What Is This Module About?

Look at the clothes that you are wearing.Think of the ways by which you get your food. Look at your home. These things prove how science and technology affects our lives. Science and technology is very important to humans. It affects the way we live. Our lives are more comfortable because of electricity and appliances that help us do our work.

In this module, you will discover more about science and technology and how it affects your life.

This module contains two lessons. These are:

Lesson 1 – *What Is Science?*

Lesson 2 – *Science and Technology in Your Life*

What Will You Learn From This Module?

After studying this module, you should be able to:

- define **science** and **technology;**
- appreciate the importance of science and technology in your life;
- distinguish between beliefs that are based on superstitions and those that have scientific bases;
- discuss the steps of the scientific method; and
- describe the contributions of Filipino and foreign scientists to the improvement of the quality of human life.

Let's See What You Already Know

Match the items in Column A with their definitions or descriptions in Column B. Write the letters on the lines before the numbers.

A		B	
_____	1. science	a.	A systematized body of knowledge covering general truths
_____	2. chemistry	b.	A product of technology
_____	3. biology	c.	The study of living things
_____	4. physics	d.	The study of matter and energy and their interactions
_____	5. A falling star is a sign of good luck.	e.	A Filipino hero and scientist
_____	6. Fish are difficult to catch on a full moon.	f.	A belief which has scientific basis
_____	7. Thomas Edison	g.	Applied science
_____	8. television	h.	Superstition
_____	9. Jose P. Rizal	i.	The study of matter, its structure and properties
_____	10. technology	j.	Inventor of the incandescent light bulb

Well, how was it? Do you think you fared well? Compare your answers with those in the *Answer Key* on page 32 to find out.

If all your answers are correct, very good! This shows that you already know much about the topics in this module. You may still study the module to review what you already know. Who knows, you might learn a few more new things as well.

If you got a low score, don't feel bad. This means that this module is for you. It will help you understand some important concepts that you can apply in your daily life. If you study this module carefully, you will learn the answers to all the items in the test and a lot more! Are you ready?

You may go now to the next page to begin Lesson 1.

What Is Science?

You may have seen shampoo and soap commercials on television. Most of the time, the advertisements say that these products are "scientifically tested." Science does indeed help manufacturing companies come up with better products.

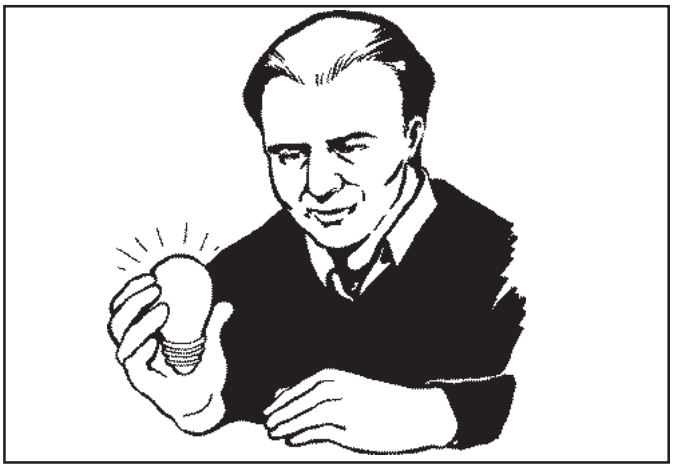
Many things which you never thought could exist now abound around you. For example, over a hundred years ago, people thought that it would be impossible to make a flying machine. As people's scientific knowledge increased, the machine became a reality. Today we have fast-moving jets and airplanes that move faster than the speed of sound.

This lesson will tell you about science and its importance.

After studying this lesson, you should be able to:

- describe science and its major branches;
- determine whether a common belief has scientific basis or not; and
- discuss the steps of the scientific method.

Let's Read



In 1879 Thomas Alva Edison, an American inventor, noticed that when electricity flowed through a piece of iron wire, the iron wire became red hot. The iron wire glowed brightly but then the light was not bright enough to light up a whole room. He

used a thinner piece of wire and allowed electricity to pass through it. He pumped out air (containing oxygen) from a bulb using a machine. He then enclosed the wire he was using in what he thought was an oxygen-free bulb. He repeated this experiment, pumping out more air each time he used the wire in lighting the bulb. He then discovered that the length of time that the wire glowed was related to the amount of air present in the bulb.

He noticed that the wire glowed but the light was still not bright enough. This time, he tried other metals. After trying many times, he discovered that a thin piece of metal called tungsten could glow so bright that it could light up an entire room.

Today, Edison is known as the inventor of the incandescent light bulb.

Let's Think About This

What did Thomas Alva Edison observe about the iron wire when electricity was made to pass through it? What did he do?

_____

_____

_____

Compare your answers with those in the *Answer Key* on page 32.

Let's Learn

What is science? **Science** is a systematized body of knowledge covering general truths and facts. How do you get these facts? You obtain facts through observation and experimentation. Do you still remember what Edison did? He first observed that a thin piece of wire glowed when electricity passed through it. He started with this observation. With this idea in mind, he tried and experimented with other methods and then used other metals. He then discovered that tungsten glowed steadily and was bright enough to light up a room.

Hence, **science** can also be defined as the systematic study of the properties of the physical world, by means of repeatable experiments and measurements and the development of objective theories describing these activities and predicting features that could be tested by experiments.

The major branches of science include:

- **Chemistry**—the study of the composition of substances and the changes they undergo. Chemists work with reactions between substances to create plastics, medicines, dyes, plastics and many other useful materials.
- **Biology—** the study of living things. It has two main branches:

  a. Botany is the study of plants. The study of plants allows us to know their uses. Most of the medicines you buy are made from the active substances found in plants.

  b. Zoology is the study of animals.

- Physics is the study of matter, energy, motion and forces. Physicists study the forms and properties of matter and energy—heat, light, electricity, magnetism and nuclear energy.

  Breakthroughs in physics have given us the supersonic jet, the laser, computer and live satellite transmission, among others.

Let's Review

1. What is science?

   _____

   _____

   _____

2. What are the major branches or areas of science? What do you study in each of these areas?

   a. _____

   b. _____

   c. _____

Compare your answers with those in the *Answer Key* on pages 32 and 33.

Let's Learn

Early man saw many of the things we see today. He saw the sun rise and set. He saw the moon change its size and shape from one night to the next until it disappeared and appeared again. He also saw the stars in the sky. He saw how the wind and rain caused changes in the surface of the earth. Seeing these things, he sought ways by which to explain their occurrence.

Let's Think About This

1. What are the things which early man saw?

   _____

   _____

   _____

2. Think of the possible explanations he came up with for the things that occurred around him.

   _____

   _____

   _____

Compare your answers with those in the *Answer Key* on page 33.

Let's Learn

How did science begin? No one really knows when people started to study things scientifically.

Definitely, people have always been curious about the various phenomena around them and have sought an explanation for these. At the beginning, they took these events to mean that other events were about to happen. These explanations took on the form of beliefs. Some of these beliefs are:

- A falling star was a sign of good luck.
- Eclipses were caused by a sky dragon called Laho. Every time an eclipse occurred, it meant Laho swallowed the sun or the moon.
- The eclipsed moon was red because it was bleeding. The marks on the face of the moon were marks of the dragon's teeth.
- Beating gongs could make Laho let go of the moon.

Can you think of other beliefs that our forefathers had to explain the things around them?

Let's Think About This

Give an example of a belief that people used to explain a certain phenomenon. Is this belief scientific? Why?

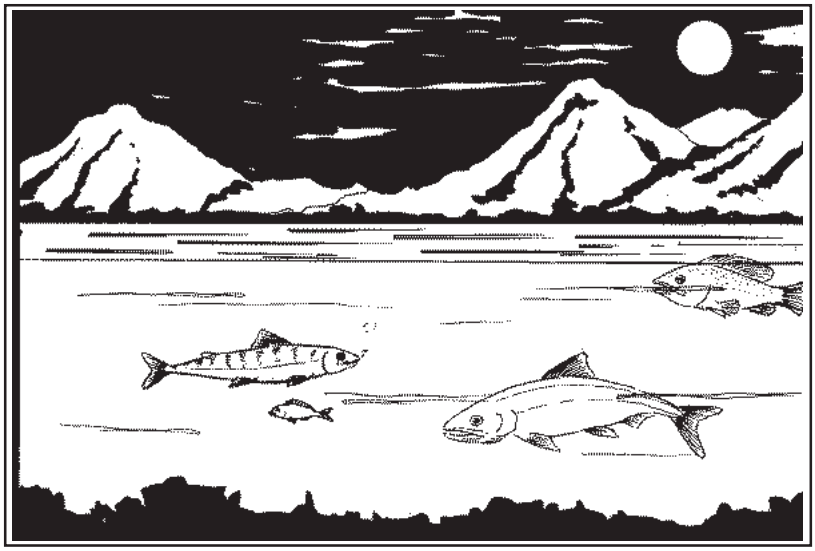
_____

_____

_____

Compare your answers with those in the *Answer Key* on page 33.

Let's Read



One of our local beliefs is that it is hard to catch fish during a full moon.

Fish are easily attracted to light. During a full moon, the light reflected in the water is scattered and covers a wide range. This causes the fish to be scattered about. A fisherman's lamp will not be bright enough to attract and keep a school of fish together. Thus, this belief has a scientific basis.

Let's Learn

A scientific mind acts based on sound reasoning. Some people act on mere impulse; they do not think hard enough before they act. Some people, on the other hand, refuse to give up old habits. Some simply imitate what others are doing. Still others cling to old beliefs and practices. It is true that some of our local beliefs do have scientific basis, but others are mere superstitions and do not have scientific basis at all.

For example, the belief that breaking a mirror will bring years of bad luck has no scientific basis. Breaking a mirror is simply an unfortunate accident. You should simply learn to take care of objects which easily break.

Some beliefs and practices, on the other hand, do have scientific bases. For example, one common practice is placing a metal spoon in a glass before pouring hot water into it. People believe that the metal spoon prevents the glass from breaking. This is not superstition. It has a logical basis. Metals are good heat conductors. When hot water is poured into a glass with a metal spoon in it, much of the heat is absorbed by the spoon and is conducted away from the glass. This prevents the glass from breaking.

Can you think of other beliefs and practices and tell which are just superstitions and which are scientifically based?

Let's Try This

The following are some common beliefs and practices. Identify which of these beliefs are superstitions and which are scientifically based.

1. A young girl who sings in front of a stove while cooking will marry a widower.

2. A marriage solemnized during a full moon will become successful.

3. You should not look directly at the sun. Otherwise the spirit of the sun will punish you for doing this.

4. Losing a tooth in a dream is a sign that a relative has died or will die.

5. If animals become restless, a disaster is coming.

6. At the end of the rainbow is a pot of gold.

7. A black cat crossing your path will bring bad luck.

8. When you lose something, go to a fortune-teller. He/She can tell you where to find it.

9. If you catch a small fish, throw it back or the spirit of the water will punish you.

10. If you touch a lizard, you will get warts *(kulugo).*

Compare your answers with those in the *Answer Key* on pages 33 and 34.

Let's Read

Nena wants to determine which detergent is the best. There are too many detergent brands at the *sari-sari* store, so before buying any, she first asked other housewives to know which detergent each one considered the best. There were various responses but she decided to consider only the top four choices. The top four detergents are Malinis, Maputi, Mabango and Matipid. She bought these detergent brands from the nearby sari-sari store. She thought that Maputi, the most expensive brand, would be the best.

Nena decided to use one brand of detergent each time she washed clothes. For each brand, she took note of how long the detergent lasted, how pleasant the smell of the clothes was after they had been washed and how well the detergent got rid of dirt. After observing all this, she was convinced that Malinis was the best detergent. It lasted longer than all three other detergents. Clothes that were washed with Malinis had the most pleasant smell. This brand also got rid of dirt faster than all the other detergents. Nena was glad to know that the most expensive brand is not necessarily the best all the time.

From then on, Nena used Malinis every time she washed clothes.

Let's Think About This

1. What did Nena want to find out?

_____

_____

_____

2. How did Nena find the answer to her question? Describe what she did.

_____

_____

_____

Compare your answers with those in the *Answer Key* on page 34.

Let's Learn

Do you like to observe the things around you? Have you tried to investigate something that made you curious? If you have, then you may have tried what scientists do when they investigate something. Scientists follow a procedure when studying a certain phenomenon. This procedure is called the **scientific method.**

The following are the steps of the scientific method:

1. Identify the problem.

   A problem is based on one's observations. In Nena's case her problem was: Which is the best detergent?

2. Gather and study information.

   Before setting out to answer the problem, Nena decided to get information about the detergents. There are many sources of information. You can observe and find out more about the problem you want to solve. You may also want to ask other people about it. People's ideas and arguments may be considered as sources of information. Nena asked other housewives which detergent they thought was the best. She decided to choose from among the top four detergents preferred by the other housewives.

3. Formulate a hypothesis.

   A **hypothesis** is an intelligent guess to explain an observation. What was Nena's hypothesis? She thought that the most expensive brand of detergent, Maputi, was the best detergent. Why do you think she had such a hypothesis? The hypothesis may come from experience and observation. She may have noticed in the past that if something was expensive, it usually had a better quality than the cheaper products.

4. Test the hypothesis.

   How did Nena test her hypothesis? She tested her hypothesis through experimentation. A given question may have several possible answers but only one right answer. Nena tested the four detergent brands for the following:

a. how long the detergent lasted;

b. how pleasant-smelling the clothes washed with the detergent were; and

c. how well the detergent got rid of the dirt in clothes.

These things which Nena observed are called variables. A **variable** is anything that changes in value or amount. For example, how well each detergent got rid of dirt is a variable. The efficiency with which dirt is rid of is different for each detergent. Malinis got rid of dirt better than Maputi, Mabango and Matipid did.

5. Make a conclusion.

Do you recall Nena's conclusion? Based on the results of her experiment, Nena concluded that Malinis lasted longer than the other detergents. She also concluded that clothes washed with Malinis were the most pleasant smelling and that Malinis got rid of dirt better than the three other detergent brands did.

6. Verify the conclusion.

You can see that based on her findings, Nena had to reject her hypothesis that Malinis was the best detergent.

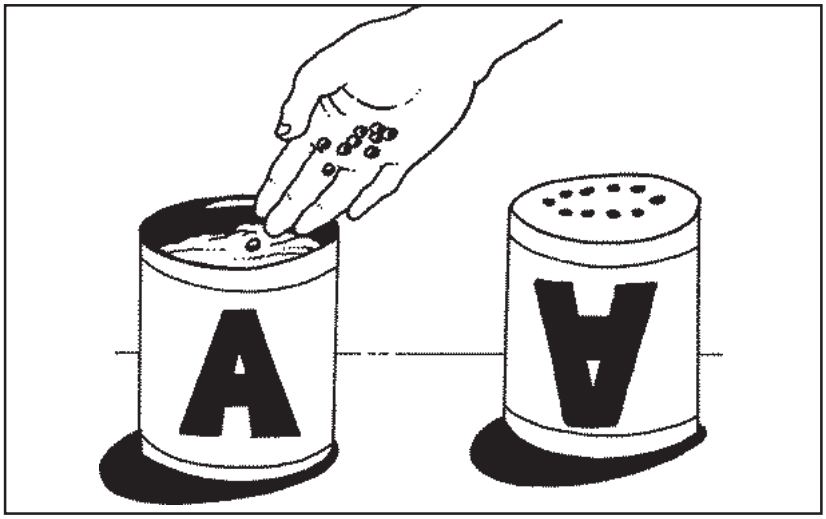
How do you think Nena can verify her conclusion? Well, to be sure about her findings, she may want to repeat the experiment again. In repeating it, Nena should make sure that she follows the same procedure. She should first ask what are considered the top four detergents in her community. Then she should test each detergent the same way she tested the detergents in her first study.

The experiment may be repeated by the same person who first did it or by another person. If the results are almost the same, we say that the conclusion is valid.

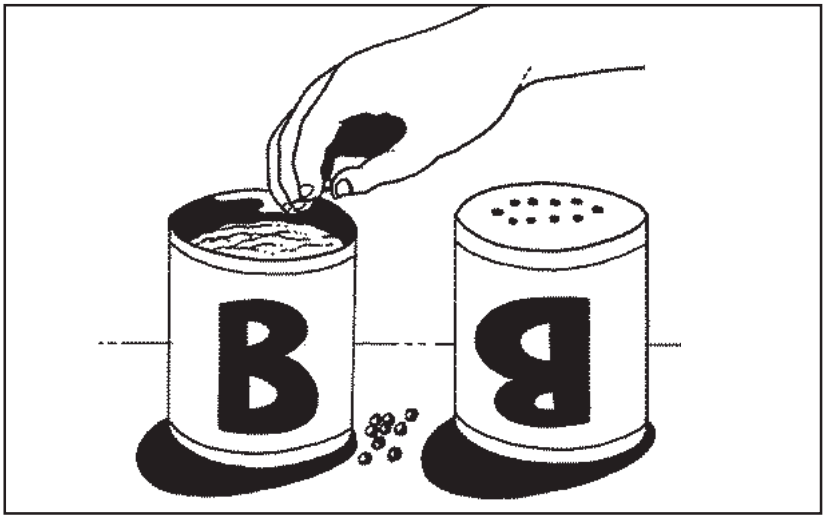
Let's Try This

Let's see if you can carry out the scientific method by doing the following activity. In this activity, you have to test if sunlight is important to plants or not.

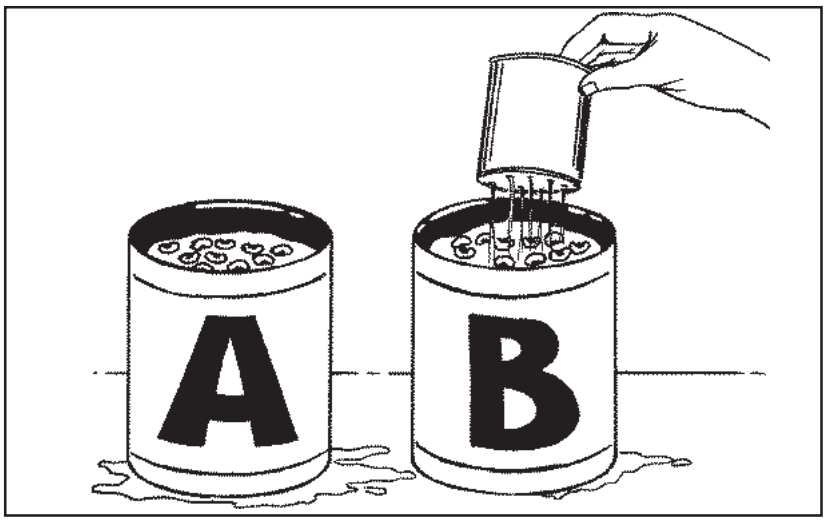
1. Plant 10 mungo seeds in one can containing soil. Label this can **A.** Make sure that there are about 10 holes on the bottom of the can.



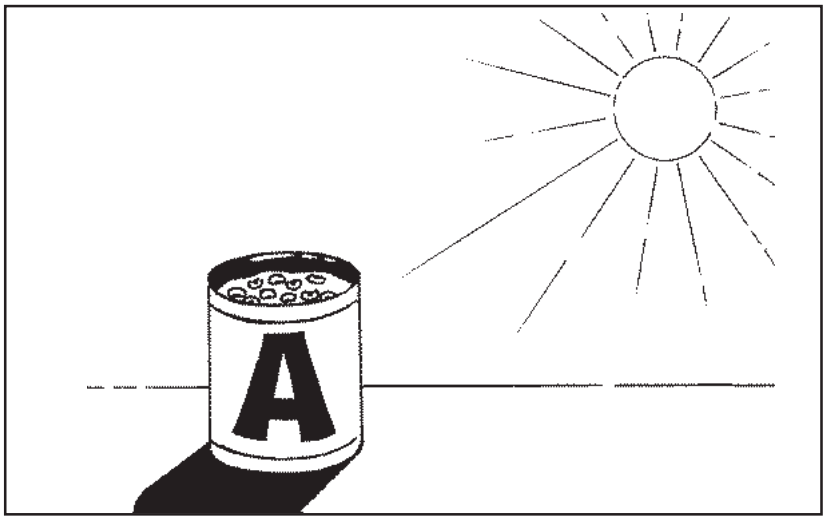
2. Plant another set of 10 mungo seeds in another can containing soil. Label this can **B.** Make sure there are also about 10 holes on the bottom of the can.



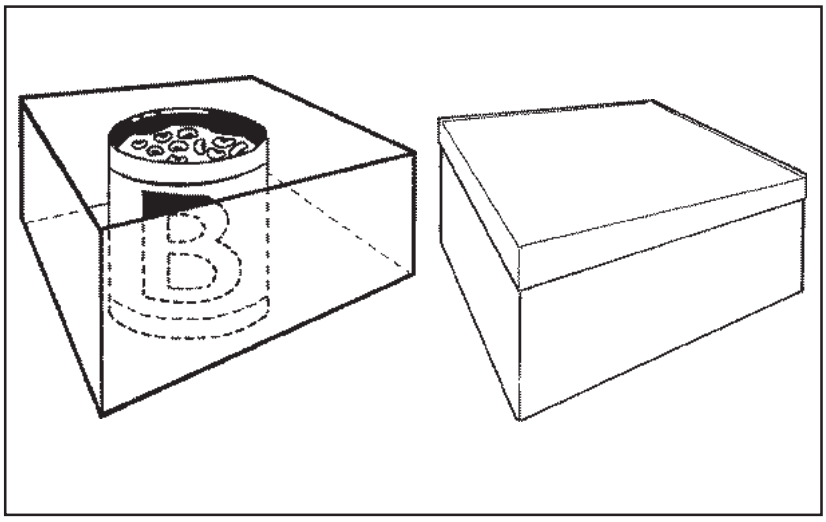
3. Water both cans for three days. Make sure you put just enough water each time.



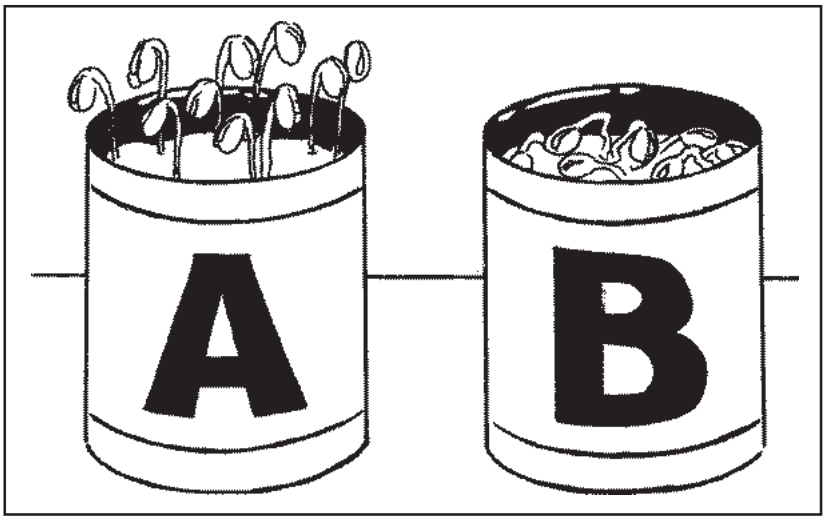
4. On the third day, place can A where sunlight can reach it.



5. Place can B inside a box. Make sure the box has no holes and that it is closed tight after you put the can inside.



6. Observe the plants in each can for three days. What can you conclude from the results of your experiment?



Compare your conclusion with the one in the *Answer Key* on page 34.

Let's Read

Did you know that our national hero, Dr. Jose P. Rizal, was a great scientist himself? He made many scientific contributions. He was a lover of nature. He discovered many animals here in our country. Some of the animals that he discovered were named in his honor. These include *Draco rizali* (the flying lizard), *Rachophorus rizali* (a toad) and *Apogonia rizali* (a beetle with five antennae). During his exile in Dapitan, he built the waterway system of the town.

Let's Think About This

1. Jose Rizal discovered and named some animals. How does naming animals help us? What are the uses of giving a scientific name to each animal?

   _____

   _____

   _____

2. One of the technological contributions that Dr. Jose Rizal made is the waterway in Dapitan. What do you think are the benefits that those in Dapitan received from this technological innovation? List these benefits below.

_____

_____

_____

Compare your answers with those found in the *Answer Key* on page 34.

Let's Learn

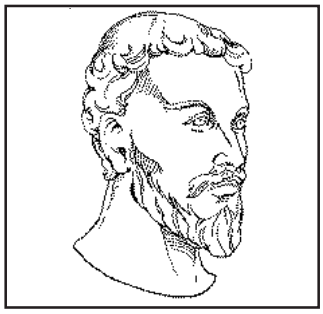
The beginning of science can be traced back to the observation of natural phenomena. Examples of natural phenomena include typhoons, earthquakes, tides and eclipses. Do you still remember what an **observation** is? It is the gathering of facts through the use of your five senses. These five senses are sight, hearing, smell, taste and touch. Early man used his senses to explain the things around him.

Egyptians were the first people to explain the existence of the universe. The earliest civilization began with the Egyptians and Sumerians about 5,000 years ago. How did the Egyptians describe the universe? They saw the universe as a very large room with the earth as its floor and the sky as its ceiling.

Ancient Greeks were the first to develop scientific thinking. Many Greek philosophers speculated on many natural events.

Famous Scientists

People who devote their time to studying science are called **scientists.** The following are some famous scientists.

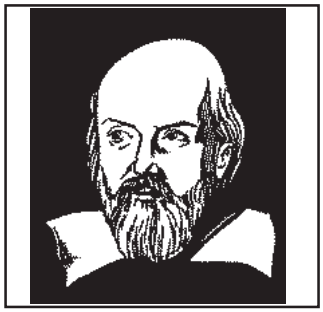


Aristotle (384–322 B.C.) was the first natural philosopher in the ancient world. He laid the foundation for modern scientific thought.

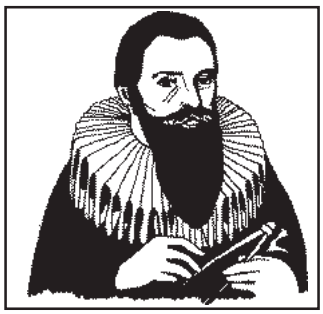
Hildegard of Bingen (1098–1179) was a Benedictine nun. She was an outstanding scientist in the Middle Ages. She wrote the medical books *Causea et Curae* and *Physica* which were about diseases and their cures. These were considered the greatest scientific works of the Middle Ages.

Nicolaus Copernicus (1473–1543) was a Polish scientist considered to be the founder of modern astronomy. He advanced the theory that the sun is the center of the solar system and that all of the planets (including the earth) revolve around the sun. This model of the solar system is now known as the Copernican system.

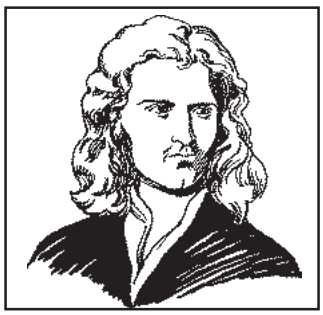
Galileo Galilei (1564–1642) was a mathematician, physicist and astronomer. He proposed laws that described the motions of falling bodies, projectiles and the pendulum. He studied heavenly bodies using the telescope.



Johannes Kepler (1571–1630) was an astronomer who formulated the laws of planetary motion.



Isaac Newton (1642–1727) was an English mathematician, physicist and astronomer. He formulated the laws of gravity and motion.

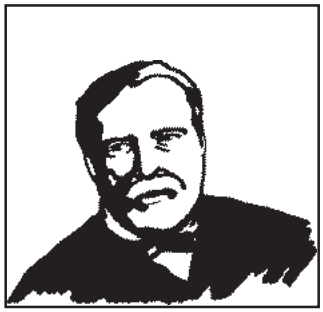


Charles Darwin (1809–1882) was an English scientist. His greatest work was *The Origin of Species* where he discussed the theory of evolution and natural selection.

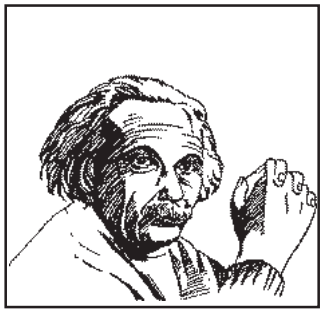
Marie Curie (1867–1934) is the first woman to receive the Nobel Prize in Physics. She was awarded this prize for her discovery of radium in 1903. She discovered it with her husband Pierre Curie and their colleague Henri Becquerel.

She was also the first person to receive two Nobel awards. She was awarded the Nobel Prize in Chemistry in 1911 for isolating pure radium.

Louis Pasteur (1822–1895) was a French scientist who became known for his work on biological fermentation and decay. This led to his formulation of the germ theory of disease and the discovery of sterilization of food through the use of heat.



Albert Einstein (1879–1955) proposed the theory of relativity. This theory debunked the Newtonian belief that time was absolute. Surprisingly, he won the Nobel Prize for his work on photoelectric effect and not for the theory of relativity.



We owe a lot to these scientists. Because of their discoveries, our lives are now more comfortable.

The following is a list of some great Filipino scientists and their contributions.

Clare R. Baltazar is the author of the book *Philippine Insects*. Her works on insects were very useful for research on insect control. Her other scientific contributions include discovering 8 species and 1 subgenus of the insect *Hymnoptera*. She also discovered 108 new species of Philippine parasitic wasps.

Filomena Campos is known for her work on cotton in the Philippines. Her studies helped develop a technology for cotton production. This technology was developed within a short period—3 years. She is also involved in research on sunflowers as a possible source of edible oil and livestock feed (feed for cows, goats, etc.).

Luz Oliveros-Belardo is a chemist and researcher. She studied essential oils that can be collected from Philippine plants. These essential oils have many uses. They may be used as flavoring, fragrance materials, medicine and energy sources. She loved her work so much that she spent 50 years of her life studying these essential oils. She was able to collect 33 new Philippine essential oils and studied their physical and chemical properties.

Eduardo A. Quisumbing is known for his studies in botany. He was one of the first researchers to study Philippine medicinal plants and orchids. He wrote the book *Medicinal Plants of the Philippines,* which is considered one of the first books on this area. He has also written 129 scientific articles.

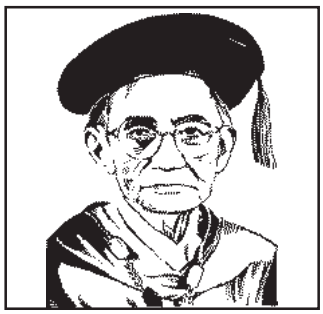
Bienvenido O. Juliano studied the characteristics of grains and proteins and how these affect the quality of rice. He showed that the amount of a substance called amylose determines the quality of rice grains in Asia. The less of this substance that rice has, the less sticky it will be.

Melecio S. Magno is a physicist. He conducted studies on the absorption and fluorescence spectroscopy of rare earth crystals, the effects of typhoons on atmospheric ozone, sky luminosity, atmospheric radiation and gravitation.

Emil Q. Javier is known for his very practical solutions to agricultural problems. Because he knows that many farmers have very limited resources, he thought of practical methods of improving crop production using cheap materials.

Alfredo C. Santos did research on the chemistry of natural products and the medicinal properties of Philippine plants. His work on herbs showed the properties of substances in local plants. His concern for poor Filipinos who cannot afford expensive drugs spurred him to conduct studies on local materials needed for the development of drugs.

Gregorio T. Velasquez is known for his work in phycology. **Phycology** is the study of algae. He devoted 30 years of his life to studying an algae called *Myxophyceae*. He was able to produce 47 basic and 77 valuable scientific papers on the subject. Dr. Velasquez was also a good educator. He taught and developed generations of good Filipino biologists, some of whom became members of the National Academy of Science and Technology.



Gregorio Y. Zara is noted for his contributions in engineering. His inventions are a source of pride for us Filipinos. His inventions include the video phone, an alcohol-fueled airplane, a solar energy absorber, an aircraft propeller that is made up entirely of wood, a wooden microscope and a semi-automatic propeller-making machine.

Let's Try This

Answer the following:

1. List five foreign scientists and their achievements.

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

2. List five Filipino scientists and their achievements.

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

Compare your answers with those in the *Answer Key* on pages 34 to 36.

Let's See What You Have Learned

Answer the following:

1. What is science?

   _____

   _____

   _____

2. What are the major branches of science? Differentiate them from one another.

   _____

   _____

   _____

_____

_____

3. Give one common belief or practice and give a scientific explanation for this.

_____

_____

_____

4. Name the steps of the scientific method.

_____

_____

_____

_____

_____

5. Name five scientists and their achievements. How do you think they have helped improve your way of living?

_____

_____

_____

_____

_____

Compare your answers with those in the *Answer Key* on page 36. Did you get a perfect score? If you did, that's very good. If you did not, that's okay. Just review the parts of the lesson that you did not understand very well before you move on to Lesson 2.

Let's Remember

- Science is a systematized body of knowledge covering general truths.
- The three major branches of science are chemistry, biology and physics.

- Scientific knowledge is arrived at by following the scientific method. The steps of the scientific method are:
  - Identify the problem;
  - Gather and study information;
  - Formulate a hypothesis;
  - Test the hypothesis;
  - Make a conclusion; and
  - Verify the conclusion.

Science and Technology in Your Life

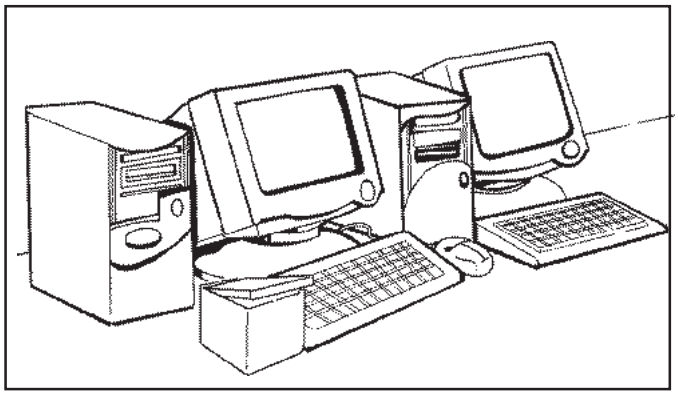
Can you imagine how your life would be if there were no electricity? What if there were no jeepneys or buses for you to ride on? Electricity and means of transportation are just some of the products of science and technology. Because of developments in science and technology, people have better means of communication and transportation, more comfortable lives and eat more nourishing food. Many lives have been saved by medical breakthroughs. Can you think of some inventions which have made your life better?

At the end of this lesson, you should be able to:

- differentiate **science** from **technology;**
- relate science, technology and society;
- give examples of recent developments in science and technology; and
- infer how science and technology can be used for the benefit of humanity.

Are you ready? Let's read together.

Let's Read



The computer was invented to make our tasks easier. The computer has many uses. This module that you are now reading was made with the help of a computer. The newspapers and magazines that you read are also made with the help of computers. Computers perform tasks faster. Have you ever tried using a calculator? Computers are many times as fast as calculators! Some computers have very special uses. Some are used to look inside the human body. They can detect injuries or diseases of the heart and other organs.

Let's Think About This

1. What are some of the uses of the computer? Describe them below.

   _____

   _____

   _____

2. Give at least two benefits that the computer gives us.

   _____

   _____

   _____

Compare your answers with those in the *Answer Key* on pages 36 and 37.

Let's Learn

Can you still recall what science is?

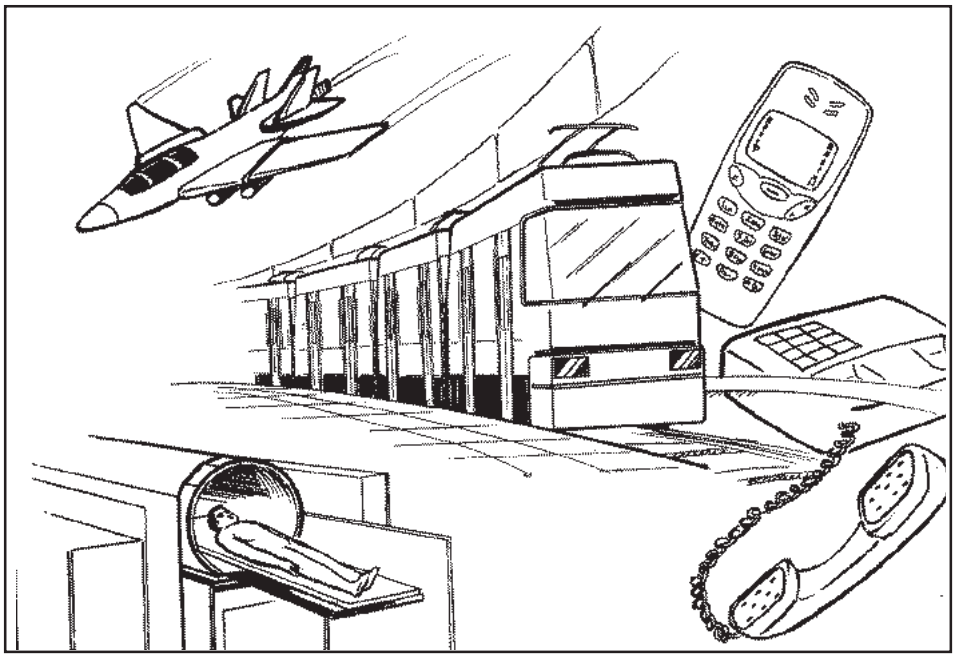
Science is a systematized body of knowledge based on facts gathered through observation and experimentation.

Scientists learn and discover new knowledge. This knowlege is then used by other people to create useful materials. This is what technology is.

Technology is applied science. Thomas Alva Edison based his invention of the incandescent light bulb on findings on electricity. Among the first scientists to study electricity comprehensively were Michael Faraday and Joseph Henry.

The word **technology** comes from the Greek word *technologia* which means "systematic treatment of an art."

What are the uses of technology? Technology helps produce medicine, preserve food and develop new sources of energy. The computer is just one of the products of technology. Can you name other products that come from technology? Some of them are shown below.



Many lives have been saved because of modern technology. Today, kidney stones can be removed without patients having to go through painful surgeries. Laser technology is used in these operations.

During the early days, science and technology were separated from each other. Science was the domain of philosophers while technology was the domain of tanners, millers and silversmiths.

In the thirteenth century, science and technology became linked with each other, thanks to Roger Bacon, an English philosopher. His emphasis on the importance of mathematics and experimentation laid the foundation for modern science and its practical application. As more and more scientific studies were done, science and technology became more and more closely related.

In the nineteenth century, a lot of new gadgets were invented because of the explosion of scientific knowledge.

- Alexander Graham Bell was inspired to invent the telephone when he read the work of German physicist Hermann von Helmholtz. Helmholtz made a study on sound waves.
- Guglielmo Marconi invented the telegraph. He based his invention on the works of Heinrich Rudolf Hertz and James Clerk Maxwell, physicists who studied electromagnetic waves.

Let's Review

1. What is technology?

   _____

   _____

   _____

2. List at least five technological products. Discuss how these help make life more comfortable.

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

Compare your answers with those in the *Answer Key* on page 37.

Let's Learn

In agriculture, technological developments help improve food production. When seeds are planted, fertilizers are placed in the soil to provide nutrients for the plants. Fertilizers help increase the growth of plants. Irrigation systems help water plants in an easier and faster way. Pesticides are sprayed on plants to ward off insects that may destroy these plants. Fertilizers, irrigation systems and pesticides are all products of technology that help farmers increase their harvests.

Let's Review

Discuss how technology helps farmers.

_____

_____

_____

Compare your answer with that in the *Answer Key* on page 37.

Let's Learn

We have been discussing the positive effects of technology. It also has some negative effects. The results of technology should be studied carefully to see how they affect society and the environment. For example, gases emitted by cars and factories can pollute the air. Polluted air can cause many respiratory and heart diseases. If pesticides and fertilizers are not used properly, they might also cause damage or harm. Pesticides may be harmful, for example, if sprayed on fruits. Some pesticides may be absorbed by fruits and crops. This is why some people prefer organically grown fruits and vegetables. These fruits and vegetables are not sprayed with fertilizers and pesticides.

Scientific knowledge should be used in making useful technology that does no harm to people and the environment.

Let's See What You Have Learned

1. Give one technological product. Discuss both its positive and negative effects.

   _____

   _____

   _____

2. Are you familiar with organ transplants? In this process, an organ from a deceased person is transferred to an ill person who needs the organ. What considerations should be made before doing an organ transplant? For example, do you think the religions of the organ donor and the organ recipient should be considered? Explain your answer.

_____

Compare your answers with those in the *Answer Key* on page 37. Did you get a perfect score? If you did, that's very good. If you did not, that's okay. Just review the parts of the lesson that you did not understand very well before you proceed to the next part of the module.

Let's Remember

- Technology is applied science.
- Technology has helped improve people's lives over the years. However, there are also products of technology that can harm people and the environment.

You have now reached the end of the module. Congratulations! Did you enjoy studying this module? Did you learn a lot from it? The following is a summary of its main points to help you remember them better.

Let's Sum Up

This module tells us that:

- Science is a systematized body of knowledge covering general truths. Technology, on the other hand, is applied science.
- Scientific truths are arrived at through the scientific method. The steps of the scientific method are:
  - Identify the problem;
  - Gather and study information about the problem;
  - Formulate a hypothesis;
  - Test the hypothesis;
  - Make a conclusion; and
  - Verify the conclusion.
- Technology is developed as a result of scientific discoveries. Sometimes, however, some products of technology tend to do more harm than good to people and the environment.

What Have You Learned?

Give what is asked for in each of the following items.

1. Science is a systematized body of knowledge. Discuss how scientists gather data and how they come up with scientific conclusions.

_____

_____

_____

_____

_____

2. An example of a superstition is the belief that a falling star is a sign of good luck. List two superstitions that you know. Explain why these superstitions do not have scientific bases.

_____

_____

_____

_____

_____

_____

3. An example of a belief that has scientific basis is the one that says fish are difficult to catch on a full moon. Think of at least one belief that you know that has scientific basis.

_____

_____

_____

_____

_____

_____

4. Technology is applied science. Give at least two technological innovations. How do these inventions make life easier or more comfortable for us?

_____

_____

_____

_____

_____

Compare your answers with those in the *Answer Key* on page 37. If you got a perfect score, that's very good! This means that you learned a lot from this module. If you got a low score, review the parts of the module that you did not understand very well.

Answer Key

A. Let's See What You Already Know *(page 2)*

1. **a.** Science is a systematized body of knowledge covering general truths.
2. **i.** Chemistry is the study of matter, its structure and properties.
3. **c.** Biology is the study of living things.
4. **d.** Physics is the study of matter and energy and their interactions.
5. **h.** "A falling star is a sign of good luck" is an example of a superstition. Superstitions are beliefs that do not have scientific bases.
6. **f.** "Fish are difficult to catch on a full moon" is an example of a belief with scientific basis. Fish are attracted to light. During a full moon, light is scattered in the sea. Because of the scattering of light, fish are difficult to attract with fishermen's lamps.
7. **j.** Thomas Edison is the inventor of the incandescent light bulb.
8. **b.** The television is a product of technology.
9. **e.** Jose P. Rizal is our national hero. He is also a Filipino scientist and technologist.
10. **g.** Technology is applied science. Technologists are people who use information from scientific studies to make inventions.

B. Lesson 1

Let's Think About This (page 4)

Thomas Alva Edison observed that when electricity was made to pass through an iron wire, the wire glowed and gave off light. But he also observed that it did not glow brightly enough to light up a room. He then pumped out more air from the bulb until it was oxygen-free. He then tested different metals for the bulb. Finally, he tested tungsten. He found that inside an oxygen-free light bulb, tungsten gave off enough light to brighten up a whole room.

Let's Review (page 6)

1. Science is a systematized body of knowledge covering general truths and facts.
2. The major branches of science are:
   a. Chemistry—the study of the composition of substances and the changes they undergo.

b. Biology—the study of living things. It is further divided into botany, the study of plants and zoology, the study of animals.

c. Physics—the study of matter and energy and their interactons.

Let's Think About This (page 6)

1. Early man saw the things that we see today. For example, he saw the rising and setting of the sun. He also saw the moon change its shape as well as the stars in the sky.

2. Early man took these natural phenomena to mean that certain events were about to happen. He related things to one another based on the sequence of their occurrence.

Let's Think About This (page 7)

Our ancestors had several beliefs that they used to explain different phenomena. Choose from any one of the following:

- A falling star was a sign of good luck.
- Eclipses were caused by a sky dragon called Laho. An eclipse occurred because Laho swallowed the sun or the moon.
- The eclipsed moon was red because it was bleeding. The marks on the face of the moon were marks of the dragon's teeth.
- Beating gongs during an eclipse could make Laho let go of the sun or the moon. When Laho let go of the sun or the moon, the eclipse ended.

Let's Try This (page 9)

1. No scientific basis.

2. No scientific basis.

3. The sun has no spirit but it does emit high-energy radiation called ultraviolet radiation, which can damage the sensitive parts of the eye. When you expose your unprotected eyes to the rays of the sun, this may eventually cause damage to the iris (a part of the eye) and lead to blindness.

4. No scientific basis.

5. A coming earthquake may cause vibrations in the earth's crust. Since some animals have very sharp senses, they may feel these vibrations. This is why they become restless.

6. No scientific basis.

7. No scientific basis.

8. No scientific basis.

9. There are no spirits in the water that will punish you. Small fish should be allowed to grow and reproduce. If we catch fish before they have fully grown, there will be less fish to catch in the future. This shall be our "punishment."

10. No scientific basis. Warts are caused by a virus.

Let's Think About This (pages 10–11)

1. Nena wanted to determine which detergent was the best.

2. The following are the steps that Nena carried out to answer her question:

   Step 1. She asked other housewives which detergent they preferred. From among the responses, she chose the top four detergents.

   Step 2. Nena decided to use one brand of detergent each time she washed clothes. For each brand, she took note of how long the detergent lasted, how pleasant the smell of the clothes was after washing and how well the detergent got rid of dirt.

   Step 3. Based on her results, she was convinced that Malinis was the best detergent because it lasted longer than the other detergents. Clothes that were washed with Malinis had the most pleasant smell. This detergent also got rid of dirt better than all the other detergents.

Let's Try This (pages 13–15)

Your conclusion should be similar to the following:

The plants in can A are very healthy while those in can B are not. Some of the plants in can B may have already withered. This shows that sunlight is needed by plants for survival.

Let's Think About This (pages 15–16)

1. Naming animals helps scientists study them more efficiently. Giving a scientific name to each animal enables us to distinguish closely related animals from each other.

2. The waterway system enabled the people of Dapitan to get water in their houses. They did not have to go to wells to get water.

Let's Try This (page 21)

1. Choose five from among the following:

   a. Aristotle was the first natural philosopher in the ancient world. He laid the foundation for modern scientific thought.

   b. Hildegard of Bingen was a Benedictine nun who studied diseases and their cures.

c. Nicolaus Copernicus was a Polish scientist who said that the sun is the center of the solar system.

d. Galileo Galilei was a mathematician, physicist and astronomer. He formulated mathematical laws that described the motions of falling bodies, projectiles and the pendulum.

e. Johannes Kepler was an astronomer who formulated the laws of planetary motion.

f. Isaac Newton was an English mathematician, physicist and astronomer. His work on optics, gravitation and motion were among the greatest scientific achievements of all time.

g. Charles Darwin was an English scientist who worked on the evolution of living things.

h. Marie Curie was a physicist who discovered radioactivity in 1903.

i. Louis Pasteur was a French scientist who became known for his work on fermentation and decay.

j. Albert Einstein proposed the theory of relativity. He also worked on the photoelectric effect.

2. Choose five from among the following:

a. Clare R. Baltazar is the author of *Philippine Insects.* Her work on insects was very useful for research on insect control.

b. Filomena Campos is known for her work on cotton in the Philippines. Her studies helped develop the technology for cotton production.

c. Luz Oliveros-Belardo is a chemist and researcher. She studied essential oils that can be collected from Philippine plants and their uses.

d. Eduardo A. Quisumbing is known for his studies in botany. He was one of the first researchers to study Philippine medicinal plants and orchids.

e. Bienvenido O. Juliano studied the characteristics of grains and proteins and how these affect the quality of rice.

f. Melecio S. Magno is a physicist. He did studies on the absorption and fluorescence spectroscopy of rare earth crystals, the effects of typhoons on atmospheric ozone, sky luminosity, atmospheric radiation and gravitation.

g. Emil Q. Javier is known for his methods of improving crop production using cheap materials.

h. Alfredo C. Santos did studies on the chemistry of natural products and medicinal properties of Philippine plants. His work on herbs helped identify the properties of substances found in local plants.

i. Gregorio T. Velasquez is known for his work on phycology.

j. Gregorio Y. Zara is noted for his contributions in engineering. His inventions include the video phone, alcohol-fueled airplane, a solar energy absorber, an aircraft propeller that is entirely made up of wood, a wooden microscope and a semi-automatic propeller-making machine.

Let's See What You Have Learned (pages 21–22)

1. Science is a systematized body of knowledge covering general truths.
2. The major branches of science are:
   a. Chemistry—the study of matter, its structure and properties and the changes it undergoes;
   b. Biology—the study of living things; and
   c. Physics—the study of matter and energy and their interactions.
3. (Have your answer checked by your Instructional Manager or Facilitator.)
4. The steps of the scientific method are:
   a. Identify the problem;
   b. Gather and study information about the problem;
   c. Formulate a hypothesis;
   d. Test the hypothesis;
   e. Make a conclusion; and
   f. Verify the conclusion.
5. (Choose five from the scientists named on pages 16 to 20. Have your answers checked by your Instructional Manager or Facilitator.)

C. Lesson 2

Let's Think About This (pages 25–26)

1. The computer has many uses. Some of these uses are listed below:
   - Computers are used to make print materials like books, magazines and newspapers.
   - Computers are used for faster, more efficient mathematical calculations.

- Some special computers have very unique uses such as for examining the internal parts of the human body.
- Computers make our tasks easier.
- Computers can detect injuries or diseases of the heart and other organs. They assist in treating diseases through surgery.

Let's Review (page 27)

1. Technology is applied science. This means that technological innovations are based on the results of scientific studies.
2. Answers may vary. Possible answers include the television, washing machine, flatiron, computer, telephone, cellular phone, videocassette player, compact disc player and microwave oven. Show your list and explanation to your Instructional Manager or Facilitator.

Let's Review (page 28)

Technology helps farmers through the following:

- Fertilizers are placed in the soil to provide nutrients for plants and help the plants grow faster.
- Irrigation systems help water plants.
- Pesticides are used to ward off insects that may destroy plants.

Let's See What You Have Learned (pages 28–29)

1. Show your answer to your Instructional Manager or Facilitator.
2. You may have to consider the moral and ethical implications of organ transplants. One ethical implication is that the family or the loved ones of the organ donor should first consent to the organ transplant. One moral implication is that the religions of both the organ donor and the organ recipient may not consider the process normal.

D. What Have You Learned? *(pages 30–31)*

1. Scientists use the scientific method in their studies. First, they identify a problem. Then they observe and experiment to find out the answer to this problem. If they come up with the same conclusions after repeated experimentation, then the conclusion becomes a scientific theory or law.

For items 2 to 4, show your answers to your Instructional Manager or Facilitator.

Glossary

Astronomer One who studies celestial phenomena.

Belief Something believed.

Conclusion The act of passing from sample data to generalizations.

Eclipse The total or partial covering of one heavenly body by another.

Moral Of or relating to principles of right or wrong in behavior; ethical.

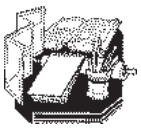
Photoelectric Involving or relating to or utilizing any of the various effects due to the interaction of radiation (as light) with matter.

Propeller A device that drives an object forward or onward through motion.

Scientific name A name given to a specific species of organism.

Solar Of or relating to the sun.

Superstition A belief or practice resulting from ignorance, fear of the unknown, trust in magic or chance or a false conception of causes and effects.



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