Science of the People

Goals 2000 - Partnerships for Educating Colorado Students

In Partnership with the **Denver Public Schools**
and the **Metropolitan State College of Denver**

El Alma de la Raza Project

El Alma de la Raza Series

Science of the People

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Grades 8-10

Implementation Time
for Unit of Study: 3 weeks

Goals 2000 - Partnerships for
Educating Colorado Students
El Alma de la Raza Curriculum
and Teacher Training Project

Loyola A. Martinez, Project Director

Science of the People

Unit Concepts

- Science in the Americas before the European conquests
- The process of producing knowledge
- Latino cultures and scientists
- The scientist within all of us
- Thinking scientifically

Standards Addressed by This Unit

Science

Students understand the process of scientific investigation and design, conduct, communicate about, and evaluate such investigations. (S1)

Students know and understand the characteristics and structure of living things, the process of life, and how living things interact with each other and their environment. (S3)

Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. (S4)

Students know and understand interrelationships among science, technology, and human activity in the past, present, and future and how they can affect the world. (S5)

Students understand that science involves a particular way of knowing and understand common connections among scientific disciplines. (S6)

History

Students understand how science, technology, and economic activity have developed, changed, and affected societies throughout history. (H4)

Students know that religious and philosophical ideas have been powerful forces throughout history. (H6)

Reading and Writing

Students read and understand a variety of materials. (RW1)

Students apply thinking skills to their reading, writing, speaking, listening, and viewing. (RW4)

Mathematics

Students use a variety of tools and techniques to measure, apply the results in problem-solving situations, and communicate the reasoning used in solving these problems. (M5)

Introduction

The scientific method, used to describe the way scientists explore the natural world, consists of the systematic testing of questions, hypotheses, predictions, and inferences. Most references to the giants in the development of the scientific method involve European men. These scientists include Galileo, Newton, Harvey, Darwin, Pasteur, Freud, and Einstein. However, diversity is a great strength in Colorado and in all of the United States. We have begun, when teaching about science achievements, to move away from an emphasis on white male Europeans to one that embraces and values the idea that people of both genders and of all races and ethnicities have made significant contributions to the scientific way of knowing.

This unit focues on Latino achievements and contributions in science and engages students in *el alma de la raza de ciencia.* The unit is designed so that the student recognizes the scientist within her / him. The aim of the unit is to present scientists of the Americas that students can identify with, to enable students to think scientifically and to do science. The lessons are presented in chronological sequence, beginning with Mayan mathematical science and Aztec measurement. Then Latinos Sor Juana of Mexico, Ynez Mexia, Dr. Bernardo Houssay, Dr. Luis Alvarez, Dr. Eloy Rodriguez, and Dr. Ellen Ochoa are presented as scientific thinkers and scientists representing the soul of the people of science.

Implementation Guidelines

This unit is designed to be taught in 9th grade Earth Science 1 or 9th grade Life Science 1. It can be adapted for use in the 8th grade science. Each lesson contains three sections: 1) learning about a group or person; 2) learning about the science of the group or person; 3) responding to the science (meaning and application). Students participate in the science of the people in order to connect the scientist within each student to the scientist introduced. The student relates to the scientist presented as a person who is like the scientist within the student. The interacting part of the lesson includes activities so that the students do “science of the people.”

Instructional Materials and Resources

TMaterials needed:

Lesson 1	phenolphtlalein
	sodium bicarbonate (baking soda)
	vinegar
	100-ml. beakers (3 per team)
	graduated cylinder (1 per team)
Lesson 2	dry beans
	toothpicks
	pennies
Lesson 3	graph paper
	rulers
	measuring compass
	calculators

Lesson 4	modeling clay
	flashlights
	lead pencils
Lesson 5	decks of playing cards
	masking tape
Lesson 6	newspapers
	heavy books
	construction paper
	adhesive plastic tape
	scissors
Lesson 7	classroom globe
	Earth Science text
Lesson 8	meter stick
	adding machine tape (paper)
Lesson 9	red, blue, yellow food coloring
	white coffee filter paper
	scissors
	pencils
	clear plastic adhesive tape
	clear plastic cups (3 per team)
Lesson 10	construction paper
	sharp lead pencils
	clear plastic adhesive tape
	hole punch
	metric ruler
	flat sheets of paper
	Video: *Not So Wild a Dream*

Minority students becoming scientists, exploring the unknown, searching for cures. Available from:

Howard Hughes Medical Institute
Office of Communications
4000 Jones Bridge Road
Chevy Chase, Maryland 20815-6789

Lesson Summary

Lesson 1 Beginning of Science

Science begins when people wonder and ask questions. There is a scientist within each of us. Inducing a sense of wonder.

Lesson 2 Mayan Zero

The civilization of the Maya in Mexico created an ingenious system of numeration and invented zero. Using the Mayan numeration system.

Lesson 3 Aztec Measurement

The civilization of the Aztec in Mexico developed an elaborate system of measurement for the area of farming. Using the Aztec invention of measurement for farms.

Lesson 4 Models in Science

Human intellect demands an explanation of our existence and the world around us. Participating in making scientific models.

Lesson 5 Sor Juana Ines de la Cruz

Sor Juana lived in Mexico in the 17th century. She was a thinker, philosopher, and poet who chose to live in a convent so that she could study. Sor Juana was constrained by the officials of her era and was not free to express her thoughts publicly. Understanding constraints.

Lesson 6 Ynez Mexia

A Mexican-American who discovered that her soul was rooted in plants and became a botanical collector, contributing to the value of biodiversity in science. Preserving plants by pressing.

Lesson 7 Dr. Bernardo Houssay

The first Latin American to receive the Nobel Prize in Medicine and Physiology as a result of his study of endocrinology and the mind-body connection. Exploring the mind-body connection.

Lesson 8 Dr. Luis Alvarez

A Latino physicist who received the Nobel Prize in Physics for his invention of the hydrogen bubble chamber which allowed photographing subatomic particles. Dr. Alvarez and his son Walter are also famous for their theory about the extinction of the dinosaurs. Plotting the geological eras of living things.

Lesson 9 Dr. Eloy Rodriguez

A Mexican-American professor of biology and chemistry who became interested in the therapeutic effects of plants because of the remedies his mother and aunts used. Isolating chemicals with chromatography.

Lesson 10 Dr. Ellen Ochoa

The first Latin American woman astronaut to go into space. Her mother valued education and was her role model. Understanding the shape of the earth as seen from space.

Lesson 1: Beginning of Science

What will students be learning?

STANDARD(S)

Students understand the process of scientific investigation and design, conduct, communicate about, and evaluate such investigations. (S1)

Students understand that science involves a particular way of knowing and understand common connections among scientific disciplines. (S6)

OBJECTIVE(S)

Students will understand that controlled experiments must have comparable results when repeated.

Students will participate in the scientific way of knowing by identifying questions that emerge from wondering and experimenting.

What will be done to help students learn this?

INSTRUCTIONAL STRATEGIES

Teacher-guided discussion

Student-generated lists

Science lab procedure

ACTIVITIES

The teacher guides the students through the steps of the scientific method. Students list things they have noticed that they wonder about. Students do a science lab that is designed to elicit "why" questions.

RESOURCES/MATERIALS

reproduced copies of Lesson 1 Worksheet

phenolphtialein

sodium bicarbonate

vinegar

100-ml. beakers (3 per team)

graduated cylinder

ASSESSMENT

Informal assessment of discussion participation. Student completion of lists. Student completion of science lab and question formulation.

Lesson 1 Worksheet

Beginning of Science

From earliest times people have wondered about themselves and their surroundings. *Wondering is the beginning of science.*

The scientific method has developed over many years through the scientific thinking of many people who have lived in diverse cultures and times. The following steps describe the process of science as agreed upon by the global community of scientists:

1. Ask a question. Identify a problem to study.
2. Collect all information that may help in answering the question or solving the problem.
3. Form a hypothesis or possible solution to the problem.
4. Plan and conduct a controlled experiment or series of observations.
5. Record the data.
6. Formulate a conclusion based on the facts discovered.
7. Compare conclusions with others who have conducted the same experiment or observations.

Activity

List three things you have noticed and wondered about.

You have contacted the scientist within you when you have a question about something that you have noticed. This sense of wonder is the scientist within you.

Lesson 1 Worksheet (cont.)

Sense of Wonder

Think of a time when you noticed something that totally captivated your attention to the extent that you were *amazed* and felt a sense of *awe.* You might have been out hiking, or gazing at the night sky, or traveling, or watching the sun go down, and you could only say *"WOW!"*

These "WOW!" experiences have resulted in people representing the experience in an art form, seeking the source of the experience through the creation of religion, or seeking an explanation of the experience through science.

Activity

Write a description of a time when you were aware of your sense of awe because of your observation of something living, or in the sky, or in the water, or on the Earth. Your description should include the following:

1. When?

2. Where?

3. What sense of your body was involved in making the observation (sight, sound, smell, touch, taste)?

4. What? (If you have a difficult time putting words to the experience, perhaps making a drawing is more appropriate.)

Lesson 1 Worksheet (cont.)

Activity: Water to Juice to Water

Materials

3 100-ml. beakers
1 graduated cylinder
phenolphthalein
sodium bicarbonate
vinegar

Procedure

1. Label a beaker as No. 1. Put 20 ml. water into the beaker. Add 5 ml. of phenolphthalein.
2. Label a second beaker as No. 2. Put 20 ml. water into the beaker. Add 5 ml. sodium bicarbonate.
3. Label a third beaker as No. 3. Put 20 ml. vinegar into the beaker.
4. Empty beaker No. 1 into beaker No. 2.

   Record your results_____
5. Now pour beaker No. 2 into beaker No. 3.

   Record your results_____
6. Write a question that you have about the above procedure.

_____

_____

This is the beginning of science of the people!

Lesson 2: Mayan Zero

What will students be learning?

STANDARD(S)

Students know and understand interrelationships among science, technology, and human activity in the past, present, and future and how they can affect the world. (S5)

Students understand how science, technology, and economic activity have developed, changed, and affected societies throughout history. (H4)

BENCHMARK(S)

Students understand the impact of scientific and technological development on individuals and societies.

OBJECTIVE(S)

Students will identify the Maya civilization as an advanced civilization in the use of mathematics.

Students will participate in the mathematical numeration system of the Maya.

What will be done to help students learn this?

INSTRUCTIONAL STRATEGIES

Classroom reading

Teacher-guided class discussion

Manupulative activity

ACTIVITIES

Students use Lesson 2 Worksheet to do a mathematical activity, using manipulatives, involving the Mayan numeration system.

MATERIALS/RESOURCES

reproduced copies of Lesson 2 Worksheet

dry beans

toothpicks

pennies

ASSESSMENT

Evaluation of student participation in the manipulative activity and student response to the "Thinking Scientifically" questions.

Lesson 2 Worksheet

The Mayan Zero

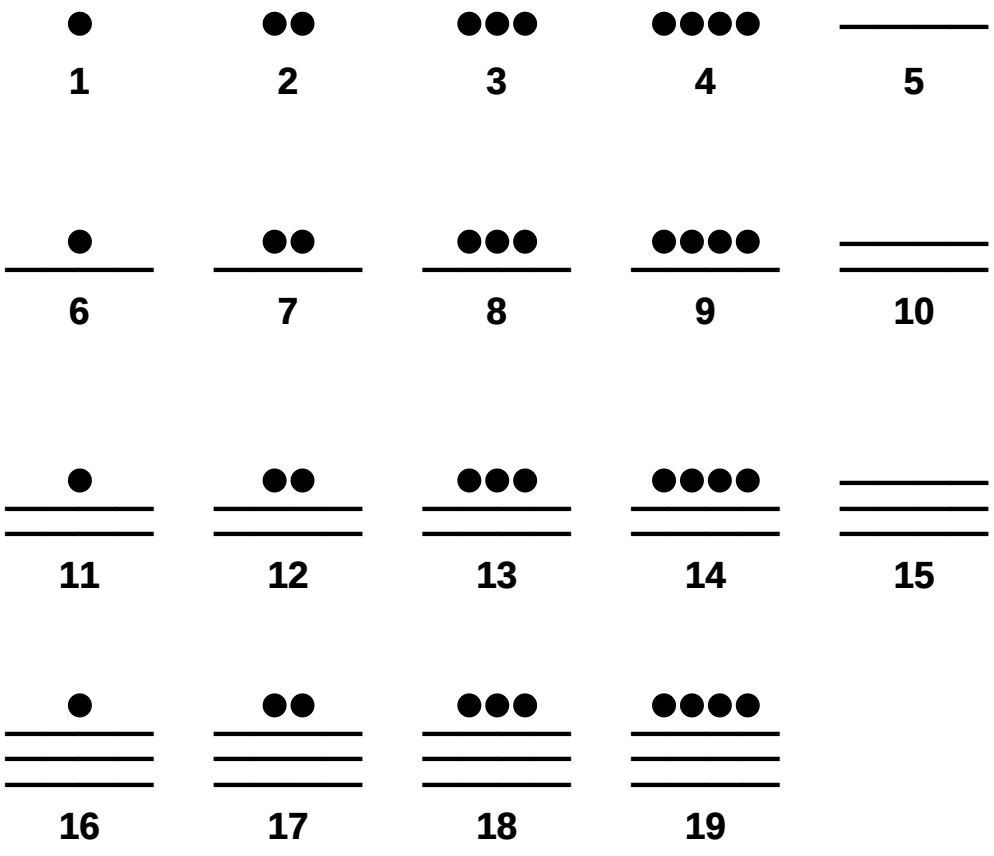
Soon after humans began walking upon the earth they began to count and tried to explain the rising and setting of the sun and phases of the moon. People learned that some plants could be used for food and for relieving sickness. These achievements marked the beginnings of scientific knowledge.

The Olmec Indians of Mexico were one of the first major civilizations in the Americas. The Olmec Indians developed a counting system and a calendar between 1200 and 100 B.C.

In the region of the Yucatan Peninsula of Mexico the Maya thrived from about A.D. 300 to 800. They were studying the motions of the sun, moon, stars, and planets from observatories. Also, they had constructed magnificent palaces and temples. The Maya advanced knowledge of mathematics and astronomy and devised a functional calendar.

An achievement of the Maya that represents a basic foundation of modern mathematics is zero. The Maya first used a zero as a place holder in representing numbers.

The Mayan numeral system was based on the number 20. Dots (•) and dashes (——) were used to write numbers.

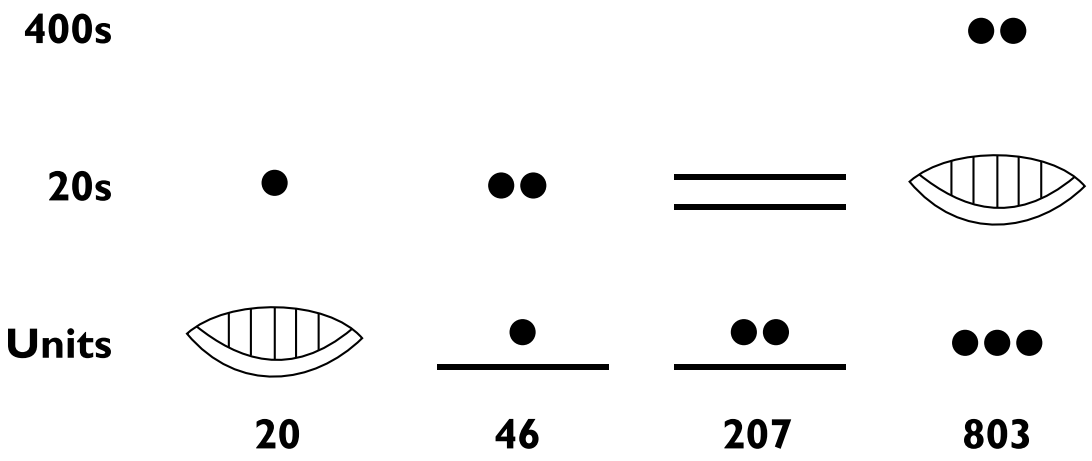


Lesson 2 Worksheet (cont.)

At the number 20, the Maya began to use the zero place holder. The symbol for zero looks something like an eye,  .

The Maya wrote their numbers in vertical columns with each row being an ascending power of 20. The power of a number is how many times the number is used as a factor in multiplying. For example, 20 to the second power is 400 (20 times 20), 20 to the third power is 8000 (20 times 20 times 20).

Here are some examples of Mayan numbers:



Write the following numbers using the Mayan number system:

	5	17	25	100	411
400s					
20s					
Units					

Lesson 2 Worksheet (cont.)

Activity: Adding with Mayan Numerals

Materials

beans

toothpicks

pennies

1. Represent the following Mayan numbers using the beans for dots, the toothpicks for dashes and the pennies for zero: 5, 10, 21, 141. Draw your representation of the numbers you made with your beans, toothpicks, and pennies.

5	10	21	141

400s

20s

Units

2. Using the beans, toothpicks, and pennies, show how you would add 141 and 248.
3. Explain, step by step, how you solved the addition problem above using the Mayan numbers.

Lesson 2 Worksheet (cont.)

The Maya recorded their astronomical observations using this system of numerals. Ruins of one group of temples in Guatemala pointed to an astronomical function. At sunrise on certain days of the year, the sun's rays passed through the temples and hit an observation point. The point where the sun's rays hit enabled the Maya to know the dates of the summer solstice and winter solstice. The summer solstice is the day of the year with the longest period of sunlight and the winter solstice is the day of the year with the shortest period of sunlight. The Maya had a solar calendar consisting of a 365-day cycle, the time it takes the earth to orbit the sun.

Thinking Scientifically

1. Why do you think the base for the Maya number system is 20?

2. How did the Maya's knowledge of the solar and lunar cycles help them develop an accurate calendar?

3. Do you think the Maya knew that the earth revolved around the sun?

Lesson 3: Aztec Measurement

What will students be learning?

STANDARD(S)
Students know and understand interrelationships among science, technology, and human activity in the past, present, and future and how they can affect the world. (S5)
Students use a variety of tools and techniques to measure, apply the results in problem-solving situation, and communicate the reasoning used in solving these problems. (M5)

BENCHMARK(S)
Students understand the structure, use of, and relationship between systems of measurement.

OBJECTIVE(S)
Students will explain the Aztec methods of measurement.
Students will calculate area of Aztec corn farms.

What will be done to help students learn this?

INSTRUCTIONAL STRATEGIES
Classroom reading
Teacher-guided class discussion
Measurement problem solving

ACTIVITIES
Students problem solve the area of Aztec corn farms on Lesson 3 Worksheet.

VOCABULARY
quahuitl Length of measurement (about 2.5 meters)

MATERIALS/RESOURCES
reproduced copies of Lesson 3 Worksheet
graph paper
rulers
measuring compass
calculators

ASSESSMENT
Teacher evaluation of classroom discussion about the Aztec civilization. Quantitative evaluation of area calculations.

Lesson 3 Worksheet

Aztec Measurement

Spanish troops entered the Aztec capital city of Tenochtitlan in 1519. The troops had not seen a city as large as Tenochtitlan because Spain did not have any city larger than Tenochtitlan. Today Mexico City is located on the site of Tenochtitlan. This grand city was constructed on an island in the middle of Lake Texcoco and had elevated roads connecting the city to the mainland. The city had temples built in the shape of pyramids.

It is estimated that the markets in Tenochtitlan had 50,000 customers each day to purchase the products of the ingenuity of the Aztec people. All this business required a system of mathematics for accounting. The Aztecs utilized the concepts of place value and the number base of 20 from the earlier Maya. But the Aztecs developed the concepts for their own culture. Farming was vital for the success of the Aztec civilization. Farmers grew corn, squash, and tomatoes. The symbol for zero was a small ear of corn.

Aztec citizens owned land and recording mathematical characteristics of the land was necessary. Records of land described boundaries, the area of the land, and the monetary value of the land. The Aztec government also required calculation of the amount of tax owed on the land. The Aztecs measured the area inside the boundaries of the property in square *quahuitls*. This was a consistent measurement for area and was used for each farm. The land was not all smooth and flat, and still the Aztecs managed to keep accurate records of the land. The following were features of the Aztec system of measurement and allowed them to make accurate calculations of the areas of their farms.

1. The Aztecs used ropes to measure. These ropes measured length in a unit called a quahuitl (about 2.5 meters).
2. The Aztecs measured area in a basic unit called the square quahuitl.
3. The Aztecs measured and recorded lengths of the sides of a field.

Lesson 3 Worksheet (cont.)

Measurement Activity

Materials

graph paper
ruler
compass
calculator

The following drawings show the measurement of 3 farms.

Make a scale drawing on graph paper using one square of the graph to represent one square quahuitl.

Estimate the area of each farm by counting the number of squares inside each scale drawing. Write your estimates on the lines provided.

Find the area of each farm using the following formulas.

Area of rectangle = length × width

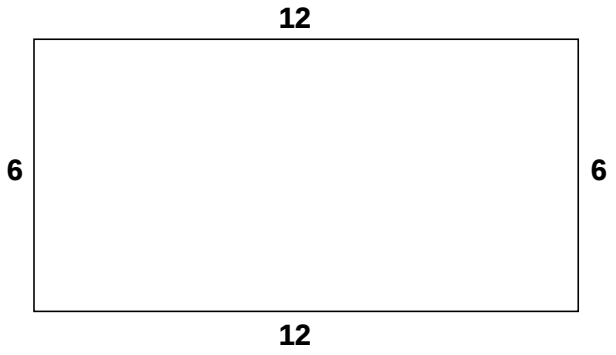
Area of triangle = ½ base × height

Farms that are not rectangular or triangular need to be divided into these figures.

Write your answers on the lines provided.

The area of the first farm is calculated as an example.

Farm 1



Area = length × width

Area = 6 × 12

Area = 72 square quahuitl

Estimate: 72 square quahuitl

Area: 72 square quahuitl

Lesson 3 Worksheet (cont.)

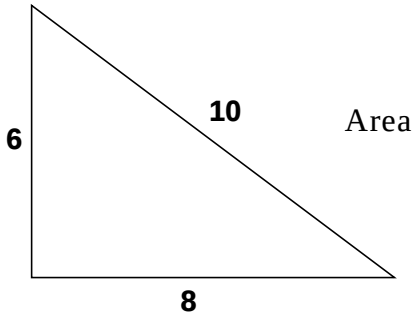
Farm 2

Area = length × width

Estimate: _____

Area: _____

Farm 3

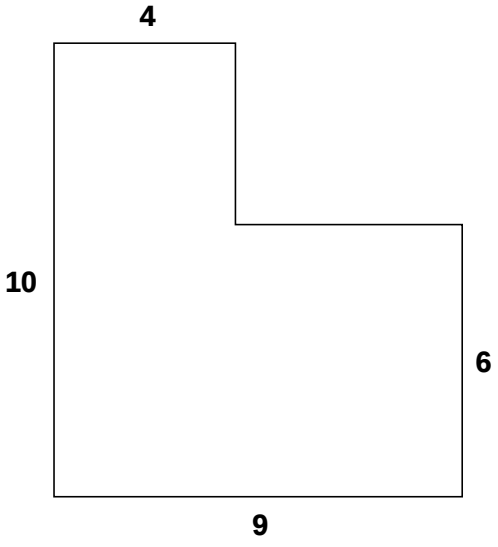


Area = ½ base × height

Estimate: _____

Area: _____

Farm 4



Estimate: _____

Area: _____

Lesson 4: Models in Science

What will students be learning?

STANDARD(S)

Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. (S4)

Students understand that science involves a particular way of knowing and understand common connections among scientific disciplines. (S6)

Students apply thinking skills to their reading, writing, speaking, listening, and viewing. (RW4)

BENCHMARK(S)

Students know and understand the general characteristics of the atmosphere and fundamental processes of weather.

Students make predictions, analyze, draw conclusions, and discriminate between fact and opinion in reading, writing, speaking, listening, and viewing.

OBJECTIVE(S)

Students will construct a scientific model.

Students will write explanations for changing seasons.

What will be done to help students learn this?

INSTRUCTIONAL STRATEGIES

Constructing a scientific model

Scientific activity of synthesizing

ACTIVITIES

Students create a model of the Earth that explains why we have changing seasons.

MATERIALS/ RESOURCES

reproduced copies of Lesson 4 Worksheet

modeling clay

flashlights

lead pencils

ASSESSMENT

Evaluation of model.

Lesson 4 Worksheet

Models in Science

Science involves thinking, observing, experimenting, discovering, and model making. A model in science is a description of a process, object, or interaction. The following model-making activity enables you to understand why we have seasons.

Activity: Building a Model

Materials

modeling clay
2 pencils
flashlight

1. Make a ball of modeling clay about the size of a tangerine. The ball represents the Earth.
2. Push a pencil through the ball of clay. The pencil represents the imaginary axis running through the Earth from top to bottom.
3. With a second pencil, mark the equator line around the center of the clay ball. This line should be halfway between the top and bottom of the ball. The top half of the ball, above the equator, is the Northern Hemisphere. The Southern Hemisphere is the area below the equator.
4. Place the ball on a desk so that the pencil eraser is leaning slightly to the right. The Earth's leaning to one side is called "tilt."
5. Darken the room. Place the flashlight about 6 inches from the left side of the ball. The flashlight represents the sun.

   Where does the light strike the ball? _____

   Is it winter or summer in the Northern Hemisphere?_____
6. Place the light about 6 inches from the right side of the ball.

   Where does the light strike the ball? _____

   Is it winter or summer in the Northern Hemisphere?_____

Lesson 4 Worksheet (cont.)

Explanation

The Northern Hemisphere is warmed the most when the Earth's axis points toward the sun. This is summer because more direct light rays hit the area.

The Southern Hemisphere receives the warming direct light rays when the Earth's axis points away from the sun. The direction of the Earth's axis changes very little during the Earth's movement around the sun, causing the Southern and Northern Hemispheres to receive different amounts of light rays. This results in changing seasons.

You have made a model to explain how we have a change of seasons. Science makes models to explain something that occurs.

Based on what you have learned from building a model, construct *your* written explanation about why we have seasons.

Lesson 5: Sor Juana Ines de la Cruz

What will students be learning?

STANDARD(S)

Students know that religious and philosophical ideas have been powerful forces throughout history. (H6)

Students apply thinking skills to their reading, writing, speaking, listening, and viewing. (RW4)

BENCHMARK(S)

Students know how societies have been affected by religions and philosophies.

Students, use reading, writing, speaking, listening, and viewing to gather data, define the problem, and apply problem-solving skills.

OBJECTIVE(S)

Students will know about Sor Juana Ines de la Cruz of Mexico.

Students will identify the concept of constraints.

Students will construct a structure under constraining conditions.

Students will participate in a decision-making activity.

What will be done to help students learn this?

INSTRUCTIONAL STRATEGIES

Teacher-guided discussion

Activity using constraints

ACTIVITIES

Students read about Sor Juana Ines de la Cruz; analyze the constraints in her life; and engage in structure building and decision making activities involving constraints.

RESOURCES/MATERIALS

reproduced copies of Lesson 5 Worksheet

decks of playing cards

masking tape

ASSESSMENT

Evaluation of classroom discussion participation. Evaluation of student participation in construction of structure with cards.

Lesson 5 Worksheet

Sor Juana Ines de la Cruz (1648–1695)

Sor Juana Ines de la Cruz lived in Mexico 150 years after the fall of Tenochtitlan. She was a thinker, a philosopher, and an influential poet. Sor Juana was a nun, lived in a convent, and devoted her life to studying and writing. Sor Juana thought scientifically and her small room in the convent contained scientific instruments. For a woman to be a thinker and to publicly express her thoughts at that time in history was very courageous.

Sor Juana was born Juana Ines Ramirez, the daughter of her single mother Isabel Ramirez. Juana's father abandoned her mother when Juana was a small child. Juana's grandfather was well-educated, owned many books, and read a lot. In writings by Sor Juana, she mentions her grandfather's many books and her passion for reading them. When Juana was about eight, she was sent to Mexico City to live with her aunt, her mother's sister, the wife of wealthy Juan de Mata. Juana grew into a beautiful young woman, with great intelligence. Probably Juana did not have a formal education because girls were not educated in schools at that time. She was mostly self-educated and learned because of her own curiosity and intellect. Since her aunt and uncle were wealthy and socially prominent, they arranged for Juana to move into the palace of Vicereina, Dona Leonor Carreto, the Marquise de Mancera. Juana was about 15 years old when she moved into the palace. She waited on the Marquise de Mancera, studied, wrote poetry, and became popular because of her beauty, wit, and learning. Juana left the palace to become a nun. Since Juana had not been a very religious person before entering the convent, her decision was probably because of the way of life available in the convent. At that time in Mexico, there were few choices available to her since her father had disappeared and she had no dowry to arrange for a good marriage. She has been quoted as saying that she was not interested in marriage and that the convent life was suitable to pursuing her studies and reading her books. Because she wrote a letter containing a critical analysis of a sermon given by a priest, Juana was reprimanded by the Archbishop of Mexico. Eventually she was required by the Archbishop to turn over her books and scientific instruments. Sor Juana was a brilliant and immensely talented woman who has demonstrated that women have a place in the world—in the world of literature and the world of science.

Lesson 5 Worksheet (cont.)

Science can be used to solve problems. A characteristic of life is the presence of problems. Each living organism, in order to survive and to reproduce, faces a unique set of problems. Human beings must overcome unique problems in order to achieve personal fulfillment. Human problems can be referred to as *constraints.* A constraint provides parameters of activity. Constraints impose conditions about what we can do and what we can not do to accomplish what we want.

List three constraints that Sor Juana had:

_____

_____

_____

Activity: Decision-Making with Constraints

Your task is to construct a free-standing structure that is as tall as possible. You may use only a deck of playing cards and masking tape to build the structure.

Identify the constraints:

_____

_____

_____

Identify alternative ways to accomplish your task without the constraints:

_____

_____

_____

Identify alternative ways to accomplish your task with the contraints:

_____

_____

_____

_____

_____

Lesson 5 Worksheet (cont.)

Making decisions involves deciding what we want, identifying the constraints, and identifying a variety of ways to accomplish the task given the constraints. Decision making is thinking scientifically.

Identify two decisions Sor Juana made:

We have to make decisions every day. We decide what to wear for the day, what to eat. Perhaps your friends want you to go to the mall instead of going to school. Sometimes decisions are very important and influence our lives. What do you do when you have to make an important decision? Identify an important decision you have made. Then write down what you did to help you make the decision.

A decision I have made was:

I did these things to help me make the decision:

Lesson 6:Ynez Mexia

What will students be learning?

STANDARD(S)

Students understand the process of scientific investigation and design, conduct, communicate about, and evaluate such investigations. (S1)

Students know and understand the characteristics and structure of living things, the process of life, and how living things interact with each other and their environment. (S3)

Students apply thinking skills to their reading, writing, speaking, listening, and viewing. (RW4)

BENCHMARK(S)

Students know and understand the characteristics of living things, the diversity of life, and how living things interact with each other and with their environment.

Students use reading, writing, speaking, listening, and viewing to gather data, define the problem, and apply problem-solving skills.

OBJECTIVE(S)

Students will understand the passion of a Latina woman for plants and how she contributed to protecting biodiversity.

Students will perform the botanical activities that Ynez Mexia did.

What will be done to help students learn this?

INSTRUCTIONAL STRATEGIES

Class reading

Responding to written critical thinking questions

Botanical science activity

ACTIVITIES

Read about Ynez Mexia and collect and prepare pressed plant specimens.

RESOURCES/MATERIALS

reproduced copies of Lesson 6 Worksheet

newspaper sheets

heavy books

construction paper

self-adhesive plastic tape

scissors

available living plants in the vicinity

ASSESSMENT

Assessment of response to “Thinking Scientifically” questions and participation in pressed plant specimen activity.

Lesson 6 Worksheet

Ynez Mexia (1870–1938)

Ynez Mexia was a Mexican-American botanical collector who collected over 100,000 plant specimens on plant collecting trips to Mexico, South American and Alaska. Ynez loved nature and thrived on adventure.

Ynez had an unhappy childhood. She was born in Washington, D.C., where her father was an agent for the Mexican government. She spent much of her childhood separated from her father. Ynez lived with her mother, Sarah Wilmer Mexia, and her six brothers and sisters in Texas, Pennsylvania, Canada, and Maryland. She lived in Mexico City from age 18 to 28 on her father's hacienda which she inherited after her father died. A hacienda is a large tract of land in a Spanish-speaking country. Ynez married in 1897 and became a widow seven years later. She started a business raising poultry while she continued to live at the hacienda. She remarried, was unhappy, divorced, sold her business and moved to California. In California Ynez became a social worker. Still she was not happy. She spent much time being alone and reading books.

At the age of 50, Ynez joined the Sierra Club, an organization that works to protect wilderness areas. She went on nature trips with the organization and discovered her passion for plants. Ynez felt with her soul was rooted in plants. She had discovered the scientist within her. She took botany classes at the University of California in Berkeley. She signed up for a plant collecting trip in 1925 to western Mexico. This trip changed her life. From that time on she devoted her life to plant collecting. She had discovered what she loved to do. Ynez traveled with guides from the local areas and went into places where other scientists had never gone before. She collected many unstudied plant species. The variety of plants Ynez found exemplified the biological diversity in the world. Her plant collections have become part of the collections of museums and universities in Latin America and the United States.

Ynez began her collecting trips by traveling on horseback. She took many photographs as she collected plants. Her photographs showed plants in their natural environments and were valuable to other scientists. While Ynez explored the rugged mountains between Tuxpan and Puerto Vallarta, she would often stay at the homes of the local people. She would inquire about the names that the local people had for the plants in their area. In the volcanic mountain area of Cruz de Vallarta, the local people showed Ynez a tall plant with small, pale-green leaves and tiny, green flowers. The people said the plant was a remedy for the bite of the poisonous insect called the *arloma.*

The local people called the plant *hierba de arloma.* Since this plant had never been cataloged, it was named *Euphorbia mexiae* in Ynez's honor. Living things are given two names when they are scientifically classified. The first name (Euphorbia) is the name of the genus and the first letter is written with a capital letter. The second name (mexiae) is the species name and the first letter is written in a small letter. Ynez traved to Alaska in 1928 to collect specimens on Mt. McKinley. She collected over 6,000 specimens during this short summer trip. A year later, she went to Brazil to collect specimen in Minas Gerais

Lesson 6 Worksheet (cont.)

for the College of Agriculture. While in Brazil Ynez organized a trip up the Amazon River. She went into Peru. With horses and guides she had hired for the trip, she explored the area around the Rio Maranon, a large river that feeds into the Amazon. Ynez collected 65,000 plant specimens from the Amazon. She was stranded in the area for three months because of the rainy season and used the time to explore the area by canoe, collecting speciment of small birds, insects, and plants. Ynez Mexia had a career in botany that lasted only 12 years, until her death in 1928. Yet in those 12 years, Ynez Mexia made a significant contribution to the understanding of plants and biological diversity.

Thinking Scientifically

1. In addition to collecting plants on her trip, Ynez took many photographs. What information could a scientist be able to gather from these photographs?

2. Ynez recorded the common names that local people gave to plants. Why do you think this was importatant?

3. Why do you think Ynez brought back 65,000 plant specimens from the Amazon and only 6,000 from Alaska?

4. One of Ynez's adventures was exploring the Amazon River. She sold her plant specimens to university and museum scientists. With the sale of her specimens, Ynez paid her living and traveling expenses. She had created a career that combined her love of plants and her thirst for adventure. What would be a great adventure for you?

Lesson 6 Worksheet (cont.)

Activity: Pressing Plants

Materials:

newspaper sheets
heavy books
construction paper cut into strips about 2" by 6"
self-adhesive plastic cut into strips ½" larger than the paper strips
scissors

1. Go on a nature hike and select one or two plants to press. (Guideline: pick a flower only if many of the same kind are present.)
2. Get newspaper sheets. Write you name on the folded newspaper sheets.
3. Place your plants inside the newspaper sheet. Leaves and petals should be facing up.
4. Fold the sheets very carefully.
5. Place the sheets in a stack.
6. Add heavy books on top of the stack of newspaper sheets.
7. Wait 3 to 5 days.
8. Remove the books.
9. Get scissors, strips of construction paper, strips of self- adhesive plastic, and newspaper sheets containing the pressed plants.
10. Open your newspaper carefully.
11. Remove the pressed plants and place on a strip of construction paper.
12. Very gently place the plastic adhesive sticky-side down over the flower and onto the strip of construction paper.
13. Trim the plastic with the scissors.

You have preserved plant specimens just like Ynez Mexia preserved over 100,000 specimens.

Lesson 7: Dr. Bernardo Houssay

What wil students be learning?

STANDARD(S)

Students know and understand the characteristics and structure of living things, the process of life, and how living things interact with each other and their environment. (S3)

Students apply thinking skills to their reading, writing, speaking, listening, and viewing. (RW4)

BENCHMARK(S)

Studetns know and understand how the human body functions in health and disease and factors that influence its structures and functions.

Students make predictions, analyze, draw conclusions, and discriminate between fact and opinion in reading, writing, speaking, listening, and viewing.

OBJECTIVE(S)

Students will know about the contribution of Dr. Bernardo Houssay in endocrinology.

Students will illustrate their knowledge of the location of specific glands in the human body.

Students will understand the connection of sugar diabetes to the pancreas gland.

What will be done to help students learn this?

INSTRUCTIONAL STRATEGIES

Guided class reading

Guided scientific thinking questions

ACTIVITIES

Read about Dr. Bernardo Alberto Houssay, label an anatomical diagram, and complete guided scientific thinking questions and activities.

MATERIALS/RESOURCES

classroom world globe

reproduced copies of Lesson 7 Worksheet

ASSESSMENT

Evaluation of the labeled anatomical diagram and the responses to the “Thinking Scientifically” questions.

Lesson 7 Worksheet

Do you know someone who has “sugar diabetes”?

Describe your current understanding of what diabetes is?

Locate, on the classroom globe, the country of Argentina in South America.

Sketch South America below and label Argentina as well as its capitol, Buenos Aires.

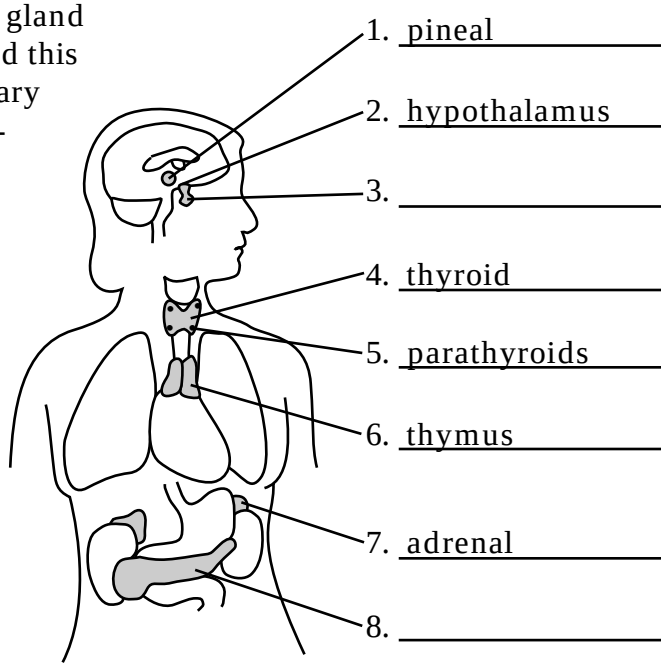
Dr. Bernardo Alberto Houssay (1887–1971)

The first Latin American to win the Nobel Prize for Medicine and Physiology was Dr. Bernardo Alberto Houssay. Nobel Prizes are awarded each year in six different fields to persons who have made valuable contribution to the "good of humanity." The awards and selection of recipients of the awards are administered by academies in Sweden.

Dr. Houssay was born in Buenos Aires, Argentina, in 1887. When he was a child, he excelled in his studies. He graduated from the School of Pharmacy at the University of Buenos Aires, then enrolled in medical school, graduating at age 23. Dr. Houssay taught medicine and focused on research in the fields of physiology, biochemistry, and pharmacology. He achieved fame for his work in endocrinology. Endocrinology is the study of the body's system of endocrine glands which secrete hormones that chemically control the body. Dr. Houssay's best known work is his study of the role of the pituitary gland in the disease *diabetes mellitus.* People who have the disease diabetes mellitus have abnormal amounts of a simple sugar—glucose—in their blood and urine. This high level of glucose in the blood is caused by not having enough or inadequate use of a hormone called insulin. Insulin causes the body's cells to take in glucose. Diabetes mellitus is not curable, but the condition can be treated and controlled. People who have diabetes mellitus follow a carefully balanced diet and take insulin to maintain a stable level of sugar in their blood.

Diabetes has been known since ancient time by scientists of several continents. "Mellitus" is a Greek word for "honeyed" because of the sweetness that ancient scientists noticed in the urine. European scientists had discovered that the pancreas was the source of a chemical that controlled the amount of sugar in the blood. This chemical was later to be known as insulin. Dr. Houssay, in the 1930s, discovered that removing the anterior lobe of the pituitary gland helped people with diabetes. He discovered this by removing the anterior lobe of the pituitary gland of dogs. We know now that a chemical produced by the pituitary gland produces hormones that control many other endocrine glands.

On the diagram, label gland 3 the "pituitary gland." Label gland 8 the "pancreas."



Lesson 7 Worksheet (cont.)

Thinking Scientifically

The pituitary gland is referred to as the "master gland." Why do you think the pituitary gland is a master gland?

What are some symptoms that a person with diabetes might have when sugar builds up in the blood because it is not taken into the body's cells?

Dr. Houssay worked to develop scientific organizations and journals in Argentina and was a founder of the Argentine Association for the Advancement of Science. He spent a lifetime working to advance science in Argentina and died at the age of 84 in Buenos Aires.

Why do you think scientific organizations and scientific journals are important in science?

Lesson 7 Worksheet (cont.)

Dr. Houssay was a pioneer in the study of endocrinology. The scientific field of endocrinology has ushered in the understanding of the mind-body interaction. This understanding went beyond the European belief that the mind and body are separate. With further scientific understanding of the glands of the human body, the interconnection of all body systems became evident. For example, the hypothalamus is a part of the brain that connects the brain with the pituitary gland. The hypothalamus is part of the nervous system and hormones from endocrine glands act on the hypothalamus. It is the center for emotions. Also, the hypothalamus is the control center for vital body functions such as heartbeat and breathing. Our emotions can change the activity of our glands. Likewise, our glands secrete hormones that influence our emotions and nervous system.

Give some examples of internal (body) symptoms when you have been quite **angry.**

1. _____
2. _____
3. _____

Give some examples of internal (body) symptoms when you have been **afraid.**

1. _____
2. _____
3. _____

Lesson 8: Dr. Luis Alvarez

What will students be learning?

STANDARD(S)

Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. (S4)

Students read and understand a variety of materials. (RW1)

BENCHMARK(S)

Students know and understand the composition of Earth, its history, and the natural processes that shape it.

Students make connections between prior knowledge and what they need to know about a topic before reading about it.

OBJECTIVE(S)

Students will know the scientific contributions of Dr. Luis Alvarez.

Students will construct a timeline for the presence of living things on the Geologic Time Scale.

What will be done to help students learn this?

INSTRUCTIONAL STRATEGIES

Guided reading

Guided scientific thinking

Construction of timeline

ACTIVITIES

Construct a timeline on the Geologic Time Scale for the presence of living things.

MATERIALS

reproduced copies of Lesson 8 Worksheet

Earth Science text

meter stick

adding machine tape (paper)

ASSESSMENT

Assessment of timeline and student response to "Thinking Scientifically" questions.

Lesson 8 Worksheet

Luis Alvarez (1911–1988)

Luis Alvarez won the Nobel Prize for Physics in 1968. He was born in San Francisco, California in 1911 and was the son of a doctor. Luis Alvarez graduated from the University of Chicago with a Bachelor of Science degree in 1932, a Master of Science degree in 1934, and a Ph.D. degree in 1936. He worked in the field of physics, the science that studies energy in all its forms. Dr. Alvarez built his career on the knowledge that matter, or mass, is one of the forms in which energy manifests itself. This says that everything that exists is energy. We call slower forms of energy "matter" and faster forms "energy." Dr. Alvarez designed a landing system for aircrafts during World War II as well as a radar system for locating planes. His selection for the Nobel Prize was for his development of the hydrogen bubble chamber, used to detect subatomic particles. This research led to the identification of over 70 elementary particles and resulted in changing the understanding of the activities of the atom.

Dr. Alvarez and his son, Walter, a geologist, proposed a theory in 1980 that an asteroid or comet crashed into the Earth at the end of the age of the dinosaurs. The theory says that because of the impact of the asteroid or comet, the dinosaurs died out and became extinct. This theory has received attention because two U.S. Geological Survey scientists have located a 25-mile-wide crater in Iowa. These scientists believe this could be the site where an asteroid or comet crashed into Earth 65 million years ago causing the extinction of dinosaurs. According to the Alvarez theory, the impact sent so much dust into the atmosphere that sunlight was blocked and temperatures became quite cold. As a result, plants withered and animals froze to death or starved. This mass extinction of the dinosaurs occurred at the end of the Cretaceous period, 65 million years ago.

Activity: Timeline

The scientific estimation of the beginning of Earth is 4.6 billion years ago. Using an Earth Science textbook, make a timeline indicating on the geologic time scale the presence of living things.

1. Using a meter stick, draw a continuous horizontal line across the middle of a 5-meter length of adding-machine paper.
2. Use a scale in which 1 meter represents 1 billion years. Therefore, each millimeter represents 1 million years.
3. At the right end of the adding-maching tape, draw a vertical line and label it "The Present."
4. Measure the place on the tape that represents 4.6 billion years ago. Label this place as "Earth's Beginning."
5. Using the table on the next page, plot each event on your timeline. Write the name of the event and the number of years ago it occurred.

Lesson 8 Worksheet (cont.)

Event	Estimated Years Ago
Earliest evidence of life	3.5 billion
Paleozoic Era starts	590 million
First land plants	400 million
Mesozoic Era starts	248 million
First dinosaurs	200 million
Cretaceous period begins	144 million
Dinosaurs become extinct	65 million
Cenozoic Era starts	65 million
Earliest evidence of primates	55 million
Earliest evidence of humans	200,000

Thinking Scientifically

What is the connection in Alvarez's theory between the asteroid or comet crashing into Earth and the extinction of the dinosaurs?

Lesson 9: Dr. Eloy Rodriquez

What will students be learning?

OUTCOME(S)

Students understand the process of scientific investigation and design, conduct, communicate about, and evaluate such investigations. (S1)

Students know and understand the characteristics and structure of living things, the process of life, and how living things interact with each other and their environment. (S3)

Students understand that science involves a particular way of knowing and understand common connections among scientific disciplines. (S6)

BENCHMARK(S)

Students know and understand how the human body functions in health and disease.

OBJECTIVE(S)

Students will know about the scientific contributions of Dr. Eloy Rodriquez.

Students will participate in doing chromatography.

Students will contrast herbal remedies and pharmaceutical remedies.

What will be done to help students learn this?

INSTRUCTIONAL STRATEGIES

Teacher-guided classroom reading

Teacher-guided response to scientific questions

Chromatography activity

PREPARATION

For each team, prepare 3 plastic cups by (1) filling each cup with 3 tablespoons of water and (2) putting 3 drops of red and blue food coloring into one cup, 3 drops of red and yellow in another cup, and 3 drops of red, blue, and yellow in another cup.

ACTIVITIES

Students read about Dr. Eloy Rodriquez, answer scientifc questions, and do an activity involving chromatography.

Lesson 9 (cont.)

MATERIALS

reproduced copies of Lesson 9 Worksheet
red, blue, yellow food coloring
white coffee filter paper
scissors
pencils
clear plastic adhesive tape
clear plastic cups (three 8-oz. cups per team)
tablespoon

ASSESSMENT

Assessment of student response to “Thinking Scientifically” questions. Evaluation of student participation in chromatography activity.

Lesson 9 Worksheet

Dr. Eloy Rodriquez

Dr. Eloy Rodriquez is a Mexican-American professor of biology and chemistry. He grew up in a poor area of Hildago County, Texas. Neither his father nor his mother was able to complete the seventh grade. Eloy's childhood was filled with the love of his Hispanic extended family, and his early exposure to science was through his family solving problems in their daily lives. He would capture tarantulas with his grandfather on the farm and his aunts would treat illnesses with herbs they had collected. His family believed that education was important and Eloy overcame the constraints of poverty by pushing himself to excel in his studies. To pay for college, he worked at a car plant and did janitorial work. Eloy became fascinated with the chemistry of plants. He began to use the scientific method to understand what his aunts understood through folk medicine.

In 1976, Dr. Rodriquez became the first natural plant biologist at the University of California-Irvine. The use of herbs to treat many different illnesses indicates that there are medically effective chemicals in plants. Examples of herbs are mint, oregano, cinnamon bark, chamomile, and yerba buena.

An anthropologist in the 1970s watched a chimpanzee pick leaves off a bush, roll them around in its mouth, and swallow them. What was unusual about this was that chimpanzees do not ordinarily chew leaves. The anthropologist saw other chimpanzees eat the same kind of leaves. The chimpanzees were suffering from vomiting and diarrhea and these symptoms ceased after eating the leaves. The anthropologist came to Dr. Rodriquez to ask the question: what substance was in the leaves that caused the chimpanzees to eat them? In his laboratory Dr. Rodriquez developed an answer. The leaves that the chimpanzees had eaten were from a sunflower shrub. From these leaves, Dr. Rodriquez isolated the medicinal chemical Thiarubrine-A, which is a chemical effective against plant and animal parasitic worms and fungi. The Thiarubrine-A has antibiotic properties. When a chemical such as Thiarubrine-A is isolated from a plant, it can be a model chemical for a pharmaceutical company to create artificially in a lab. Usually drugs produced artifically are stronger than chemicals found in nature. Dr. Rodriquez has observed that nature does not usually produce strong toxic chemicals. However, Dr. Rodriquez warns that just going out and picking herbs for medicine is not a good idea.

Dr. Rodriquez prefers to test plants that have been collected from the desert. Many of the plants from the desert have medicinal value. One in particular, the creosote bush, has over 1,000 chemicals potentially useful for medical purposes. Dr. Rodriquez worries that the plants in the desert will not survive. If they do not survive, we will never know about their medical benefits, as well as their potential as sources of food, oil, rubber, and natural pesticides.

Lesson 9 Worksheet (cont.)

Thinking Scientifically

What are remedies your family has for ailments such as cold, flu, sore throat, headache, indigestion, wound, or burn? List these remedies and explain how they are used.

Some people think herbal remedies are better for you than pharmaceuticals from the drug store.

What are some arguments for this point of view?

What are some arguments against this point of view?

What problems could people have if they take herbs for medicine without medical advice?

Lesson 9 Worksheet (cont.)

Activity: Isolating Chemicals with Chromatography

Dr. Eloy Rodriquez isolates chemicals from plants to determine what substances have a therapeutic effect. One way chemists can separate out chemicals is by a process called chromatography. In this activity you will try to figure out what is in a mixture by using chromatography.

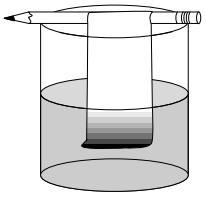
Materials

white coffee filter
metric ruler
scissors
3 pencils
clear plastic tape
three 8-oz. clear plastic cups
tablespoon

Your task is to determine which cup contains which food coloring.

Procedure

1. Take an unused coffee filter and cut three strips about 10 cm. long and about 2 cm. wide.
2. Label your cups #1, #2, and #3.
3. Wrap one end of a strip around a pencil and lower the other end so that it extends about ½ cm. into the water.
4. Tape the filter paper to the pencil and place the pencil on the rim of the cup.
5. Repeat steps 3 and 4 for your other cups.
6. Watch as the water and food coloring move up the filter paper.
7. Which cup contains which food coloring?
8. Record your results:



cup #1_____

cup #2_____

cup #3_____

Lesson 10: Dr. Ellen Ochoa

What will students be learning?

STANDARD(S)

Students understand the process of scientific investigation and design, conduct, communicate about, and evaluate such investigations. (S1)

Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space. (S4)

BENCHMARK(S)

Students know the structure of the solar system, composition and interactions of objects in the universe, and how space is explored.

OBJECTIVE(S)

Students will know about the achievements of Dr. Ellen Ochoa, a Latina astronaut.

Students will conduct an earth science investigation.

What will be done to help students learn this?

INSTRUCTIONAL STRATEGIES

Teacher-directed reading

Teacher-directed scientific response questions

Earth science investigation

ACTIVITIES

Students read about Dr. Ellen Ochoa, answer scientific questions, and do an earth science activity. Students watch a video and write about the dreams they have for themselves.

MATERIALS

reproduced copies of Lesson 10 Worksheet

construction paper

sharp lead pencil

adhesive tape

hole punch

scissors

metric ruler

sheets of paper

Not So Wild a Dream (video)

ASSESSMENT

Assessment of student response to "Thinking Scientifically" questions. Teacher evaluation of student participation in earth science investigation.

Lesson 10 Worksheet

Ellen Ochoa (1958–)

The National Aeronautics Space Administration (NASA) selected Ellen Ochoa to become an astronaut in 1987. Ellen was born in Los Angeles, California to Rosanne and Joseph Ochoa, both of Mexican descent. Her parents were divorced when she was in middle school. Ellen has three brother and one sister, and she grew up in a close-knit family. Ellen's mother instilled in her daughter at an early age a high value on education. Her mother insisted that her children go to college. Ellen's mother pursued her value of education by taking college courses for twenty-three years and finally receivng her degree with three majors, in business, biology, and journalism. Ellen Ochoa became as dedicated to her school work as her mother and did quite well in math and science. She was the valedictorian of her class at Grossmont High School in La Mesa and at San Diego State University where she earned a Bachelor of Science degree in physics. After earning her bachelors degree, Ellen went to Stanford University where she earned a masters degree in electrical engineering. Then she earned a doctorate degree in electrical engineering. She applied and was admitted into the NASA space program. She worked as a research engineer and was chosen by NASA to enter the astronaut training program. Her training was at the Johnson Space Center. Upon completing her training, Ellen Ochoa became the first Latin American female astronaut. Ellen Ochoa became the first Latin American woman in space during a nine-day mission aboard the shuttle *Discovery*. Ellen Ochoa's achievements were recognized in 1989 when she was awarded the Hispanic Engineer National Achievement Award for most promising engineer in government. In 1990, she was given the Pride Award by the National Hispanic Quincentennial Commission in Washington, D.C. In 1993, she received the Congressional Hispanic Caucus Medallion of Excellence. Ellen Ochoa makes numerous public speeches and she has stated that being a role model for Latin America children is one of her top priorities. She believes in the value of education and hopes that young Latin American youth will see a bit of themselves in her.

Thinking Scientifically

Ellen Ochoa's mother took college courses for twenty-three years before she earned her bachelors degree. What influence do you think this had on Ellen?

What traits of Ellen Ochoa enabled her to become an astronaut?

Lesson 10 Worksheet (cont.)

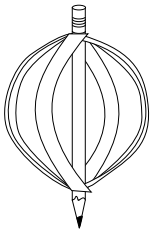
Activity: The Bulging Earth

Materials

construction paper
sharp lead pencil
adhesive tape
hole punch
scissors
metric ruler
sheet of paper

Procedure

1. On construction paper, measure two strips measuring 3 cm. by 40 cm.
2. With scissors, cut out the two strips of construction paper.
3. Make a mark at the center of each strip.
4. Cross the strips where you made the mark and tape them together.
5. Overlap the four loose ends and tape them together.
6. Make a hole in the center of each end where the strips overlap with the hole punch.
7. Push the pencil through the holes in each end, like this:



8. Holding each end of the pencil, roll the pencil. Notice what happens to the equator and the poles.
9. Record your observations of the equator and the poles here.

   Equator _____

   Poles _____

10. Adjust the strips of paper so that they once again form a sphere.
11. Place a sheet of paper on a flat surface.
12. Place the tip of the pencil on the paper. Twirl the pencil. Observe the equator and the poles. Record your observations here:

    Equator _____

    Poles _____

The Bulging Earth (cont.)

Scientific Analysis

1. What does the sphere represent ?

2. What does the twirl of the pencil represent ?

3. Explain what happens at the equator when the pencil is twirled.

4. Explain what happens at the poles when the pencil is twirled.

View the video *Not So Wild a Dream*. After viewing the video write a paragraph describing a dream you have for yourself.

Unit Assessment

PERFORMANCE TASK

Many cultures and scientific thinkers have contributed to the development of the scientific method. In this unit we have learned about the contributions of Latino cultures and Latino scientists to the scientific understandings of our time.

1. Select two cultures, two scientists, or a culture and a scientist in this unit that was specifically interesting to you.
2. Write a short paragraph describing the scientific contribution of the culture and / or scientist.
3. In the second paragraph, connect the contribution of the culture and / or scientist with at least one of the steps of the scientific method as presented in Lesson 1. This means that you explain what the culture or scientist did that is now a part of the scientific method.
4. In the third paragraph, write at least two ways you are like the people of that culture or you are like the scientist.

SCORING RUBRIC

4. Student selected two cultures, two scientists, or a culture and a scientist. Student named the selection and accurately wrote the scientific contribution. Student completely wrote the step of the scientific method that his / her selection worked with and described the activity of the selection. There is a clear connection to what the culture / scientist did and the step of the scientific method. Student wrote at least two ways that the student is like the selection.
3. Student selected two cultures, two scientists, or a culture and a scientist. Student named the selection and accurately wrote the scientific contribution Student wrote the step of the scientific method that his / her selection worked with. Student wrote at least two ways that the student is like the selection.
2. Student selected two cultures, two scientists, or a culture and a scientist. Student named the selection and wrote the scientific contribution. Student's step of the scientific method did not match the activity of the selection. Student named at least one way that the student is like the selection.
1. Student selected two cultures, two scientists, or a culture and a scientist. Student did not accurately write the scientific contribution. Student's step of the scientific method not named or did not match the activity of the selection. Student did not list a way that the student is like the selection.

OPTIONAL ASSESSMENT ACTIVITY

As a class, students will participate in the Bingo of the People of Science activity. Assess by reviewing the Bingo sheets for completion of squares with student signatures.

Bingo of the People of Science

Directions: Each student is allowed to sign the Bingo Grid once. The object is to have a signature in each square.

Like Sor Juana, I like to write poetry.	Like the Maya, I notice the time of daylight.	Like Luis Alvarez, I wonder why the dinosaurs became extinct.	Like Eloy Rodriquez, my mother gave me plant-derived remedies for illness.	Like Ynez Mexia, I am fascinated by different plants.
I have a hypothesis about the water to juice activity in Lesson 1.	Like the Maya, I use a calendar to organize my life.	Like Sor Juana, I like to be alone sometimes to read and to think.	Like the Aztec, I measure area within boundaries.	Like Luis Alvarez, I am interested in physics.
Like Bernardo Houssay, I am fascinated with the human body.	Like Eloy Rodriquez, I have lived in Texas.	**La Raza de Ciencia**	Like Sor Juana, I want to make my own decisions.	Like Ellen Ochoa, I was born in California.
Like Ellen Ochoa, my mother insists on the importance of education.	Like Bernardo Houssay, I want cures for people who have disease.	Like Eloy Rodriquez, I am interested in the desert.	Like Ynez Mexia, I like to take photographs.	Like a scientist, I wonder about things.
Like Ellen Ochoa, I am fascinated with space travel.	Like Ynez Mexia, I wonder what I really want to do with my life.	Like a scientist, I enjoy making models.	Like Eloy Rodriquez, I worry about plants becoming extinct.	Like all these Latino scientists, I like science.

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An excellent resource for involvement of students in science activities related to women in science.

Internet:

Dartmouth University has a web site dedicated to Sor Juana Ines de la Cruz.
http://www.dartmouth.edu~sorjuana

About the Author

Dorotha Hogue was born and grew up in Meade, Kansas, and graduated from the University of Kansas with a Bachelor of Science degree. She is a registered nurse. Dorotha has lived in Colorado since 1969 and studied at the University of Colorado in the science teacher education program. She attended the University of Denver, Iliff School of Theology for her Masters Degree.

Dorotha has served the Denver Public Schools since 1984 at The Florence Crittenton School, the teen parent program within Denver Public Schools. She took the position of Education Coordinator for the teen parent program and is now full time in the classroom as a science teacher.

In 1992 Dorotha was selected for an Eleanor Roosevelt Teacher Fellowship. The Board of Education of Denver Public Schools awarded Dorotha the recognition of Outstanding Contribution to the Children of Denver in 1993. She was Colorado Teacher of the Year Honoree in 1993. Dorotha's aim of education for her students is personal fulfillment, social cooperation, and ecological responsibility.