

How Does a Virus Work?

Stage 1: Identifying Desired Results

Unit Description:

The purpose of this two week unit is for students in grades 6/7 understand the structure of a virus, how a virus is able to spread throughout a population, and what measures can be taken to prevent becoming infected with a virus. The lessons will be structured using the framework of backward design (Wiggins et al., 1998). Students will be asked to perform and complete specific activities and assignments, which will guide the student through the process of learning about viruses. The first activity will concern how viruses (infectious diseases) can spread throughout a small classroom, enabling the students to trace the paths that it took to infect other people. This will be a striking visual for how fast a virus can spread. The second activity will allow students to build an icosahedral virus helping the students to understand the structure of a virus and how it is able to infect a body. The third activity involves the students going on a Web Quest to identify and assess the degree of infection the virus that has infected the crew of a yacht. The fourth activity involves students looking at the preventions of infections and the methods used as in individual to keep one healthy. The culminating activity involves the student researching a particular virus and presenting a PowerPoint to be presented or designing an informational pamphlet to be distributed to the members of the community.

Unit Enduring Understandings:

1. Students will understand that viruses spread throughout a population, and that vaccinations can prevent an infection from spreading.
2. Students will understand the structure of a virus and that a virus can change or mutate in order to continue to reproduce.
3. Students will understand that they have the ability to keep themselves healthy by maintaining good eating habits, exercising and practicing good hygiene.

Unit Essential Questions:

- What is a virus and how is it able to infect my body?
- What is the essential structure of a virus?
- How do viruses spread from person to person?
- How can people prevent becoming infected with a virus?
- What is a vaccination?

Content Standards/Benchmarks taken from *Benchmarks for Science Literacy*:

Chapter 6 Human Organisms

6E. Physical Health (Grades 3-5)

-If germs are able to get inside one's body, they may keep it from working properly. A healthy body can fight most germs that do get inside. However, there are some germs that do interfere with the body's defenses.

-There are some diseases that human beings can catch only once. After they have recovered, they do not get sick from them again. There are many diseases that can be prevented by vaccination, so people do not catch them even once.

Grades 6-8

-Viruses, bacteria, fungi, and parasites may infect the human body and interfere with normal body functions. A person can catch a cold many times because there are many varieties of cold viruses that cause similar symptoms.

Chapter 10 Historical Perspectives

I. Discovering Germs (Grades 6-8)

Pasteur found that infection by disease organisms-germs-caused the body to build up immunity against subsequent infection by the same organisms. He then demonstrated that it was possible to produce vaccines that would induce the body to build immunity to a disease without actually causing the disease itself.

-Vaccinations to strengthen the body's immune system against subsequent infection by the same kind of microorganisms.

Objectives and Skills Students Need to Know:

1. Students will be able to describe and identify the paths, which a virus may take to infect other humans.
2. Students will illustrate the structure of a virus and explain its components
3. Students will be able to identify types of infectious diseases that are caused by germs specifically viral.
4. Students will be able to differentiate a bacterial infection from a viral infection
5. Students will be able to illustrate and describe the ways in which people can prevent becoming infected with a virus.
6. Students will be able to demonstrate their knowledge of infectious diseases by presenting a power point or pamphlet educating others about a particular virus.

Instruction Strategies:

1. Socratic method of questioning (inquiry method)
2. Small cooperative groups (2-3)
3. Jigsaw work

4. Differentiated instruction
5. Teacher whole group instruction
6. Student led instruction
7. Technology, internet access
8. Problem-solving techniques

Materials:

Lesson 1

Baking Soda
 Water
 Cups
 Phenolphthalein Indicator solution
 Dixie Cups
 Chart paper
 Markers
 Graph paper

Lesson 3

Copies of virus capsid
 10 meters of yarn per person
 Tape per person
 3 pipe cleaners per person
 1 pencil
 Teacher power point w/internet access

Lesson 5

Individual copies of the book Fever 1793
 Journals
 Internet access for research
 Discussion worksheets

Lesson 2

Internet access
 Computer lab or laptop
 Notebooks, pencils
 Chart Paper/markers

Lesson 4

Internet access for students
 Notebook/pencils

Lesson 6

Secrets of the Dead Video
 1918 Spanish Flu Epidemic
 Bar codes from various
 products
 Notebook/pencils

Students' Misconceptions

Research in the area of misconceptions students have about illness has focused in on three aspects, the cause, the treatment and the prevention.

Causes

Although most children understand that colds and illnesses in general are contagious (Kister et al., 1980) they are not quite sure of the underlying cause of it. According to a study done by Badani and Schonfeld (2002), most children in grades K to 6 believe that colds are caused by being exposed to inclement weather and improperly dressed for it.

Treatment

A study done by Goldman et.al (1991), found that most preschool children believed that by taking medicine and resting, you would feel better. Badani and Schonfeld found similar results within the kindergarten to sixth grade respondents as Goldman, but with 22% of children stating that staying in a warm environment and wearing appropriate clothing will help one to feel better.

Prevention

The misconceptions concerning prevention again focused on articles of clothing and the weather (Badani and Schonfeld, 2002). If you dress appropriately for the weather you will not get sick. Some children also responded by emphasizing the avoidance of constantly touching your hands to your face, particularly the nose, mouth and eyes as well as washing your hands.

In conclusion, the main misconception seems to be that colds develop from improper dressing and exposure to bad weather rather than organisms inside their own bodies. Students do seem to understand that these colds are contagious and that, with the help of good hygiene, can be prevented. However, it is evident that they do not understand what is actually causing the illness.

Stage 2: Determining Acceptable Evidence

The performance assessment for this unit will require the students to work in pairs and either present a power point presentation on a specific virus or to produce an informational pamphlet that may be distributed throughout the community for educational purposes.

Title: The name of each project will depend upon the virus chosen by the students to research.

Goal: The goal of the performance is to inform and educate other students and community member about a chosen virus. The presentation must include the structure of the virus, how it infects the body, how is it spread, how to prevent infection and what treatments are available.

Role: The role of the student is to educate others concerning the type of virus they choose. This will include how the virus is structure, how it spreads, ways to prevent infection and the treatment of the infection.

Audience: The audience will consist of the teacher, community members and lower classmen.

Situation: The performance will take place within a health fair workshop located in one of the many classrooms set up for the health fair. Students will have approximately 15 minutes to present their information.

Product: The product should be a power point presentation or an informational pamphlet to be distributed to the audience.

Standards: The presentation will be expected to educate/explain to the public the steps they can take to prevent becoming infected with the virus, the treatment available at the moment for infection of the virus, and how the virus is able to spread within a population.

Preconception Assessments:

Prior to beginning the unit, a short pre-assessment consisting of four questions will be given to the students to assess their prior knowledge and possible misconceptions that would need to be addressed within the unit of study.

1. What is a virus?
2. How do viruses spread within the population?
3. How are viruses prevented from spreading?
4. What is a vaccine?

Based upon the answers to these questions, I will be able to address any preconceived notions my students may hold concerning viruses.

Quizzes, Tests and Academic Prompts:

Students will be assessed on the structural components of a virus, how viruses are spread and how vaccines work within the body to prevent being infected with a virus.

Academic Prompts:

- Have you ever been sick?
- What kinds of illnesses have you had within the past year?
- How do you think you became sick?
- Have you and a family member been sick at the same time?

Other Evidence:

- Informal teacher observations
- Class discussion and debates
- Building a model of a virus
- Virus comic strip
- Concept map
- Journal notebook from Fever 1763
- Answering questions from 1918 Spanish Flu Epidemic
- WebQuest
- Final product

Stage 3: Plan Learning Experiences, Instruction, and Resources

Within this section of the unit plan, I will incorporate the WHERE strategy to help keep the focus on the unit goals and to help with organization.

Where are we headed? The goals of this unit will be posted along with the essential questions on the board. A timeline with assignments and rubrics will be distributed so that students can get a general feel for where we are heading in the unit.

Hook: The unit will begin with a simulation of a virus that is spreading throughout the class. The title of the lesson is *How Does an Infectious Disease Spread?*(EU 1) Everyone in the class will have cups full of clear solution. No one will know who has the cup with the virus. By mixing the solutions, the virus will spread. When the students have completed two rounds in the class, a phenolphthalein indicator will be dropped into their cups and if the solution turns red, it means they have been infected. Students will then try to track down the source of the infection to identify the path it had taken. See Appendix A for complete lesson.

Experience: The second lesson involves the students being online at Science Net Links. Students

will explore the website of *Germs and the Body*(EU 1 and 2) and answer questions concerning the text, in particular how the body reacts to the infection of the germ. Students will complete the activity by playing the online game of *Infection*. See appendix A for details.

The third lesson the students will complete involves learning the structure and characteristics of a virus. The teacher will introduce a power point lesson showing different types of viruses and their corresponding components using *The Big Picture Book of Viruses* online website at www.virology.net/Big_Virology/BVHomePage.html Students will then build an icosahedral virus complete with labeled components (EU 2). Appendix B

The fourth lesson involves the students completing a Web Quest entitled Yellow Jackie. This involves the students reading an online mystery concerning a crew who suddenly fall ill. The job of the students is to take down all the symptoms and other related information and ultimately identify the virus, which has sickened the crew in varying degrees (appendix C)

Students during the course of this unit will be reading the book entitled *Fever, 1793* by Laurie Halse Anderson. This book tells the story of the deadly yellow fever epidemic here in Philadelphia. Students will be required to complete various activities that can be found in Appendix D. (EU 1, 2, 3)

The unit will also utilize parts *Secrets of the Dead*, which included a program on the 1918 Spanish Flu Epidemic. Included in this video program are activities for the students to complete which focus on DNA fingerprinting (Appendix E) (EU 1,2,3)

Reflect: Students will have the opportunity to reflect upon their learning through researching their selected virus for either a power point presentation or through the informational pamphlet. They will be able to think not only about how the virus can spread but how infects the body and replicates. It will be an opportunity to reflect about their own history of illness and how they can prevent any future illness.

Evaluate: Students will be able to self-evaluate their work through the use of the rubrics distributed at the same time as the assignment was given. They will exhibit their power point presentations, their informational booklets, the model of the icosahedral virus, and their diagnosis for the Yellow Jackie story.

At the end of the unit, the questions from the preconception assignment will be given to the students. Comparing their answers at the end of the unit to those answers given at the beginning of the unit should demonstrate growth and understanding concerning the structure, spread, prevention, and characteristics of a virus.

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Lesson Plan References

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This is an activity developed by Amy Doherty and Dr. Waldron to teach students about how viruses spread.

Eklund, Kevin (2001). Science Mystery. Retrieved July 20, 2007, from Access Excellence Web site: <http://www.writerguy.com/sciencemystery/teachers.htm>
Access Excellence has great web quests, which the teacher can incorporate in the lesson to encourage inquiry and to refine the students ability to problem solve.

Jones, G, Falvo, M, Taylor, A, & Broadwell, B (2007). *Nanoscale Science*. Arlington, Virginia: NSTA Press. Great website that focuses on microorganisms and how they can affect mankind. It offers great lesson plan ideas on all the sciences

Wolfe, Betty (August 16, 2002). Fever, 1793. Retrieved July 23, 2007, from Writerlady.com Web site: www.writerlady.com/fever1793_teachers.html
Literature is the foundation of the writer lady. The website contains a variety of fiction and nonfiction books that teachers can use to develop a lesson.

(08/01/2002). Germs and the Body. Retrieved July 5, 2007, from Science NetLinks Web site: <http://www.sciencenetlinks.com/lessons.cfm?BenchmarkID=6&DocID=66>
Science NetLinks is a website that offers teachers lessons on all of the scientific disciplines. A great resource to go to for ideas and very easy to navigate.

HOW DOES A VIRUS WORK?

Pedagogy of a virus

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Unit Plan for Virus
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