chapter 6

Technology Connections

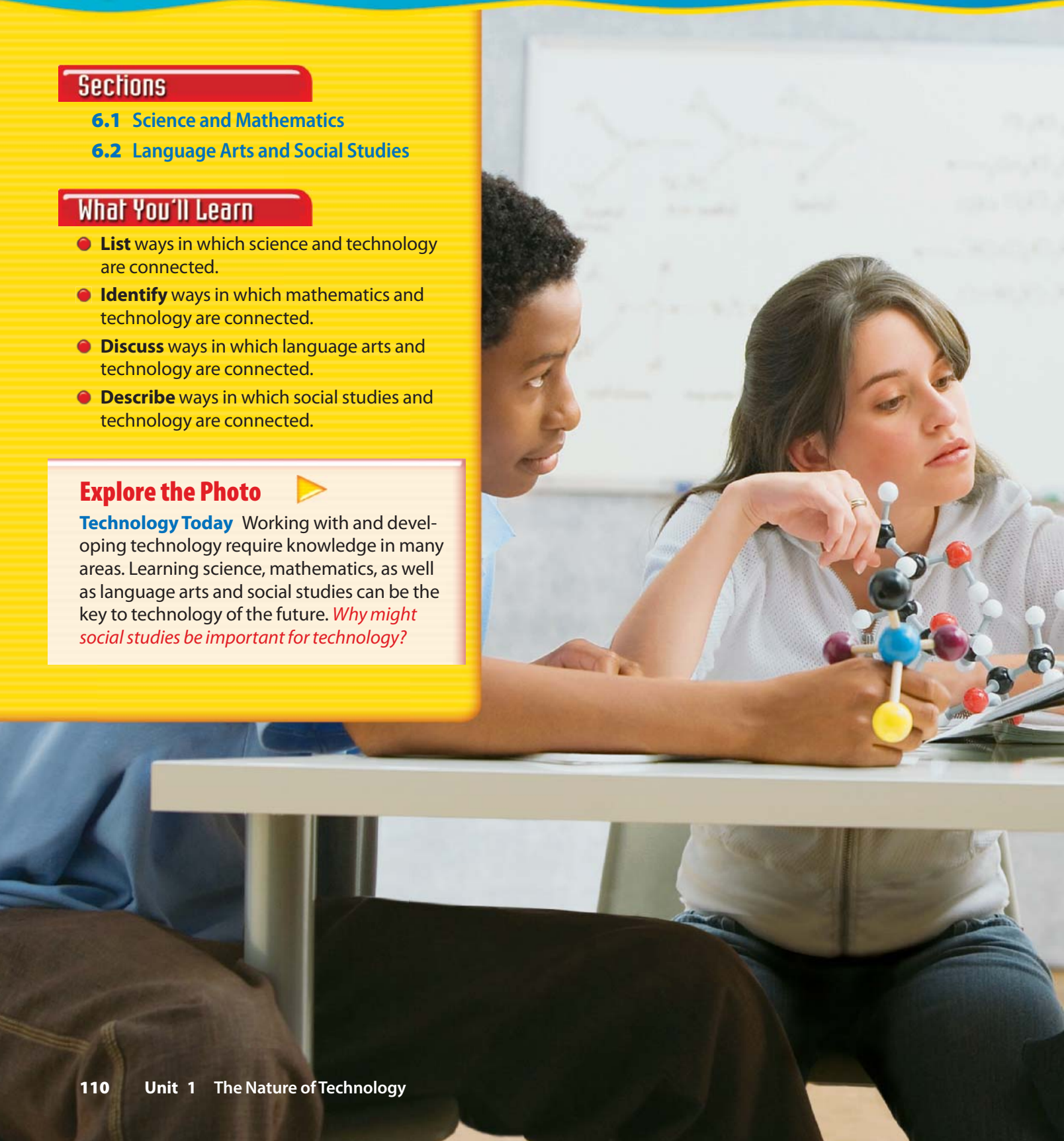
Sections

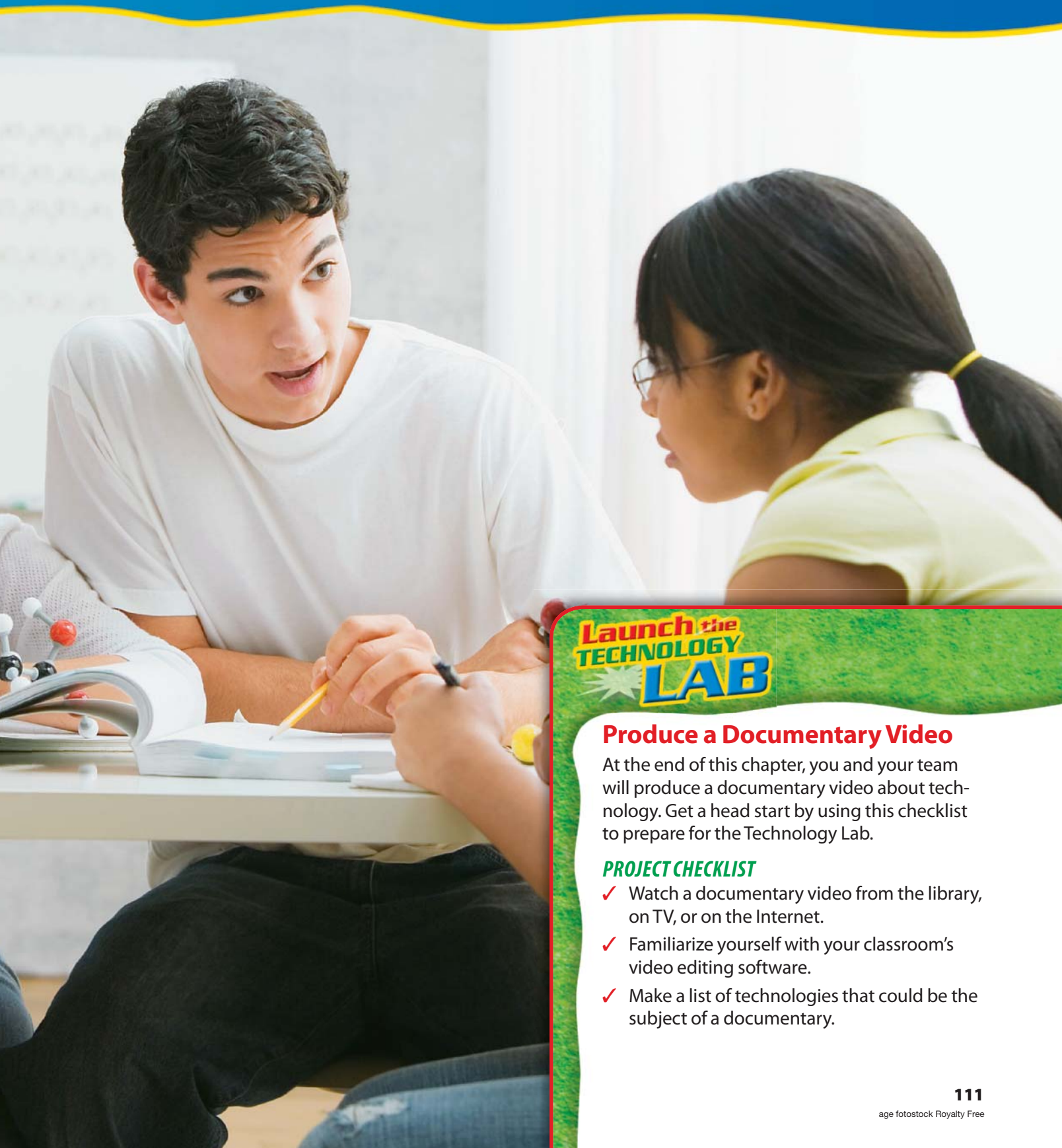
What You'll Learn

- **List** ways in which science and technology are connected.
- **Identify** ways in which mathematics and technology are connected.
- **Discuss** ways in which language arts and technology are connected.
- **Describe** ways in which social studies and technology are connected.

Explore the Photo

Technology Today Working with and developing technology require knowledge in many areas. Learning science, mathematics, as well as language arts and social studies can be the key to technology of the future. *Why might social studies be important for technology?*





Launch the TECHNOLOGY LAB

Produce a Documentary Video

At the end of this chapter, you and your team will produce a documentary video about technology. Get a head start by using this checklist to prepare for the Technology Lab.

PROJECT CHECKLIST

- ✓ Watch a documentary video from the library, on TV, or on the Internet.
- ✓ Familiarize yourself with your classroom's video editing software.
- ✓ Make a list of technologies that could be the subject of a documentary.

section 6.1

Science and Mathematics

Reading Guide

Before You Read **Connect** Why are science and mathematics necessary for technology?

Content Vocabulary

- hypothesis
- scientific theory
- scientific law

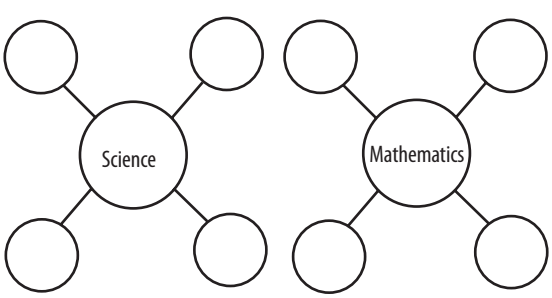
Academic Vocabulary

You will see these words in your reading and on your tests. Find their meanings at the back of this book.

- volume
- area

Graphic Organizer

Draw the section diagram. Use it to organize and write down information as you read.



Go to **glencoe.com** to this book's OLC for a downloadable graphic organizer and more.

TECHNOLOGY STANDARDS

STL 3 Relationships & Connections

STL 7 Influence on History

STL 10 Troubleshooting & Problem Solving

ACADEMIC STANDARDS

Mathematics

NCTM Algebra Understand patterns, relations, and functions

Science

NSES E Understandings about science and technology

STL *National Standards for Technological Literacy*

NCTM *National Council of Teachers of Mathematics*

NCTE *National Council of Teachers of English*

NSES *National Science Education Standards*

NCSS *National Council for the Social Studies*

Science

What is the scientific method?

Early humans created very simple technologies using crude tools and natural materials. They learned what worked by trying different combinations. Modern technology is quite different. It depends heavily on science and mathematics.

As You Read

Predict How does mathematics help in the development of technology?

Scientific Method

All scientists apply the same process to solve problems. This process is called the "scientific method."

1. Scientists make observations and form questions.
2. Next, they gather information about what was observed.
3. They use this information to form a **hypothesis**.
4. Scientists then develop an experiment to test it.
5. They carefully analyze the results of the experiment.
6. They then repeat the experiment to see whether they get the same results. Finally, they present their conclusions.

Scientists use technology as a tool for scientific discovery. Their discoveries often lead to the development of new technologies.

Scientific Theories and Laws

To develop new technology, engineers must have a clear understanding of the principles, theories, and laws of science. Scientific conclusions that have been carefully developed through experimentation are called **scientific theories**. Over time, these theories are tested again and again. Eventually, they may be accepted as **scientific laws**, which are theories proven true and accepted as fact. In time, scientific law can be challenged by new knowledge.

For example, Newton's third law of motion states that the greater an object's mass, the greater its attraction force. Newton's law explains why apples fall to the earth and why the planets in our solar system revolve around the sun. However, telescopes show that light, which has no mass, bends in a strong gravitational field. Albert Einstein developed his theory of relativity to account for this warping of light by the massive objects in our universe.

Most scientists think that Newton's law and Einstein's theory cannot be reversed. But NASA researchers are working on an anti-gravity machine, which would actually revolutionize air and space travel.

Reading Check **Summarize** What is the relationship between science and technology?

Academic Connections — Math

Looking for Profit Mathematics is needed to calculate the profit from selling a product. Profit is the money earned after all expenses are paid.

Apply You and a friend decide to build dog houses to sell during summer vacation. One load of lumber and other materials to build 12 dog houses costs $648. If you sell them for $80, how much total profit will you earn?

STEM

Gravity at Work According to legend, Newton's third law of motion was inspired by an apple falling from a tree. *What is the difference between scientific theory and scientific law?*

Mathematics

How can mathematics help us design technology products?

Few subjects are more important to technology than mathematics. Engineers use mathematics to determine things such as the flight characteristics of airplanes and the shape of cell phones. Mathematics is often the reason products look the way they do.

A narrow river might require only a simple bridge. A larger river might require a complex bridge with suspension cables. Mathematical calculations tell engineers which design is better.

EcoTech

Sea Robot

As Earth's environment changes, so does the ocean. The oceans affect global weather and sea life. So, technologists at Rensselaer Polytechnic Institute devised a solar robot that "swims" underwater, calculating sea levels, algae blooms, and the melt and drift of ice.

Try This Almost anything you do to help the environment can help our oceans. Many cleaning products are toxic and get washed into the sea. Read the labels of cleaning products at the market. Make a list of environmentally friendly products and share it in class.

Working with Robots

Industrial robots are important machine tools in manufacturing. Engineers make mathematical calculations to determine where robots should be used and for what tasks.

For example, hydraulic robots use pressurized oil, and pneumatic robots use pressurized air. Pneumatic robots operate at an air pressure of about 100 psi (pounds per square inch). Hydraulic robots operate at about 3,000 psi. A hydraulic robot can lift about 30 times as much weight because the pressure is 30 times higher. If a pneumatic robot can lift 20 pounds, a hydraulic robot could lift up to 600 pounds (30 × 20 = 600 pounds).

A robot having an arm extension speed of 40 inches per second is not unusual. How long would it take such a robot to move its arm five feet? The robot could do it in 1.5 seconds! (Convert feet to inches: 5 feet × 12 = 60 inches. Divide this result by 40.)

Reading Check

Describe What are some of the ways that engineers use mathematics?

Building Ships

Isambard Kingdom Brunel was England's greatest 19th century technologist. He designed and built the world's first all-metal steamship, the *SS Great Britain*. Many people scoffed at him because they knew that metal sinks easily. However, Brunel knew that it is easy to make metal float if you give it the proper shape. As long as the density of a solid is less than that of water, the solid will float. Density is weight divided by **volume**. The density of water is 0.0361 pounds per cubic inch (pci). Any solid that is less dense than 0.0361 pci will float.

SuperStock Royalty Free

Real Robots Many mathematical calculations determine how much weight this robot can lift. *This robot is hydraulic and can lift 360 pounds. How many pounds could it lift if it were a pneumatic robot?*

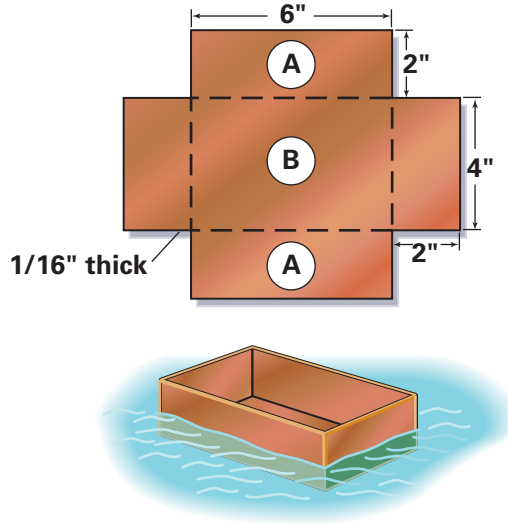
Applying Math

Suppose you wanted to make the flat piece of copper shown in **Figure 6.1** into a boat. The piece of copper weighs 1.3 pounds, and its **area** is 64 square inches. Find its volume by multiplying its area by its height, or thickness, which is 1/16 inch. The volume of the flat copper piece is 4 cubic inches (64 × 1/16 = 4). In order to make the copper float, you must increase its volume. You can do this by folding it into a box.

- The box's volume is length times width times height:
  Volume = 6 inches × 4 inches × 2 inches
  Volume = 48 cubic inches
- The density of the boxy copper boat is its weight divided by its volume:
  Density = 1.3 pounds (divided by) 48 cubic inches
  Density = 0.0271 pci

The density of the copper boat (0.0271 pci) is less than the density of water (0.0361 pci), which means it will float. The *SS Great Britain* weighed 6.89 million pounds—but its volume was large enough, and it could also float.

Figure 6.1 Making Metal Float



Density As long as the density of the copper boat is less than the density of water, it will float. *In addition to density, what other factor would be important for keeping this box afloat?*

section 6.1 assessment

After You Read Self-Check

1. Tell the difference between a hypothesis and a scientific law.
2. Explain the importance of calculating a robot's ability to extend its arm.
3. Describe how it is possible for a very large, heavy ship to float.

Think

4. Suppose you observed that certain metals could be melted at lower temperatures than previously thought. Explain how you would establish your observation as a scientific law.

Practice Academic Skills

English Language Arts/Writing

5. Divide a sheet of paper into two columns. Label one column "Science" and the other "Mathematics." Think of ways in which science and mathematics are connected to technology in your school and at home and write them in the appropriate column.

STEM Mathematics

6. Brianna wants to be a race car driver. She is able to practice at a course that is 2.25 miles long. If it takes her 1 minute and 15 seconds to complete one lap, what is her average speed in miles per hour?

Math Concept Average Speed Average speed is total distance divided by time.

1. When calculating average speed, make sure to solve using the correct units.
2. To convert something from miles per minute to miles per hour, multiply by 60.

For help, go to **glencoe.com** to this book's OLC and find the Math Handbook.

section 6.2

Language Arts and Social Studies

Reading Guide

Before You Read **Preview** How are language arts and social studies linked to technology?

Content Vocabulary
- humanities
- Information Age
- shadowing program

Academic Vocabulary
- element
- region

Graphic Organizer
Draw the section diagram. Use it to organize and write down information as you read.

Technology and the Working World

Occupation	Related Technologies
Health	X-ray machines, microscopes

Go to **glencoe.com** to this book's OLC for a downloadable graphic organizer and more.

TECHNOLOGY STANDARDS

STL 17 Information & Communication Technologies

ACADEMIC STANDARDS

English Language Arts

NCTE 7 Conduct research and gather, evaluate, and synthesize data to communicate discoveries

NCTE 11 Participate as members of literacy communities

Social Studies

NCSS 8 Science, technology, and society

STL *National Standards for Technological Literacy*

NCTM *National Council of Teachers of Mathematics*

NCTE *National Council of Teachers of English*

NSES *National Science Education Standards*

NCSS *National Council for the Social Studies*

Technology and the Humanities

Which subjects are called the "humanities"?

Some subjects that you study in school are called the humanities. They include language arts, social studies, and art. In this section, we will look at how technology is connected to language arts and social studies.

As You Read **Connect** How will studying technology help you in your future career?

Language Arts

What is the relationship between language arts and technology?

Spoken and written communication helps develop technology and teach it. Technology provides for better communication.

Language and Technology in the Past

Early humans probably used hand gestures to communicate. Eventually, they developed a written language to pass along information.

The invention of the plow helped change our ancestors from hunters and gatherers to farmers. This led to property ownership and the need for records, making written and spoken language even more important.

In the 15th century, Johannes Gutenberg developed movable metal type. That led to the manufacture of inexpensive books, which paved the way for universal education. Before Gutenberg, few people learned reading and writing. As more people became educated and communication increased, inventions multiplied. The printed word helped spread the use of technology.

Language and Technology Today

How is language connected to technology today? If you invented a new kind of computer, you would need language to program it and to create plans for producing it. You would also need language to create a company, hire employees, keep business records, and communicate with customers. People who work with companies overseas need world language skills.

Reading Check **Recall** What led to universal education?

Tech Stars

Mike Blake/Corbis

Burt Rutan and Mike Melvill

Designer and Pilot of SpaceShipOne

SpaceShipOne was the first privately owned and operated rocket ship. In June 2004, it traveled into space. It was designed by Burt Rutan of Scaled Composites and piloted by Mike Melvill. SpaceShipOne traveled less than a tenth of a mile into space before returning to earth. But it made history, marking a new era in which tourists could travel in space. Both men are now in the *Guinness Book of World Records*.

Wild Ride Rutan and Melvill had planned to send SpaceShipOne further into space. However, a glitch in the flight control system knocked the rocket plane off course. Once in zero gravity, Melvill released a bag of M&Ms into the cockpit just to watch them fly around.

English Language Arts/Writing You have been invited to ride on a rocket ship that will orbit the earth once. Explain why you would or would not want to go.

Go to **glencoe.com** to this book's OLC to learn about young innovators in technology.

BusinessWeek Tech NEWS

Amazon's E-Book

Gadget makers have been trying to sell us on e-books—digital devices that display text. Amazon [came] up with the first e-book to function independently of a computer. When you purchase a "Kindle," you take the reader out of the box, go to Amazon's Kindle store, make your book selection, and it downloads in seconds.

Critical Thinking *How might using an e-book affect studying English language arts?*

Go to **glencoe.com** to this book's OLC to read more about this news.

Social Studies

How do technology and social studies work together?

The study of technology deals with more than things. It deals with how people use technology and how it changes their lives. You learn about these interactions in social studies.

Reading Check **Predict** What is social studies?

The Industrial Revolution

The Industrial Revolution began about 1750 and resulted in worldwide social changes. Before the Industrial Revolution, most countries' economies were based on farming. Then they became based on factory production.

Today we are experiencing another revolution as we move into the Information Age. We still need factories, but more people make their living by creating, processing, and distributing information.

The Information Age

It is difficult to say when the Information Age began. It may have started in 1844 when Samuel Morse tapped out the first long-distance telegraph message. Or perhaps it started in 1944 when Howard Aiken operated the world's first large-scale digital computer. Whenever it began, the Information Age is here to stay.

With the world linked by computers, everyone can share specialized knowledge. Doctors can send information immediately around the world to save lives. Consumers can find out about product recalls for toys, pet food, or laptop batteries.

Ethics in Action

Cell Phones in School

Some schools have banned students from carrying cell phones. Many teachers think they are too distracting. Students could also use cell phones to cheat. But many parents want to be able to contact students in case of emergencies.

Petitions To protest the ban, parents have submitted petitions, which are requests to change the rules. Petitions do not have legal power, but they show support for a cause, and can persuade authorities to make changes.

English Language Arts/Writing

Online Causes After someone writes a petition, they show it to as many people as possible. If people agree with it, they add their signatures. The more signatures a petition has, the more persuasive it can be.

1. Write a petition for a cause that you would want to post online.
2. Write a paragraph about the cause and why you would sign it.

Visualizing the World

The rapid exchange of information has changed the way we visualize the world. Television, computers, cell phones, and other Information Age products are **elements** that have changed the way schools educate students. Today's young people have immediate access to large amounts of information.

Global positioning system (GPS) satellites help map the world with great accuracy. A small receiver picks up satellite data to tell you exactly where you are located. GPS is useful for hikers, travelers, and for ship captains planning long ocean voyages. It also helps engineers construct roads in undeveloped **regions**.

Figure 6.2 The U. S. Department of Education Career Clusters

Career Cluster	Job Examples
Agriculture, Food, and Natural Resources	farmer, ecologist, veterinarian, biochemist
Architecture and Construction	contractor, architect, plumber, building inspector
Art, Audio/Video Technology, and Communications	graphic designer, musician, actor, journalist, filmmaker
Business, Management and Administration	executive assistant, receptionist, bookkeeper, business owner
Education and Training	teacher, trainer, principal, counselor, financial planner
Finance	bank teller, tax preparer, stockbroker, financial planner
Government and Public Administration	soldier, postal worker, city manager, nonprofit director
Health Science	pediatrician, registered nurse, dentist, physical therapist
Hospitality and Tourism	chef, hotel manager, translator, tour guide
Human Services	social worker, psychologist, child care worker
Information Technology	Web designer, software engineer, technical writer
Law, Public Safety, Corrections, and Security	attorney, police officer, firefighter, paralegal
Manufacturing	production supervisor, manufacturing engineer, welding technician, quality technician
Marketing, Sales, and Service	sales associate, retail buyer, customer service representative
Science, Technology, Engineering, and Mathematics	lab technician, marine biologist electrical engineer, cryptanalyst
Transportation, Distribution, and Logistics	pilot, railroad conductor, truck driver, automotive mechanic

Career Clusters The United States Department of Education groups careers into 16 career clusters that are based on similar job characteristics. *How might career clusters help you explore careers?*

Imagine This...

GPS on Your Cell Phone

Imagine knowing exactly where your friends are when they call you. Some cell phones have a built-in GPS feature. This is special software that allows users to share their location with their friends. If the friends do not have a GPS-capable model, they will receive a text message with a Web link to a customized map. *Would you like people to know exactly where you are all the time?*

Go to **glencoe.com** to this book's OLC for answers and to learn more about GPS and cell phone technology.

Business in the Information Age

We also conduct business differently in the Information Age. In retail stores, universal product code (UPC) readers rapidly sense the price of food and clothing. People can get through checkout lines faster or even check out their own purchases.

With a credit card and an Internet Service Provider, you can pay bills, make banking transactions, and buy products online.

Technology and the Working World

Economics involves the goods and services we produce. It also relates to how people earn a living. Today's jobs require workers with technology-based abilities. In our Information Age, many jobs are available for people with education and training.

Technology and Careers

Try this activity. With your teacher's guidance, divide the class into groups of students with similar occupational interests. See **Figure 6.2** on page 119. Each group should research its chosen field to determine what technological devices are used and how workers in each field might need to use:

- English language arts
- Science
- Mathematics
- Social studies
- World languages

With your teacher's help, establish a **shadowing program** in which you and your classmates spend a day in the work environment of your chosen field. Share your experiences with the class.

section 6.2 assessment

After You Read

Self-Check

1. Name at least three subjects included in the humanities.
2. Describe how Johannes Gutenberg influenced both language arts and technology.
3. Explain how the Information Age has changed education.

Think

4. Explain how the global positioning system could be used to help find lost children.

Practice Academic Skills

English Language Arts/Writing

5. Do some research to find the difference between the Internet and the World Wide Web. Write a paragraph explaining your findings.

STEM Science

6. The Information Age has linked the world through computers and other technologies. One such technology is the Global Positioning System (GPS). GPS allows for accurate positioning around the world. Research how GPS was developed and the different applications that utilize GPS. Write a few paragraphs describing what you find.

Exploring Careers in Technology

Beth Heller

SCIENCE TEACHER

Q: *How did you get interested in being a science teacher?*
A: The teachers I had in school made learning science fun! We did all kinds of neat, hands-on activities, and I was inspired to do the same.

Q: *What is a typical day like for you on this job?*
A: Before the students arrive, I answer parent e-mails, grade papers, go over my lesson plans, or set up labs. I also spend my early mornings attending faculty meetings and meeting with students who have questions. Each day, I teach six classes and supervise a study hall period.

Q: *What do you like most about your job?*
A: I really enjoy interacting with so many different students and teaching a variety of science subjects. I enjoy being able to watch the students grow up and mature. It amazes me how uniquely every person changes, along with their interests.

Q: *What can you tell aspiring students about preparing for a career as a science teacher?*
A: Take as many different science classes as you can, especially physics and chemistry. A psychology course will help you understand how the brain works and how to present new topics to students. See if your school will allow you to become a teacher's assistant, tutor, or mentor. These activities can give you an idea of what teaching is like. We need more good teachers!

English Language Arts/Writing

Write an E-mail Letters and e-mail have the same basic elements but different purposes. Send an e-mail message to a classmate comparing e-mail to letter writing. List the advantages and disadvantages of each form.

1. Copy your teacher on the e-mail. To do this, add your teacher's e-mail address to the CC line.
2. Ask for a response from your classmate. Request that they "Reply to All", so that your teacher will receive the response as well.
3. Be clear and concise. Make sure you proofread your message before you send it.

Go to **glencoe.com** to this book's OLC to learn more about this career.

Real-World Skills
Speaking and listening, problem-solving, organization

Academics and Education
Science, English language arts, mathematics

Career Outlook
Growth as fast as average for the next ten years
Source: *Occupational Outlook Handbook*

chapter 6 Review and Assessment

Chapter Summary

Section 6.1 Modern technology depends heavily on science and mathematics. All scientists apply the same scientific method to solve problems. Scientific conclusions that have been carefully developed through experimentation are called "scientific theories." Over time they may be accepted as scientific laws. Few subjects are more important to technology than mathematics.

Section 6.2 We need verbal and written communication skills in order to develop technology and teach it to others. Social studies teaches us that past inventions have improved people's lives, changed economies, and altered governments. Our society has moved into the Information Age. Today's jobs require workers with technology-based abilities.

Review Content Vocabulary and Academic Vocabulary

1. On a sheet of paper, use each of these terms and words in a written sentence.

Content Vocabulary
- hypothesis
- scientific theory
- scientific law
- humanities
- Information Age
- shadowing program

Academic Vocabulary
- volume
- area
- element
- region

Review Key Concepts

2. **Describe** the connections between science and technology.
3. **Discuss** the connections between mathematics and technology.
4. **Explain** the scientific method.
5. **Identify** what mathematical calculations tell us about robots.
6. **Discuss** ways in which language arts and technology are connected.
7. **Describe** how social studies is connected with technology.
8. **Define** the Information Age.
9. **Discuss** why the Information Age and technology are important to a career.
10. **Explain** the difference between technology and the humanities.

Real-World Skills

11. Written Communication Write instructions for doing a simple task, such as putting on a jacket or tying shoes. Give your instructions to a classmate to use and ask for feedback. Describe how well the instructions were written.

STEM Technology Skill

12. Global Communications In the past, the only way to communicate with people in other countries was through mail or on the phone.

a. Use the Internet to find a Web site that allows you to e-mail someone in another country.

b. Write an email to someone in another country. Say why you are writing and ask for a reply.

Academic Skills

Social Studies

13. Research the Information Age on the Internet and write a few paragraphs on how it has affected the way goods and services are produced.

STEM Mathematics

14. Sunjana works for a delivery service. She is paid $5.15 an hour, plus half of her cost for gasoline. Her car is old and gets only 21 miles per gallon of gas. If she drives a total of 86 miles one day, and gas costs $2.59 a gallon, how much should she be reimbursed for gas?

Math Concept Multi-Step Problems Multi-step problems require extra attention. Note the information given and determine what to solve for so you can eliminate unnecessary information.

TSA WINNING EVENTS

Summer Work

Situation You want to get a summer job by showing employers you are the best candidate.

Activity Conduct job research, write a cover letter and a résumé, and practice being interviewed.

- Letters and résumés should be one page.
- With classmates, develop interview questions. Take turns interviewing each other.

Evaluation You will be evaluated on how well you meet these performance indicators:

- A list of five jobs
- Cover letter—well written, featuring your strengths related to the position
- Résumé—showing work history, related activities, grades, or awards
- Practice interviews—answers, poise, voice

Go to **glencoe.com** to this book's OLC for information about TSA events.

Standardized Test Practice

Directions Choose the letter of the best answer. Write the letter on a separate piece of paper.

1. What is the circumference of a circle with a radius of 4.24 inches? $Pi = 3.14$

A 13.3136 inches

B 26.6272 inches

C 13.6272 inches

D 26.3136 inches

2. A scientific conclusion that is developed through careful experimentation is a scientific law.

T

F

Test-Taking Tip Always focus on the question at hand; do not let your mind wander.

chapter 6

TECHNOLOGY LAB

Produce a Documentary Video

Have you ever seen a documentary? A documentary gives facts and information about real events and people rather than telling a fictitious story. However, some documentaries unfold like a story. The best keep viewers interested by showing action rather than just talking about something.

Tools and Materials

- ✓ Camcorder
- ✓ Tripod
- ✓ Computer
- ✓ Presentation and video editing software
- ✓ Art materials
- ✓ Props for your video

Set Your Goal

You and your team will produce a documentary video. The subject will be the ways in which a particular technology of your choice (or an event involving that technology) is connected to at least three subjects taught in school. Subjects may include history, mathematics, science, English language arts, economics, and art.

Know the Criteria and Constraints

In this lab, you will:

1. Your documentary must examine the connections between the technology you choose and at least three different school subjects. The connections may involve how the technology was developed or how it is used. They must be described in your documentary by a narrator or with written or printed signs.
2. Your documentary must be at least ten minutes long but no longer than 20 minutes.
3. You must produce a script for either the narrator or the actors.
4. Your teacher must approve your choices before you begin.

Design Your Project

Follow these steps to complete this lab.

1. Brainstorm with your teammates to select a technology that interests you. Think of at least three subjects you can connect with your technology.
2. Be creative and have fun. For example, you could make a documentary about the sinking of the *Titanic* ship by making and filming a model.
3. Create a plan and a script for your documentary.
   - What will you show and how will you show it?
   - Keep in mind the audience, purpose, and nature of your message.
   - How much time will each part of your film take?
4. Rehearse before filming.
   - Gather or build props. If you are doing an experiment, make sure it works before you film it.
   - Create signs or other graphics.
5. Shoot your documentary.

Evaluate Your Results

After you complete the lab, answer these questions on a separate piece of paper.

1. Was it easy or difficult to find connections to other subjects? Explain.
2. How long did it take to plan, write, and produce your documentary?
3. Was editing necessary? Did you use video editing software or just the camera's editing function? Explain.

Academic Skills Required to Complete Lab

Tasks	English Language Arts	Math	Science	Social Studies
Research the subject of your documentary.	✓		✓	✓
Explore how the topic connects to subjects of study in school.	✓			✓
Write a plan for the film.	✓	✓	✓	
Shoot the film, write script, or act in it, and edit film.	✓	✓		
Present to the class.	✓		✓	

Peter Griffith/Masterfile

Technology Time Machine

On Technology's Trail

Play the Game This time machine will travel to the past to show you technology since its beginnings more than 2.5 million years ago. People use technology every day to extend their abilities and satisfy their wants and needs. To operate the time machine, you must know the secret code word. To discover the code, read the clues, and then answer the questions.

Clue 1

Prehistoric Times Human beings have been using technology since they first invented primitive tools from materials such as wood, stone, or bone. Prehistoric people also learned how to make fire, which gave them power.

Clue 2

8000 B.C.E. People developed skills to raise crops and animals for food. The development of agriculture promoted civilization as people no longer had to move around searching for food. They settled down in small groups to grow crops and tend their land.

Clue 3

4000 B.C.E. The first real civilizations were based on agriculture. But when the plow was developed, civilization took a giant leap forward.

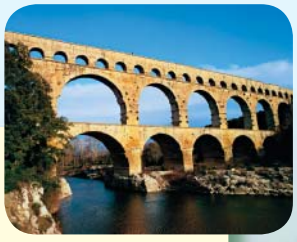
Clue 4

3500 B.C.E. Although no one knows for sure, many experts believe the wheel was invented around the same time as the plow and the wagon. Until the first automobile was developed, the wagon remained the most basic form of transportation.

Clue 5

1700 B.C.E. Up until this time, construction methods had been slow to develop, but construction technology began to rapidly change. Simple rectangular structures were transformed with columns and beams, as seen in Greek architecture.

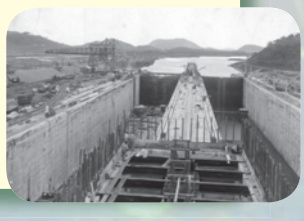
Clue 6



27 B.C.E. (start of the Roman Empire) The ancient Romans were groundbreaking engineers. They developed roads, bridges, tunnels, and aqueducts, some of which are still used today. Similar achievements were taking place in China and Central America.

Clue 7

1881 People dreamed of digging a canal across the Isthmus of Panama in Central America. This would shorten the route for ships traveling between the Atlantic and Pacific Oceans. Construction faced many problems, including workers dying from yellow fever. The Panama Canal opened for passage in 1914.



Clue 8

2000s Today computer programs can draw floor plans, figure out electrical and plumbing systems, and design doors and windows. Some can build 3D models of your design and landscaping ideas.

Crack the Code

On a piece of paper, write the answers to these questions:

1. What opened for passage in 1914?
2. What did the Romans build over land during the Roman Empire?
3. The Atlantic and the Pacific are two of these.
4. Primitive tools were made of wood, stone and what else?
5. Civilization developed when people could grow crops and tend to this.
6. The Romans were skilled _____.
7. Prehistoric people found power when they learned how to do this.
8. What word describes the design of early buildings?

Now write down the first letter of each answer. Put them together to discover the secret code word!

Hint Solving these often leads to technological developments.

Unit 1 Thematic Project

Redesigning an Invention

In Unit 1, you learned about how products are designed. Creating a new invention or innovation takes time and energy to plan. Inventors must build prototypes, try out, and problem-solve a design. They need to know about physics, power sources, CAD, and other elements of engineering.

Filling a Need Once a need is determined, the engineers get to work inventing. Developing a new product can be expensive. Engineers take many steps before finalizing an invention. 3D software shows how parts fit and work together. A prototype proves parts fit. When the invention works, parts are made.

Form and Function Inventors have made flops by forgetting about form or function. A beautiful chair may be uncomfortable, or an economical hybrid car may be ugly. Designers need to keep beauty and usefulness in mind.

This Project In this project, you will redesign an everyday invention.

Your Project

- Choose any everyday object to redesign, such as a stapler, a chair, or spatula. Explain why it needs to be redesigned.
- Choose and complete one of these tasks:
  1. Create a two-dimensional model of your redesign, by freehand or CAD. Label parts.
  2. Fill out a patent application for your design.
  3. Create a working model of your invention.
  4. Create a 1-minute commercial.
- Write a report.
- Create a presentation with posters, video, or presentation software.
- Present your findings to the class.

Big Cheese Photo/Jupiter Images

Tools and Materials

- ✓ Computer
- ✓ Internet access
- ✓ Trade magazines
- ✓ Word-processing software
- ✓ Presentation software
- ✓ Posterboard
- ✓ Colored markers

The Academic Skills You'll Use

- Communicate effectively.
- Speak clearly and concisely.
- Use correct spelling and grammar in a written report.
- Conduct research using a variety of resources.
- Incorporate reading, writing, and speaking with viewing, representing, and listening.

English Language Arts

NCTE 8 Use information resources to gather information and create and communicate knowledge.

Science

NSES Content Standard F Science and technology in society

Step 1 Choose Your Topic

You can choose any product to redesign for your project. Examples include:

- Ballpoint pen
- Pillow
- Soda-pop can
- Clothes hanger
- Coffee table
- Night light
- Hand-soap pump
- Messenger bag

Tip! *If you have thought there must be a better ____, design one!*

Step 2 Do Your Research

Research your project. Your fact-finding may include a combination of these ideas:

- Ask for feedback from someone who has used your product.
- Search for articles about your topic—try libraries and online magazine archives.
- Look at how the item was made in the past.
- Study blueprints or specifications for similar products.
- Ask for tips from someone who does drafting.

Tip! *Keep your improvements simple!*

Step 3 Explore Your Community

Find someone in your community who knows something about designing products—a designer or a teacher. Ask how the job connects to engineering design. Or visit a factory.

Tip! *Try visiting a small factory or a shop.*

Step 4 Create Your Project

Your project should include:

- 1 research project (design, blueprint, patent application, video, or model)
- 1 report
- 1 presentation

Project Checklist

	Objectives for Your Project
Visual	✓ Make a poster, blueprint, model, video, or slide presentation to illustrate your project.
Presentation	✓ Make a presentation to your class and discuss what you have learned.
	✓ Turn in research and names from your interview to your teacher.

Step 5 Evaluate Your Presentation

In your report and presentation, did you remember to:

- Demonstrate your research and preparation?
- Engage your audience?
- Back up statements with facts and evidence?
- Use visuals effectively?
- Speak slowly and enunciate clearly?

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GLOBAL TECHNOLOGY

Musical Innovations

Innovations are improvements to existing inventions—and they all rely on technology. Robotics technology by a German company called *Tronical Gmbh* allows a guitar to tune itself in two seconds. The Powertune System uses self-tuning technology. Its processor directs motors on six tuning pegs of a guitar to tighten or loosen the strings to find the right pitch.

Critical Thinking *What innovations might improve other musical instruments?*

German

hello	hallo
goodbye	Auf wiedersehen
How are you?	Wie geht es dir?
thank you	danke
You're welcome	Keine ursache

Go to **glencoe.com** to the book's OLC to learn more and to find resources from **The Discovery Channel.**