

Testing For Biological Plants

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Overview and Rationale: This unit engages students in research into traditional herbal remedies and medicines, examines possible scientific reasons for effectiveness of some traditional treatments, and familiarizes students with the properties of some household herbs, spices and plants. Students use print and electronic resources to investigate the history of diseases, the causes of diseases and the relationship between plants and medicine. Based on the written research students chose one plant to investigate experimentally for biological activity. Using various simple assays students determine if their plant of choice is biologically active.

Objectives: Students will ...

- Use print and electronic resources to investigate diseases and disease agents.
- Use print and electronic resources to investigate the medicinal properties of plants
- Conduct experiments that test for some possible medicinal properties of a plant of choice.
- Use Microsoft Publisher to develop a pamphlet to display the information the gathered about diseases, disease agents and plants for the public.

Timeframe: 3 weeks

Content Area: General Science

Content of DVD used:

- Lecture One – Microbe Hunters: Tracking Infectious Agents, chapters 4, 8, 9, 10, 15
- Lecture Two – The Microbes Strike Back, chapters 13-15, 18, 19, 21-23, 34

Correlation with Standards:

- **The Nature of Science (from project 2061)**
 - View science and technology thoughtfully, being neither categorically antagonistic nor uncritically positive.
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 - Participate in group discussions on scientific topics by restating or summarizing accurately what others have said, asking for clarification or elaboration, and expressing alternative positions

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- Scientists can bring information, insights, and analytical skills to bear on matters of public concern. Acting in their areas of expertise, scientists can help people understand the likely causes of events and estimate their possible effects. Outside their areas of expertise, however, scientists should enjoy no special credibility. And where their own personal, institutional, or community interests are at stake, scientists as a group can be expected to be no less biased than other groups are about their perceived interests
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Materials: Public Library, Internet, DVD, DVD – Confronting the Microbe Menace, Microsoft office, plant, yogurt, milk, beakers, medicine droppers, sterile petri dishes, paper disks, forceps, sterile nutrient agar, flour, yeast, mixing bowl, metric scale, rubbing alcohol, distilled water, white bread, plastic bags, microscope, petri dishes, brine shrimp

Procedure: The unit is divided into four sections, part A – D. In part A, students use print and electronic resources to gather information in order to develop a timeline of diseases in history. In part B, students use print and electronic resources to gather information about different “agents” that cause diseases. One of the resources used in this section is the DVD, 2000 and Beyond: Confronting the Microbe Menace. A DVD is programmed to the chapters listed above. Students answer the attached questions, and use the information in their final product.

Homework: Readings: Folk Medicine, Then and Now: Flinn Scientific, Inc 1993; The Terrible Agent of Death: Flinn Scientific, 1993; Paye Gabriell, “ Cultural Uses of Plants”, New York: The New York Botanical Garden Press, 2000.

Assessment: For the unit – student pamphlet, for the DVD – see attached rubric

Modifications for Honors/Sped/Gifted: None

Unit Outline

PART A: DISEASES

Key question: What is a disease?

Activities:

- o Using the internet, encyclopedias, periodicals and books answer the following:
 - What is a disease?
 - List at least 10 human diseases, location of the first outbreak, and year of the first outbreak
 - What are disease agents? List agents that cause disease.
- o Create a scaled timeline of diseases in history

PART B: MEDICINAL PLANTS

Key Question: Throughout history how has man used plants to combat disease?

Activities:

- o Using the Internet, encyclopedias, periodicals and books find and record information about nine plants used to combat disease.
- o Please find the following information about nine plants:
 - Common name of plant
 - Scientific name of plant
 - A picture of the plant
 - Where does the plant naturally propagate?
 - Is the plant legal to use in the U.S. (If the plant is not legal in the US, stop here and find another plant)
 - Does the plant grow in MA, in the northeast, in the US
 - Can the plant be cultivated?
 - Can you buy it in the store? If yes, which store can you buy the plant?
 - Is the plant sold fresh, dry?
 - What part of the plant is used for medicinal purposes? (roots, shoots, stems, leaves, flower)
 - Description of medicinal activity (anti-bacterial, anti-fungal, anti-viral)
 - Other uses of for the plant
 - Cultural history
 - Additional characteristics of interest (seasonality, persistence, etc.)

PART C: ASSESSING POTENTIAL MEDICINAL PROPERTIES OF YOUR PLANT

Key Question: How is biological activity determined in plants?

Activities:

- o Procure the plant for testing
- o Preparation of plant and plant extract for testing
- o Antibiotic lab A: Using *Lactobacillus acidophilus* to determine plant biological activity
- o Antibiotic lab B: Using check cells to determine antibiotic properties

- o Antifungal lab: Using yeast to determine plant biological activity
- o Antifungal lab B: Using bread to determine plant biological activity
- o Antiprotozoal lab: using protozoa to determine plant biological activity
- o Cytotoxic lab: using brine shrimp determine plant biological activity

PART D: PUTTING IT ALL TOGETHER

Key Question: How are plants used for medicine?

Activity:

- o Using the information from parts A-C and your homework, create a pamphlet that encapsulates the research you have done on your plant. The brochure should include:
 - A cover page with a creative title, a picture of the plant, and all the names of the people in your group
 - A brief discussion about folk medicine (Include a definition of folk medicine and some examples)
 - A background page that includes all the information from part A and B
 - A discussion about the tests that were. The discussion should include, purpose, data and results
 - A conclusion that discusses how plants are used for medicine as well as specifically how your plant is used is for medicine. In addition, the conclusion should include a summary of what the chemical test revealed about your plant
 - A Glossary: A section where key terms and words are defined
 - A bibliography that includes more books and magazines than websites
 - Your group should use at least one encyclopedia, two books, and 2 periodical articles

2000 and Beyond: Confronting the Microbe Eminence
Guided Questions for Research

Directions: View the listed sections of the DVD and answer the questions and or statement in complete sentences.

Lecture One:

Chapter 4

1. What is the Black Death?
2. Summarize the eyewitness account of the Black Death.

Chapter 8

3. What are epidemics?

Chapter 9

4. What are microorganisms?
5. What are the classes of microorganisms?

Chapter 10

6. What is a virus
7. Describe the structure of a virus

Chapter 15 and Chapter 16

8. What is an infectious disease

Lecture Two:

Chapter 13

9. What are the leading infectious diseases?

Chapter 14

10. What type of people are more susceptible to bacterial disease

Chapter 15

11. What are some major infectious diseases in history?

Chapter 18-19

12. How do bacteria spread?
13. What are vaccines?

Chapter 21 – 23

14. What are antibiotics
15. How do they work

Chapter 34

16. What are vaccines
17. How do they work?

Summary Questions

Using your notes from the DVD, answer the following questions and or statements in complete sentences

1. Explain how viruses differ from bacteria.
2. Explain how antibiotics differ from vaccines.
3. What is an inoculation? How do inoculations work?
4. What is the difference between an infectious and a noninfectious disease?
5. Why is there always a need for new medicines and why are new illnesses always developing
6. What has helped to increase the life expectancy of people in the past 100 years?

Rubric

Level 6

Student's reflection shows extensive knowledge of the scientific ideas presented. The student uses relevant terms appropriately, providing evidence of excellent growth in understanding of scientific ideas through comparison of original and revised samples of work. There is exceptional evidence that the entry has been revisited and improved to reflect newly gained knowledge, skills, and increased depth of understanding. Insightful inferences are made with analogies, metaphors, examples, and personal experience. All aspects of the tasks and analysis are completed thoroughly. Written expression is well organized and contributes to clear, coherent, and exemplary communication.

Level 5

Student work and self-reflection show strong knowledge of the scientific ideas presented. The student uses relevant terms appropriately, providing evidence of very good growth in understanding of scientific ideas through comparison of original and revised samples of work. There is convincing evidence that the entry has been revisited and improved to reflect newly gained knowledge, skills, and increased depth of understanding. Thoughtful inferences are made with analogies, metaphors, examples, and personal experience. All aspects of the tasks and analysis are completed. Written expression is very good and contributes to clear and coherent communication.

Level 4

Student work and self-reflection show solid knowledge of the scientific ideas presented. The student uses relevant terms appropriately, providing evidence of solid growth in understanding of scientific ideas through comparison of original and revised samples of work. There is ample evidence that the entry has been revisited and improved to reflect newly gained knowledge, skills, and increased depth of understanding. Relevant inferences are made with analogies, metaphors, examples, and personal experience. All major aspects of the tasks and analysis are completed. Written expression is good and contributes coherent and effective communication.

Level 3

Student work and self-reflection show basic knowledge of the scientific ideas presented. The student may use terms appropriately, providing some evidence of growth in understanding of scientific ideas through

comparison of original and revised samples of work. There is some evidence that the entry has been revisited and improved to reflect newly gained knowledge, skills, and increased depth of understanding. Some inferences are made with analogies, metaphors, examples, and personal experience. Most aspects of the tasks and analysis are completed. Written expression is flawed and exhibits basic communication.

Level 2

Student work and self-reflection show limited knowledge of the scientific ideas presented. The student may use terms inappropriately, providing little evidence of growth in understanding of scientific ideas. Student work may not include original and revised samples of work. There is limited evidence that the entry has been revisited and it may not have been improved to reflect newly gained knowledge, skills, and increased depth of understanding. Limited inferences are made with analogies, metaphors, examples, and personal experience. Tasks and analysis are largely incomplete. Written expression is flawed and exhibits limited communication.

Level 1

Student work and self-reflection show minimal knowledge of the scientific ideas presented. The student may use terms incorrectly, providing little evidence of growth in understanding of scientific ideas. Student work may not include original and revised samples of work. There may not be evidence that the entry has been revisited and it may not have been improved to reflect newly gained knowledge, skills, and increased depth of understanding. Inferences may not be made with analogies, metaphors, examples, and personal experience. Tasks and analysis are mostly incomplete. Written expression is very flawed and exhibits ineffective communication.