

Lesson Plan: Using the History of Vaccines in the Classroom

Overview and Purpose: The purpose of this lesson is to offer suggestions on how to use the History of Vaccines website in a high school biology or health class. This lesson gives you a one-period class option (Plan A) as well as a two-period class option (Plan B). Both options give students the chance to explore specific site areas that deal with the history of vaccines and the science behind vaccines. Additionally, the two-period lesson plan includes time for students to play an epidemic simulation on the site.

Grade Level: Grades 9-12

Estimated Time Allotment

Plan A: One 50-minute class period

Plan B: Two 50-minute class periods

Curriculum Focus: Biology, Health

Learning Objectives

After completing Part A of this lesson, students will be able to:

- explain how vaccines work
- describe different vaccines and the diseases they prevent
- describe several immunization pioneers and the contributions they made
- describe how the scientific method is employed in the investigation of a disease outbreak

After completing Part B of this lesson, students will be able to:

- list factors that contribute to a society's ability to create and use vaccines
- explain how public health and vaccination strategies can limit the spread of a disease
- describe some of the limitations of public health measures in controlling disease spread

Standards Addressed

National Science Education Standards

Unifying Concepts and Processes: Systems, order, and organization; Evidence, models, and explanation; Form and function

Science as Inquiry: Understandings about scientific inquiry

Life Science: The cell, Biological evolution, Behavior of organisms

Science and Technology: Understanding about science and technology

Science in Personal and Social Perspectives: Personal and community health, Science and technology in local, national, and global challenges

History and Nature of Science: Science as a human endeavor, Nature of scientific knowledge, Historical perspectives

Health Standards

National Health Education Standards

Health Education Standard 1: Students will comprehend concepts related to health promotion and disease prevention.

Health Education Standard 3: Students will demonstrate the ability to access valid information, products, and services to enhance health.

Lesson Procedures

Teacher Background: Familiarize yourself with the different sections of the History of Vaccines so that you can provide support to students as they work. All of the different sections are available from the main navigation bar.

Teacher Preparation:

- Plan to have the students use the Internet during class.
- Make copies of the recording sheets, one per group.

- Email vaccines@collegeofphysicians.org to receive answers to questions on recording sheets.

Plan A and B: Opening Activity – Discuss Disease and Vaccination

Time: 5 minutes

1. Introduce the topic of infectious disease and vaccination by leading a class discussion. Ask the students to describe experiences they have had with infectious disease and vaccination.
2. Ask students, *Why do we vaccinate? What do you think would happen if there were a problem with vaccine supply, and we could no longer vaccinate for measles?* Students may not realize that measles is a highly infectious (easily spread disease) and that while most measles cases are mild, in the pre-vaccine era, about 1 in 1,000 children who caught measles died from it.
3. Invite students to tell you what they know about the history of vaccines. Ask them, *What was the first vaccine for? Who developed it?* Some students may know that the first vaccine was developed by English physician Edward Jenner, who used matter taken from cowpox sores to protect people from smallpox. Tell students that Jenner developed his vaccine before people knew that infectious diseases were spread by microbes.

Plan A: Using the History of Vaccines Website

Time: 35 minutes

1. Divide the class into four groups. Tell the students that they will be exploring web resources related to vaccination and its history. Assign one small group of students to each of the following learning activities on the website:
 - a. Smallpox vaccination timeline
 - b. Diphtheria vaccination timeline
 - c. Scientific Method activity
 - d. How Vaccines Work activity
2. Give each group the appropriate recording sheet(s). Let them know that they are responsible for gathering information and reporting to the class what they have learned.
3. Have students access the specific section of the History of Vaccines to which they have been assigned. Circulate among the groups as they work, ensuring that they stay on task and are finding the resources they need.

Plan A: Closing Activity

Time: 10 minutes

Have each group of students report on what they learned, using their recording sheets as a guide.

Ask students to describe what they thought of the different sections of the website. *What surprised you most about what you learned? What would you like to explore in more detail?*

Plan B: Using the History of Vaccines Website

Time: 75-90 minutes

1. Tell the students that they will be exploring web resources related to the history of vaccine development. Tell each group of students that they are responsible for gathering information about two diseases/vaccines and two pioneers of immunization. (Options for diseases are yellow fever, smallpox, measles, polio, and diphtheria. Options for pioneers are Maurice Hilleman, Louis Pasteur, and Edward Jenner.) They are also responsible for completing one of the following learning activities:
 - a. Scientific Method activity
 - b. How Vaccines Work activity
2. Give each group the appropriate recording sheet(s.) Let them know that they are responsible for gathering information and reporting to the class what they have learned.
3. Have students access the specific section of the History of Vaccines to which they have been assigned. Circulate among the groups as they work, ensuring that they stay on task and are finding the resources they need. Give students about half the allotted time to explore the resources assigned in Step 1.

4. Next, tell students that they have gathered enough information about vaccines and infectious disease to complete the game **Fight the Disease**. (If class time is running short, you may assign the game as a homework assignment.)
5. Tell students that the game is designed to simulate a disease epidemic, including the spread of disease, how vaccination works to control disease spread, and how public health measures can affect the outcome of an epidemic.
6. Once the students have completed the game, have a class discussion about the results of the simulation.

Plan B: Closing Activity

Time: 10 minutes

1. Have each group of students report on what they learned, using their recording sheets as a guide.
2. Ask students to describe what they thought of the different sections of the website. *What surprised you most about what you learned? What would you like to explore in more detail?*

Plan A and B: Assessment

- Anecdotally observe students during whole group discussions and independent work.
- Assess content knowledge by evaluating students' recording sheets and oral reports. Email vaccines@collegeofphysicians.org to receive answers for recording sheets.
- Plan B only: Have students write a paragraph describing which factors were most crucial to success in the game.

Extensions

- Hold a class debate about whether certain vaccinations should be required for school or college entry.
- Ask students to investigate their own vaccination history. What kinds of records do they have to document which immunizations they've received? How many of the vaccines they've received are featured on the History of Vaccines?

Student Name: _____
Student Recording Sheet 1

VACCINE #1: _____

- a. Describe the disease agent, disease transmission, and disease symptoms:
- b. What type of immunization exists for this disease? Is it a toxoid, attenuated virus vaccine, killed virus vaccine, or a bacterial vaccine?
- c. What were some milestones in the development of the vaccine? Who was responsible for each milestone?
- d. Is the vaccine part of the regular immunization schedule for children or adults, or is it given only in special circumstances? Describe.

VACCINE #2: _____

- a. Describe the disease agent, disease transmission, and disease symptoms:
- b. What type of immunization exists for this disease? Is it a toxoid, attenuated virus vaccine, killed virus vaccine, or a bacterial vaccine?
- c. What were some milestones in the development of the vaccine? Who was responsible for each milestone?
- d. Is the vaccine part of the regular immunization schedule for children or adults, or is it given only in special circumstances? If the latter, explain.

Student Name: _____
Student Recording Sheet 2

PIONEER #1: _____

Describe the pioneer in 3-5 sentences. Include information about where and when the pioneer was born, the pioneer's training, important discoveries made by the pioneer, and when the pioneer died.

PIONEER #2: _____

Describe the immunization pioneer in 3-5 sentences. Include information about where and when the pioneer was born, the pioneer's training, important discoveries made by the pioneer, and when the pioneer died.

Student Name: _____
Student Recording Sheet 4

How Vaccines Work Activity

1. Describe the role of each of the following when a vaccine is introduced into the body.

Antigen-presenting cell _____

Helper T cell _____

Active Killer T cell _____

B cell _____

Antigen-presenting cell _____

Antibodies _____

2. In words, or in drawings with labels, describe or show how the human immune system responds to a vaccine.

3. How is the body's immune response different when it re-encounters a disease antigen after vaccination?