



Herbal Remedies: Myth or Medicine?

Grade: 7 | Time: 4-5, 60 minute periods

Standards:

Georgia Performance Standards in Science
S7CS2.a, c; S7CS4.b; S7CS6.a; S7L2.a; S7L4.d; S7L5.b
Next Generation Science Standards
LS1.C, LS2.A, LS4.C, LS4.D, PS3.D
Common Core Literacy Standards
ELACCG-8RST2, ELACCG-8RST3, ELACCG-8RST4,
ELACCG-8WHST6, ELACCG-8WHST9

Supplies:

for Salt Scrub

Epsom salt, table salt, or sea salt;
Essential oil of choice (e.g., lavender, lemon,
peppermint, tea tree, eucalyptus, jasmine, etc.)

Bring Your Own . . .

BYO: large bowl;
BYO: oil (coconut, sunflower, safflower,
peanut, olive, almond, etc./ not mineral)
BYO: zip top bags (1 per student)
BYO: spoons (1 per group)
BYO: ½ c measuring cup (1 per group)

for Peppermint Tea

Peppermint seeds (to grow)

for Iliad Project (per class)

Iliad Project Kit with supplies for 8 groups, including:
1 mortar and pestle
8 plates (petri dishes) and agar powder
8 syringes
2 cell spreaders
200 paper filter circles / discs
1 mL antibacterial control
8 culture tubes w/ media (add 5 ml distilled water)
8 empty culture tubes
8 pair nitrile gloves
8 syringe filters
50 mL buffer
40 micro-centrifuge tubes
Non pathogenic bacteria on paper in foil
1 inoculating loop
Protocol for Iliad Project (copy it for ea group)

for research

an Internet-connected computer per student
Student Claim / Evidence / Reasoning forms

Garden Connection:

Students will harvest plants from the garden to create essential oils, scrubs, salves, and other products using medicinal plants. Students can also create or build upon an existing herb garden.

STEM Connection:

Students will design and construct their own herbal first aid kit container to house their herbal remedies.

Overview

Students will learn about plants that have traditionally been used for medicinal purposes; make their own herbal remedies; research plant adaptations to understand what properties protect plants from predators and disease and how those properties might also be effective in protecting people from disease or infection; distinguish among claims; and plant an herb garden with a corresponding field guide on medicinal plants.

Essential Questions

What special adaptations do plants have that could make them useful to humans as medicine? What makes a plant “medicinal”? How do medicinal plants affect the human body? How can I tell if claims about herbal remedies or medicinal plants are based on folklore or backed by scientific evidence?

Engage

Students will share any personal experiences with herbal remedies and conduct research to discover a variety of ways that plants are used medicinally. They will then make a hand cleaner with oil, salt and essential oil for fragrance.

Explore

Students will use their research findings to select a plant species and test it for antibiotic potential, reporting results to the Iliad Project, a citizen science database.

Explain

Students will be able to distinguish between claims substantiated by evidence and those that are not; use that distinction to evaluate claims; and argue from evidence about plants that supposedly have medicinal value.

Environmental Stewardship

Students will create or expand an herb garden, label the plants with numbers or QR codes, and develop a laminated paper or web-based field guide that profiles a plant’s traditional uses as an herbal remedy as well as scientific evidence of its medicinal effectiveness. Herbs selected may also attract pollinators.

Evaluate

A rubric has been created to assess the extent to which students meet performance expectations.

Extend

Students may make additional remedies from herbs in the school garden, including salves, poultices, lip balms, and infused oils, for which recipes are provided.

Standards

GEORGIA PERFORMANCE STANDARDS IN SCIENCE

S7CS2. Students will use standard safety practices for all classroom laboratory and field investigations.

- a. Follow correct procedures for use of scientific apparatus.
- c. Follow correct protocol for identifying and reporting safety problems and violations.

S7CS4. Students will use tools and instruments for observing, measuring, and manipulating equipment and materials in scientific activities.

- b. Use appropriate tools for measuring objects and/or substances.

S7CS6. Students will communicate scientific ideas and activities clearly.

- a. Write clear, step-by-step instructions for conducting particular scientific investigations, operating a piece of equipment, or following a procedure.

S7L2. Students will describe the structure and function of cells, tissues, organs, and organ systems.

- a. Explain that cells take in nutrients in order to grow and divide and to make needed materials.

S7L4. Students will examine the dependence of organisms on one another and their environments.

- d. Categorize relationships between organisms that are competitive or mutually beneficial.

S7L5. Students will examine the evolution of living organisms through inherited characteristics that promote survival or organisms and the survival of successive generations of their offspring.

- b. Describe ways in which species on earth have evolved due to natural selection.

NEXT GENERATION SCIENCE STANDARDS

LS1.C: Organization for Matter and Energy Flow in Organisms

Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or to release energy. (MS-LS1-7)

LS2.A: Interdependent Relationships in Ecosystems

Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1)

Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)

LS4.C: Adaptation

Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)

LS4.D: Biodiversity and Humans

Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary to MS-LS2-5)

PS3.D: Energy in Chemical Processes and Everyday Life

The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary to MS-LS1-6)

COMMON CORE LITERACY STANDARDS

ELACC6-8RST2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

ELACC6-8RST3: Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

ELACC6-8RST4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

ELACC6-8WHST6: Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.

ELACC6-8WHST9: Draw evidence from informational texts to support analysis, reflection, and research

Teacher Background Information

Medicinal Plants

- Do you think that ginger gets rid of an upset stomach? Does Cayenne pepper get rid of a headache? No – and plants don't have the equivalent of human body parts. So why do they have chemicals in them that help soothe a person's upset stomach or headache? The phytochemicals w/in these plants react with our bodies to cause the reactions. These chemicals will react differently to different parts of our bodies, seemingly unrelated. Such as foaming ginger which treats both diarrhea and mouth sores. Also, they may have different reactions when applied with different methods.
- Cayenne pepper relieves headaches when taken internally but applied topically it relieves sore muscles and arthritis. Why would a plant have these chemicals? Why would it waste energy in creating them? Perhaps to prevent herbivory or fungal diseases. It is important to point out that just because these medicines come from a plant does not mean they are totally safe. There are a number of plants that are just plain poisonous, but you can also overdose on beneficial plants. Just as an aspirin (derived from willow bark) may cure a headache, taking the whole bottle may kill you. The same can happen with medicinal plants. It is important to follow directions and be sure plants are identified properly.
- Plants are made up of many different components. There are physical components that we can see that make up plant structures like the stem, leaves, and roots, or adaptations like thorns, hairs or a waxy coating. There are also structural components like tiny tubes that draw water up from the ground or send energy from leaves to roots.
- In addition, inside of plants there are components such as pigments that, although we can tell they exist, we cannot actually see without a strong microscope. Pigments reflect light, allowing us to see plants as certain colors, and also absorb solar energy in the plant's process of making its own food called photosynthesis.
- Other "invisible" components of plants are chemicals often produced as defense against herbivores or fungal diseases. Because of these chemicals, many of these plants have been used historically and are used today as medicine by humans.
- Long ago, people thought of forest and fields as their pharmacies. Today, although most of our medicines are manufactured by pharmaceutical companies, many were and still are derived from natural sources like the plants we will be using in this lesson.

Phytochemicals

Phytochemicals are non-nutritive plant chemicals that have protective or disease preventive properties. They are non-essential nutrients, meaning that they are not required by the human body for sustaining life. It is well-known that plants produce these chemicals to protect themselves but recent research demonstrates that they can also protect humans against diseases. There are more than thousand known phytochemicals.

Efficacy of Herbal Remedies

In popular culture, folk remedies and herbal cures are often referred to as "alternative medicine." However, in the world of science there are only three possibilities regarding the effectiveness of plant based medicine:

1. Medicine that rigorous, peer-reviewed scientific investigation and clinical trials have shown to be effective;
2. Medicine that scientific investigation has shown to be ineffective, and;
3. Medicine that has not yet been researched well enough to determine whether it is effective.

Some of the concerns about herbal remedies that have not been through a rigorous, peer-reviewed, replicable test:

- They are not regulated by the FDA and therefore may not contain what their labels say they do
- The contents may be of unknown purity and the dosage may be inappropriate (too little or too much)
- Taking unsubstantiated herbal remedies that may prevent someone from taking medicine that is effective
- Herbal remedies may cause side effects
- Herbal remedies may interact with prescription drugs to cause problems

In evaluating the effectiveness of plant-based medicines, students should consider the source of claims about effectiveness, and conduct research using reliable sources.

Teacher Preparation

- Study the background information, if necessary.
- Determine which garden plants can be harvested for the activities you choose to do and gather the necessary materials needed for each activity. If the plant is not available in your garden you can purchase it from your local market. NOTE: some plants may need to be dried prior to making medicinal products.
- Have the directions for each Extension activity printed for student use at each station. Stations can be prepared ahead of time by having supplies set out and ready for use so that rotation can happen in a timely manner.

Engage

- Show the class this short video about how Monarch butterflies depend on toxic plants to fight parasites: https://www.youtube.com/watch?feature=player_embedded&v=6Mjs39mF17I
Summarize information from these articles when initiating a conversation with the class about milkweed and its medicinal value to monarch butterflies
 - Ask students to share personal experiences with herbal remedies or pharmaceuticals made from plants. Introduce this activity with the following questions:
 - Have you or someone in your family used herbal remedies or pharmaceuticals (over the counter or prescription drugs) made from plants before?
 - What plant was used and what effect was it supposed to have?
 - Do you think that scientific evidence backs this claim for this plant's medical effectiveness, or that the remedy was based on folklore without any scientific basis?
 - Discuss adaptations that can cause plants to be used as medicine (see the teacher background information section) with the following questions:
 - » How can plants help humans with headaches or stomach aches when plants don't have these problems?
 - » What special adaptations do plants have that cause them to be useful to humans as medicine?
 - » How can I evaluate claims about medicines or cures made from plants?
 - » What are some examples of medicinal plants? Which ailments do they treat?
 - (Optional) Have students read a series of articles about the positive impact that medicinal plants have on the human body and discuss their findings using cooperative grouping. Sample articles:
 - “Wild Medicine: Healing Plants (from The New York Botanical Garden) <http://www.nybg.org/wildmedicine/plants.htm>
 - “Wild Medicine Plant List with Uses” <http://www.nybg.org/files/wild-medicine/Wild-Medicine-plant-list.pdf>
- Make an Herbal Remedy: Salt Scrub** (adapted from <http://www.wikihow.com/Make-Your-Own-Salt-Scrubs>)
- **Materials:** *Epsom salt, table salt, or sea salt; coconut oil, almond oil, or jojoba oil; essential oil of choice (e.g., lavender, eucalyptus, lemon, lime, peppermint, tea tree, etc.); large bowl; sandwich bags or glass/plastic jars; spoons; ½ cup measuring tool.*
 - **Uses:**
 - » Sea salts and Epsom salts, or magnesium sulfate, both commonly used in the beauty industry, contain minerals that can help skin. The magnesium in Epsom salts can reduce inflammation, while sulfates flush out toxins, according to the Epsom Salt Council. Sea salt, derived from evaporated seawater, is also chock full of minerals beneficial to the skin.
 - » Gently rubbing the skin in circular motions with a salt scrub removes dead skin cells in a process known as exfoliation. Dead skin cells harden with age. The longer they lie on the surface of the skin, the harder they get. This layer of skin will become thicker and thicker until it is finally removed. Layers of dead skin cells can make the

- skin look dry and flaky; exfoliation with a salt scrub reveals the moist, shiny skin hidden underneath.
- » The abrasive action associated with salt scrubs invigorates the skin and helps to improve circulation.
- Improved circulation gives skin a natural glow. Scrubbing with salt also helps to remove bacteria from the skin and unclog pores. Salt has antiseptic qualities, and when applied to the skin it may help kill bacteria and reduce inflammation along with any itching and pain associated with bacterial-related skin disease.
- » Exfoliating with a salt scrub not only removes dead skin cells and increases circulation, but it also encourages regeneration. Sloughing away dead skin cells actually promotes the growth of healthy new cells. This regeneration process tightens the skin, giving it a firmer and younger-looking appearance. Skin regeneration also reduces skin discoloration, evening out skin tone and improving texture.
- **Directions:**
 - » Find a jar to hold your salt scrub. Almost any jar would be fine. You can get one that locks or one that has a screw on lid. If you are a clumsy person, use a plastic jar instead of glass, because this scrub will be put near the shower or bath tub, and a glass jar may slip out of your hands and break into shards! Plastic has its disadvantages too. A plastic jar will absorb any essential oils you add into the scrub, and that means that you can never use the jar in any other purpose. Make sure whatever jar you are using is clean. A plastic zip top container will work well too.
 - » Choose a salt to use. Almost any kind will do. Sea salt, Epsom salt, kosher salt, even plain old table salt!

Usually table salt is the cheapest, and it has smaller granules, which means you don't have to mash any big salt clumps found in the other salts. Epsom salt has relaxing properties, while sea salt is often used in bath salts. Once you have chosen salt, fill about half of your jar or container with it. A good ratio to use is ½ cup oil to 1 cup salt.

 - » Pick an oil. Any kind will do, but a few skin nutritive oils are almond oil, coconut oil, grapeseed oil, safflower oil, jojoba oil, avocado oil, peanut oil, rosehip oil, sesame oil, macadamia nut oil, sunflower oil and olive oil. But one oil you should avoid is baby oil, which contains mineral oil (a by-product of petroleum) because it doesn't absorb into skin and when it evaporates, this oil makes your skin feel even dryer than before. Also baby/mineral oil clogs your pores, making your skin look drab.
 - » Mix your salt scrub using a spoon.
 - » Add a few drops of essential oils into the mixture. Choose a scent that suits your tastes. Some great ones are lavender (relaxing), peppermint (energizing), orange, lime/lemon, sandalwood, and vanilla. Or you can try extracts, like vanilla, almond, peppermint and coconut. Stir the salt scrub after you add the essential oil.
 - » Put your salt scrub near the bathtub, shower or sink. Use your salt scrub while you are cleaning or soaking on particularly dry areas, like knees and elbows. This exfoliant works especially well on hands and feet too. Scrub skin in a circular motion using a loofah, shower puff, shower gloves, mesh scrubby, washcloth, or even just your hands. After waiting for a few minutes for the scrub to do its job, rinse off with warm water and pat dry with a soft towel. If your skin feels a tad bit too oily, you can wash it off with some soap, but it is not necessary because usually the skin would absorb all the oil and that would benefit dry skin more. Your skin should feel soft, moisturized, and exfoliated, with the hint of the fragrance you've chosen. No need to reach for the body lotion afterwards. The salt in the scrub had exfoliated the layer of dead skin on the surface, while the oil had already done the job of moisturizing the new skin exposed, leaving you with super soft skin.

Explore Part 1

Conduct research on medicinal plants and herbal remedies

Provide this list of reliable resources to students for evaluating claims about herbal cures and plant-based medicine: **Reliable Sources for Scientific Evidence on Effectiveness of Herbal**

Remedies and Medicinal Plants Cochrane Collaborative articles and meta-analysis on herbal remedies <http://www.cochrane.org/search/site/medicinal%20plants>

Herbal Medicine: Traditional Uses, What the Science Says, Side Effects and Cautions (from NIH) <http://www.nlm.nih.gov/medlineplus/herbalmedicine.html>

Time to Talk: What You Should Know about 5 Popular Herbs (from National Institutes of Health) <https://nccih.nih.gov/health/tips/topsupplements>

Memorial Sloan Kettering's "About Herbs" Web App: <http://www.mskcc.org/apps/herbs> and Downloadable App for Apple devices: <https://itunes.apple.com/us/app/about-herbs/id554267162?mt=8>

Ethnobotanical and Phytochemical Databases of Plants <http://www.ars-grin.gov/duke/>

PLANT-BASED REMEDIES RESEARCH

SYMPTOM/CONDITION TO

BE TREATED: COMMON

NAME OF PLANT:

LATIN NAME

OF PLANT:

PLACE OF

ORIGIN:

HOW PLANT IS USED MEDICINALLY:

PART OF THE PLANT USED FOR MEDICINE:

ADAPTA

TIONS:

INTERES

TING

FACTS:

BRAND NAMES OF ANY DRUG DERIVED FROM THIS PLANT: _

ANY SIDE EFFECTS OR

PRECAUTIONS:

ANY DRUG INTERACTIONS:

RESEARCH FINDINGS ABOUT EFFECTIVENESS AND SOURCE OF RESEARCH OR CLAIM:

Explore Part 2

Investigate a plant's antibiotic potential by conducting an experiment

Students will research plant species and test one for its antibiotic potential, reporting results to the Iliad Project, a citizen science database. Students will follow the protocols enclosed with the Iliad Project kit, to:

- ³⁵₁₇ Grow non-pathogenic bacteria on an agar plate
- ³⁵₁₇ Grind up the leaves and flowers of a plant species in a buffer solution, for testing
- ³⁵₁₇ Soak a filter paper circle in the ground plant solution (freezing an additional sample of the plant for re-testing)
- ³⁵₁₇ Place filter paper circles on the agar plate, which will also contain buffer control and antibiotic control sections
- ³⁵₁₇ Allow bacterial cultures to grow and observe them to see if a clear space forms around a filter paper circle, indicating that bacterial growth is inhibited by the ground plant on the filter paper
- ³⁵₁₇ Report results to the Iliad Project, whether an antibiotic property is detected or not: <http://www.the-odin.com/the-iliad-project-kit-find-new-antibiotics-at-home/>

Explanation from Evidence

Based on research and evidence, students will be able to distinguish among claims for medicinal use of plants.

Environmental Stewardship

Students will collaborate to design and build, install or expand an herb garden, selecting species that have traditionally been regarded as having medicinal properties. Then they will mark plants with numbered or QR coded labels and create a corresponding online or paper field guide.

Free QR code reader and scanner for I-phones

<https://itunes.apple.com/us/app/qr-reader-for-iphone/id368494609?mt=8>

Evaluation

A rubric is provided to assess how well students meet performance expectations.


Extension

- Students can make their own essential oils at home. See the following websites:
 - » http://www.ehow.com/how_12055425_make-homemade-essential-oils-crockpot.html

Name: _____ Date: _____ School: _____


Name(s): _____

Date: _____

Claim (answers question)	
	
Evidence (must include data)	Reasoning (the argument: how the evidence supports or does not support the claim)
Revised Claim (if necessary to account for evidence that does not support original claim)	

Name(s): _____

Date: _____

Claim (answers question)	
	
Evidence (must include data)	Reasoning (the argument: how the evidence supports or does not support the claim)
Revised Claim (if necessary to account for evidence that does not support original claim)	

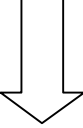
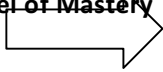



Herbal Remedies: Myth or Medicine

Grade: 7 | Time: (3-5) 50 minute periods

Name: _____

Date: _____

School: _____

<p>Level of Mastery</p>  <p>Benchmark or Performance Measure</p> 	 <p>EMERGING Not yet proficient 1 point</p>	 <p>COMPETENT Partially proficient 4 points</p>	 <p>PROFICIENT Mastered task 5 points</p>	<p>TOTAL POINTS</p>
<p>Making of Herbal Salt Scrub</p>	<p>Did not complete</p>	<p>Sometimes stayed focused on the task of creating herbal remedies.</p>	<p>Consistently stayed focused on the task of creating herbal remedies.</p>	
<p>The Iliad Project</p>	<p>Plant tested.</p>	<p>Plant tested following project protocols. Findings not uploaded</p>	<p>Plant tested following project protocols. Findings uploaded</p>	
<p>Research Project</p>	<p>No evidence based research</p>	<p>Some evidence based research</p>	<p>All research was evidence based from reliable sources</p>	