

Second Opinion

INTEGRATED
CURRICULUM UNIT
ON COMPLEMENTARY
AND ALTERNATIVE
MEDICINE



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Second Opinion

UNIT OVERVIEW

Essential Question for This Unit

How can we ensure the safety and effectiveness of complementary and alternative medicine (CAM)?

Unit Summary

In this unit, students will explore the variety of medical practices that exist outside of conventional Western medicine. Complementary and alternative medicine, known as CAM, is becoming more widely accepted in the United States as our population becomes more diverse. At the same time, scrutiny of these practices, some of which are not subject to any regulatory oversight, is an issue that becomes increasingly pressing for the healthcare industry, healthcare workers, and the general public.

In Subunit 1, students are introduced to the various types of practices that fall within the description of CAM. Students discuss their own experiences with family-administered medical care and classify their practices into the five categories of CAM. They study the origins of CAM practices, both general and specific, in Geography, English Language Arts, and Spanish. Also, in Geography, students trace the means by which local medical knowledge and practices are dispersed to other regions of the world. As cultures mix, fundamental beliefs about healthcare can come into conflict. Students examine the importance of cultural sensitivity when providing healthcare for immigrant populations.

In Subunit 2, students examine how CAM is being integrated into the conventional Western medicine typically practiced in the United States. In Chemistry, students study a variety of herbal supplements, many of which share active ingredients with modern pharmaceuticals. An experiment with willow bark tea illustrates the variability of effectiveness of naturally occurring products. In Geometry, students examine how body size and shape can affect the absorption of drugs. Despite CAM's popularity, it is not always clear whether they have any beneficial health effects. Students research five controversial CAM practices, examine the claims made about them, evaluate the

evidence of their effectiveness, and discuss current and proposed efforts by the Food and Drug Administration (FDA) to regulate this burgeoning industry. Students conclude the unit by debating the level of regulation that the government should impose upon CAM.

Culminating Event

The debate on CAM regulation can be extended into a culminating event. Pairs of students can select a specific type of CAM and debate increasing or relaxing regulation of its manufacture, practice, and marketing. Another possible culminating effort for this unit would be for students to develop educational materials and/or presentations to inform healthcare workers about culturally sensitive care for individuals from various ethnicities. Groups of students would select an ethnic group, research its beliefs and attitudes about medical care, and explore its common folk healing practices that might come into conflict with conventional medicine. Students could deliver these presentations and materials to local healthcare agencies.

Key Questions/Issues

- What is CAM, and how does it differ from conventional medicine? (Health Science I)
- Where do CAM practices come from? How have they become popular in the United States? (World Geography)
- What medical diagnoses and treatments are addressed by practitioners of traditional Hispanic folk healing? How do those diagnoses and treatments compare to conventional medicine? (Spanish I)
- How are traditional, local medical practices spread to other regions of the world? How do they gain popularity in a new culture? (World Geography, English Language Arts)
- What medical beliefs are held by people from different cultures? Why is it important for healthcare workers to be aware of these beliefs? (English Language Arts, World Geography)

- What conventional medical treatments used by doctors today have their origins in folk medicine? (Chemistry)
- What regulations are currently in existence for CAM? Are they adequate? How could they be improved? (Social Studies, English Language Arts)

Learning Scenario to Kick Off the Unit

When you get sick, a nice nap and some hot soup isn't a bad way to spend the day, but if you were really sick, your parents would take you to see a doctor. Not everyone agrees. When your friend, Jorge, is sick, sometimes his parents take him to see a *curandera*, or folk healer, instead. And he's not the only one. Natural remedies for every conceivable illness are just one Google search away. There are 656,000 hits for "natural remedy, muscle strain" and 2,180,000 hits for "natural remedy, cancer." If you don't have time or money to see a doctor, or if you don't trust

doctors, you have plenty of other options. Will they really help you to get better? Is it possible they might actually make your health worse?

Biomedical/Healthcare and Education Partner Roles

- School librarians/media specialists can assist the Health Sciences and/or English Language Arts instructors with teaching research skills, particularly in the use of print and other media resources.
- Career counselors from the school or local post-secondary institutions can be invited to discuss the educational opportunities available and relevant to practitioners of CAM.
- Employees from various local biomedical research facilities or health services providers can be invited to speak to students about integrating CAM into conventional care.

SUBUNITS AND MAJOR TOPICS (ACROSS ACADEMIC AND TECHNICAL SUBJECT AREAS)

Subunit 1

Old Medicine, New Places

HEALTH SCIENCE I · WORLD GEOGRAPHY · SPANISH I · ENGLISH LANGUAGE ARTS

- Five divisions of CAM
- Geographic differences in medical knowledge and practice
- Transfer of knowledge between cultures as a result of human migration
- Hispanic folk healing beliefs and practices
- Using print and multimedia sources for research
- Writing research reports

Subunit 2

Merging Two Traditions

CHEMISTRY · GEOMETRY · ALGEBRA I · SOCIAL STUDIES · ENGLISH LANGUAGE ARTS

- Molecular structure diagrams
- Acids and bases
- Origin and chemical composition of aspirin
- Volume and surface area for cylinders and prisms
- Hypothesis testing including Type I and Type II errors
- FDA regulations regarding the health care industry
- Formal debate

Old Medicine, New Places

SUBUNIT 1 OVERVIEW

Essential Question for This Unit

How can we ensure the safety and effectiveness of complementary and alternative medicine (CAM)?

Unit Summary

In Subunit 1, students are introduced to complementary and alternative medicine (CAM)—what it entails, where it originated, and the need for healthcare workers to be aware of various alternative practices and beliefs in the general population. Upon completing this subunit, students should understand how medical knowledge and healing practices from other regions of the world are brought to the United States and how the interaction between the two cultures can facilitate or hinder transfer of knowledge. Students should also recognize the role of curanderos in Hispanic society, and be able to compare Hispanic folk-healing practices to conventional treatments. They should be able to discuss the importance of culturally sensitive healthcare, and why conventional health care workers still need to be aware of CAM.

Key Questions/Issues

- What is the difference between CAM and conventional medicine? (Health Science I)
- Where did CAM practices come from? Who uses them and why? (World Geography)
- What is curanderismo? How are illnesses diagnosed and treated in traditional Hispanic culture? How are those treatments different from conventional medicine? (Spanish I)
- How did some medical practices from other regions of the world become conventional, while others remained alternative or complementary practices? (World Geography, English Language Arts)
- Why is it important for practitioners of conventional medicine to be aware of complementary and alternative medicine and medical beliefs? (English Language Arts)

Lesson Summaries

Lesson	Subject	Description
1.1	Health Science I	Introduction to Complementary and Alternative Medicine Students are introduced to the five-category classification of CAM, briefly review examples from each category, and distinguish between CAM and conventional medicine.
1.2	World Geography	Local Cultures and Their Healing Practices Students select a geographical region of the world, research the culture of that region, and explore its unique healing practices.
1.3	Spanish I	Curanderismo: Hispanic Folk Healing Practices Students study the origins and beliefs of Hispanic folk medicine practitioners, and their status in Hispanic society. Students also learn the Spanish vocabulary for common ailments and the related Hispanic folk treatment.
1.4	World Geography	Medicine in Motion: Native Healing in New Societies Students identify patterns of cultural dispersal by following the spread of healing practices from six regions of the world to the United States.
1.5	English Language Arts	CAM Research Paper Students select a single type of complementary or alternative medicine to research in depth.
1.6	English Language Arts	Cultural Competence and Refugee Health Students read excerpts from <i>The Spirit Catches You and You Fall Down</i> , an account of healthcare conflict within a community of Hmong immigrants. Students then discuss the importance of “cultural competence” in healthcare.

Introduction to Complementary and Alternative Medicine

LESSON 1.1

HEALTH SCIENCE I

Time

90 minutes

Materials

Equipment

Access to the Internet

Resources

Complementary and Alternative Medicine (CAM) handout

Prior Student Learning

Students should be familiar with the concept and general practices of conventional medicine as practiced by holders of a medical degree (M.D. or D.O.) and allied health professionals, such as registered nurses, physical therapists, and psychologists.

Essential Question for This Unit

How can we ensure the safety and effectiveness of complementary and alternative medicine (CAM)?

Objectives

After completing this lesson, students should be able to

- Explain and distinguish among the five categories of CAM therapies.
- Compare complementary medicine and alternative medicine.

Lesson Activities

Lesson Springboard

Write the words *complementary* and *alternative* on the board. Ask students for various contexts in which they have seen these two words. Based on these contexts, how would they define each? Most students will be familiar with *alternative*, but many students will confuse *complementary* with *complimentary*. The most likely place students will have encountered *complementary* is in Geometry, where students learn about complementary angles, or in Art, where they learn about complementary colors.

Lesson Development

Class Discussion

Tell students that there is branch of medicine referred to as *complementary and alternative medicine* (CAM). Ask students what they think CAM means based on their own definitions of *complementary* and *alternative*. CAM is defined by the National Center for Complementary and Alternative Medicine (NCCAM) as “a group of diverse medical and health care systems, practices, and products that are not presently considered to be part of conventional medicine.” Complementary medicine is used *together with* conventional medicine. Alternative medicine is used *in place of* conventional medicine.

Tell the students that CAM is broken up into several different categories and in today’s lesson they will be learning about the various types.

Jigsaw—Expert Groups

Pass out the Complementary and Alternative Medicine (CAM) handout. Assign students into one of five Expert Groups corresponding to the five categories of complementary and alternative medicine defined by NCCAM:

- Alternative Medical Systems—Refers to complete systems of theory and practice that have evolved independently from or parallel to conventional Western medicine. Examples of alternative medical systems include traditional Chinese medicine, ayurvedic medicine, homeopathy, and naturopathy.

Introduction to Complementary and Alternative Medicine

LESSON 1.1

- **Mind-Body Interventions**—Focuses on the interactions among mind, body, and behavior and how mind and behavior can directly affect health. Meditation and yoga are two examples of mind-body interventions.
- **Biologically Based Therapies**—Typically involve the ingestion of biological products such as botanicals, animal-derived extracts, vitamins, minerals, fatty acids, amino acids, proteins, prebiotics and probiotics, whole diets, and functional foods.
- **Manipulative and Body-Based Methods**—Focus primarily on the structures and systems of the body, including the bones and joints, the soft tissues, and the circulatory and lymphatic systems. Examples of manipulative and body-based methods include chiropractic and osteopathic manipulation, massage therapy, Rolfing, reflexology, and many others.
- **Energy Therapies**—There are two types of energy therapies. The first involves veritable energies (which can be measured), such as sound waves and electromagnetic forces. The second type involves putative energy, or biofields, which have yet to be measured. Examples of putative energy include qi (from traditional Chinese medicine), doshas (from ayurvedic medicine), etheric energy, and many others.

Using the Internet, have students fill in the worksheet individually or in pairs. Possible starting points for student research include these websites:

<http://nccam.nih.gov/health/whatisacam>

<http://www.altmedicine.com>

<http://health.allrefer.com/alternative-medicine>

After students have done their own research, have them meet in their Expert Groups to check their information and fill in any gaps. Each group of experts should also prepare a short presentation on their CAM category, which each “expert” will then present in their respective sharing groups.

Jigsaw—Sharing Groups

Reorganize students into groups that contain one member of each of the five Expert Groups. Have each expert share the information she or he learned with the other four members of their sharing group.

Lesson Closure

Discuss the placebo effect with students—effects resulting from the power of suggestion rather than from any pharmacological or other active treatment. Ask each Expert Group to describe how the placebo effect might work in their CAM category and to consider how they might distinguish a real effect from a placebo effect.

Introduction to Complementary and Alternative Medicine

LESSON 1.1

Possible Prior Misconceptions

Some students may come to class with strong beliefs (either positive or negative) regarding the legitimacy of complementary and alternative medicine.

Student Assessment Artifacts

Student notes on each of the five CAM categories

Variations and Extensions

Have students in Expert Groups prepare a presentation on their CAM category for the entire class, rather than just for their sharing group. This will probably take less class time, but each student will be responsible for presenting less information.

Extend this lesson by having students seek out and interview a practitioner within their CAM category. Have students turn in a report on their chosen CAM practice, including the information gathered in their interview.

Invite a CAM practitioner to speak to the class.

National and State Career Technical Education Standards

NATIONAL NCHSTE National Healthcare Skill Standards

- 6.31 Discuss the impact of religions and cultures on those giving and receiving health care with an understanding of past and present events.
- 6.32 Demonstrate respect of individual cultural, social, and ethnic diversity within the health care environment.
- 9.15 Evaluate the validity of alternative health practices.

STATE

List your state-specific standards in the space below.

Name _____ Date _____ Period _____

Complementary and Alternative Medicine (CAM)

1. What is the definition of “complementary and alternative medicine”?

2. What is the difference between alternative medicine and complementary medicine?

Expert Group _____

Using the following websites, look for information on the category of medicine that you are researching and answer the questions below.

National Center for Complementary and Alternative Medicine

<http://nccam.nih.gov/health/whatiscam>

Alternative Health News Online

<http://www.altmedicine.com>

United States Food and Drug Administration (FDA)

<http://www.fda.gov>

AllRefer Health

<http://health.allrefer.com/alternative-medicine>

1. Describe the scope of practices that fall under your CAM category.

2. Describe four specific examples of practices within your CAM category.

Local Cultures and Their Healing Practices

LESSON 1.2

WORLD GEOGRAPHY

Time

50 minutes

Materials

The World of Medicine—
Guidelines handout

Prior Student Learning

Students should be familiar with using the Internet and library as tools for research.

Students should have basic knowledge of world geography.

Essential Question for This Unit

How can we ensure the safety and effectiveness of complementary and alternative medicine (CAM)?

Objectives

After completing this lesson, students should be able to

- Research, write, and present a report on a geographical region and the healing practices found there.
- Draw comparisons between traditional healing practices and conventional Western medicine.

Lesson Activities

Lesson Springboard

Read the following excerpt to the class:

“Traveling up the remote jungle river was like moving back through millennia: our little canoe became a time machine and the compass was set for the Age of Reptiles. Only a thin shell of wood separated us from the man-eating crocodiles that swarmed in the watery depths below us. And as the sun rose higher in the sky, the mist rising off the water, the hoots, whistles, and howls of creatures in the surrounding forest and the sweet smell of a strange and luxuriant vegetation reminded us that we had left behind the land where humans ruled and we were now entering another dominion.”

So begins ethnobotanist Mark Plotkin’s journey through the northeast Amazon rainforest, in search of native plants and the *shamans*, or medicine men, who use them. Soon Plotkin realizes he will never be able to record more than a fraction of the medical wisdom possessed by even the most ordinary tribesman. Arriving at an old woman’s cottage, he recalls:

“What she called her garden looked to me like a weed patch. Nevertheless, the vegetation growing helter-skelter behind her house was a source of pride. She pointed out the cacao and papaya trees ... surrounded by a variety of herbs and bushes with little to distinguish them to my untrained eye. But it soon became apparent that I was standing in the middle of a green pharmacy. With a tea brewed from the *mont-joly* bush, she treated fevers. A cold-water infusion of the leaves of the *maveve* shrub cured liver ailments. To stanch bleeding from a cut, the old woman instructed, apply the sap of the *mokomoko* plant. The bloodwood tree healed skin lesions, and the *jeajeamadoe* tree sap relieved toothache. The list went on and on ... leaving me with a growing sense of wonder for the botanical riches that encircled me.” (Mark Plotkin, *Tales of a Shaman’s Apprentice*, 1993)

Local Cultures and Their Healing Practices

LESSON 1.2

Lesson Development

Group Work

Tell students that for thousands of years, healers have used plants to cure illness. Now Western medicine, faced with health crises such as AIDS, Alzheimer's disease, and cancer, has begun to look to the healing plants and practices used by native peoples to develop powerful new medicines. In this class they will begin a study of one specific region of the world, identifying its physical features and local culture and exploring its healing practices, which may make a great contribution to modern medicine.

Students will work in groups of four to five to prepare a presentation and written report (3 pages) about a region of the world, its local culture, and healing practices. Distribute the World of Medicine—Guidelines hand-out, a model for this project. Explain that the groups may follow this model but are free to vary it with the teacher's permission.

Divide students into groups and allow them 10 minutes to read the Guidelines. Encourage them to discuss the material among themselves.

Class Discussion

Besides providing facts about a particular region and its healing practices, the group presentations should raise larger questions about alternative medicine and its relation to modern life. Using the Guidelines as an example, ask students questions such as the following:

- The Tirio shaman is a “doctor,” but also a psychiatrist, pharmacist, and priest. Compare his role to that of a Western physician. Do Western doctors also serve some of these functions?
- How rainforest tribes use their native plants is part of the field known as *ethnobotany*. Can ethnobotany be studied within the United States? List some folk remedies that you know about, or even better, that you have used. Are they effective? Are they peculiar to a certain place or people?
- The “wonder drugs” derived from tropical plants are worth hundreds of millions of dollars in world trade. Have the native peoples benefited from what they teach us? How might we compensate them? What do they ask for in compensation? How might we protect their land?

Group Work

For the remainder of the class, allow groups to brainstorm their choice of topic. Tell them that for this research, the library is a better source of information than the Internet, because materials on native peoples are scattered and fragmentary on the Web.

Lesson Closure

After students have brainstormed in groups, have them report back to the class. Discuss the merits and shortcomings of their choices for a topic. Ask the class which geographical regions, if any, have contributed their products or practices to Western medicine. Discuss whether

Local Cultures and Their Healing Practices

LESSON 1.2

any of these CAM practices have been regulated, or even resisted, by the government.

Student Assessment Artifacts

Notes for group report and presentation

Possible Prior Misconceptions

Some students may think that traditional medicine is superstition, and is therefore ineffective and irrelevant.

Some students may not realize that traditional medicine is continuously changing, along with the local cultures that practice it.

Variations and Extensions

Have students read excerpts from Mark Plotkin's *Tales of a Shaman's Apprentice*, in particular his remarks about the millennial "chemical warfare" between insects and plants, which has evolved alkaloids made use of in modern wonder drugs.

Students can take a virtual tour of the rainforest on many websites. For an excellent list of these, see "Take a Walk on the Wild Side: A Unit on Ecosystems" (<http://www.teachersnetwork.org/readyssettech/seymour/ecosystem3.htm>).

National and State Academic Standards

NATIONAL NCSS Curriculum Standards for Social Studies

1. Culture

Social studies programs should include experiences that provide for the study of culture and cultural diversity, so that the learner can:

- d. compare and analyze societal patterns for preserving and transmitting culture while adapting to environmental or social change;
- f. interpret patterns of behavior reflecting values and attitudes that contribute or pose obstacles to cross-cultural understanding

STATE

List your state-specific standards in the space below.

Name _____ Date _____ Period _____

The World of Medicine—Guidelines

Your group will report on a region of the world, describing its physical features, the local culture, and the healing practices that developed there. Here is a model to guide you. Feel free to go beyond the questions addressed by the model. For instance, you may want to consider the different roles that men and women play in healing; differences between healers, shamans, and witch doctors; or native theories of illness, disease, and recovery.

The Place

The northeast Amazon Basin is situated on the northeast shoulder of South America between northern Venezuela and French Guiana. It lies on the edge of the world's largest and most fertile rainforest. In the north, this region touches the Atlantic Ocean and is a coastal plain covered mostly by swamp and mangrove forest. South of the plain lies the savannah belt, grassland punctuated by shrubs and small trees. Lush tropical rainforest blankets the rest of the region, where remote jungle rivers teem with more varieties of plants and animals than anywhere else on earth. The forest is so dense that travel is solely by boat or plane. Heat and humidity are intense, and the rainy season lasts 6 months.

The Animals and Plants

Life in the Amazon is unimaginably diverse. In only a small fraction of this region are more bird species than one finds in the entire United States. A single river harbors more types of fish than are found in all the rivers of Europe. One of every four plants on earth grows here—60,000 species—and most are unknown to Westerners. A majority of the world's insects live in the Amazon, and to protect themselves from them, plants produce an astonishing variety of toxic chemicals that contain alkaloids, the building blocks of numerous medicines. When ingested by humans, these chemicals may be nutritious, poisonous, hallucinogenic, or therapeutic.

Important medicinal plants, and their uses, include the fig (an antidote for heart problems), cinchona tree (the basis for quinine, to fight malaria), yew tree (taxol, for ovarian cancer), liana (fever), piripiri (contraceptives), St. John's wort (fungal infections), tonka bean (anti-blood clotting agent), and ginger root (coughs and colds).

The People

Forest-dwelling Indians have lived here for 10,000 years, but their culture is rapidly disappearing as logging, mining, farming, and other industries encroach upon the region. Most tribes are Carib (from the group that Christopher Columbus encountered)—including the Tirio, Wayana, Waiwai, and Macushi—but one, the Yanomamo, is isolated and may have crossed the Bering Strait from Asia into the Americas much earlier.

The Tirio tribe, about 2,000 members, is typical of the northeast Amazon. They live in palm-thatched huts in villages of 10 to 50 people along the rivers, and depend on hunting for survival. The men are friendly and inquisitive, the women shy and retiring, and the young marry around age 14. The most powerful Tirios are the chief and subchiefs and the shaman and his apprentices. All Tirios, including children, are familiar with the forest and sophisticated at finding and using jungle plants.

The Healing

Along with the chiefs, the shamans are the most powerful members of the Tirio tribe. They heal the sick and maintain contact with the spirit world. Illness is thought to be the work of evil spirits (sometimes

Name _____ Date _____ Period _____

sent by rival shamans) and the medicine man contacts the spirit world to diagnose the sickness and to determine what special plants are needed to treat it. The shaman thus serves not only as doctor but also as priest, pharmacist, psychiatrist, and as one who conducts souls to the afterworld. Today the shaman is losing his power to doctors, social workers, and government officials from the outside world.

At about age 14, some boys will express a desire to be the shaman's apprentice. The healer paints secret symbols on the boy's body, and tells him to think carefully about his decision for one month. If he is still interested, he works with the shaman to learn about illnesses, medicinal plants, healing rituals, and sacred songs.

The most important medicinal plants for the Tirio are those mentioned above, and in addition, various fungi that serve as antibiotics to fight infections. An extract of the cotton plant is used to treat burns, the sap of edible palms to stop bleeding, and a species of violet to treat insect stings. On a weeklong trip into the jungle with a shaman, one anthropologist reported that the healer showed him how to treat heart problems, burns, malaria, malaise, rashes, impotence, and gonorrhea—all with tropical plants.

Curanderismo: Hispanic Folk Healing Practices

LESSON 1.3

SPANISH I

Time

90 minutes for class

60 minutes for presentation

Materials

Equipment

Computer lab with Internet access
or

Library access

Resources

Folk Remedies handout

Prior Student Learning

Students should be familiar with the different categories of complementary and alternative medicine (CAM).

Essential Question for This Unit

How can we ensure the safety and effectiveness of complementary and alternative medicine (CAM)?

Objectives

After completing this lesson, students should be able to

- Understand the origins and applications of Hispanic folk medicine.
- Identify common Hispanic folk illnesses and their remedies.
- Incorporate the knowledge of Hispanic folk medicine beliefs into effective patient management and counseling plans.

Lesson Activities

Lesson Springboard

Ask students if they have ever heard the term *folk healer* or *shaman*. What do they think these terms refer to? Ask students to give a definition or describe a practice they think would be associated with folk healers or shamans. Expect to get a wide range of responses, including some that are skeptical or dismissive of alternative medicine.

Mention to the class that while stereotypical folk medicine is often thought to be used by only poor and/or unacculturated people, all of them have probably used (or have had used on them) some form of folk medicine in the guise of home remedies. People use folk remedies (or home remedies) for several reasons: treatment of minor illnesses (for which they would not consider consulting a doctor), the retention of a locus of self-control, and self-care if accessibility to medical care is limited. Introduce the term *curandero* (or *curandera*), a practitioner of traditional Hispanic folk healing. Some curanderos practice only folk healing, while others also have medical or nursing degrees.

Lesson Development

Direct Instruction

Introduce some basic concepts regarding the Hispanic tradition of folk medicine and its relation to standard medical practices in the United States.

Origins of Hispanic Folk Medicine

People tend to look for reasons why they become ill. From the ancient Greeks came the concept that disease occurs when there is an imbalance of the four humors. This interpretation has survived and evolved into Hispanic folk medicine today as the understanding that disease is caused by an imbalance between hot and cold principles.

Vasoconstriction and a low metabolic rate signify one has a “cold” disease, while “hot” conditions are characterized by vasodilation and a

Curanderismo: Hispanic Folk Healing Practices

LESSON 1.3

high metabolic rate. Examples of hot diseases or states are pregnancy, hypertension, diabetes, acid indigestion, *susto*, *ojo*, and *bilis*. Some cold disease examples are menstrual cramps *frio de la matriz*, coryza, pneumonia, *empacho*, and colic. Most people do not think about hot and cold principles unless they have been stressed by illness or are in another vulnerable state.

The goal of treatment is to restore harmony and balance. Thus, hot diseases are treated with cold remedies, and cold diseases are treated with hot remedies.

The Meso-American Indians had a very sophisticated system of health, disease, and treatment. They established the first medical schools in Mexico 50 years before Jamestown was settled, and used a pharmacopoeia of over 5,000 well-studied and efficacious Indian herbal medications that were categorized in the *Badiano Codex* (1552). In that native system of medicine, there was a strong connection between religion and health.

Folk Remedies

According to Webster's dictionary, folk medicine (or lay medicine) is "the ordinary person's concept of health, illness, and healing; it is the treatment of disease practiced traditionally among the common people stressing the use of herbs and other natural substances." It is felt that intrinsic goodness and comfort come from these remedies—they are accessible, economical, and validated by one's family and faith. While the medical profession has tended to attribute any beneficial effects from folk remedies to the power of the placebo, many of these remedies have been in existence for thousands of years and may well have physical benefits.

Support Strategy

You may wish to group students into pairs to do their research. You may wish to provide students with suggestions for websites or reference books to begin their research.

Student Research

Using the Folk Remedies handout as a guide, have students research one of the following remedies:

<i>Ajo</i>	Garlic	<i>Pasionara</i>	Passion Flower
<i>Azarcón/Greta</i>	Lead/mercury oxides	<i>Rodigiosa</i>	Bricklebush
<i>Damiana</i>	Damiana	<i>Ruda</i>	Rue
<i>Estafiate</i>	Wormwood	<i>Saliva</i>	Sage
<i>Eucaliptoe</i>	Eucalyptus	<i>Tilia</i>	Linden flowers
<i>Gobernadera</i>	Creosote bush	<i>Tronadora</i>	Trumpet flowers
<i>Gordolobo</i>	Mullein	<i>Yerba buena</i>	Mint
<i>Manzanilla</i>	Chamomille	<i>Zábila</i>	Aloe vera
<i>Orégano</i>	Oregano	<i>Zapote blanco</i>	Sapodilla

Other examples of common Hispanic herbs can be found on the University of Arizona, College of Medicine website. See "Hispanic Herbs of Significance: A Guide for Clinicians" (<http://www.arizonacert.org/medical-pros/herbs/hispanic-herbs.pdf>).

Curanderismo: Hispanic Folk Healing Practices

LESSON 1.3

Classroom Management

Assign multiple students to the same folk remedy. Have students conduct research independently, but collaborate on a presentation to reduce time.

Student Presentations

After completing their research, have students prepare and deliver a short presentation on their findings, including a preparation of the herbal remedy, where appropriate and available.

You may also wish to have students research the *curanderismo* treatments for well-known medical conditions, such as hypertension, diabetes mellitus, upper respiratory infection, osteoarthritis, and rheumatism.

Lesson Closure

Review with the class which folk remedies are beneficial, which are neutral, and which are actively harmful. For homework, have students create a flyer with graphics and text in Spanish. The goal of the flyer is to educate the public on a potentially dangerous folk remedy while remaining sensitive to the role of folk healing in Hispanic culture.

Student Assessment Artifacts

Completed Folk Remedies handout

Folk Remedy presentation

Folk Remedy flyer

Variations and Extensions

Invite a practicing *curandero* or *curandera* to speak to class.

Have students interview an older adult in the Latino community about traditional Hispanic healing remedies. Students should ask questions about the various healing remedies the interview subject is familiar with, as well as the subject's opinion on the effectiveness (or conflict) of complementary and alternative healing practices with conventional Western medicine.

Have students read the insomnia plague passages from *One Hundred Years of Solitude* (1970) by Gabriel Garcia Marquez. Discuss the cultural and religious practices reflected in this classic work of magical realism.

Extend the lesson with activity on folk illnesses. *Curanderos* are the clearly acknowledged experts in diagnosing and treating folk illness in the *barrio*. According to Arthur Rubel (1966) in *Across the Tracks*, folk illness is “a syndrome in which members of a particular group claim to suffer and for which their culture provides an etiology, diagnosis, preventive measure and regimen of healing,” but which are not generally defined by conventional medicine. Folk illnesses have strong psychological and/or religious overtones. Family involvement is an intrinsic part of the healing process, and people improve because of their religion, personal faith in the remedies, and familial commitment.

Divide students into groups of two or four and have them research the following folk illnesses recognized by Hispanics of Mexican origin. For each one, they should (1) identify potentially dangerous outcomes of

Curanderismo: Hispanic Folk Healing Practices

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standard folk treatment and (2) consider how they would counsel a patient who attributed his or her symptoms to the folk illness.

- *Aire*
- *Empacho*
- *Caída de la Mollera*
- *Ojo*
- *Susto*
- Others (*sereno, colico, bilis, corajes, chipil/chipi, frio de la matriz*)

National and State Academic Standards

NATIONAL

ACTFL Standards for Foreign Language Learning

Standard 2.1: Students demonstrate an understanding of the relationship between the practices and perspectives of the culture studied.

Standard 2.2: Students demonstrate an understanding of the relationship between the products and perspectives of the culture studied.

Standard 3.1: Students reinforce and further their knowledge of other disciplines through the foreign language.

Standard 3.2: Students acquire information and recognize the distinctive viewpoints that are only available through the foreign language and its cultures.

Standard 4.2: Students demonstrate understanding of the concept of culture through comparisons of the cultures studied and their own.

STATE

List your state-specific standards in the space below.

Name _____ Date _____ Period _____

Folk Remedies

Name of your assigned folk remedy	
Where does it come from? What kind of plant? What part of the plant?	
Does it need special preparation before it can be used? If so, what kind—does it need to be dried, roasted, ground up, etc.?	
What diseases or other health problems does it treat?	
Is there a folk explanation for why it works? If so, what is the explanation?	
What is the standard medical science treatment for the same disease or health problem?	
What is the effectiveness of this folk remedy? What is the evidence for effectiveness?	
Is there any evidence that this folk remedy is harmful?	
Is this folk remedy similar to any standard Western medical science treatment? If so, which one?	
Who usually takes this folk remedy?	
Who usually prescribes this folk remedy?	
Would you use this folk remedy? Why or why not?	

Medicine in Motion: Native Healing in New Societies

LESSON 1.4

WORLD GEOGRAPHY

Time

180 minutes

Materials

Equipment

Internet access

Resources

World atlas

Prior Student Learning

Students should be able to locate countries on a world map.

Students should have a basic knowledge of common diseases and disorders.

Essential Question for This Unit

How can we ensure the safety and effectiveness of complementary and alternative medicine (CAM)?

Objectives

After completing this lesson, students should be able to

- Identify patterns of cultural dispersal.
- Explain interaction of “host” and “donor” cultures.
- Appreciate the diversity of CAM practices and the cultures that use them.

Lesson Activities

Lesson Springboard

When Harry Potter battles the evil Voldemort, he wields a wand made of ordinary holly. Only it turns out that holly isn't so ordinary, even in the nonmagical world. For centuries, healers made a tea of its leaves to induce sweating and relieve fever. They also believed that its berries could cure jaundice. Many real plants studied at the wizard school, Hogwarts, have ancient or modern medicinal uses—and how they came to us is the subject of this lesson.

- The *mandrake* is a gnarled, toxic root that helps Harry's teacher reverse a turn-to-stone spell. The Bible refers to its use as a contraceptive, and ancient Greeks added it to wine as an anesthetic. Today, eye drops contain a mandrake derivative that temporarily paralyzes eye muscles so the pupil can stay open.
- Voldemort's wand is carved from the evergreen *yew*, a symbol of death in Renaissance literature and a cancer fighter in modern medicine. The anticancer drug Taxol is synthesized from the tree's bark and needles.
- Harry's late mom, Lily, brandished a wand made from *willow*, a traditional emblem of grief. Our ancestors drank willow tea for pain relief, and a forerunner of aspirin was made from its leaves.
- *Wolfsbane*, as any wizard can tell you, helps keep werewolves at bay. Real doctors once mashed it into a pulp, diluted it with alcohol, and applied small doses to the skin to relieve pain. Now known as *aconite*, the plant is still used as medicine, although ingesting just 1 gram can be fatal.

Ask students where these medicines might have originated and how they spread from their origins. Were they always regarded as witchcraft? If not, when and how were they marked with that term?

Medicine in Motion: Native Healing in New Societies

LESSON 1.4

Lesson Development**Direct Instruction**

Explain that traditional medicines have followed a forked and twisted path from their folk origins into the modern world. Yew trees, for example, are abundant in the British Isles and were brought to the Americas by English and Scottish settlers. Yet they were identified as cancer fighters only when American researchers discovered tribal cultures in the Amazon that used them that way. The mandrake is cultivated throughout Europe, for the most part because potion-makers and medicine men traveled far and wide, and their reputations traveled even farther. Willow tells a different story of medicine in motion because it was adopted by newcomers from an indigenous population, rather than disseminated by wandering individuals. The Native Americans who brewed tea from its leaves for pain relief were conquered and absorbed into the United States, and their native remedies with them.

Ask students if they can identify other CAM practices that have traveled from a folk culture into a modern society. Ask if they can think of practices that were (1) legitimate on arrival, (2) illegitimate but eventually accepted, (3) illegitimate but survived in the “underground,” or (4) died out, sooner or later.

From Harry Potter and your own examples, you can see that medicines move in many ways. Simplifying a bit, we can group these into three patterns:

- **Diaspora**—They are transported by the peoples that use them, whether these groups are migrants, refugees, or victims of conquest or colonization.
- **Diffusion**—They are circulated by individuals, word-of-mouth, scholars and specialists, or trade.
- **Adoption**—They are deliberately sought by the host society, its government, scientists, corporations, or medical personnel.

Research Project

Tell students they will diagnose and treat a common symptom, or set of symptoms, from the perspective of a healing tradition that has come to the United States from elsewhere in the world. Students will be presented with three “cases” to diagnose. They will break into groups, and in the remainder of this class each group will (1) research a particular tradition and (2) determine how it would cope with each of the three cases.

1. The group must identify the cultural and geographic origin of their tradition, describe how it reached the United States, and explain briefly how it is practiced here. For example, is the healing tradition confined to a particular ethnic group? Is it fully accepted, closely regulated, highly controversial, carried on “underground”? Is it a complement to Western medicine?
2. The group must diagnose each case, describe the folk theory that supports their diagnosis, and propose a treatment.

Medicine in Motion: Native Healing in New Societies

LESSON 1.4

These are the cases:

- A patient arrives fearful and perspiring, with symptoms that include insomnia, extreme nervousness, sadness, or depression.
- An obese patient complains of frequent and heavy urination, excessive thirst, hunger, and recent weight loss.
- A patient coughs and sneezes and states that for several days he has had a sore throat and runny nose.

These are the healing traditions:

- Afro-Caribbean Santeria
- Indian ayurvedic medicine
- Traditional Chinese medicine
- Southwest Native American healing
- African-American folk medicine
- Contemporary American medicine

Group members may divide the labor of research and presentation however they wish, but each group must appoint a “case manager” to take notes that will be handed in at the end of class.

Presentations

Representatives from each group will present their diagnoses, theories, and cures. Then a spokesperson from each group will lead the class in discussion of three questions related to the essential theme of this unit (“How can we ensure the safety and effectiveness of complementary and alternative medicine (CAM)?”).

- Consider the diagnoses and treatments recommended by your group. Are any of them regulated, discouraged, outlawed?
- Is this regulation justified?
- Is the government regulating the CAM practice itself, or rather the culture with which it is associated? What is the reputation of the culture and its healing practitioners, and how has this affected their treatment by government?

Lesson Closure

Remind students that native or folk medicine traditions do not cover the entire range of CAM but that they are an important source of them. Explain that healing practices within the traditions overlap due to both common geographic features and similar social organization among the peoples who developed them. Conclude by noting that the interaction between CAM and mainstream medicine will be an important issue for our health care system in the 21st century, as American society becomes increasingly diverse.

Medicine in Motion: Native Healing in New Societies

LESSON 1.4

Possible Prior Misconceptions

Students may not understand that the concept of CAM is “socially constructed.” CAM practices may be defined as superstitious, fraudulent, or ineffectual by one society or in one historical period, but seen as valid medical practice in another.

Students may not realize that any type of CAM that enters a new society will evolve, attract new practitioners and users, and adapt to the laws and customs of the host society. CAM practices in a new society may bear little resemblance to those in their society of origin.

Student Assessment Artifacts

Notes for group research and presentations

Variations and Extensions

Students may use their research and presentations to develop a 3–5 page report on the origins, transmission, and reception of one healing practice from its homeland to the United States. They should focus on (1) changes in the practice, (2) changes, if any, in the practitioners and clients, and (3) the dissemination of the practice beyond its original practitioners, clients, theory, and method.

Extend the case studies to other traditional healing practices within the United States. Emphasize the importance of CAM in American history prior to the formation of the American Medical Association and the FDA. Students may research CAM in rural New England, Appalachia, and the Mississippi delta, the Ozark Mountain region of Missouri and Arkansas, the Southwest from West Texas to Arizona, and the Native American communities of the Southwest, the West Coast, and the Pacific Northwest.

National and State Academic Standards

NATIONAL NCSS Curriculum Standards for Social Studies

1. Culture

Social studies programs should include experiences that provide for the study of culture and cultural diversity, so that the learner can:

- d. compare and analyze societal patterns for preserving and transmitting culture while adapting to environmental or social change;
- f. interpret patterns of behavior reflecting values and attitudes that contribute or pose obstacles to cross-cultural understanding

STATE

List your state-specific standards in the space below.

CAM Research Paper

LESSON 1.5

ENGLISH LANGUAGE ARTS

Time

90 minutes

Materials

Equipment

Internet-capable computer lab

Resources

CAM Research Guidelines handout

Prior Student Learning

Students should have received an introduction to complementary and alternative medicine (CAM) practices in their health science class.

Students should be familiar with the basic guidelines for finding information on the Internet.

Students should be familiar with paraphrasing and summarizing other resources for original work.

Support Strategy

Assign multiple students to the same CAM practice and allow them to do their research in pairs or teams.

Essential Question for This Unit

How can we ensure the safety and effectiveness of complementary and alternative medicine (CAM)?

Objectives

After completing this lesson, students should be able to

- Find and evaluate sources from the Internet on a complementary and alternative medicine (CAM) practice.
- Write an essay describing the origins, current and historical practices, and evidence for or against the effectiveness of a CAM practice.
- Cite resources using the *American Psychological Association (APA) Publication Manual* style guide.

Lesson Activities

Lesson Springboard

Write a list of commonly accepted facts on the board, like the ones below.

- The sky is blue on a sunny day.
- Our school mascot is a _____.
- The American Revolutionary War began in 1775.
- Shakespeare was a great British playwright.
- Bill Gates is a billionaire.
- Global warming is a serious environmental problem.

Ask students if all the statements are true, and how they know. Discuss how some information you know to be true arises through personal observation, but most information is gathered from other sources, and that any source can be mistaken or biased in some way.

Lesson Development

Research Project

Remind students of what they have learned about CAM practices.

Assign or have students select a CAM practice as a subject of research. Common CAM practices include

- Acupuncture
- Ayurveda
- Homeopathic medicine
- Naturopathy
- Folk medicine from various cultures

Subunit 1—Old Medicine, New Places
CAM Research Paper

LESSON 1.5

- Chelation therapy
- Megavitamin therapy
- Chiropractic care
- Massage
- Biofeedback
- Meditation
- Guided imagery
- Hypnosis
- Yoga
- Tai chi
- Prayer
- Reiki

Classroom Management
Assign the Internet research to be done at home and concentrate class instruction on teaching APA style.

Have students research their CAM practice on the Internet, using the CAM Research Guidelines handout. Remind students that not all sources are equally reliable and that they need to consider where they are finding their information.

Direct Instruction

Introduce the two predominant documentation styles: Modern Language Association (MLA) and American Psychological Association (APA). Tell students that for this assignment they will be using APA style for their research papers. Explain that citing your sources allows the audience to verify your research and protects you against plagiarism.

Review how to cite from online resources, as well as print. You may wish to direct students to “The Citation Machine” (<http://citationmachine.net>) for help in formatting their citations. Also review the characteristics of direct quotations and paraphrasing.

Classroom Management
If students conduct their research at home, this exercise will need to be done in the following class.

In class, have students practice writing a passage about the origins of their CAM practice incorporating a paraphrase of their source material. Have students write a second passage on the benefits of their CAM practice incorporating a direct quote from their research materials. Both of these passages should require parenthetical citations within the body of the text.

Have students sit with a partner, exchange passages, and edit each other’s work. Circulate around the room and do spot checks as you give students time to correct their work.

Lesson Closure

Discuss any student questions or concerns regarding the application of APA style. Have students expand their passages into a short research paper (3–5 pages) on their CAM practice, complete with bibliography.

Subunit 1—Old Medicine, New Places
CAM Research Paper

LESSON 1.5

Student Assessment Artifacts

Sample writing passages with parenthetical citations
CAM research paper
APA-style bibliography

Possible Prior Misconceptions

Some students may believe that citing a website's homepage URL is sufficient, when in fact their citation should lead the reader directly to the information they are citing.

Variations and Extensions

Since students are learning the difference between cut-and-paste direct quotes and paraphrasing, you might wish to provide them with an electronic copy of the CAM Research Guidelines handout and have them cut-and-paste information directly into the handout. Have them turn in the handout along with their research paper so you can check that their paraphrasing is being done appropriately.

Rather than have students conduct their own research, have articles prepared as source material.

Provide samples of sloppy documentation for students to correct when you initially introduce APA style.

National and State Academic Standards

NATIONAL

NCTE Standards for the English Language Arts

1. Students read a wide range of print and non-print texts to build an understanding of texts, of themselves, and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works.
3. Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics).
5. Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.
6. Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and non-print texts.
7. Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and non-print texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.
8. Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.

STATE

List your state-specific standards in the space below.

Name _____ Date _____ Period _____

CAM Research Guidelines

Question	Information	Source
Name of your assigned folk remedy		
What diseases or other health problems can your CAM practice treat?		
What does treatment in your CAM practice entail?		
What are the benefits of your CAM practice compared to other treatments?		
What is the evidence that your CAM practice is effective?		
What are the disadvantages or dangers of using your CAM practice?		
Is your CAM practice used together with standard medical treatments? If so, how?		
What are some examples of successful use of your CAM practice?		

Cultural Competence and Refugee Health

LESSON 1.6

ENGLISH LANGUAGE ARTS

Time

45 minutes

Materials

- *The Spirit Catches You and You Fall Down* (excerpts, 70 pages altogether)
- Two reviews of *The Spirit Catches You*
- Two websites on complementary and alternative medicine (CAM) practices and refugee health

Resources

Reviews of *The Spirit Catches You and You Fall Down*

- <http://query.nytimes.com/gst/fullpage.html?res=9F05E0DB133BF937A1575AC0A961958260&n=Top%2fFeatures%2fBooks%2fBook%20Reviews>

- http://www.hmongnet.org/publications/spirit_review.html

On CAM and Refugee Health Issues

- http://www3.baylor.edu/%7ECharles_Kemp/refugees.htm (refugee health issues)
- <https://ccnm.thinkculturalhealth.org/default.asp> (online course for culturally competent nursing)

Prior Student Learning

Students should be familiar with CAM and have a basic awareness of non-Western medicines.

Essential Question for This Unit

How can we ensure the safety and effectiveness of complementary and alternative medicine (CAM)?

Objectives

After completing this lesson, students should be able to

- Define the concept of “cultural competence” in medicine.
- Interpret a cross-cultural medical encounter from the viewpoints of both sides.
- Compare perspectives and contribute to the current discussion of refugee and immigrant health care issues.

Lesson Activities

Prior to Lesson

Assign students to read the following excerpts from *The Spirit Catches You and You Fall Down* by Anne Fadiman (1997): pages 10–11, 20–31, 38–41, 46–51, 58–59, 65–66, 75–77, 106–112, 140–145, 171–180, 210–215, and 258–277.

Lesson Springboard

Class Discussion

The U.S. Department of Health and Human Services (HHS) provides courses on “cultural competence” for doctors and nurses who treat patients from other cultures. Its website contains videos that show health-care professionals interacting with a variety of such patients—and you are encouraged to view these. Here is one of the HHS scenarios. Consider how the nurse copes with her patient, and how you might do so yourself.

Helen Birdsong, Native American woman, age 76, was recently diagnosed with non-small-cell lung cancer. At her initial diagnosis, Mrs. Birdsong opted against a traditional treatment protocol, including surgery or chemotherapy for her lung cancer, preferring instead to seek healing from traditional American Indian medicine. One month after her diagnosis, Mrs. Birdsong is at her doctor’s office. The nurse is trying to convince Mrs. Birdsong that she needs surgery and possibly adjuvant chemotherapy. “There are many effective therapies for this type of lung cancer,” the nurse tells Mrs. Birdsong, “and we’ve come a long way in managing the worst side effects of chemotherapy.” The nurse explains to Mrs. Birdsong that she can have her chemotherapy treatments as an outpatient at the hospital, and that the medications that follow chemotherapy are very effective with relatively few serious side effects. The nurse is adamant that Mrs. Birdsong needs treatment, because she is aware that lung cancer is the leading cause of death among American Indians.

Cultural Competence and Refugee Health

LESSON 1.6

Mrs. Birdsong does not want to talk about cancer, as she believes discussing her condition will make it worse. Her husband died in a hospital several years earlier, and Mrs. Birdsong associates entering the hospital with death. She also does not feel safe with the idea of being in the hospital and is concerned that the hospital will make her sicker. Mrs. Birdsong feels at peace staying with her family and feels better with the traditional remedies that her tribe's healer has provided. She prays daily and believes that her cancer will be cured without help from the doctor or the hospital.

- What is the nurse's attitude toward medicine and illness?
- Do you sympathize with Mrs. Birdsong? Are you familiar with CAM practices that advocate alternatives to invasive treatments, such as chemotherapy or surgery?
- Can an argument be made that Mrs. Birdsong ought to be persuaded to accept the hospital's treatment regime?

Direct Instruction

Explain to students that the excerpts they have read from *The Spirit Catches You and You Fall Down* capture the essence of the book, but that a brief synopsis will help them discuss the issues it raises.

The story begins when 3-month-old Lia Lee is carried into the emergency room of the county hospital in Merced, California. Lia's parents, Hmong refugees from the hill country of Laos, do not speak English; and the hospital staff speaks no Hmong. On a later visit, Lia's doctors determine that she is suffering from a severe case of epilepsy. Her parents, however, believe that her seizures are caused by the flight of her soul from her body, a condition they call *qaug dab peg* (the spirit catches you and you fall down).

This misunderstanding, coupled with a host of smaller confusions, ultimately resulted in tragedy for Lia. The author tells her story from the perspectives of both Western medicine and Hmong spiritual traditions. Lia's parents, Nao Kao Lee and Foua Yang, care tremendously for their daughter, carrying her everywhere, making animal sacrifices for her, and concocting traditional remedies from herbs grown behind their apartment building. Lia's doctors, a husband-and-wife team who work for almost nothing, do whatever they can to help her and spend many sleepless nights pondering how to give the best care possible.

As Lia's condition worsens, doctors and parents looked on helplessly, each stubbornly committed to their own views, and each blaming the other. The doctors are angry because the parents fail to give Lia her prescribed medications in the proper doses; the parents are angry because the medications had side effects. To understand this tragic stalemate, the author explores the very different worldviews of Americans and Hmong, and manages to empathize with those on both sides.

Cultural Competence and Refugee Health

LESSON 1.6

Ask students if this is a fair summary, based on their reading of the excerpts. Would they add or change anything, if they were describing the book to a friend?

Class Discussion

Lead a discussion using the following questions:

- When Lia arrives at the hospital (*pages 20–31*), there are several cross-cultural misunderstandings. Her parents and her doctors have very different attitudes to the girl's seizures, for example. What are these attitudes? How do they influence Lia's early treatment?
- The Western doctors prescribe a complicated regimen of drugs to stop Lia's seizures, but her family balks at giving the medication (*pages 46–51, 58–59*). Why do they resist? Do you understand their motivation? Do you sympathize with it? And how does the Hmong theory of illness help explain their behavior? (*pages 10–11*)
- The Hmong are stubborn and independent, to the point of defying the medical authorities and stressing out everyone who attempts to treat them. But the Western doctors are stubborn, even arrogant, in their own way. Give some examples where each side shows cultural stubbornness and pride. (*pages 65–66, 75–77, 140–145, 210–215*)
- What might the average American doctor learn from a Hmong *txiv neeb* (shaman)? What might the *txiv neeb* learn from the doctor? (*pages 106–112, 258–277*)
- Lia's doctor says, "I felt it was important for these Hmong to understand that there were certain elements of medicine that we understood better than they did and that there were certain rules they had to follow with their kids' lives." Why didn't this message get through to the Lees? If you were the doctor, would you feel this way too? (*all the excerpts*)
- The American medical system is more differentiated and disjointed than the healing systems most refugees know. Lia is examined by doctors and nurses, but also by neurological specialists, Child Protective Services workers, public health workers, and pediatric staff. She also receives attention from juvenile court officers. How do her parents interpret this? (*pages 140–145, 210–215*)

Lesson Closure

The author understands that Western medicine, though lacking the charm of a spirit-filled invisible world, is a more reliable way of curing disease than sacrificing pigs or chickens. Her argument is that a better understanding of the Hmong culture might have enabled the Western doctors to overcome the family's resistance to science and lead them toward a more cooperative attitude. What could the doctors have done differently? What should they have known about their patients, the Hmong?

Possible Prior Misconceptions

Students may assume that Western medical practices are always superior to CAM or native healing traditions, especially in cases like this girl's

Cultural Competence and Refugee Health

LESSON 1.6

epilepsy. Or they may believe that Western doctors should simply defer to the preferences of minority and refugee groups.

Students may believe that cross-cultural medical encounters are limited to the doctor and patient. In reality, they include entire communities.

Variations and Extensions

Have students use the two websites on CAM and refugee health (http://www3.baylor.edu/%7ECharles_Kemp/refugees.htm) and (<https://ccnm.thinkculturalhealth.org/default.asp>) to research the experiences of other refugee communities with the American healthcare system, and compare these to the Hmong experience. Is the Hmong experience unique? What common problems or opportunities do refugees face, regardless of their ethnicity or origin?

Students may compose a glossary of medical terms from Western and Hmong culture that they find in *The Spirit Catches You and You Fall Down*. Which terms are easily translated from one culture to the other? Which are harder to communicate, or even incomprehensible? Why?

Invite a guest speaker from a refugee or immigrant community to discuss the topic of cultural competence in medicine.

Invite a nurse or other healthcare practitioner to speak about how healthcare roles are changing as American population demographics change and as we grow more sensitive to the need for cultural competence in medicine.

National and State Academic Standards

NATIONAL NCTE Standards for the English Language Arts

1. Students read a wide range of print and non-print texts to build an understanding of texts, of themselves, and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works.
2. Students read a wide range of literature from many periods in many genres to build an understanding of the many dimensions (e.g., philosophical, ethical, aesthetic) of human experience.
3. Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics).

STATE

List your state-specific standards in the space below.

Merging Two Traditions

SUBUNIT 2 OVERVIEW

Essential Question for This Unit

How can we ensure the safety and effectiveness of complementary and alternative medicine (CAM)?

Subunit Goals

By the end of Subunit 2, students should be familiar with and able to draw the chemical composition and structure of many herbs and supplements. Students should also be able to identify the active ingredients that herbs and supplements share with conventional pharmaceuticals, such as salicylic acid. Students should recognize that a limitation of natural products is their inconsistency in dosage delivered and understand that manipulating surface area and volume can be used to control absorption rates of medication into the body.

They should also be able to read and interpret survey data and set up experimental designs for testing the statistical significance of a medical intervention. Finally, students should be aware of the prevalence of CAM in the United States and be able to evaluate the adequacy of the FDA regulations and guidelines currently in place.

Subunit Key Questions

- What active ingredients are present in herbal supplements? Do herbal supplements share active ingredients with pharmaceuticals? (Chemistry)
- How are volume and surface area related to medicine pill design? How do you calculate the surface area and volume of different figures? (Geometry)
- How prevalent is the use of CAM in the United States? Have any CAM practices been proven effective? (Algebra I)
- What is the FDA's position on the regulation of CAM? Is its position appropriate given what we know about CAM usage and effectiveness? (Social Studies)
- Should the government be more vigilant in regulating CAM? Are there other ways to ensure the safety and efficacy of CAM practices? (Social Studies, English Language Arts)

Lesson Summaries

Lesson	Subject	Description
2.1	Chemistry	Introduction to Herbs and Supplements Students study the active ingredients and chemical structure of common herbs and supplements used in CAM.
2.2	Chemistry	Herbal Medicine Lab Students learn the origin and chemical structure of aspirin. They also test various preparations of willow bark infusion for the presence of salicylic acid, the active ingredient of aspirin.
2.3	Geometry	Pill Design Students calculate the volume and surface area of pills in order to determine the rate at which medication is absorbed into the body. Students design their own pill shapes to maximize or minimize absorption rate.
2.4	Algebra I	Hypothesis Testing Students read and interpret a survey of CAM in the United States. Students also design experiments to test CAM for statistically significant beneficial health effects.
2.5	Social Studies	Government Regulation of CAM Students research five controversial types of CAM and discuss the FDA guidelines for regulation of alternative medical practice and medical products.
2.6	English Language Arts	CAM Debate Students learn the procedures and format of formal debating and engage in a formal debate on regulation of CAM in the United States.

Introduction to Herbs and Supplements

LESSON 2.1

CHEMISTRY

Time

120 minutes

Materials

Equipment

- Access to Internet-capable computer lab
- Class set of molecular model kits

Resources

- Introduction to Dietary and Herbal Supplements worksheet
- Compounds in Your Culture worksheet

Prior Student Learning

This lesson should follow and reinforce instruction on covalent bonding, Lewis Dot Theory, VSPER, and in-line structures.

Essential Question for This Unit

How can we ensure the safety and effectiveness of complementary and alternative medicine (CAM)?

Objectives

After completing this lesson, students should be able to

- Define conventional and alternative medicines using information from the FDA and National Institutes of Health and describe cautions that need to be taken before using them.
- Describe procedures required by the FDA to market conventional and alternative medicines.
- Identify 10 (potential) herbal medicines. Using the FDA website, record the positive (pro) and negative (con) evidence found in clinical trials related to each medicine.
- Interpret a line structure of active ingredients found in conventional and alternative medicines.
- Create a molecular model of an active ingredient of one conventional and one alternative medicine, given its line structure.

Lesson Activities

Lesson Springboard

Ask students if they can name some vitamin-fortified foods. Common examples are milk, orange juice, breakfast cereal, and fortified water. Write some common vitamins on the board and ask students if they know the functions any of them serve in a standard diet. Students may be familiar with vitamins C, D, E, or others.

Lesson Development

Internet Research

Pass out the Introduction to Herbs and Supplements worksheet. Give students time to answer the questions using the websites provided on the worksheet. To save time in class, you may wish to have students answer the questions on the worksheet as homework prior to this lesson and then review responses at the beginning of class.

Modeling

Have students practice building models of organic compounds from their line structures using the class set of organic molecular models. Have students complete models such as vitamin C, aspirin, ibuprofen, and acetaminophen. Use this lesson to review the different ways a chemist can express a compound—i.e., 2-D and 3-D Lewis Dot structures, empirical formulas, line structure, 3-D models, etc.

Introduction to Herbs and Supplements

LESSON 2.1

Based on their previous lessons studying the origins of various CAM practices, have students select a culture that interests them. Pass out the Compounds in Your Culture worksheet. Have students research some of the biologically based therapies that are used by folk medicine practitioners in that culture. Using ChemFinder.Com (<http://chemfinder.cambridgesoft.com>) students can look up the chemical structure of the active ingredients. Some of the active ingredients will be the same as those found in conventional pharmaceuticals.

Presentations

Have students select one active ingredient that is used by both CAM and conventional medicine found in their assigned culture. Be sure to approve each student's selection before they begin work on their presentation. Do not let more than two or three students research the same active ingredient. Students will prepare a short (3-minute) presentation that compares the prescription and delivery of this active ingredient in both conventional and folk medicine. As part of the presentation, students should build a model of the active ingredient using their own materials. Encourage students to be creative in their choice of materials, but emphasize that the accuracy of the models should not be compromised.

Lesson Closure

After they have finished the presentations, ask students if they were surprised by the number of active ingredients shared by CAM and conventional medicine. Discuss what this implies about how pharmaceuticals are discovered and developed.

Possible Prior Misconceptions

Some students may believe that the term *natural* indicates a safer product. Although medicines may be labeled natural, the medicine may not be as safe as those synthesized in labs. Natural is not always "better."

Student Assessment Artifacts

Student Presentations

Molecular models of the active ingredients of students' Western and complementary or alternative medicines will be graded on structural accuracy.

Variations and Extensions

Extend the presentation into a written report.

Collaborate with the Social Studies teacher and assign a joint project where students also research and do a presentation on the originating culture of the CAM.

Introduction to Herbs and Supplements

LESSON 2.1

National and State Academic Standards

NATIONAL

NRC National Science Education Standards

Structure and Property of Matter

- Atoms interact with one another by transferring or sharing electrons that are furthest from the nucleus. These outer electrons govern the chemical properties of the element.
- Bonds between atoms are created when electrons are paired up by being transferred or shared. A substance composed of a single kind of atom is called an element. The atoms may be bonded together into molecules or crystalline solids. A compound is formed when two or more kinds of atoms bind together chemically.
- The physical properties of compounds reflect the nature of the interactions among its molecules. These interactions are determined by the structure of the molecule, including the constituent atoms and the distances and angles between them.

STATE

List your state-specific standards in the space below.

Name _____ Date _____ Period _____

Introduction to Dietary and Herbal Supplements

<http://www.ods.od.nih.gov/factsheets/dietarysupplements.asp>

<http://nccam.nih.gov/health/supplement-safety>

<http://nccam.nih.gov/health/bottle>

http://www.nlm.nih.gov/medlineplus/druginfo/herb_All.html

<http://health.nih.gov/result.asp/1103>

<http://www.nlm.nih.gov/medlineplus/druginformation.html>

In complete sentences, answer the following questions using the resources above. Write in your own words. Make sure to avoid plagiarism (copying directly from a resource).

1. What are dietary supplements?
2. How are dietary supplements related to herbal supplements?
3. If you wanted to sell your own brand of dietary supplement that contains a new dietary ingredient at your local grocery store, what are some first steps you need to take with the FDA?
4. If there is a problem with your product, what does the FDA need to do in order to remove it from the store?

Name _____ Date _____ Period _____

For the following supplements, fill in the table below. You may choose any of the supplements that you find on the websites above. Complete at least **10 supplements**.

Name of Supplement	Naturally Found...	Scientific Evidence	
		Positive Evidence	Negative or Unclear Evidence
Example: Vitamin A (Retinol)	in dark fruits or vegetables, such as carrots, and in dairy products	Under medical supervision, vitamin A can be beneficial for children who have measles. The vitamin can reduce the length of time a child has measles.	Vitamin A may not be beneficial for people who have lung cancer, as it may increase the adverse effects associated with lung cancer.

Name _____ Date _____ Period _____

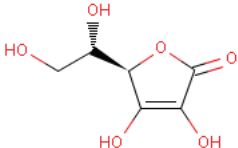
Supplement list, continued

Name of Supplement	Naturally Found...	Scientific Evidence	
		Positive Evidence	Negative or Unclear Evidence

Name _____ Date _____ Period _____

Compounds in Your Culture

1. Use Internet resources to research the Western **and** alternative medicines that are consumed orally in your culture.
2. Create an account at ChemFinder.Com, which allows you to search for the chemical structures of active ingredients found in oral medicines.
3. Fill in the chart below.

Active Ingredient and Its Line Structure	How It Is Found in Your Culture
<p>Example</p> <div style="text-align: center;">  </div> <p style="text-align: center;">Vitamin C</p>	<p>In the _____ culture, vitamin C, which is found in oranges, is eaten often to prevent scurvy. In the _____ culture, vitamin C is believed to prevent cancer, although this use has not been supported by the scientific studies.</p>

Name _____ Date _____ Period _____

Active Ingredient and Its Line Structure	How It Is Found in Your Culture

Herbal Medicine Lab

LESSON 2.2

CHEMISTRY

Time

90 minutes

Materials

Equipment

- Dried willow bark
- Fresh willow bark
- Bark of another tree
- 150 ml beakers
- Distilled water
- Triple pad pH paper
- FeCl_3 solution
- Balances
- Weigh paper
- Hot plates or Bunsen burners

Resources

Herbal Medicine Lab worksheet

Prior Student Learning

Students should have a basic understanding of chemical structure diagrams.

Essential Question for This Unit

How can we ensure the safety and effectiveness of complementary and alternative medicine (CAM)?

Objectives

After completing this lesson, students should be able to

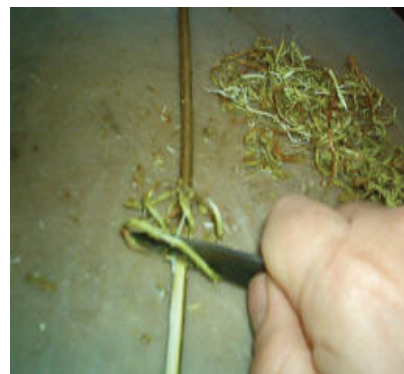
- Identify the elements present and draw the chemical structure of salicylic acid.
- Test for the presence of salicylic acid in a compound.
- Follow an experimental design.
- Discuss the possible disadvantages associated with inconsistency in herbal remedy dosages.

Lesson Activities

Teacher Preparation

You will need to obtain your bark samples in advance. Dried willow bark can be found in health or organic food stores, often in the tea section, or online.

You will need to locate willow in your community to collect fresh willow bark. White willow is the traditional source of willow bark remedies, but any species of willow will contain some level of salicylic acid. Ideally, you would collect bark samples from multiple parts of the tree (trunk, root, branches); however, harvesting bark from the trunk of a living tree can damage it irreparably, so it is best to harvest from pruned branches. To remove the bark from the branches, snip off any side branches and spurs. Take a sharp paring knife or pocketknife and peel the bark in thin strips or shavings, much like peeling a carrot. Be sure to cut deeply enough to get the inner bark, which will be slightly wet and also is usually green in color. The different layers are easy to distinguish when you are peeling the branches.



© Prodigal Gardens

Willow is very common, but if you cannot find it in your area, try using dried willow bark from a variety of different sources/retailers. Another possible source for willow is florists, who sometimes use fresh willow branches in flower arrangements.

Subunit 2—Merging Two Traditions
Herbal Medicine Lab

LESSON 2.2

FeCl_3 solution can be prepared as either a 1% solution or a 0.1 M solution. Be sure to use ferric chloride/iron(III) chloride. Ferrous/iron (II) compounds are not appropriate for this lab. The solution will be a golden color that turns purple in the presence of salicylic acid.

Triple pad pH paper allows for greater accuracy in determining pH, but regular pH paper is acceptable, as is any other acidity test you prefer to use.

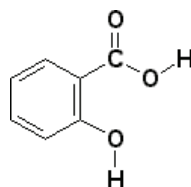
Lesson Springboard

Ask the class to share any home remedies that their parents or grandparents have used with them when they had a cold. You may initiate conversation by describing the use of chicken soup and orange juice as examples of home remedies. Record the students' examples on the board, and discuss how home remedies are examples of CAM.

Lesson Development

Direct Instruction

Ask the class if they have ever heard of willow bark tea. If not, introduce it as a common herbal medicine used around the world, including by Native Americans, as a remedy for headache. Explain that willow bark contains salicylic acid, the active ingredient of aspirin (acetylsalicylic acid).



Salicylic Acid

Classroom Management

The number of beakers used is determined by the number of different willow bark samples you provide.

Don't forget to add an extra beaker for the control.

In addition to the distilled water control, you may also wish to have a beaker with aspirin for comparison.

Lab Activity

Pass out lab worksheet and have students read the introduction and follow the procedures.

1. Number each of the five 150 ml beakers.
2. Place 50 ml of distilled water into each beaker.
3. Measure and record the acidity of each water sample in the data table.
4. Measure 10 g of willow bark from each sample.
5. Place each willow bark sample into a separate beaker and record the type in the data table.
6. Bring the water in each beaker to a boil.
7. Keep the samples at a roiling boil for 5 minutes.
8. Remove samples from heat and allow them to cool for 5 minutes.
9. Using pH paper, measure and record the acidity of each sample in the data table.

Subunit 2—Merging Two Traditions
Herbal Medicine Lab

LESSON 2.2

10. Add several drops of FeCl_3 solution to each beaker and observe the color reaction, if any.
11. Record observations in the data table.

Lesson Closure

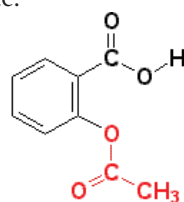
After students have completed the lab, compare the results from each group. Students should observe variation in pH and color between the different samples. Discuss what factors might be responsible for these variations. Ask students to consider how these differences might affect the medicinal potency of the various samples. Discuss whether this variation would be acceptable in modern medical treatments, and why rigorous standards are required of pharmaceutical companies.

Student Assessment Artifacts

Herbal Medicine Lab worksheet

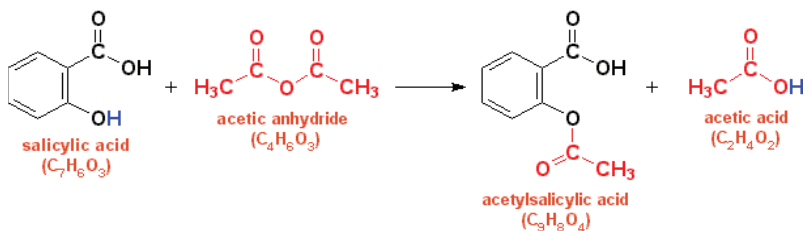
Variations and Extensions

Extend lesson to include instruction about chemical structure and synthesis of aspirin. Aspirin is less acidic due to the added acetyl group, and is thus easier to tolerate.



Acetylsalicylic Acid

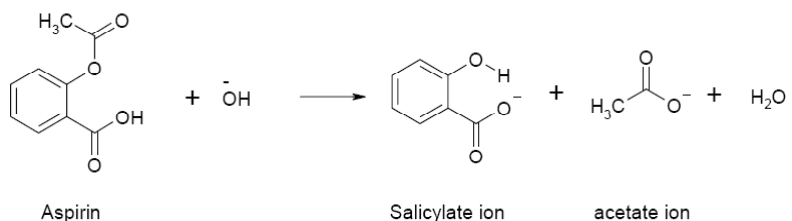
You may choose to introduce or review esterification at this time, in the context of the synthesis of aspirin from salicylic acid.



Subunit 2—Merging Two Traditions
Herbal Medicine Lab

LESSON 2.2

Once in the intestine, aspirin is hydrolyzed back to salicylic acid to perform its analgesic, antipyretic, and anti-inflammatory actions.



Have students synthesize aspirin from salicylic acid and test its purity, calculate theoretical and actual yield, and determine the limiting reagent.

Have students research the action mechanism for aspirin's analgesic, antipyretic, and anti-inflammatory properties, including its noncompetitive, irreversible inhibition of the COX enzymes, which in turn inhibits the production of prostaglandins and thromboxanes.

National and State Academic Standards

NATIONAL

NRC National Science Education Standards

Structure and Properties of Matter

Carbon atoms can bond to one another in chains, rings, and branching networks to form a variety of structures, including synthetic polymers, oils, and the large molecules essential to life.

Chemical Reactions

Chemical reactions occur all around us, for example in health care, cooking, cosmetics, and automobiles. Complex chemical reactions involving carbon-based molecules take place constantly in every cell in our bodies.

STATE

List your state-specific standards in the space below.

Name _____ Date _____ Period _____

Herbal Medicine Lab

Introduction

One of the biggest problems in the use of “natural” or herbal medicines is the variation in the amount of the herb’s active ingredient(s) due to seasonal changes, location, soil chemistry, and other biotic and abiotic factors. Compared with the more accurate compounding of modern pharmaceuticals, herbal medicines vary widely in concentration of active ingredients. Some studies have even indicated the presences of heavy metals in certain herbal compounds.

In this lab, you will determine the variation in strength of a common herbal medicine used widely by Native Americans. Willow bark, used for the treatment of fever and arthritis, contains naturally occurring salicylic acid, the active ingredient of aspirin.

Materials (per group)

5 bark samples	Triple pad pH paper
5 150 ml beakers	FeCl ₃ solution
1 hot plate	Beral pipets or medicine droppers
1 balance (digital or triple-beam)	Distilled water

Procedure

1. Number each of the five 150 ml beakers.
2. Place 50 ml of distilled water into each beaker.
3. Measure and record the acidity of each water sample in the data table.
4. Measure 10 g of willow bark from each sample.
5. Place each willow bark sample into a separate beaker and record the type in the data table.
6. Bring the water in each beaker to a boil.
7. Keep samples at a roiling boil for 5 minutes.
8. Remove samples from heat and allow them to cool for 5 minutes.
9. Using pH paper, measure and record the acidity of each sample in the data table.
10. Add several drops of FeCl₃ solution to each beaker and observe the color reaction, if any.
11. Record observations in the data table.

Data Table

Beaker Number	Sample Type	Acidity Before	Acidity After	FeCl ₃ Observation
1				
2				
3				
4				
5				

Name _____ Date _____ Period _____

Conclusions

1. What was the range of acidity you observed among the various willow bark samples?
2. Which sample had the highest concentration of salicylic acid? Which sample had the lowest concentration of salicylic acid?
3. What might account for the differences among the samples?
4. Would each sample be equally effective at treating headaches? Why or why not?
5. What variation in results would you expect if you tested different brands of aspirin? Explain your reasoning.
6. Would using willow bark tea be more or less reliable than using aspirin to treat a headache? Explain.

Pill Design

LESSON 2.3

GEOMETRY

Time

100 minutes

Materials

Equipment

- Construction paper (11" x 17")
- Scissors
- Tape
- Rulers
- Examples of different types of pills (optional)
- 2–3 liters of breakfast cereal, small beans, or other similarly shaped material
- Large measurement beaker

Resources

Planning a Pill worksheet

Prior Student Learning

Students should already be familiar with finding the areas of polygons and circles and the surface area of cylinders.

Essential Question for This Unit

How can we ensure the safety and effectiveness of complementary and alternative medicine (CAM)?

Objectives

After completing this lesson, students should be able to

- Determine the surface area of prisms, cylinders, and figures made of prisms and cylinders.
- Determine the volume of prisms, cylinders, and figures made of combinations of the two.
- Sketch graphs or write paragraph descriptions of how quickly a medication might be absorbed by the body given its surface-area-to-volume ratio.
- Discuss possible considerations when designing the shape of a medicine pill, as related to surface area and volume.

Lesson Activities

Lesson Springboard

Ask students to volunteer descriptions of the shapes of different pills they have encountered. If possible, have actual examples of different pills for students to examine and have the class compare and contrast their shapes. Ask, "What are some reasons you can come up with for the similarities and differences between these pills? What did the designers of the pill have to consider?" If not stated by a student, suggest that different drugs need to be absorbed by the body at different rates, and surface area is one determinant of absorption rate. Further, drugs require different dosages, which determine the volume of the pill. This lesson will focus on how to figure out the surface area and volume of shapes that are combinations of prisms and cylinders.

Lesson Development

Direct Instruction

First, define *surface area* and *volume*. Then define *prism* and *cylinder* for the class. (A deck of cards is a useful tool for explaining right and oblique prisms. Each card in the stack is congruent to the base, just as any slice parallel to the base of a prism is congruent to the base regardless of whether the prism is right or oblique.) Show examples of prisms with different bases and point out that lateral faces are always parallelograms.

Small Group Work

Divide students into groups of three or four. Introduce a class contest where groups are asked to create a 3-D model of (1) a pill design that would be absorbed the most quickly in the body (has the highest surface-area-to-volume ratio) and (2) a pill design that would be absorbed

Pill Design

LESSON 2.3

the most slowly (has the lowest surface-area-to-volume ratio). The rules of the contest are

- Each group may only use one sheet of construction paper per pill design. A group may not ask for more paper if they make a mistake, so they must plan ahead.
- The pill must be a prism, cylinder, or combination of these figures.
- All sides of the pill must be included in the model. Groups may not keep the top or bottom of the prism open.
- Tape may not be used to create extra surface area.

Hand out the Planning a Pill worksheet, and have groups come to an agreement on their two pill designs and record their plans on the worksheet. When the group has a plan, they can build their models.

Class Discussion

When all groups have built their two models, ask students to quickly examine all of the models and rank them by which they believe has the lowest volume up to the highest. Have the class discuss and defend the reasoning behind their judgments. All students then record their predictions on the worksheet.

Using the cereal and the measuring beaker, measure the volume of the different pills and record the results. A slit may have to be cut in the model to pour the cereal in and out. Discuss as a class any results that surprised students.

Small Group Work

Using their knowledge of finding the area of polygons and circles, have groups determine the surface area of their own models. Agree on whether the entire class is using English or metric units. Discuss how to calculate the volume of a prism and cylinder. Students then calculate the volumes of their models and determine the surface-area-to-volume ratio. Share all class data and name the winners of the two contests.

Lesson Closure

Have groups discuss how their different pills would dissolve when ingested. Students then sketch a graph describing their predictions on the worksheet and write a paragraph also describing how they think the pill will act. Have students consider which kinds of medicines might take the shape of the two pills they designed and then share their insights with the class. Tie the lesson back to their study of herbal remedies. What different pill shapes can be found in herbal supplements? If possible, find an herbal remedy that comes in multiple shapes and have students observe them. Ask students to discuss what impact would shape have on the effect of an herbal supplement, and if there should be guidelines regulating pill shape.

Pill Design

LESSON 2.3

Possible Prior Misconceptions

Students often assume that there is a direct relationship between the surface area and volume of an object (more surface area = more volume).

The class also may not have thought about how a surface-area-to-volume ratio might change as a pill dissolves; more advanced students could be asked to consider this when sketching their graphs.

Student Assessment Artifacts

Planning a Pill worksheet

Pill Models

Variations and Extensions

If time is available, have students measure and approximate the surface area and volume of real medicines. This lesson can also include cones, pyramids, spheres, and irregular objects.

Students may also determine shapes that maximize surface area compared to volume and ones that minimize this ratio.

National and State Academic Standards

NATIONAL NCTM Standards for School Mathematics

Geometry

Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.

Use visualization, spatial reasoning, and geometric modeling to solve problems.

Algebra

Use mathematical models to represent and understand quantitative relationships.

Analyze change in various contexts.

STATE

List your state-specific standards in the space below.

Name _____ Date _____ Period _____

Planning a Pill

Your group must design and build two different models of pills:

Pill #1: a pill that will **dissolve quickly** in the body

Pill #2: a pill that will **dissolve slowly** in the body

1. How do you think surface area and volume are related to your pill design? How can these concepts affect how fast a pill dissolves?

2. When your group has agreed on a design for both pills, sketch your design here. Include dimensions.

These are the rules:

- Only one piece of construction paper can be used for each pill.
- The model must include all sides of the pill without holes.
- Tape cannot be used to increase surface area.
- The shape must be a prism, cylinder, or combination of both.

Sketch of Pill #1:

Sketch of Pill #2:

Name _____ Date _____ Period _____

3. Rank all the models in the class from lowest to highest surface-area-to-volume ratio. Record your predictions here:



Lowest

Highest

4. Write down any surprises you had when the volume of each pill was measured. What happened that you didn't expect?

5. Calculate the surface area and volume of each of your pills. Don't forget units! Record all of your calculations here.

Pill #1

Pill #2

Total surface area _____

Total surface area _____

Volume _____

Volume _____

Surface area: Volume _____ : _____

Surface area: Volume _____ : _____

6. Write a few sentences describing how you think the pills your group designed will dissolve in the body. Will the pill start dissolving quickly or slowly? Will that rate change at any time? What are the mathematical reasons for your conclusions?

Pill #1:

Pill #2:

Name _____ Date _____ Period _____

7. Sketch a graph that shows what you described in problem #6.
 - a. Label both axes (% dissolved vs. time).
 - b. Create a title that makes sense.
 - c. Graph the action of both pills on the same set of axes. Use a different color for each pill and create a key.



Hypothesis Testing

LESSON 2.4

ALGEBRA I

Time

180 minutes

Materials

CDC report: *Complementary and Alternative Medicine Use Among Adults: United States 2002* (<http://www.mbcrc.med.ucla.edu/PDFs/camsurvey2.pdf>)

Prior Student Learning

Students should be able to calculate measures of central tendency and variation.

Students should understand the difference between a statistic and a parameter.

Students should have a basic understanding of sources of bias in data sampling.

Essential Question for This Unit

How can we ensure the safety and effectiveness of complementary and alternative medicine (CAM)?

Objectives

After completing this lesson, students should be able to

- Read and understand a technical article.
- Define key terms used in hypothesis testing.
- State null and alternative hypotheses.
- Find critical values for $\alpha = .01$, $.05$, and $.10$ for one- and two-tailed tests.
- Explain Type I and Type II errors.

Lesson Activities

Prior to Lesson

For homework prior to this lesson, have students read pages 1–6 and 15–19 of the CDC report *Complementary and Alternative Medicine Use Among Adults: United States 2002*.

Have students prepare three lists from the reading for class.

- Treatments they (or people they know) have had
- Treatments they do not recognize
- Treatments they think are unlikely to be effective

Lesson Springboard

Have students share their lists with the class and discuss whether or not they were surprised by the prevalence of CAM in the United States. Allow students to share anecdotal stories of effective CAM practices they or someone they know have experienced.

Lesson Development

Survey Activity

Have students survey others in their cohort (or the entire school, if possible) on their usage of the CAM practices listed in the article over the past 12 months. Have students calculate the percentages of each practice being used by students in the school as a whole, and for students in their classroom. Discuss the following comparisons:

- School sample to classroom data—Is the classroom a representative sample of the school? Why or why not?
- School sample to national sample (from the research article)—Is the school representative of the nation? Why or why not?

Subunit 2—Merging Two Traditions
Hypothesis Testing

LESSON 2.4

Examine and discuss what the researchers who authored the article needed to consider when designing their sample set so that it would represent the national population.

Discuss the benefits and limitations of representing a population through random sampling and introduce the concept of hypothesis testing. Define the following concepts:

- *Null hypothesis*—The hypothesis corresponding to the “default” assumption. In this case, it would be that CAM has no real medical effect.
- *Type I statistical errors*—False positive; you see an effect when there actually is none.
- *Type II statistical errors*—False negative; you don’t see the effect that is actually present.

Assign students into groups to design an experimental trial of the effectiveness of a CAM practice. Their design should include appropriately worded null and alternative hypotheses, appropriate attention to controls, and an explanation of possible results (including acceptable confidence intervals, significance of Type I and Type II errors, and so on). They can choose from the list provided in the article, or they may wish to choose the same CAM practice they are researching for their English Language Arts class.

Have a discussion with the class on whether or not the government and insurance agencies should be involved in promoting, using, and paying for these types of therapies. Lead students to consider what criteria official agencies should use to judge the legitimacy (effectiveness) of medical practices.

Lesson Closure

Have students share their experimental design with another group for critique. If time allows, have all groups share their design for review in front of the class.

Student Assessment Artifacts

Three lists from the reading assignment
Experimental design for a CAM treatment trial (including statistical analysis methods)

National and State Academic Standards

NATIONAL
NCTM Standards for School Mathematics

Data Analysis and Probability

Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.

Develop and evaluate inferences and predictions that are based on data.

Understand and apply basic concepts of probability.

STATE

List your state-specific standards in the space below.

Government Regulation of CAM

LESSON 2.5

SOCIAL STUDIES

Time

50 minutes

Materials

Equipment

Internet access

Resources

- Five Types of CAM bibliography
- CAM Research worksheet
- National Center for Complementary and Alternative Medicine (<http://nccam.nih.gov>)
- FDA guidance for the CAM industry (<http://www.fda.gov/OHRMS/DOCKETS/98fr/06d-0480-gld0001.pdf>)

Prior Student Learning

Students should be familiar with all five categories of CAM.

Essential Question for This Unit

How can we ensure the safety and effectiveness of complementary and alternative medicine (CAM)?

Objectives

After completing this lesson, students should be able to

- Explain the principles that underlie federal regulation of CAM in general.
- Identify the benefits and drawbacks of five controversial examples of CAM.
- Apply general regulatory principles and evaluate the government's attempts to regulate these five practices.

Lesson Activities

Prior to Lesson

Pass out the Five Types of CAM bibliography and the CAM Research worksheet. Divide the class into five equal groups and have each group read the information on one controversial example from each of the five categories of CAM. Ask each student to fill in the relevant column on the CAM Research worksheet. Students may refer to the FDA guidance for the CAM industry for additional information.

Lesson Springboard

Assemble students in their groups and have each group provide the rest of the class with a short, one- or two-sentence description of their CAM practice. Also ask them to share one surprising fact they learned from their research. Encourage students to offer facts about all five examples of CAM and their regulation.

Lesson Development

Jigsaw—Expert Groups

Pass out the CAM Research worksheet. Students in each expert group should consult about their individual homework and help each other fill in the column on the CAM Research worksheet that corresponds with the information they read the previous night.

Jigsaw—Teaching Groups

Reorganize the students into groups that contain at least one member from each of the five expert groups. Have each “expert” teach the other members of the group about the nature and regulation of their controversial practice. This exercise will help them organize the research they’ve done and compare the history of federal regulation of the five CAM practices. Allow most of the lesson for this work.

Government Regulation of CAM

LESSON 2.5

Student Writing

In the final 15 minutes of class, have students choose one of the five types of CAM and write a one-paragraph report assessing whether it is over-regulated or under-regulated, and why. Their report must cite at least two facts from a reputable source regarding the efficacy, safety, or cost of the CAM practice or the practicality of federal regulation.

Lesson Closure

Ask students if they have changed their opinions about any or all of these types of CAM as a result of their research and discussions. Do they have a more positive or more critical opinion of the FDA?

Possible Prior Misconceptions

Students may believe that the government simply prohibits or permits a type of CAM and its practitioners, when in fact it regulates specific CAM practices or aspects.

Students may believe that CAM regulation shows steady progress toward greater or less regulation, when in fact the history of regulation shows a variety of changes in policy direction.

Student Assessment Artifacts

CAM Research worksheet

One-paragraph reports on CAM regulation

Variations and Extensions

As homework, or as a second lesson, have students write reports on all five controversial types of CAM. Because this requires more research, they may share one another's CAM Research worksheets for background information.

Have students nominate other controversial types of CAM for use in a lesson like this and ask them to justify their choices. Also, ask students to provide sources for research on that particular CAM and its regulation.

Students may be interested to learn that other countries take different views of these practices and regulate them in different ways. Have students choose one of the five types of CAM and describe its regulation in Great Britain, France, the Netherlands, or Japan.

Government Regulation of CAM

LESSON 2.5

National and State Academic Standards

NATIONAL

NCSS Curriculum Standards for Social Studies

VI. Power, Authority, and Governance

Social studies programs should include experiences that provide for the study of how people create and change structures of power, authority, and governance, so that the learner can:

- c. analyze and explain ideas and mechanisms to meet needs and wants of citizens, regulate territory, manage conflict, establish order and security, and balance competing conceptions of a just society.

STATE

List your state-specific standards in the space below.

Name _____ Date _____ Period _____

Five Types of CAM: A Bibliography

1. WHOLE MEDICAL SYSTEMS

A specific treatment within a whole medical system was chosen in place of requiring students to research an entire Whole Medical System, which often has many different branches and treatments that overlap into more than one of the five types of CAM such as acupuncture, which is a part of TCM and is also an energy medicine. In this case, Ma Huang was selected from TCM for the interesting history of its uses and its regulation.

Traditional Chinese Medicine: Ma Huang

Background information:

<http://www.botgard.ucla.edu/html/botanytextbooks/economicbotany/Ephedra/index.html>

FDA actions:

<http://www.fda.gov/oc/initiatives/ephedra/february2004>

FDA and FTC actions:

<http://www.cfsan.fda.gov/~dms/ds-ephed.html>

2. MIND-BODY MEDICINE

Hypnotherapy

“Hypnosis: An Altered State of Consciousness” (Mayo Clinic):

<http://www.mayoclinic.com/health/hypnosis/SA00084>

“Q&A: Hypnotherapy” (California Institute of the Healing Arts and Sciences):

http://www.californiainstitute.net/licensing_hypnotherapy.htm

3. BIOLOGICALLY BASED PRODUCTS

Medical Marijuana

FDA position on medical marijuana:

<http://www.fda.gov/bbs/topics/NEWS/2006/NEW01362.html>

“Marijuana as Medicine” (Mayo Clinic):

<http://www.mayoclinic.com/health/medical-marijuana/GA00014>

4. MANIPULATIVE and BODY-BASED

Chiropractic

“About Chiropractic and Its Use in Treating Low-Back Pain”:

<http://nccam.nih.gov/health/chiropractic>

“What Is Chiropractic?” (American Chiropractic Association):

http://www.acatoday.org/level2_css.cfm?T1ID=13&T2ID=61

Name _____ Date _____ Period _____

5. ENERGY MEDICINE

Acupuncture

“Acupuncture”:

<http://nccam.nih.gov/health/acupuncture>

“Acupuncture: Is It Safe?”:

http://medcomres.com/articles/acupuncture_safe.htm

Acupuncture laws by state:

<http://www.healthy.net/public/legal-lg/regulations/acustlaw.htm>

Name _____ Date _____ Period _____

CAM Research		Ma Huang	Hypnotherapy	Medical Marijuana	Chiropractic	Acupuncture
What are the cultural origins of your CAM practice?						
What health problem(s) can your CAM practice treat?						
What does this treatment entail?						
What benefits are claimed for your CAM practice?						
What is the evidence that your CAM practice is effective?						

Name _____ Date _____ Period _____

	Ma Huang	Hypnotherapy	Medical Marijuana	Chiropractic	Acupuncture
What are the drawbacks or risks of this CAM practice?					
What are its costs to consumers or insurance firms?					
What were the major federal regulations of your type of CAM from 1950 to 2000?					
What are the current regulations?					

CAM Debate

LESSON 2.6

ENGLISH LANGUAGE ARTS

Time

180 minutes

Materials

Equipment

Stopwatch

Resources

- Debate handout by Melissa Evans (<http://www.pps.k12.or.us/schools-c/pages/clinton/debate.html>)
- Classroom Debate Rubric

Prior Student Learning

Students should have completed their research on CAM practices and heard presentations from their classmates in previous English classes.

Students should have reviewed statistics on the use of CAM practices in math classes.

Essential Question for This Unit

How can we ensure the safety and effectiveness of complementary and alternative medicine (CAM)?

Objectives

After completing this lesson, students should be able to

Take a position on a controversial subject supported by reasoned arguments.

- Defend a position against possible objections.
- Construct persuasive arguments based on research.
- Refute opposing arguments with evidence.
- Write and deliver a speech to a critical audience.

Lesson Activities

Lesson Springboard

Ask students to recall their last disagreement with a friend or family member. Ask them to try to identify the different sides and the arguments each side used to defend its position. Explain to students that while there is often no right or wrong answer in a disagreement, having reasoned arguments with supporting evidence increases your chances of convincing an audience to accept or reject a position.

Remind students of the essential question for this curriculum unit and that they will eventually be asked to take a position on the regulation of CAM practices. In this lesson, they will learn to formally defend their position in an effective manner.

Lesson Development

Role-Play Debate

Assign students to teams. In these teams, they will role-play the process of constructing an argument, asserting a position, and providing supporting evidence.

Distribute large cards and a marker to each student. Post a resolution, either regarding a mundane topic (e.g., jelly beans are not good for you) or a contemporary topic that is controversial among students (e.g., dress code, legality of music downloads, school restriction/monitoring of personal website postings on MySpace or Facebook).

Post three signs—Agree, On the Fence, Disagree—on three different walls around the classroom. Instruct students to decide which of the three positions they will support based on how they feel about the resolution.

CAM Debate

LESSON 2.6

Have students fill out their cards with the reasons they do or do not agree with the resolution, one reason per card. Encourage students to fill out at least two or three cards. Students who select On the Fence as their position should have at least one reason supporting the resolution and one reason against it.

Once all the students have finished filling out their cards, have them take their cards and move to the area corresponding to their position. Once students are in these groups, have them share their reasons within the group. As a group, have the students select the five strongest reasons and post those cards on the wall under their position.

Ask a representative from each group to read the five posted reasons supporting their position to the class, beginning with the group that agrees with the resolution. End with the concerns of the group that is On the Fence.

As a class, identify any arguments that might address the concerns of the On the Fence group. Did the Agree and Disagree groups provide any arguments that swayed members of the On the Fence group? Give the opposing groups an opportunity to elaborate on their arguments for the undecided group.

Take down the On the Fence sign and instruct the undecided to choose to agree or disagree with the resolution and stand by their position. Have each of these students explain to the class what persuaded them.

Connect the lesson activity to the basic features of persuasive writing, emphasizing that argumentative strategy requires writers to counter opposing arguments in addition to supporting their own position.

CAM Debate

Present the class with the resolution for debate: The government should regulate complementary and alternative medicine. Explain to students that they will research and conduct a formal debate on this issue. You may wish to specify a particular type of CAM for regulation.

Pass out copies of the Debate handout. Read through the procedures and discuss the process of formal debate with the class.

Divide the class into two teams—Affirmative and Negative. You may wish to allow students to select their side. You might also choose to assign students to the opposite side from the one that they support.

Distribute and review the Classroom Debate Rubric with the class. Assign students to specific responsibilities within their teams: resolution, construction, cross, and rebuttal. Have all students separately prepare a relevant Construction speech. Students should prepare their arguments based on a minimum of five major points logically developed and substantiated by factual evidence that supports their position.

Classroom Management
Conduct a straw poll on the students' positions regarding the resolution. You may wish to use this information later when assigning students to different sides on the debate.

CAM Debate

LESSON 2.6

Have all Affirmative team members and Negative team members meet separately and decide on their best arguments. Select seven students for roles in the debate (four affirmative speakers and three negative speakers). The remaining students will act as audience and judges. Students selected as Affirmative Construction and Negative Construction speakers will need to memorize their speeches.

Once preparations have been completed, stage the debate either in class or in a theater setting.

Lesson Closure

Allow time for judges to share evaluations of the debate with the team and debrief the debating experience with the class.

Student Assessment Artifacts

Classroom debate

Variations and Extensions

Show a clip from a television news program with a debate format, such as *Crossfire*, to illustrate how evidence is used to support arguments. Choose your clip carefully—not all episodes are equal in quality.

Stage multiple debates so that all students have to speak publicly.

Allow students to create posters or other graphical representations supporting their position on the class resolution. You may group students into pairs to work on this assignment.

Ask local industry and legislative professionals to hear and/or judge the debate.

Invite a trial lawyer to come and discuss rhetorical techniques for swaying a jury.

You may wish to extend the debate into a formal essay. Have students use the debate as the basis for writing a three-page persuasive essay.

National and State Academic Standards

NATIONAL

NCTE Standards for the English Language Arts

3. Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics).
4. Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
5. Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.
11. Students participate as knowledgeable, reflective, creative, and critical members of a variety of literacy communities.
12. Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).

STATE

List your state-specific standards in the space below.

Name _____ Date _____ Period _____

Classroom Debate Rubric

Criteria	Levels of Performance			
	1	2	3	4
1. Organization and clarity Viewpoints and responses are outlined both clearly and orderly.	Unclear in most parts	Clear in some parts but not overall	Mostly clear and orderly in all parts	Completely clear and orderly presentation
2. Use of arguments Reasons are given to support viewpoint.	Few or no relevant reasons given	Some relevant reasons given	Many reasons given; most were relevant	Most relevant reasons given in support
3. Use of examples and facts Examples and facts are given to support reasons.	Few or no relevant supporting examples/facts	Some relevant examples/facts given	Many examples/facts given; most were relevant	Many relevant supporting examples and facts given
4. Use of rebuttal Arguments made by the other team are responded to and dealt with effectively.	No effective counterarguments made	Few effective counterarguments made	Some effective counterarguments made	Many effective counterarguments made
5. Presentation style Tone of voice, use of gestures, and level of enthusiasm are convincing to audience.	Few style features were used or they were not used convincingly	Some style features were used convincingly	All style features were used, most convincingly	All style features were used convincingly

