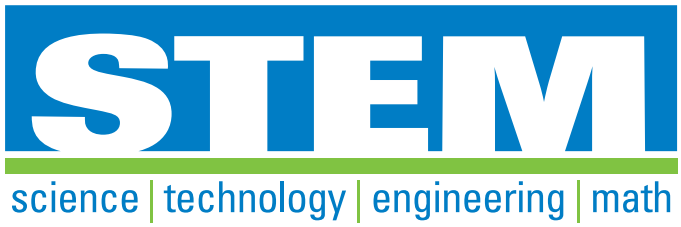

Introduction

The STEM Essentials modules were designed to be used in a variety of classroom settings. They can be used as whole class discussions, with small groups of interested students, or even with individual students who need a new challenge. The goal of these activities is to give students exposure to a spectrum of STEM fields and careers. By giving students an opportunity to hear about and learn about STEM careers the hope is that it will spark one student's interest to learn more about a specific topic, one student will discover hidden or unknown skills and talents, or one student will set higher goals and realize the opportunity that is in front of him/her.

We each look at the world in a different way or from a different perspective. Think about the sky. Some students will look at the sky and want to paint a picture depicting the beautiful colors of a morning sunrise or the deep vivid colors of a sunset. Others will want to write a poem or a song to express how it makes them feel. Still others will look at the sky and want to meditate on the meaning of life. Some students would want to study the clouds to see if they could predict the weather. And then there are students who don't want to just look at the sky, they want to explore it. . .to be a part of the final frontier. Think about these many responses—and we all looked at the same sky. That is what STEM Essentials does---it is providing the opportunity to challenge students to respond to topics, each in their own individual way.

Besides the teaching support found below, there are also additional readers that have been referenced at the end of each module. These materials are available for purchase from McGraw-Hill and continue the study for students who are interested. At the end of each grade span you will find a listing of the top 20 Engineering disciplines. This can be a resource to guide students interested in specific topics.

Technology A Closer Look

Title	Using the STEM Lessons	Making a STEM Connection
Technology A Closer Look	**Lesson 1** *What is Technology?* **pp.** *4–6*	Use resources from ***Energy Sources*** and ***Energy*** to expand upon this lesson. ***Energy Sources*** *Energy and Our Natural Resources* *Hydrothermal Vents* *Three Gorges Dam* *Giant Dames: Waterpower Wonders* *Wind Energy* *The Power of Wind* ***Energy*** *An Eye On Energy* *Energy* *Sources of Energy* *Fossils and Fossil Fuels*
	Lesson 2 *Ideas and Inventions* **pp.** *7–9*	Use resources from ***Inventions*** to expand upon this lesson. ***Inventions*** *Bright Ideas: Inventions That Changed History* *Young Inventors* *Electrical Inventions* *It's Electric!* *Incredible Inventions: Computers* *Incredible Inventions: Everyday Wonders*
	Lesson 3 *Technology in Communications* **pp.** *10–12*	Use resources from ***Inventions*** to expand upon this lesson. ***Inventions*** *Bright Ideas: Inventions That Changed History* *Young Inventors* *Electrical Inventions* *It's Electric!* *Incredible Inventions: Computers* *Incredible Inventions: Everyday Wonders*
	Lesson 4 *Technology in Medicine* **pp.** *13–15*	Use resources from ***Energy Sources***, ***Energy***, and ***From Farm to Table*** to expand upon this lesson. ***Energy Sources*** *Energy and Our Natural Resources* *Hydrothermal Vents* *Three Gorges Dam* *Giant Dames: Waterpower Wonders* *Wind Energy* *The Power of Wind* *Continued...*

Technology A Closer Look

Title	Using the STEM Lessons	Making a STEM Connection
Technology A Closer Look	**Lesson 4** *Technology in Medicine* **pp.** *13–15*	***Energy*** *An Eye On Energy* *Energy* *Sources of Energy* *Fossils and Fossil Fuels* ***From Farm to Table*** From Farm to Dinner Table: Food's Great Journey Resources All Around Us What is Recycling
	Lesson 5 *Technology in Industry* **pp.** *16–18*	Use resources from ***Inventions, Archeology*** and ***From Farm to Table*** to expand upon this lesson. ***Inventions*** *Bright Ideas: Inventions That Changed History* *Young Inventors* *Electrical Inventions* *It's Electric!* *Incredible Inventions: Computers* *Incredible Inventions: Everyday Wonders* ***Archeology*** *Fossil Hunters* *Dinosaur Sue: Tale of a T. Rex* *Discovering Pompeii* *Discovering Tutankhamen* *Solving the Pyramid Puzzle* ***From Farm to Table*** *From Farm to Dinner Table: Food's Great Journey* *Resources All Around Us* *What is Recycling?*
	Lesson 6 *Technology, Society, and the Environment* **pp.** *19–21*	Use resources from ***Archeology*** and ***From Farm to Table*** to expand upon this lesson. ***Archeology*** *Fossil Hunters* *Dinosaur Sue: Tale of a T. Rex* *Discovering Pompeii* *Discovering Tutankhamen* *Solving the Pyramid Puzzle* ***From Farm to Table*** *From Farm to Dinner Table: Food's Great Journey* *Resources All Around Us* *What is Recycling?*

Technology A Closer Look

Title	Using the STEM Lessons	Making a STEM Connection
Technology A Closer Look	**Lesson 7** *Technology and the Future* **pp.** *22–24*	Use resources from ***Energy Sources, Energy*** and ***From Farm to Table*** to expand upon this lesson. ***Energy Sources*** *Energy and Our Natural Resources* *Hydrothermal Vents* *Three Gorges Dam* *Giant Dames: Waterpower Wonders* *Wind Energy* *The Power of Wind* ***Energy*** *An Eye On Energy* *Energy* *Sources of Energy* *Fossils and Fossil Fuels* ***From Farm to Table*** *From Farm to Dinner Table: Food's Great Journey* *Resources All Around Us* *What is Recycling?*
Science Fair Handbook	Can be used with any lesson to further explore STEM fields and careers. This book is available for purchase from McGraw-Hill. ISBN 0-02-285258-1	

Lesson 1 What is Technology?

Objectives

- Recognize that technology is how humans adapt nature to meet their needs
- Identify the difference between natural resources and manufactured goods
- Describe a system as a group of parts that work together to do something

1 Introduce

▶ Assess Prior Knowledge

Discover what students know about technology.

- **What technology have you used today? Did your great-grandparents have this technology?**
- **What technology did your great-grandparents have when they were your age?**
- **Do those technologies still exist?**

As students share ideas, help them understand that technology is how humans adapt nature to meet their needs. Examples of technology include clothing, food, TV, phones, cars, medicine, lights, and eyeglasses.

2 Teach (Student pages 2–5)

▶ Discuss the Main Idea

Stress how technology changes over time.

- **How did the discovery of the wheel change transportation?** *(Before the wheel, people had to walk to get from one place to another. The invention of the wheel led to faster means of transportation, such as horse-drawn wagons, to transport people and things.)*

▶ Use the Visuals

What Is Technology? (pp. 2–3) Draw attention to the "Transportation Systems" illustration and read the caption. Discuss the transportation system in your area. What are its parts? How do they work together to help transport people and goods?

Quick Check

Advances in technology have allowed people to create transportation systems that include vehicles (airplanes, trains, boats, cars, trucks), roads, bridges, and water routes.

Power and Production (pp. 4–5) Read the text and scan the visuals. Discuss how the technology involved in making goods and supplying services has changed over time.

Quick Check

New inventions and materials allowed people to make goods faster and cheaper that ever before. Transportation systems made it possible to transport goods all over the world quickly.

Tech Activity

individual 20 minutes

Objective To construct a boat to carry cargo

Plan Ahead Bring in large baking pans or dishpans to hold water.

Tips Encourage students to experiment with unique shapes for their boats.

Explore More Discuss which boats held the most cargo and why.

- **How did the shape or size of a boat influence the amount of cargo it held?**
- **How might you change your boat to carry more cargo?**

Technology in Action

Are You There Yet?

Write About It Encourage students to use the Internet to investigate Global Positioning Systems (GPS). Student journals should contain the following:

- Descriptions of the improvements scientists have planned for GPS.
- Explanations of how these improvements will change people's lives in terms of navigating in automobiles.

3 Close (Student page 7)

Think, Talk, and Write

Students may answer the questions independently or as a group.

1. *Technology is the way humans adapt, or change, nature to meet needs.*
2. *Answers should touch on the advances in transportation and manufacturing as discussed in the lesson.*
3. ***(A)** adapt, needs; **(B)** systems; **(C)** bridges, roads, waterways; **(D)** service; **(E)** Global Positioning System*
4. *Answers will vary.*
5. *Once students complete the exercise, have them share their ideas about what they will learn in the book.*
   - **How did skimming the Table of Contents and the photos help you predict what you would learn?**

Writing Link Invite students to keep a log of content words as they navigate through the book. Encourage them to write about the meanings of the words.

Extend

Extra Activity Copy and distribute **Lesson 1** worksheet on page 26 of this booklet.

Art Link

Technology Posters Challenge students to use technology (paper, markers, magazine photos, scissors, glue, or a computer) to prepare a poster about technology. Ask students to title their posters *Technology Is Everywhere!* Invite students to explain their posters to the class.

Differentiated Instruction

Leveled Activities

EXTRA SUPPORT Invite students to define the term *technology* in their own words.

ENRICHMENT Encourage students to find examples of technology around the classroom. Challenge them to choose one item and write or draw an explanation of how the item helps people.

STEM Encourage interested students to make a list of five products that were made by hand years ago, but are now made in a factory. Think about shoes that were discussed on pages 4-5. How do you think did producing shoes at a factory changed shoes for the average person?

Name _____ Date _____

What is Technology?

Serious hiking in the wilderness requires bringing along a compass—just in case you get lost. A compass always points in one direction. Make your own compass and you'll find out in which direction a compass always points.

Materials

- a needle
- a small magnet
- a piece of cork or packing foam
- 1 small bowl of water

Instructions

1. Magnetize the needle by stroking one pole of the magnet along the needle 20 times, in the same direction.
2. Float the cork or foam in water.
3. Balance the magnetized needle carefully on the cork or foam.

Be careful not to drop or bang the needle. If you do, the magnetized particles will move out of line and the needle will no longer be magnetized.

Observe the needle swing around to point north. How can a compass help you when you are lost?

Using a compass will tell you which way is north.

Lesson 2 Ideas and Inventions

Objectives

- Realize that the design process is a series of steps for turning ideas into useful products
- Understand that if a design does not work, it can be changed and retested

1 Introduce

▶ Assess Prior Knowledge

Discover what students know about the design process.

- **What do you think inventors do once they get ideas for new things?**
- **How do inventors find out if their ideas really work?**

As students share ideas, help them conclude that inventors figure out what people need, design something to fit that need, and then test it to make sure it works.

2 Teach (Student pages 8–14)

▶ Discuss the Main Idea

Stress that inventors go through a process that involves testing materials.

- **What did Thomas Edison have to do before he found the right filament for his lightbulb?** *(He had to test many different kinds of materials. Finding the right filament was one step Edison had to take in inventing his lightbulb.)*

▶ Use the Visuals

Ideas and Inventions (pp. 8–9) Read the text and scan the photos of the various inventions shown. Discuss the term *patent* with students. Explain that it's a way of protecting an inventor's idea.

Quick Check

Edison and Knight noticed a human need.

Steps in a Design Process (pp. 10–13) Draw attention to the diagrams as you read the text aloud. Discuss each step in the design process. (Apply these to the upcoming Tech Activity.)

Quick Check

(p. 11) Identify the problem first.
(p. 13) Set the price once you know how much it will cost to make and advertise the product.

Tech Activity

small groups · 40 minutes

Objective To compare and evaluate design solutions to determine the best one

Plan Ahead Gather supplies for building each design solution shown on page 11 in the student book. Have available copies of the worksheet *Use the Design Process*, on page 29 of this book.

Tips Have each group build and test one prototype and rate its performance, recording data on the worksheet.

Explore More Have groups come together and share their data. Tally the results on a "master" worksheet. Use the results to determine which device worked best. Have students discuss why their device worked or didn't work. Go on to discuss ways of improving each design. Repeat the activity incorporating suggested improvements and retest the designs.

Technology in Action

Designed for Speed

Student research should focus on the design of the aerodynamic object of choice. Student journals should include the following:

- A description of the aerodynamic object.
- Specific details on how the design cuts down on drag.
- Thoughts on whether or not the design concept could be applied to other objects to increase their speed.

3 Close (Student page 15)

Think, Talk, Write

Students may answer the questions independently or as a group.

1. *Answers should focus on how the design process works, from identifying a problem, to listing solutions, to making a model, to testing and refining, to communicating results.*
2. *Accept reasonable answers.*
3. *Answers in the graphic organizer should be given in the following order: identify a problem, list solutions, make a model, test and refine the model, and communicate results.*
4. *true, true, false*

Writing Link Have students share their ideas and newspaper ads with the class.

Extend

Extra Activity Copy and distribute **Lesson 2** worksheet on page 29 of this booklet. The worksheet is designed to support the *Tech Activity* on page 13 of the student book.

Art Link

Design a Poster Have each student work on a poster about the design process, showing all the steps in proper sequence. Suggest that students set up the posters as a series of stepping-stones along a path, or show the steps in boxes using a flowchart format.

Differentiated Instruction

Leveled Activities

EXTRA SUPPORT Write the word *inventor* on the board and circle the suffix, *-or*. Underline the root word, *invent*, explaining that to invent means to think up or create. Point out that an inventor is someone who thinks up ideas for making new things.

ENRICHMENT Challenge students to draw a familiar object and label the most significant parts. Finally, ask them to explain how each part functions.

STEM Have students think about the design process shared on page 13. Then think about sports equipment and the information shared on page 14. How would the equipment be tested? What new invention or improvement would you like to see that would enhance your sports performance in a sport such as soccer?

Name _____ Date _____

Use the Design Process

Test some design solutions.

Use each tool listed in the table below to pick up each object listed below. Does each tool pick up each object? Record your results by writing "yes" or "no" in the boxes. The first one has been done for you.

Materials

- a pair of tongs
- sticky meter stick
- magnet on a string
- objects (quarter, paper clip, eraser, paper, pencil, chalk, ruler, marker)

Object	Tongs	Sticky meter stick	Magnet
Quarter	no	yes	no
Paper clip			
Eraser			
Paper			
Pencil			
Chalk			
Ruler			
Marker			

What were the limitations of each of the following tools: tongs, sticky meter stick, magnet?

Answers will vary.

Think about how you might design a tool that combines the advantages of each tool listed above. Write your ideas below.

Answers will vary.

Lesson 3 Technology in Communications

Objectives

- Describe how new technology has changed and improved the way people communicate
- Identify the parts of a communications system
- Explain how advances in communications might change people's lives in the future

1 Introduce

▶ Assess Prior Knowledge

Discover what students know about communications.

- **How and why do people communicate?**
- **What are the advantages and disadvantages of technology in communications?**

As students share their answers, list the reasons people communicate in different venues, like at home, in school, and at work.

2 Teach (Student pages 16–22)

▶ Discuss the Main Idea

Highlight the technological advances in the communications industry.

- **How has technology changed communication over the past 200 years?** *(Student answers should trace the progress from primitive (smoke signals, drumbeats) to pre-electricity (letter writing, talking) to electricity (Morse code, telephone) to the radio wave (cell phone)).*

▶ Use the Visuals

Technology in Communications (pp. 16–17) Read the text and scan the photos. Explore with students the basic principles behind the technology of the telegraph, telephone, and cell phone.

Quick Check

Electricity gave birth to the telegraph and telephone. These inventions allowed fast communication over great distances.

Communications Systems Connect People (pp. 18–19) Look at the text and analyze the diagrams. Talk about how the postal and e-mail systems work. Help students become familiar with the terms *input*, *process*, *output*, and *feedback*.

Quick Check

A communications system has four parts: input, process, output, and feedback. You send a letter (input) through the postal service (process). The letter is delivered (output). You get a return letter (feedback).

Communicating Using Images (pp. 20–21) As students read, discuss how technological advances have changed photography and moviemaking. Stress that even though the technologies involve different systems, they each communicate through images. Have students speculate on how they might improve these technologies.

Quick Check

Movies and photographs record images. Photographs can be digital or film based, as can movies. Movies show movement and typically record sound. Movies can be thought of as many photographs shown in sequence.

Tech Activity

partners 20 minutes

Objective To create a primitive telegraph

Plan Ahead Have batteries, bulbs, and wires on hand. Copy the Morse Code chart for student reference. Provide students with pliers and screwdrivers to make assembly easier.

Tips Demonstrate safe assembly of electrical circuits for students. Leaving one end of the circuit open will allow the students to use this as a switch to signal Morse Code.

Explore More Have students test materials that could be used as a switch in place of the bare wire.

Technology in Action

Transmitting TV

TV has impacted society through its ability to show important historical events—often as they are happening. Student journals should include the following:

- A flowchart that traces a broadcast from the newsroom to the home.
- A story based on the information in the flowchart. (Students might create a "newscast" character who uses internal dialogue to describe being transmitted from a studio to a TV somewhere in the world. Perhaps the newscast concerns an important historical event that has been transmitted live. In this case the story could describe people's reactions to it.)
- Thoughts on how broadcasting the news has changed with the new technology.

3 Close (Student page 23)

Think, Talk, and Write

Students may answer the questions independently.

1. *Accept all reasonable answers. Explain that new technology allows fast communication with many people over great distances.*
2. *Accept all reasonable answers based on reading page 22 in the student book.*
3. ***(A)** exchange, ideas; **(B)** electric wires; **(C)** radio waves; **(D)** film; **(E)** sensors, electrical energy*
4. ***(A)** input; **(B)** transmit; **(C)** communication; **(D)** camera; **(E)** computer*
5. *Send a message (input). Computer transmits message (process). Receive e-mail (output). Get a reply (feedback).*

Extend

Extra Activity Copy and distribute **Lesson 3** worksheet on page 31 of this booklet.

Differentiated Instruction

Leveled Activities

EXTRA SUPPORT Have students cut out images of communications technology from magazines and newspapers. As a class, discuss the input, process, output, and feedback of each technology. Make connections between related technologies.

ENRICHMENT Have students send an e-mail to a classmate or teacher describing the input, process, output, and feedback aspects involved in communicating through the e-mail system.

STEM Have students compare and contrast the two systems illustrated on pages 18–19. Encourage students to predict what they believe will be the next new way of communicating and why they believe so.

Name _____ Date _____

Technology in Communications

Before the camera was invented, people made "photographs" by arranging objects on light-sensitive paper and putting them out in the sunlight. The result is a sun print. Some artists still make sun prints. Here's how to do it.

Materials

- photographic paper
- baking sheet
- 3 or 4 objects of your choice
- clock or timer
- water
- paper towels
- colorful construction paper
- scissors
- glue

Instructions

1. Lay the photographic paper on the baking sheet.
2. Place the baking sheet in a sunny spot.
3. Arrange your objects on the paper.
4. Leave the objects in the sun from 8 to 10 minutes, not longer unless necessary.
5. Remove the objects from the print.
6. Rinse the print in tap water for 1 minute to "fix" it.
7. Lay the print on paper towels to dry.
8. Make a construction-paper frame to show off your sun print!

Lesson 4 Technology in Medicine

Objectives

- Describe the impact of medical technology on society
- Understand how medical research impacts agriculture

1 Introduce

▶ Assess Prior Knowledge

Discover what students already know about medical technology.

- **Can you describe the medical tools your doctor or dentist uses when seeing patients?**
- **How do these tools help?**

As students share their thoughts, help them conclude that medical personnel use tools to diagnose and treat diseases.

2 Teach (Student pages 24–30)

▶ Discuss the Main Idea

Stress that the field of health care has improved greatly over the past two decades.

- **What has caused big improvements in health care in recent years?** *(New technologies, like X rays, MRI, and lasers have improved patient care.)*

▶ Use the Visuals

Technology in Medicine (pp. 24–25) As you read the introductory paragraph, stress that today's scientists base some medicines on substances found in plants. Explore the diagram on page 25 and discuss the aspects of a medical technology system: input, process, output, and feedback.

Quick Check

Scientists identify medicinal plants and then test them in a laboratory. They might collect these plants in faraway places and bring them home to study.

Modern Medical Tools (pp. 26–27) Before reading, scan the visuals and ask students to describe the images. Then read about and discuss the many medical tools in existence today. See if students can expand on the list.

Quick Check

Answers include: to spot cavities in teeth and to detect broken or fractured limbs.

A Healthy Environment (pp. 28–29) Draw attention to the diagram. Stress that graphs give added details about the text.

- **What does the graph show?**
- **How does it help you better understand the problems caused by the use of DDT?**

Biotechnology (p. 29) Discuss the use of biotechnology in the future of medicine.

Quick Check

Biotechnology can be useful in pest control and in harvesting larger and healthier crops.

Tech Activity

individual 15 minutes

Objective To model an X ray print

Plan Ahead Set up work area and supplies in advance. Make sure to have paper towels handy for cleanup.

Tips Remind students to hold their hands still as they spray the liquid over the gloved hand.

Explore More Discuss what the dark line means. How does an X ray help doctors diagnose a broken bone?

Technology in Action

Not Just for Humans

Write About It Before tackling the exercise, have students research the technology involved in making artificial limbs. Students' journals should include the following:

- For which animal and limb is the prosthesis being developed?
- What materials would go into making the prosthesis?
- How would you attach the prosthesis to the body?

3 Close (Student page 31)

Think, Talk, and Write

Allow students to complete the exercises independently.

1. *Answers should touch on the various medical solutions discussed in the lesson, including medicines, X ray machines, MRIs, laser surgery, artificial limbs.*
2. *Answers will vary but should include reasons for making either choice.*
3. *true, true, true, false, true, false, true*

Writing Link Have students turn to a partner to discuss their thoughts before beginning the exercise. Students can then complete the exercise and share their work with a partner and/or the class.

Extend

Extra Activity Copy and distribute **Lesson 4** worksheet on page 35 of this booklet.

Social Studies Link

Take a Survey Ask students to survey their grandparents, great-grandparents, and other senior citizens to discover how medical technology has changed since they were kids. Brainstorm questions for the survey.

- Were there as many different kinds of doctors and health-care professionals then as now?
- Did doctors treat a cold the same then as now?
- Where did you go to receive treatment?

Differentiated Instruction

Leveled Activities

EXTRA SUPPORT Review the vocabulary words with students. Pronounce each word and give its meaning. Then ask students to use each word in a sentence to demonstrate understanding.

ENRICHMENT Challenge students to make a flowchart to show the input, process, output, and feedback involved in performing surgery to replace an animal's lost limb.

STEM Encourage interested students to follow up on the discussion on page 29. Have students look at the produce section of your local grocery. Have students note the many, many varieties of an identified food—such as apples, plums, grapes, melon, broccoli, and so on. Ask students to select one species and to identify what has been done over the years to improve this crop.

Name _____ Date _____

Technology in Medicine

A modern stethoscope lets a doctor listen to your heart with both ears. But long ago, doctors listened with just one ear. Try making an old-fashioned stethoscope and test it out.

Materials

- piece of rubber or plastic tubing 18-20 inches long
- 2 funnels
- masking tape

Instructions

1. Place the tubing over the small end of each funnel and secure with masking tape.
2. Hold one funnel against a clock, wall, or door. Hold the other funnel carefully to your ear.
3. Tell what you hear.

   Answers will vary.

4. Listen to your own heartbeat.
5. Put down the stethoscope, and then jump up and down 10 times.
6. Listen to your heart again. Does it sound different? Describe what you hear.

   Answers will vary.

Lesson 5 Technology in Industry

Objectives

- Recognize that mass production saves time and money
- Identify ways that industries have changed over time

1 Introduce

▶ Assess Prior Knowledge

Discover what students already know about technology in industry.

- **What materials are used in making jeans and T-shirts? Where do the materials come from?**
- **Where are jeans and T-shirts made?**
- **What do we call a person who buys jeans and T-shirts?**

As students share ideas, point out that industry involves manufacturing raw materials *(cloth)* and goods *(jeans)* to sell to consumers.

2 Teach (Student pages 32–38)

▶ Discuss the Main Idea

Preview the lesson. Point out that technology makes industry more productive.

- **How do factories manufacture goods quickly and cheaply?** *(Factories mass-produce goods by building them piece by piece on an assembly line.)*

▶ Use the Visuals

Technology in Industry (pp. 32 and 33) Read the text and scan the visuals. Make a list of the various industries discussed in the text. Have students add their own ideas to the list.

Quick Check

All industries include people working together to produce a product, but the products differ from industry to industry.

Workers and Industry (pp. 34–35) Read about the various stages involved in constructing a school. Note the number of different businesses and skilled workers needed to complete the job.

Quick Check

All the workers contribute to building the school; they differ in the skills they bring to the job.

Mass Production (pp. 36–37) Scan the photos and captions. Read the text and discuss how an assembly line works.

Quick Check

Students should understand that robots are limited in the kinds of tasks they perform. They don't think or problem-solve the way humans do.

Tech Activity

 small group  20 minutes

Objective To reinforce the concept of a division of labor by mass-producing items on an assembly line

Plan Ahead Designate the workstations on the line and set out supplies at each one. Make sure students understand the task called for at each workstation.

Tips When assigning students to workstations, remind them to work efficiently to avoid a "shutdown", which happens when work piles up in one spot.

Explore More Have students form a longer assembly line to complete a more complex task. Ask them to compare the experiences.

Technology in Action

Positively Plastic

Write About It Students' journals will vary, depending on whether they research the making or recycling of plastics. They should, however, include the following:

- A chronology that runs from manufacturing raw materials to producing a specific product.
- Images (photos or drawings) to support the text.

3 Close (Student page 39)

Think, Talk, and Write

Have students complete the exercises independently.

1. *An industry involves the making, selling, and buying of goods and services.*
2. *An increase in productivity normally results in increased profit.*
3. *Accept all reasonable explanations.*
4. ***(A)** goods, services; **(B)** mass production; **(C)** dangerous; **(D)** petroleum oil*
5. *Lists will vary. Accept any entries a student can justify.*

Writing Link Have students share their ideas with the class.

Extend

Extra Activity Copy and distribute **Lesson 5** worksheet on page 38 of this booklet.

Social Studies Link

Bags of Goods Invite students to bring in an equal number of inexpensive practical items, such as 5 pairs of socks, 5 toothbrushes, 5 tubes of toothpaste, and 5 bars of soap. Have students set up an assembly line to fill paper bags, making sure one of each item goes into each bag. With students' help, contact a local community service organization and arrange to have the bags distributed.

Differentiated Instruction

Leveled Activities

EXTRA SUPPORT Write the vocabulary terms *(industry, consumer, manufacturing, profit, mass production, productivity, robot)* on the board. Pronounce each term and ask volunteers for definitions. Challenge students to use each term in a sentence.

ENRICHMENT Challenge students to create crossword or hidden-word puzzles using the words *industry, factory, productive, mass production, assembly line, goods, services, computer, construction*. Students can then exchange puzzles and have a solve-it session!

STEM As a class, look at p. 38 and create a list of common items made from plastic. What characteristics make plastic attractive to engineers? What are items made from recycled plastics? Encourage interested students to make a chart of the 7 different levels or kinds of plastic and which can be recycled. The two most common are 1 (PETE) and 2 (HDPE).

Name _____ Date _____

Technology in Industry

Working together to build things in industry is a form of technology. Making a product can be done more efficiently by dividing the work among members of a group. Try constructing a candy "community" to learn about how dividing work among a group can get a job done faster!

Materials

- mini-marshmallows (or gumdrops)
- toothpicks
- stopwatch or clock
- paper
- pencil

Instructions

1. Time yourself as you build a marshmallow-and-toothpick house.
2. Try building the same house, but this time work with a small group.
3. Divide the work among group members. For example, one person makes the roof, another a side, and so on.
4. Build as many houses as possible in 20 minutes.
5. Analyze your results. How many houses did you make? How many could you have made alone in the 20-minute period? How much time, if any, did you save by working together?

Students will find that working in small groups allows them to build more houses in a shorter time period.

Lesson 6 Technology, Society, and the Environment

Objectives

- Recognize that technology can have a positive and a negative effect on society and the environment
- Understand that it's important for people to use technology in ways that will not harm society or the environment

1 Introduce

▶ Assess Prior Knowledge

Discuss what students understand about the history of technology.

- **What are some examples of modern technology? Of ancient technology?**
- **What do you suppose the terms Stone Age, Bronze Age, and Iron Age mean?**
- **What "Age" do we live in?**

As students share ideas, help them conclude that major scientific discoveries often lead to major advances in technology. Examples of major scientific discoveries include learning how to make tools from stone *(ancient world)* and learning how to split the atom *(modern world)*.

2 Teach (Student pages 40–43)

▶ Discuss the Main Idea

Stress that advances in technology tend to change people's lives, often for the better. Remind students that advances in technology can have unintended consequences that can be harmful.

- **In what ways do cell phones have a positive effect on society? A negative effect?** *(Cell phones are wireless, small, and easy to carry around. Cell-phone signals are not as reliable as "land line" phones.)*

▶ Use the Visuals

Early and Modern Technology (pp. 40–41) Trace the development of technology through the ages as you read the text and view the supporting visuals. Reinforce the idea that scientific discoveries often lead to advances in technology. You might want to make a chart listing various scientific discoveries and the technologies they have generated.

Quick Check

The invention of the steam engine, for example, led to the growth of factories, which in turn led to the growth of cities. Cities grew up around factories, as people moved from rural areas to find work.

Technology and Nature (pp. 42–43) Read the text and draw students' attention to the photo on page 42. Discuss the importance of laws that help protect the natural world.

Quick Check

To identify positive and negative effects of technology on society and nature. To determine how negative effects can be minimized, and so on.

Tech Activity

20 minutes

Objective To make a sundial

Plan Ahead Collect materials called for in the activity, including copies of a sundial rectangle.

Tips Assist students in bending the cardboard at a precise 90-degree angle.

Explore More Research solar energy. How is it being used. What are the benefits?

Technology in Action

Down in the Dumps

Write About It Student's work should include the use of persuasive words *(easy, results, save, guarantee, health, money, need, proven)* and persuasive writing strategies *(use short sentences to drive home a point)*. Student journals should include the following information:

- Does the student know where nearby landfills are located? What does the student know about them?
- What measures could be taken to improve the landfills?
- What new alternatives to landfills are being developed?

3 Close (Student page 45)

Think, Talk, and Write

Have students work in pairs to complete the exercises.

1. *Answers will vary.*
2. *Accept reasonable explanations.*
3. *The government and concerned citizens urge people to reduce and reuse certain items, such as plastic containers. In many areas in the United States, recycling is required by law.*
4. ***(A)** landfill; **(B)** impact; **(C)** environment; **(D)** society; **(E)** laws.*

Writing Link Before students begin writing, have them turn to a partner to talk about their ideas. Encourage students to discuss their personal experiences with automobiles.

Extend

Extra Activity Copy and distribute **Lesson 6** worksheet on page 41 of this booklet.

Social Studies Link

Fire! Speculate about how the ancient humans who discovered fire learned about its positive and negative impacts on society and the environment. Write your ideas down in a paragraph.

Differentiated Instruction

Leveled Activities

EXTRA SUPPORT Write the English and Spanish words *society/sociedad, technology/tecnología,* and *impact/impacto* on the board and point out the similarity in spelling. Emphasize that many diverse words can come from the same basic roots.

ENRICHMENT Have students make posters about cell-phone technology. Ask students to include how cell phones have changed. Ask them to speculate how cell phones will change in the future.

STEM Have students look at the photo on page 42. Divide into small groups where half of the groups will think about the pros and half will present the cons. Give students time to research and prepare materials for a persuasive presentation. You may want to have them give this presentation for other classes or to parents.

Name _____ Date _____

Technology, Society, and the Environment

Make a mini-landfill and see for yourself which items break down in a landfill and which do not.

Materials

- dirt dug up from outside
- empty fish tank or large glass jar
- small pieces of the following items: paper, foam cup, wood, eggshell, cloth, soap, orange or lemon peel, apple
- water
- plastic wrap
- tape
- spoon
- plastic gloves

Instructions

1. Put 3-4 inches of dirt in the bottom of the tank or the jar.
2. Place bits of paper and other objects on top of the dirt.
3. Pour 3-4 inches of dirt over the objects. Moisten dirt with water.
4. Cover the container with plastic and secure with tape to make it airtight.
5. Place the container in direct sunlight.
6. Watch the water inside evaporate, condense, and "rain" to keep the top of the dirt moist.
7. Unseal the container after 3 or 4 weeks. Wear gloves and use the spoon to dig up the buried objects. Which object changed most? Least?

   Answers will vary. Students will find that organic matter such as the lemon peel, orange, and apple break down more quickly than other items.
8. Re-bury the objects, reseal the container, and leave it in sunlight for another month. Then reopen it and recheck the contents. Record your observations. What conclusions can you draw?

   Answers will vary. Again, students will find that organic matter breaks down more quickly than other items.

Lesson 7 Technology and the Future

Objectives

- Realize that alternative energy sources could help solve some of Earth's problems, such as air pollution
- Recognize that nanotechnology will play a major role in shaping the future of society

1 Introduce

▶ Assess Prior Knowledge

Reflect on the future of technology with your students.

- **What technology have you seen in science-fiction movies that might be a reality one day?**
- **How might phones, computers, cameras, and cars change in the future?**

As students share ideas, point out that more advances in technology have happened over the past century than ever before in human history, with inventions that include the radio transmitter, television, and the computer.

2 Teach (Student pages 46–49)

▶ Discuss the Main Idea

Stress that over the years technology will continue to evolve, or change.

- **Why will technology continue to have an impact on society?** *(People will continue to invent new technologies to make life easier and more enjoyable.)*

▶ Use the Visuals

Technology and the Future (pp. 46–47) Study the paintings that represent how two artists think cities of the future might look. Discuss whether these imaginary cities could or could not become a reality. Read the text on page 47 and discuss the future of the Internet and how it will impact society.

Quick Check

Scientists investigate the past and gather information about today's trends. (A trend is how something is developing or changing.) They use the information to make an educated guess about the future.

Biomass and Nanotechnology (pp. 48–49) Read the text and scan the images on these pages. Many scientists believe that newer sources of renewable energy will have to be developed within the next 20 to 30 years to keep society and the environment healthy. Biomass *(organic matter used as a fuel)* is one energy alternative in use today. Other sources of energy may come from experiments with nanotechnology.

Quick Check

Nanotechnology involves manipulating matter at the atomic level, and scientists predict that this trend will lead to radical innovations in energy, health care, food production, and building materials.

Tech Activity

individual 40 minutes

Objective To test the strength of woven material

Plan Ahead Cut up strips of poster board in advance.

Tips Have students write their observations in a science journal.

Explore More Have students try a different pattern (two over and two under; or one over and two under) and compare the strength of the new weave to the original.

Technology in Action

Go for the Glow

Write About It Have students use the Internet to read about nanotechnology before tackling the assignment. Student journals should show evidence of the principles of narrative writing, including:

- A beginning, middle, and end. (This ensures that the writer tells the story in logical order.)
- Rich vocabulary that includes some science content words.
- Enough details to make the story interesting to a reader.

3 Close (Student page 51)

Think, Talk, Write

Allow students to complete the exercise independently.

1. *Scientists investigate the past and gather facts about trends. (A trend is the way something is developing or changing.) They use this information to make an educated guess about the future.*
2. *1,000,000,000*
3. *Accept any reasonable ideas.*
4. ***(A)** predict; **(B)** globalization; **(C)** twigs, leaves, energy; **(D)** small, products; **(E)** nanolights*

Writing Link Have students share their ad with the class.

Extend

Extra Activity Copy and distribute **Lesson 7** worksheet on page 44 of this booklet.

Social Studies Link

Time Capsule In studying objects from the past, scientists try to explain how people of that period lived. Have students list items they would put in a time capsule to be found 100 years from now. Discuss the logic behind each choice. Narrow the list to five items through class consensus. Collect the items and bury them.

Differentiated Instruction

Leveled Activities

EXTRA SUPPORT Write the term *hybrid* on the board. Explain that it means a *mixture*. Tell students that a *hybrid car* has a gasoline engine and an electric motor. Each of these devices can run the car. Have students look for photos of hybrid cars in newspapers.

ENRICHMENT Explain that hybrid cars use less gasoline. Talk about how a car that uses less gasoline helps the environment. Then write a paragraph together based on your discussion. Have students illustrate the paragraph with pictures of hybrid cars cut out of newspapers.

STEM Encourage interested students to look at the car shown on page 51. Expand upon the activity and ask students to think about what features this car might have. What benefits would these features have to the driver and passengers? Help them think about problems we have with cars today or things we would like to have in a car while driving or riding along.

Name _____ Date _____

Technology and the Future

Scientists are looking for ways to use solar energy to help conserve Earth's resources. Solar energy is very powerful. Try this experiment to prove the point.

Materials

- wooden salad bowl
- aluminum foil
- double-sided tape
- clay
- hot dog
- fork
- bun

Instructions

1. Line the inside of the bowl with foil, shiny side out. Keep the foil as smooth as possible.
2. Tape the foil to the rim of the bowl and put the bowl on a flat surface directly in the sun.
3. Tip bowl so the sun's rays hit it. Put clay under the bowl to hold it at the correct angle.
4. Place the hot dog in the center of the bowl.
5. Wait a few minutes as the hot dog cooks.
6. Use the fork to safely remove the cooked hot dog. Then eat and enjoy a solar snack!
7. Why were you able to cook the hot dog with the aluminum foil and salad bowl?

The curved bowl focused the Sun's rays bouncing off the aluminum foil onto the hot dog.

Energy Sources

Title	Using the Leveled Reader	Making a STEM Connection
Energy and Our Natural Resources This book takes a quick look at various natural resources that make energy. ☐ This book supports Lesson 1, 4, and 7 in ***Technology A Closer Look.*** **Reading Levels** GR R Benchmark 40 Lexile 780	**Before Reading** Create a K-W-L chart as a class to see what information is already known about oil, gas, and nuclear energy. Ask how they are alike and different. **During Reading** Remind students that the blue type is a caption for the photo or diagram and contains valuable information. On page 4, students will see the first of several green bubbles that share additional "Did You Know..." information. Encourage students to read these fun facts. **After Reading** Encourage students to revisit the K-W-L chart. Now ask how oil, gas, and nuclear energy are alike and how they are different.	**Engineering Connection** • As a class make a listing of likenesses and differences in national resources such as oil, gas, coal, nuclear, sun, wind, and water. • Divide into small groups and brainstorm pro/cons for each source of energy. Students will need to do some outside research to extend their lists. • Have students work in small groups to compare mileage for advertised vehicles for city and highway driving. Encourage students to research and share ways to get higher mileage. • Students may want to track the cost of gasoline in your area compared to the national average. Students can keep a double line graph to show the cost of a barrel of oil and the cost of a gallon of gasoline. **STEM Careers** Students who enjoy this kind of study may be interested in more information on Agricultural and Biological Engineering, Environmental Engineering, or Marine/Ocean Engineering.
Hydrothermal Vents This book looks at this underwater phenomenon and the creatures that are able to survive in these extreme conditions. ☐ This book supports Lesson 1, 4, and 7 in ***Technology A Closer Look.*** **Reading Levels** GR U Level 50 Lexile 780	**Before Reading** Point out vents in your classroom or have students look for vents in their homes. Ask: **What do you think a vent does? Why is it needed?** **During Reading** On page 3 the word hydrothermal is introduced. Talk about the meaning of this word. *hydro-* (water) + *-thermal* (heat) = heated water Have students turn to page 7 to see the blue box with the title "Alvin". These blue boxes are used throughout this book to share additional information. **After Reading** Have students share the main idea of this book with the class. Ask how they would describe a hydrothermal vent.	**Engineering Connection** • Hydrothermal vents are one of the newest found sources of energy and probably one of the greatest resources we have discovered thus far. Ask students to compare/contrast a hydrothermal vent with a chimney. • Have interested students brainstorm what we could do with this energy source—how could we harness this? Who would benefit most from this? Research Old Faithful---how is this alike and different from hydrothermal vents? **STEM Careers** Students who enjoy this kind of study may be interested in more information on Mechanical Engineering, Structural Engineering, Civil Engineering, or HVR&AC.

Three Gorges Dam This book takes a look at the building of the Three Gorges Dam on the longest river in Asia, the Yangtze River.  This book supports Lesson 1, 4, and 7 in ***Technology A Closer Look.*** **Reading Levels** GR T Benchmark 50 Lexile 740	**Before Reading** On a map or globe have students locate the Yangtze River in Asia. Have students research to find the top ten longest rivers. Compare the Yangtze, which is ranked #3 in the world to a river near you. The only river in the top ten in the United States is the Mississippi-Missouri river system. **During Reading** Have students look at the map on page 4 and diagram of the dam on page 9. Talk about each and how they can be used to illustrate what is being built. **After Reading** You may want to extend the timeline on page 20 to add additional information and construction that has taken place.	**NOTE: You may want to use these two books in conjunction with each other to expand upon the use of dams as sources of energy.** **Engineering Connection** • Divide the class into two groups--one group that is supporting of the building of the Three Gorges Dam and shares the pros. The other group is not in favor of the dam construction and presents the cons. • Encourage interested students to research and report on the current status of the Three Gorges Dam. It was completed in 2008 and expected to add additional turbines in the years following construction. **What problems are they having? What are the benefits of this dam? Is it working the way it was expected to? What have been the biggest obstacles or concerns? Has the dam be a good thing or bad thing?** Have students support their thoughts. • Compare a dam in your area to one of the dams presented in the books. **How are they alike? How are they different?** Compare the two dams in: size, budget to build, amount of energy created, number of people/homes who receive energy from the dam, and so on. • Look at a picture or create a model of a dam with the flying buttresses. **How does this compare with large cathedrals that have the flying buttresses? What do the buttresses do for the structure?** **STEM Careers** Students who enjoy this kind of study may be interested in more information on one of these fields of Engineering: Civil, Computer, Environmental, Mechanical, or Structural Engineering.
Giant Dams: Waterpower Wonders This book explores how dams turn running water into electricity and then takes the reader on a tour of three of the world's largest structures.  This book supports Lesson 1, 4, and 7 in ***Technology A Closer Look.*** **Reading Levels** GR R Level 40 Lexile 660	**Before Reading** Have students look at the picture of the dam on the cover of the book and call out words that come to mind, such as *huge, strong, heavy, concrete, river, engineer, canyon, flood, fishing,* and *boating.* **During Reading** Have students read the "Dam Databank" on pages 4, 7, 9, and 15. Explain that this extra information supports the regular text but might interrupt the flow if inserted directly into the body of text. **After Reading** Help students reflect on the material they just read. Ask: **In what places does the author presnt both sides of an issue? Why is this important?**	

Wind Energy This book explores wind as an environmentally friendly energy source.  This book supports Lesson 1, 4, and 7 in ***Technology A Closer Look.*** **Reading Levels** GR O Benchmark 38 Lexile 720	**Before Reading** Display the cover of the book and identify the wind turbines. Ask students if the wind is blowing and how they came to that conclusion. **During Reading** Point to the vocabulary word renewable on page 12. Model strategies students can use to determine the meaning of multi-affixed words. Have them identify the base word *new,* the prefix *re-* (again), and the suffix *–able* (like, able to be). Help students rebuild the word with these meanings: *re-* + *new* = *renew* (new again) + *-able* = *renewable* (able to be like new again). Guide students to draw conclusions by asking questions, such as: **How do you know the wind is blowing on pages 2-3 even though you can't see it? Why are countries using wind energy?** **After Reading** Have students summarize the science facts they have learned about wind energy.	**NOTE: You may want to use these two books in conjunction with each other to expand upon the concept of wind power.** **Engineering Connection** • Find out where the nearest wind farm is to your school. **Do any businesses in your area have wind turbines?** For example, some car dealerships have a wind turbine to create energy to light their car lots. **What does the wind farm or turbines in your area support? How is the wind energy used?** • Have students develop a proposal for your school or school district. **How much would one turbine cost? How much energy would it create? What would that energy be used for? How long would it take the district to recoup the purchase costs? Where would the turbine(s) be placed—suggest the best location.** Have students prepare arguments for both sides of this issue. Then try to address concerns in a letter to the school board and superintendent in favor of purchasing a turbine. Encourage students support their proposal with data. **STEM Careers** Students who enjoy this kind of study may be interested in more information on one of these fields of Engineering: Civil, Computer, Environmental, Mechanical, or Structural Engineering.
The Power of Wind This book takes a close up look at wind power as a clean, renewable energy source.  This book supports Lesson 1, 4, and 7 in ***Technology A Closer Look.*** **Reading Levels** GR U Benchmark 50 Lexile 720	**Before Reading** Talk about ways people have used wind in history. They may be most familiar with sails on ships or large windmills that pump water or grind grain. Ask students to share any other ways we use wind. **During Reading** Talk about the vocabulary word **wind farm** introduced on page 13. Students, especially ELL students, may be confused with the use of "farm" in this context. On page 18 you may want to discuss what **livestock** is if your students are not familiar with this terminology. **After Reading** Look at page 18. **Why is being able to raise livestock and grow crops in and around a wind farm a bonus for the farmer?**	

Energy

Title	Using the Leveled Reader	Making a STEM Connection
An Eye On Energy This book takes a look at energy and how we use it. ☐ This book supports Lesson 1, 4, and 7 in ***Technology A Closer Look.*** **Reading Levels** GR P Benchmark 38 Lexile 770	**Before Reading** Ask students to stand up and do ten jumping jacks. Talk about that their bodies needed energy to hear your request, to stand up, to push in their chair, and to do the jumping jacks. Remind students that energy is the ability to do work. **During Reading** Call out the chart on page 5 that shares the different types of stored energy. You may want to stop and discuss this chart to give additional examples of each. **After Reading** Ask students to summarize the main points of this book and share with the class.	**NOTE: You may want to use these two books in conjunction with each other to expand upon the concept of energy.** **Engineering Connection** • In the mid-2000's, UPS looked at their delivery routes and changed them so that every truck only makes right turns—less time sitting in traffic and just idling. In 2007 alone, they reported saving 3.3 million gallons of gasoline. **How could you use this information to help your school district or your family?** Encourage students to redesign the school bus routes to include only right turns. Students could present the new routes and track the savings in gasoline. • Challenge another school building within your district or another district to see who can lower their energy costs the most in a specific timeframe. As a class, brainstorm ways to reduce costs such as: turning out classroom lights and opening blinds; turning the thermostat down a degree or two in the winter or up a degree or two in the spring and fall; or making sure that lights are turned off when you leave a classroom. Students can create an entire ad campaign to get your school building on board. **For more information on energy sources such as the use of wind turbines and water dams, refer to STEM Essentials *Energy Resources* module.** **STEM Careers** Students who enjoy this kind of study may be interested in more information on one of these fields of Engineering: Agricultural and Biological, Environmental, Marine/Ocean, Metallurgical, or Nuclear Engineering.
Energy This book explores three different kids of energy you use everyday—light, heat, and sound. ☐ This book supports Lesson 1, 4, and 7 in ***Technology A Closer Look.*** **Reading Levels** GR N Benchmark 30 Lexile 580	**Before Reading** You may want to take several colors of modeling clay and layer them one on top of the other. Then have students look at the diagram on page 9 of the layers of Earth and discuss how the model and diagram are alike and different. **During Reading** Review the vocabulary *chlorophyll* found on page 5. *chloro-* comes from the Greek word for "green". **After Reading** Have students share the main idea of the book and why it is important to develop other sources of energy.	

Sources of Energy This book identifies the different sources of energy people have used in the past and continue to use, along with new energy sources. ☐ This book supports Lesson 1, 4, and 7 in ***Technology A Closer Look.*** **Reading Levels** GR N Benchmark 34 Lexile 660	**Before Reading** Start a word web around the term energy sources. Prompt students by asking: **Is the Sun an energy source?** **During Reading** Point to the word *hydropower* on page 6. Write it on the board and underline the combining form *hydro.* Ask students what they think *hydro* means. (water) Share other words that include this base word for water such as *hydrant, hydrothermal,* and *hydroplane.* **After Reading** Write a summary frame on the board, inviting groups of students to complete it for the book. *Because of _____, _____. _____ caused _____. Therefore, _____. Finally, because of _____, ____. This explains why _____.* Have the class assess which group wrote the clearest and most comprehensive summary.	**NOTE: You may want to use these two books in conjunction with each other to expand upon the concept that the fossil fuel supply is limited.** **Engineering Connection** • Currently forty of the 50 states have an official state fossil. Have students research the one for your state. If you live in one of the ten states that do not have a state fossil, have students research and recommend one, giving the reasons they believe the proposed one is a good choice for your state. You may want to encourage students to send an official request to your state governor. • Talk about the difference in and the relationship between fossils and fossil fuels. This can be especially confusing for ELL students. Discuss the fact that limited amounts are available and take a long time to develop—we can't just make more fossil fuels that take millions of years to develop. • Ask students. **Why are new energy sources necessary?** Have students share why we must find new energy sources. Encourage them to write a persuasive letter, a skit, or an ad campaign to gain public support and funding for the exploration about new sources of energy. **For more information on energy sources such as the use of wind turbines and water dams, refer to STEM Essentials *Energy Resources* module** **STEM Careers** Students who enjoy this kind of study may be interested in more information on Agricultural and Biological, Metallurgical, or Nuclear Engineering.
Fossils and Fossil Fuels This book explains the formation of fossils and fossil fuels. ☐ This book supports Lesson 1, 4, and 7 in ***Technology A Closer Look.*** **Reading Levels** GR T Benchmark 44 Lexile 860	**Before Reading** Display the book cover and read the title aloud. Begin a cause-and-effect chart to record what students know about fossils and how they form. Suggest that students fill in the chart as they read about fossil fuels. **During Reading** Point to the word *nonrenewable* on page 16 and *renewable* on page 19. Model strategies students can use to read unfamiliar words, helping them to identify the base word and affixes: new + *re-* (again) = *renew* (make new again) + =*able* (capable of being) = *renewable* (capable of being made new again) +*non-* (not) = *nonrenewable* (not capable of being made new again) **After Reading** Have groups of students prepare a summary of the book. Encourage discussion of why renewable energy sources might be better.	

The following book is also recommended to extend the concepts presented in this module. This book is available for purchase from McGraw-Hill.

- ***Sun Power*** This book tells how the Sun's power—solar energy—can be used as an energy source. (ISBN—978-0-02-285852-0)

Inventions

Title	Using the Leveled Reader	Making a STEM Connection
Bright Ideas: Inventions That Changed History This book gives a quick look at three inventions (the wheel, the Alphabet, and the telephone) that changed the history of our world. ☐ This book supports Lesson 2 and 3 in ***Technology A Closer Look.*** **Reading Levels** GR O Benchmark 34 Lexile 590	**Before Reading** Ask students what they think our world would be like without wheels. It seems funny to think about, but we didn't always have them. As a class make a list of inventions that changed the way we live—such as washing machines, cars, planes, microwaves, computers, cell phones, and so on. **During Reading** Remind students to read the captions. Captions often give additional information or descriptions not found in the regular text. In this book the captions are shown in blue type. **After Reading** As a class, discuss the book you just read and ask, **What do you think will be the next "big" invention that will change the way we live?** Discuss what the quote, *"Invention is the talent of youth, as judgment is of age"* (accredited to Jonathan Swift) and what it means.	**NOTE: You may want to use these two books in conjunction with each other to expand upon inventions and how they have changed the way we live.** **Engineering Connection** • Encourage students to think of a problem they see everyday, or possibly a chore that they are responsible for doing every day either at school or at home. What invention could make this easier? Have students return to page 14 in the book and think about the questions posed. • Interested students may want to participate in local competitions such as Invention Convention (*www.InventionConvention.com*), By Kids For Kids (*www.bkfk.com*), or the National Museum of Education (*www.pafinc.com*) . Check the website for your state or local competition. If you school has not participated in the past, you may want to visit this year's competition to see what is involved and start a team at your school. **STEM Careers** Students who enjoy this kind of study may be interested in more information on one of these fields of Engineering: Computer, Electrical, Industrial, Manufacturing, Materials, Mechanical or Software.
Young Inventors This book shares that idea that inventions are solutions to a problem and inventions are different from discoveries. ☐ This book supports Lesson 2 and 3 in ***Technology A Closer Look.*** **Reading Levels** GR O Benchmark 34 Lexile 590	**Before Reading** Please check the websites listed on page 14 to be sure they are still accurate and appropriate. They were checked at the time of this publication but should be checked again before distributing books to students. Share a couple of common items in your classroom such as the paper towel distributor, pencil sharpener, and so on. These items were inventions that someone created to solve a problem or to make work easier. **During Reading** Point out the chart on page 5 that shares the process most inventors follow. The charts on pages 12 and 13 reinforce the process of someone seeing a problem and searching to find a solution. **After Reading** Talk about the age of the inventors mentioned in this book and ask **Were they old? Is there a certain age you need to be to invent something?**	

Electrical Inventions This book gives a brief introduction to inventions that came about through the study of electricity. ☐ This book supports Lesson 2 and 3 in ***Technology A Closer Look.*** **Reading Levels** GR P Benchmark 38 Lexile 720	**Before Reading** Draw a K-W-L chart on the board. Help volunteers use the chart to record what they know about electrical inventions and what they would like to know. You might prompt students by asking; **What early electrical inventions do you know about? Who invented them?** **During Reading** Point to the words and photographs of the *phonograph, kinetograph,* and *kinetoscope* on pages 10-11. Model how students can figure out the meaning of these words, noting the combining forms *phono-* (sound, voice), *-graph* (write), *kineto-* (motion), and *scope-* (see). Discuss how these electrical inventions live up to" their names. **After Reading** Guide students' discussion by asking, **"How do you think Franklin knew that metals such as iron conducted electricity?"** Encourage students to summarize the information in the book.	**NOTE: You may want to use these two books in conjunction with each other to expand upon inventions involving electricity.** **Engineering Connection** • Have students estimate how many items they use each day that require electricity or how many items they have in their home or school that run on electricity. Then ask students to make lists and compare their estimates to the real numbers to create awareness of our dependence upon electricity. • Have students think about a time when the electricity has been out at either home or school. **What was it like? What does your family (or class) do? How does your life change when there is no electricity?** • Students can research the cost of electricity for your school or home. **How much is spent each month? What are some ways to conserve the use of electricity in your school to lower the monthly bills? In your home?** Students can create campaigns to inform other classes about ways to lower electric consumption, or run a contest between school buildings to see who can lower usage the most. **STEM Careers** Students who enjoy this kind of study may be interested in more information on Electrical Engineering.
It's Electric! This book explains how electricity is made, stored, and delivered to homes ☐ This book supports Lesson 2 and 3 in ***Technology A Closer Look.*** **Reading Levels** GR Q Benchmark 40 Lexile 760	**Before Reading** Ask pairs of students to keep a sequence chart to find out how electricity reaches our homes. Have student preview the photographs, diagrams, realia, and text features in the book. **During Reading** Point to the word *hydropower* on page 10. Note the combining form *hydro-* (water). Repeat with *geothermal* on page 11, eliciting the meaning of the combining forms *geo-* (Earth) and *therm-* (heat). Lead students to see that hydropower uses water to produce energy and that geothermal power comes from heat inside Earth. **After Reading** Help pairs of students summarize the information in the book sharing how electricity is made and how it travels to our homes.	

Incredible Inventions: Computers This book traces the development of the computer from the devices that preceded the first computer to the possible computers of the future. ☐ This book supports Lesson 2, 3, and 5 in ***Technology A Closer Look.*** **Reading Levels** GR N Benchmark 30 Lexile 560	**Before Reading** Give each group of students a statement, such as the ones below. Have the groups discuss whether their statement is true or false and the thinking/ reasoning behind their answer. *The first computers were heavy.* *The first video game was a football game.* *Filmmakers use computers to create movies.* *Computers make clocks and traffic lights work.* **During Reading** As they read, ask students to find out what devices people used before computers were invented. You may want to remind students that sidebars, like the one on page 5, often have text that provides additional facts about the subject matter. **After Reading** Ask students to share one thing they learned from reading the book and their favorite thing to do on the computer. It may be fun as a class to have students describe computers that they think they will use in the future—what they'll look like and what tasks they will do.	**NOTE: You may want to use these two books in conjunction with each other to expand upon the idea of inventions and how they continue to change and improve over time.** **Engineering Connection** • Have students create a chart or Venn diagram to compare and contrast the evolution of inventions presented in these books. Ask: **Do the inventions follow a similar pattern of change? What changes do you see? What do you think brings about the changes? What do you think the next changes will be?** • Have interested students pick one invention from the book and create a drawing or model to show what they believe the next major change will be for that object/ invention. Students should prepare a written document or an advertisement that shares the new features---giving the benefits or the problem that has been solved. • Students may want to select another invention not mentioned in these books and trace it from its initial invention to today. **STEM Careers** Students who enjoy this kind of study may be interested in more information on one of these fields of Engineering: Computer, Electrical, Industrial, Manufacturing, Materials, Mechanical or Software.
Incredible Inventions: Everyday Wonders This book looks at several key inventions and how they have been improved over the years. ☐ This book supports Lesson 2, 3 and 5 in ***Technology A Closer Look.*** **Reading Levels** GR N Benchmark 30 Lexile 690	**Before Reading** Before students begin reading you may want to talk about the features found in this book such as the blue-type photo captions, the "Amazing Inventions" features, and the blue sections that show the progression or evolution of inventions over time. **During Reading** You may want to stop and discuss each chapter separately to be sure students understand each section. There is a great deal of information provided for each. **After Reading** Ask students to summarize what they have read by asking, **What is one take-away you have from this book?**	

The following books are also recommended to extend the concepts presented in this module. These books are available for purchase from McGraw-Hill.

- ***The Camera's Eye*** This book examines the way in which the human eye and cameras take in light to receive and record images. (ISBN—978-0-02-284675-1)
- ***Electricity*** This book explores the nature of and uses of electricity. (ISBN—978-0-02-285859-9)
- ***The Discovery of Electricity*** This book shares more information into how electricity was discovered. (ISBN—978-0-02-284697-8)
- ***Thomas Edison*** This book presents a brief overview of Thomas Edison's life and work. (ISBN—978-0-02-284695-4)
- ***Thomas Alva Edison*** This book gives more information into the life of this inventor. (ISBN—978-0-02-193064-7)

Archeology

Title	Using the Leveled Reader	Making a STEM Connection
Fossil Hunters This book describes how fossil are formed, what information they hold, and how scientists uncover them. ☐ This book supports Lesson 5 and 6 in ***Technology A Closer Look.*** **Reading Levels** GR I Benchmark 16 Lexile 340	**Before Reading** Ask how many students have lost baby teeth. Explain that some lost teeth can be studies as fossils—parts of animals left behind. Have students tell what they know about fossils. **During Reading** Have students set a purpose for reading by asking them to watch for places where people find fossils. **After Reading** Have students tell what fossils are, where they are found, and how paleontologists study them.	**NOTE: You may want to use these two books in conjunction with each other to expand upon the study of archeology—focusing on fossils and the branch of study that includes paleontology.** **Sciecne Connection** There are two fields of science that focus on studying life in the past. Archeologists study past human life. They study human cultures by analyzing remains of previous societies. These remains may include ruins of buildings and artifacts (pottery and tools)—as is the case of the book students just read. Paleontologists gather information about life in the past by focusing on animal and plant fossils. Engage students in class discussions about these two books by asking a series of questions such as: • **What could you learn from a fossil about a living thing?** • **What would looking at pottery (dishes and containers) tell you about a civilization?** • **What could you learn from old tools?** • **What would bones tell you about a dinosaur or other animal? What about their teeth?** • **Why do scientists take such care in uncovering a site?** **STEM Careers** Students who enjoy this kind of study may be interested in more information on Architectural Engineering, Structural Engineering, Anthropology or one of the many specialized branches within this area of study such as Paleontology or Archeology.
Dinosaur Sue: Tale of a T. Rex The book describes the biggest, most complete and best preserved Tyrannosaurus rex, or T. rex, fossil ever found. ☐ This book supports Lesson 5 and 6 in ***Technology A Closer Look.*** **Reading Levels** GR Q Benchmark 40 Lexile 930	**Before Reading** Ask students if anyone has a nickname—specifically point out students who go by their initials. This shortened way to refer to a name is the same thing that has been done with *Tyrannosaurus rex,* who often goes by *T. rex.* **During Reading** Remind students to use the sidebars, such as those found on pages 4 and 5, to obtain additional information. You may need to review how to read a timeline. **After Reading** As a class, make a list of all the names of dinosaurs that you know or can find. Students may enjoy researching to find additional names.	

Discovering Pompeii This book shares how scientists uncovered the city of Pompeii, Italy ☐ This book supports Lesson 5 and 6 in ***Technology A Closer Look.*** **Reading Levels** GR Q Benchmark 40 Lexile 660	**Before Reading** Find Italy on the globe or map. Discuss that the city you are reading about begins thousands of years ago. **During Reading** You may want to stop and talk about the diagram on page 5 to discuss how a volcano erupts and what happens when this amount of ash falls quickly and how fast lava flows. **After Reading** **Could the events that destroyed Pompeii happen today? Why or why not? Would you like to visit Pompeii? Why or why not?**	**NOTE: You may want to use these three books in conjunction with each other to expand upon the study of archeology—focusing on ruins.** **Sciecne Connection** *Archeologists* study past human life. They study human cultures by analyzing remains of previous societies. These remains may include ruins of buildings and artifacts (pottery and tools)—as is the case of the book students just read. • Interested students may want to research and compare recent volcano eruptions in the world or the closest eruption to your school. Compare and contrast this eruption to the one described that hit Pompeii. Engage students in class discussions about these two books by asking a series of questions such as: • **How do you think the pyramids were built without heavy machinery?** • **How long do you think it would take to build the pyramids today? What equipment would be needed?** • **What do you think scientists, many, many years from now, will learn about our culture? What will landfills full of plastic containers, plastic water bottles, and Styrofoam cups tell them about us? What do you think their take away will be?** **STEM Careers** Students who enjoy this kind of study may be interested in more information on Architectural Engineering, Structural Engineering, Anthropology or one of the many specialized branches within this area of study such as Paleontology or Archeology.
Discovering Tutankhamen This book describes the exploration of the tomb and the priceless treasures the team of Lord Carnarvon and Howard Carter discovered there. ☐ This book supports Lesson 5 and 6 in ***Technology A Closer Look.*** **Reading Levels** GR R Benchmark 40 Lexile 710	**Before Reading** As a class, look at the book cover and explain that the cover art shows the golden mask of the Egyptian boy king Tutankhamen (often called simply, "King Tut"). Explain that the mask and other treasures in Tutankhamen's tomb were discovered after being buried for thousands of years. **During Reading** Point out the sidebar at the bottom of page 4 and the design elements that makes it stand out from the main body text. Explain that sidebars may expand on an idea presented in the text and often include maps, drawing, charts, and other graphics that help clarify ideas. **After Reading** Have groups of students share a summary of the story and any generalizations that can be made based on the facts that were read.	

Solving the Pyramid Puzzle This book describes the precision and geometric knowledge ancient Egyptians used to build the Great Pyramids. ☐ This book supports Lesson 2, 5 and 6 in ***Technology A Closer Look.*** **Reading Levels** GR O Benchmark 38 Lexile 690	**Before Reading** To activate prior knowledge ask students the following questions and discuss as a class. **Why did ancient Egyptians build the pyramids?** They built them as tombs for important people. **How do you think the builders got the huge stones in place?** (You might need to remind students that heavy equipment as we know today, did not exist at this time) Answers may include—ramps, ropes, pulleys **During Reading** Look at page 4 of the book. **About how many people visit the Egyptian pyramids each day?** about 25,000. Look at pages 7 and 18. **Which pyramid is larger?** How much larger? The Great Pyramid is 756 ft on each side; the pyramid at the Louvre is 115 ft on each side. The Great Pyramid is about 450 ft high; the Louvre pyramid is about 70 ft high. **After Reading** Have students summarize main points of this story. You may want to assign groups of students to research other modern buildings that are shaped like pyramids to compare and contrast. It may be helpful for students to compare the height of the pyramids to other structures that students may be more familiar with including local structures in your area. Scale drawings of each could be created or a bar graph used to compare heights would put them in perspective. *St. Louis Gateway Arch* – 630 ft *Golden Gate Bridge* – 746 ft *Washington Monument* – 555 ft *Statue of Liberty* – 305 ft (from foundation of pedestal to torch) *Seattle Space Needle* – 605 ft	

The following books are also recommended to extend the concepts presented in this module. These books are available for purchase from McGraw-Hill.

- ***Fossils Over Time*** This book answers many questions about fossils in general and dinosaurs in particular. (ISBN—978-0-02-100879-7)
- ***Trapped in Tar*** The book explains the history of the La Brea tar pits in Los Angeles. (ISBN—978-0-02-101100-1)

From Farm to Table

Title	Using the Leveled Reader	Making a STEM Connection
From Farm to Dinner Table: Food's Great Journey This book shares what happens to food once it is picked and transported to our cities and towns. This book supports Lesson 4, 6, and 7 in ***Technology A Closer Look.*** **Reading Levels** GR M Benchmark 28 Lexile 570	**Before Reading** Ask students how many have planted gardens. Make a list of as many fruits and vegetables as students can think of that are often raised in a garden. Ask students where they get their food. **Does everyone get food at a grocery? Does anyone go to a farmer's market or similar venue in your area? Does anyone raise fresh vegetables/fruits at home?** This discussion will depend upon where you live. **During Reading** Have students stop reading periodically to discuss the maps, diagrams, and charts found throughout the book. **After Reading** As a class, discuss: **What do you think people did long ago before planes and trucks? Do you think they had the variety of foods that we enjoy today? Or did they have fruits and vegetables all year long? Why or why not?**	**Engineering Connection** • Talk about your local grocery store. **Did the store grow the fruit and vegetables? Did they raise the livestock? Where did the food come from and how did it get there?** Have students compile a list of questions such as these to ask of a local grocery store manager. • Have each student find ten foods from different states and/or countries on their next visit to the grocery store. See how many different states and countries you can be found by the class. • **How many grocery stores do you have in a 5-mile radius of your school?** Have students locate and plot these on a map. **Do students notice any trends? Are the grocery stores located away from homes or near them? Are the stores clustered close together or spread apart?** Depending upon where you school is located, you may need to expand the radius for this activity. • **Where is the closest farm market or orchard to your school? How do fruits and vegetables get to your school?** Have students interview the staff at your school or district responsible for food service. • Assign students a number of items found at your local grocery store. Ask students to make a tally mark for each brand or variety of item found on the shelves. **Do you think the number of brands/varieties has increased or decreased over the last 50 years? Why?** **STEM Careers** Students who enjoy this kind of study may be interested in more information on Agricultural and Biological Engineering, Chemical Engineering, or Environmental Engineering.

Title	Using the Leveled Reader	Making a STEM Connection
Resources All Around Us This book takes a close look at four resources we use daily—water, wood, soil, and oil. ☐ This book supports Lesson 4, 6 and 7 in ***Technology A Closer Look.*** **Reading Levels** GR M Benchmark 28 Lexile 650	**Before Reading** Have students look at the cover of the book and read the title. Ask them what they think we will be learning about. Then turn to page 1, the Table of Contents. Ask students to explain how this helps clarify what they will be learning. **During Reading** Remind students to read the call outs such as the "Did You Know..." on page 4 and the circle graph on page 5. These features throughout the book give additional information at point of use. **After Reading** Have students share one thing they learned from reading this book.	**NOTE: You may want to use these two books in conjunction with each other to expand upon the concept of using resources wisely.** **Engineering Connection** • Have students compare and contrast these four resources. **How are they alike and how are they different? Are they renewable?** • **What are some ways to reduce or reuse kitchen waste at school and/or at home?** Sample answers—don't take or make more than you'll eat or use; compost fruit and vegetable scraps; feed scraps to pets/animals; and so on **STEM Careers** Students who enjoy this kind of study may be interested in more information on Environmental Engineering or Marine/Ocean Engineering.
What is Recycling? This book focuses on reducing, reusing, and recycling trash. ☐ This book supports Lesson 6 and 7 in ***Technology A Closer Look.*** **Reading Levels** GR P Benchmark 38 Lexile 790	**Before Reading** To activate prior knowledge, ask: **What do you do with cans and bottles when you finish using them? Do you have a special place at home to keep things you're going to recycle?** **What have you bought that is made of recycled materials?** **During Reading** Model strategies students can use to determine the meaning of multi-affixed words. Have them identify the base word *reuse,* the prefix *re-* (again), and the suffix *–use* (to bring into service). Help students rebuild the word with these meanings: *re-* + *use* = *reuse* (use again). Repeat with *recycle* and *reduce.* **After Reading** "One person's trash is another person's treasure." **What might this saying have to do with recycling?**	

The following book is also recommended to extend the concepts presented in this module. This book is available for purchase from McGraw-Hill.

- ***Let's Recycle!*** This book explains the "how" and "why" of recycling. (ISBN—978-0-02-284643-5)

Top 20 Engineering Disciplines

Below is a list of the top 20 Engineering Disciplines. Engineering is a diverse and challenging field of study. With more than 25 major branches of engineering and 100 specialties, there is something for everyone who pursues the field.

Aeronautical / Aerospace Engineering - Aeronautical/aerospace engineers design and develop technology for commercial aviation, national defense and space exploration. They may help design and manufacture military aircraft, missiles, helicopters, and spacecraft. Within this field, they may specialize in the structure of the aircraft, aerodynamics, guidance and control, propulsion and design, manufacturing, or a certain type of aircraft. Commercial airliners, military aircraft, space shuttles, satellites, rockets, and helicopters are all within reach for talented aeronautical engineers, who may also be referred to as astronautical, aviation or rocket engineers.

Agricultural and Biological Engineering - Biological and agricultural engineering, two closely integrated disciplines often called biological systems (biosystems), bioresources, or natural resources engineering, are concerned with finding solutions for life on a small planet. Our swelling world population places great demands on our limited natural resources, and biological and agricultural engineers work to ensure that we have the necessities of life: safe and plentiful food to eat, pure water to drink, clean fuel and energy sources, and a safe, healthy environment.

Architectural Engineering - Architectural engineers apply engineering principles to the design and technical systems of buildings - mainly their structural, mechanical, plumbing and lighting/ electrical design. Engineers need to be aesthetic as well as technical, creative as well as practical. They need to know if what looks good on paper is also technically possible.

Biomedical Engineering - The objective of biomedical engineering is to enhance health care by solving complex medical problems using engineering principles. Those who specialize in this field want to serve the public, work with health care professionals, and interact with living systems. This broad field allows a large choice of sub-specialties. Many students say they choose biomedical engineering because it is people-oriented. The field includes many branches: biomechanical, bioelectrical, biochemical, rehabilitation, clinical, and genetic engineering. There are also many sub-specialties within biomedical engineering such as surgical lasers, telemedicine, nuclear medicine, and clinical computer systems.

Chemical Engineering - Everything that our senses enjoy consists of chemicals in one way or another. Chemical engineers have worked on creating the purple rose that has no thorns, the caramel on a caramel apple, and even your tennis shoes. The chemical engineering profession has improved water and waste systems, created new drugs and drug delivery systems, and improved the crop yields for farmers. Most chemical engineers work in manufacturing, pharmaceuticals, healthcare, design and construction, pulp and paper, petrochemicals, food processing, specialty chemicals, microelectronics, electronic and advanced materials, polymers, business services, biotechnology, and the environmental health and safety industries.

Civil Engineering - Traditionally, civil engineers planned and designed such things as roads, bridges, high-rises, dams, and airports. Because of population growth and a booming economy, however, the civil engineer now also designs new things such as underwater tunnels, new and better wastewater treatment plants, solutions for highway congestion, and special tracks for the magnetic levitation trains of the future.

Computer Engineering - Computer engineering deals with the many aspects of computer systems. These engineers may design computer systems, networks, operating systems, or software. They may design the future automobile dashboard computers that will monitor engine functions. Engineers in this field design computer chips, circuits, equipment, and systems; plan computer layouts; and formulate mathematical models to solve technical problems on computer. They design, develop, and test computer hardware and peripheral equipment. They also design, develop, and maintain software programs and software systems.

Electrical Engineering - The developments of electrical and electronic engineers are everywhere. There are thousands of electrical devices and systems available today that electrical engineers have somehow touched. Anything you plug into the wall – stereos, computers, microwaves, televisions, power tools, air-conditioners, and major appliances – has been touched by an electrical engineer. Even things you can't plug into the wall – satellites, cellular phones, and beepers – have been designed, manufactured, or modified by electrical engineers. Electrical engineers also work in areas that generate, transmit, and distribute electrical power to consumers.

Environmental Engineering - Environmental engineering focuses on the development of a sustainable future, preventing pollution, assessing the environmental impact of everything, water distribution systems, recycling methods, sewage treatment plants, and pesticide prevention. This fast-growing field offers a challenging and satisfying chance to protect the health and safety of people and our environment. These earth-friendly professionals concern themselves with preventing and fixing problems caused by industrialization. They concentrate on delivering better environmental conditions for the public through knowledge, research, a caring attitude, and common sense.

Heating, Ventilating, Refrigerating, and Air-Conditioning Engineering - Heating, ventilating, refrigeration, and air-conditioning (HVR&AC) engineers have dramatically improved our lives. HVR&AC engineers develop systems to create and maintain safe and comfortable environments. Airplanes, trains, schools, cars, and computer rooms are only a handful of the environments that depend on HVR&AC engineers.

Industrial Engineering - Industrial engineers figure out how to improve everything. They work with people to help them do things better. Industrial engineers save employers money by streamlining systems, often making the workplace better for employees too. They improve productivity and quality while saving time and money. Industrial engineers work on all type of businesses. They see the big picture and focus on what makes a system perform efficiently, safely, and effectively to produce the highest quality.

Manufacturing Engineering - Just as the mechanical engineer designs parts, the manufacturing engineer designs the processes that make them. Wherever there's a production process to be designed and managed, you'll find manufacturing engineers at work. They work with plant managers, production supervisors, CNC programmers, quality managers, product designers, and R&D staff on issues ranging from evaluating new technology and choosing equipment and suppliers to leading industry-wide standards development to reorganizing a plant into a more efficient production system.

Materials Engineering - Materials engineers design, fabricate, and test materials. They may work to make automobiles lighter and more fuel efficient by creating stronger and lighter metals. They may help to create artificial knees and elbows using special polymers, or they may design new materials for the space ship. A materials engineer can work with any type of material – plastic, wood, ceramic, petroleum or metals –and create completely new synthetic products by rearranging molecular structure.

Mechanical Engineering - Mechanical engineers is one of the broadest and most diverse disciplines. Mechanical engineers design, develop, and manufacture every kind of vehicle, power system, machine, and tool: jet engines, steam engines, power plants, underwater structures, tractors for food production, hydraulic systems, transportation systems, medical devices, sports equipment, smart materials, materials and structures for space travel, measurement devices, and more. Any type of machine that produces, transmits, or uses power is most likely the product of a mechanical engineer.

Metallurgical Engineering - Metallurgical engineers turn raw materials into useful products. Metallurgical engineering includes processing mineral and chemical resources into metallic, ceramic or polymeric materials; creating new high strength or high performance materials; or developing new ways to refine and process materials for new consumer applications.

Nuclear Engineering - Nuclear engineering falls into three major areas of benefit to mankind: nuclear medicine, agricultural uses and pest control, and nuclear energy. Nuclear engineers search for efficient and beneficial ways to use the power generated from splitting an atom, and they research peaceful ways to use nuclear energy and radiation.

Naval Architecture, Marine Engineering, and Ocean Engineering - Naval architecture, marine engineering, and ocean engineering are professions that integrate disciplines such as materials science and mechanical, civil, and electrical engineering. These engineers and architects design, build, operate, and maintain ships such as aircraft carriers, submarines, tankers, tugboats, sailboats, and yachts. They also develop underwater structures, underwater robots, and oil rigs. They develop transportation systems, plan new uses for waterways, design deep-water ports, and integrate the land and water transportation systems and methods. They are concerned with discovering, producing, and transporting offshore petroleum as sources of energy and developing new ways to protect marine wildlife and beaches against the unwanted consequences of offshore oil production.

Software Engineering - Software engineering is on the cutting edge of technology. Software enables us to use computers. It is the translator between humans and computers. Without software, a computer would be nothing but ones and zeros. The current demand for software engineers far exceeds the supply. The largest employers of software engineers include familiar names such as Microsoft, Motorola, Autodesk, Netscape, Adobe, Symantec, Nintendo, and Corel. However, there are thousands of software manufacturers that hire software engineers.

Structural Engineering - Structural engineering focuses not only on the design and development of structures, such as houses, coliseums, bridges, and shopping malls, but on the design and development of materials that will create these structures. The structural engineering profession offers exciting challenges and potential for growth. Each day brings new and more sophisticated materials that will change the shape and the future of structures. Structural engineers must be creative and resourceful. They must visualize the framework of a structure and determine what forces will produce what loads upon it. Many structural engineers in California design buildings that are able to sustain ground-shaking (earthquake) loads.

Transportation Engineering - Transportation engineering is a branch of civil engineering that aims to allow people and goods to move safely, rapidly, conveniently, and efficiently. Transportation engineers design streets, highways, and public transportation systems. They design parking lots and traffic flow patterns that will prevent major congestion at busy intersections, shopping malls, and sporting events. They are involved in planning and designing airports, railroads, and busy pedestrian thoroughfares.

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http://www.engineeringedu.com/celestes_blog/2011/04/top20.html