mathematics, and technology
  - A. What they are
    1. **Science** is the study of the natural world through observation, identification, description, experimental investigation, and theoretical explanations.
    2. **Mathematics** is the science of patterns and order and the study of measurement, properties, and the relationships of quantities using numbers and symbols.
    3. **Technology** is human innovation in action that involves the generation of knowledge and processes to develop systems which solve problems and extend human capabilities.
  - B. What they do for us
    1. Science answers questions and helps us understand the natural world.
    2. Mathematics is a numbers tool; through it we are able to measure, analyze, describe, predict, and communicate.
    3. Technology helps us meet our needs and desires by creating hardware, software, and systems.
  - C. How they relate to one another
    1. Science, mathematics, and technology as enterprises share the following values and features:
      - a. Belief in order
      - b. Belief in the ideals of honesty and openness
      - c. Belief in the importance of criticism by colleagues
      - d. Belief in the essential role played by imagination
    2. Science provides a resource of information for technology.
    3. Mathematics is a tool resource for both science and technology.
    4. Technology provides tools and materials for science.

*Many techniques can be used to help students master this objective. As an example, use VM–A to reinforce the definitions of key terms. Use VM–B to illustrate the beliefs science, mathematics, and technology have in common.*

**Objective 2:** Understand that technological progress promotes the advancement of science and mathematics.

**Anticipated Problem:** How does technological progress promote the advancement of science and mathematics?

- II. Technological progress as it relates to other fields of study
  - A. Technological innovation
    - 1. Often results when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields
    - 2. Sometimes protected through the process of patenting
  - B. Science, mathematics, and technology
    - 1. There are different traditions in science about what is investigated and how, but they all have in common certain basic beliefs about the value of evidence, logic, and good arguments.
    - 2. Developments in science or technology often stimulate innovations in mathematics by presenting new kinds of problems to be solved.
    - 3. Developments in mathematics often stimulate scientific progress and technological advancement by providing the tools (e.g., formulas and equations) needed to conduct a scientific experiment and produce a new technology or advance an existing one.

*Many techniques can be used to help students master this objective. Use LS–A to help students understand how science, mathematics, and technology relate to one another in several different enterprises.*

- **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 the ends of chapters in the textbook may also be used in the review/summary.
- **Application.** Use the included visual masters and lab sheet to apply the information presented in the lesson.
- **Evaluation.** Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. A sample written test is provided.

## ■ **Answers to Sample Test:**

### **Part One: True or False**

- 1. False

2. False
3. True
4. False
5. True

### **Part Two: Completion**

1. predict
2. tools
3. imagination

### **Part Three: Multiple Choice**

1. b
2. c
3. d
4. c

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## ► Part One: True or False

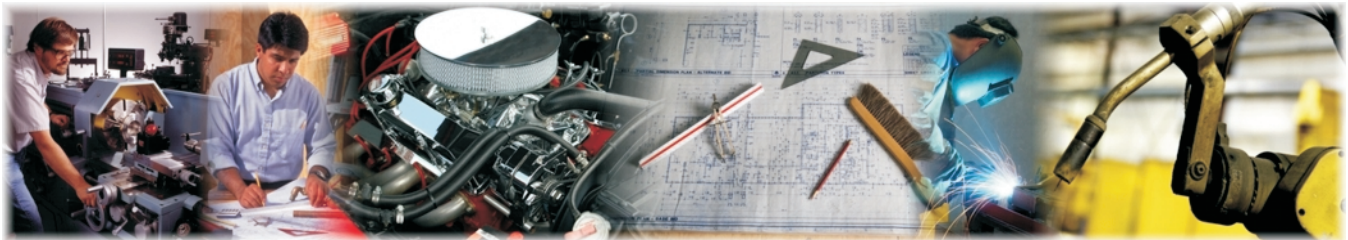
**Instructions:** Write *T* for True or *F* for False next to each statement.

- \_\_\_\_ 1. Science is a numbers tool.
- \_\_\_\_ 2. The purpose of mathematics is to meet our needs and desires by creating hardware, software, and systems.
- \_\_\_\_ 3. Science is a process for studying the universe.
- \_\_\_\_ 4. The purpose of technology is to answer questions and give us understanding.
- \_\_\_\_ 5. Technology is things and systems created by people.

## ► Part Two: Completion

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

1. The purpose of mathematics is to enable us to measure, analyze, describe, \_\_\_\_\_, and communicate.
2. Mathematics provides science and technology with \_\_\_\_\_.
3. A belief in the essential role played by \_\_\_\_\_ is a value shared by science, mathematics, and technology.



► **Part Three: Multiple Choice**

**Instructions: Write the letter of the correct answer.**

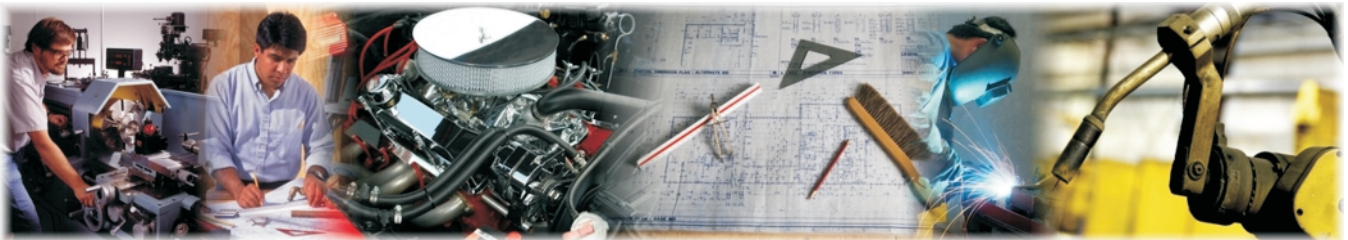
- \_\_\_\_\_ 1. Technological \_\_\_\_\_ often results when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.
- a. trade-offs
  - b. innovation
  - c. traps
  - d. constraints
- \_\_\_\_\_ 2. Technological ideas are sometimes protected through the process of:
- a. design
  - b. optimization
  - c. patenting
  - d. copyrighting
- \_\_\_\_\_ 3. Technological progress \_\_\_\_\_ the advancement of science and mathematics.
- a. inhibits
  - b. prolongs
  - c. restrains
  - d. promotes
- \_\_\_\_\_ 4. Developments in science or technology often \_\_\_\_\_ in mathematics by presenting new kinds of problems to be solved.
- a. create confusion
  - b. inhibit progress
  - c. stimulate innovations
  - d. stifle advancements



# DEFINITIONS OF TERMS

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- ◆ Science is the study of the natural world through observation, identification, description, experimental investigation, and theoretical explanations.
- ◆ Mathematics is the science of patterns and order and the study of measurement, properties, and the relationships of quantities using numbers and symbols.
- ◆ Technology is human innovation in action that involves the generation of knowledge and processes to develop systems which solve problems and extend human capabilities.



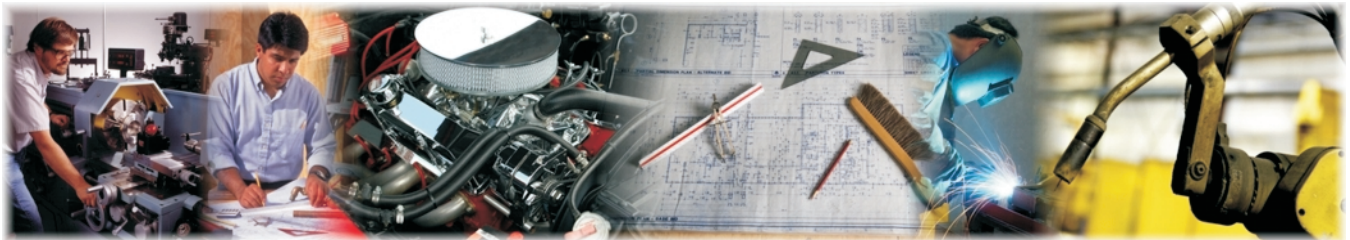


# SHARED BELIEFS

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Science, mathematics, and technology as enterprises share the following values and features:

- ◆ Belief in order
- ◆ Belief in the ideals of honesty and openness
- ◆ Belief in the importance of criticism by colleagues
- ◆ Belief in the essential role played by imagination



# Bulletin Board Display

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## Purpose

The purpose of this activity is to enable students to understand how science, mathematics, and technology relate to one another in several different enterprises.

## Objectives

1. Research and design a bulletin board display on applications of science and mathematical concepts and processes in a particular enterprise.
2. Present and describe the display to the class.

## Materials

- ◆ bulletin boards
- ◆ thumbtacks
- ◆ paper
- ◆ writing utensils

## Procedure

1. Have students break up into small groups.
2. Distribute to each group the necessary materials.
3. Have each group select one of the following enterprises:
  - a. Medical technology
  - b. Agricultural and biotechnologies
  - c. Energy and power technologies
  - d. Information and communication technologies
  - e. Transportation technologies
  - f. Manufacturing technologies
  - g. Construction technologies
4. Each group should research and design a bulletin board display illustrating the science and mathematical concepts and processes that are involved in its chosen enterprise.
5. Upon completion, each group will then present and describe its display to the class.