



VIRUS: CELL HOSTAGE TAKER

Subject Matter: Science

Grade Levels: 11-12

Time Allotment: Two 50-minute class sessions

Master Teacher: Susan Daugherty

Overview

What are viruses? Why are they considered hostage takers and “assassins”? How can these organisms, which cannot reproduce on their own, be responsible for thousands of deaths each year? Through activities presented in this lesson, students will develop an understanding of the structure and function of these often-deadly organisms.

Learning Objectives

Students will be able to:

- Identify the characteristics and structure of a virus.
- Identify virus target cells.
- Explain how a virus reproduces.
- Create a three-dimensional model of a virus.
- Research a virus.

Oregon Standards Available at:

<http://www.ode.state.or.us/cifs>

Science - Life Science

Understand structure, functions and interactions of living organisms and the environment.

Organisms

- Describe, explain and compare the structure and functions of cells in organisms.

Heredity

- Explain laws of heredity and their relationship to the structure and function of DNA.

Media Components

Video

Check the link at <http://www.opb.org/edmedia/trs/> to find access to the video(s) from unitedstreaming™ referenced in this lesson plan.

- “The Body’s Defenses Against Disease” (23:46)
 - **Clip:** “Viruses” (01:04)
- “Life Science: Viruses” (20:00)
 - **Clip:** “Introduction to Viruses” (02:58)
- “Understanding: Viruses” (54:00)
 - **Clip:** “How Viruses Work” (02:25)

Web

- **All the Virology on the WWW**
A “one-stop shopping” collection of Internet Web sites. Each Web site has a description which can be used to select the Web site or sites that will provide the most appropriate information about the search topic.
<http://www.tulane.edu/~dmsander/garryfavweb.html>

Materials

Per Student:

- Scissors
- 2 sheets plain computer paper
- Balls: foam, yarn, clay, etc.
- Materials to stick into the balls (toothpicks, golf tees, pipe cleaners, wooden splints, pins, birthday candles, etc.)
- Making a Four-Page Science Journal Handout (located at end of lesson plan)

Prep for Teachers

When using media, provide students with a **Focus for Media Interaction**, a specific task to complete and/or information to identify during or after viewing of video, Web sites or other multimedia elements.

Prior to teaching this lesson, bookmark the Web site used in the lesson on each computer or provide students with the URL so they can type it into the address bar. Make sure that the Web site is still active before you start the booklet-making activity.

Make sure there are enough scissors, paper, balls and projection-type materials (toothpicks, etc.) available for each student.

Download the video clips onto the computer that will be used for the classroom presentation. Be sure each video clip displays appropriately by using appropriate plug-ins and media players. Make sure the screensaver is turned off or is on a long delay.

Introductory Activity

Step 1: Provide each student with scissors and paper. Use the Making a Four-Page Science Journal handout for demonstrating and leading the students through the process of making a four-page booklet. Explain to students that they are going to use this booklet as a science journal to list the information they learn about viruses.

Step 2: Have the students title their booklets “Virus: Cell Hostage Taker” and number the inside pages one through six.

Step 3: On page one of their science journals, ask students to write down *their* definitions of a virus and list three questions that they have about viruses. Space should be left in between the questions for answers (*see Example Booklet at end of lesson plan for ideas*).

Step 4: Brainstorm as a class and compile a list of information or characteristics that would be important to know about viruses. Direct student responses to include virus structure and size, infection methods, illness characteristics, reproduction and nucleic acid.

Step 5: Identify the six categories of information (viral size, structure, reproduction process, type of nucleic acid, target cells and result of infection) that will be answered by watching the video clips.

Step 6: Write the six categories in chart form on the chalkboard.

Step 7: Have the students write the same six categories down on pages three and four of their science journals (*see Example Booklet at the end of the lesson plan*). Page two will be used for additional questions that are generated by the video clips.

Learning Activities

Step 1: Explain to students that they will be watching a short video clip about viruses. Provide students with a **Focus for Media Interaction** by asking them to record information from the video clip under the appropriate categories they just created on pages three and four of their science journals.

Step 2: **Play** the video clip, “Viruses” (01:04), from the video, “The Body’s Defense Against

Disease” (23:46). At the conclusion of the video clip, ask students to share the information they recorded and the categories under which they recorded the information (*see Example Booklet at the end of the lesson plan for information students should have recorded from the video clip*).

Step 3: Record the information under the correct categories on the chalkboard.

Step 4: Have students turn to page two of their science journals and write down any new questions they may now have about viruses.

Step 5: Tell students that they are going to watch another video clip. Provide students with a **Focus for Media Interaction** by having them record additional information in the six categories in their science journals. **Play** the video clip, “Introduction to Viruses” (02:58), from the video, “Life Science: Viruses” (20:00).

Step 6: Again, ask students what information they recorded and the categories that they recorded it in. Complete the chart on the chalkboard as students share their information (*see Example Booklet at the end of the lesson plan for information students should have recorded from the video clip*).

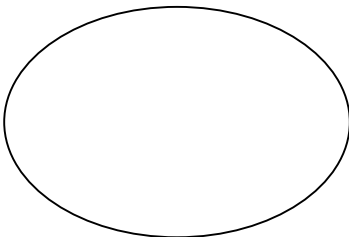
Step 7: Tell students that they are going to watch the final video clip. Provide students with a **Focus for Media Interaction** by having them record additional information into their science journals. **Play** the video clip, “How Viruses Work” (02:25), from the video, “Understanding: Viruses” (54:00).

Step 8: For the final time, ask students for the information that they recorded and the categories that they recorded it in. Complete the chart on the chalkboard as students share their information (*see Example Booklet at the end of the lesson plan for information students should have recorded from the video clip*).

Step 9: Now have students write a one-sentence definition of a virus on page five of their science journals. The definition should include that a virus has a tiny size, that it is nonliving, and that it must reproduce in a host. Ask students to compare this definition with their definition on page one. Ask students how their definitions have changed.

Step 10: Review the virus with students by constructing the following diagram on the chalkboard.

Have students name a target cell and draw a cell on the chalkboard.

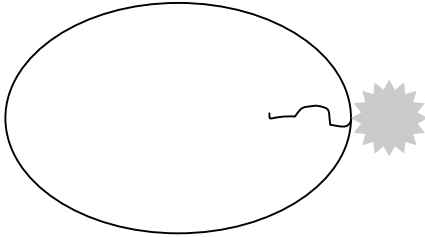


Ask students to describe how a virus looks.



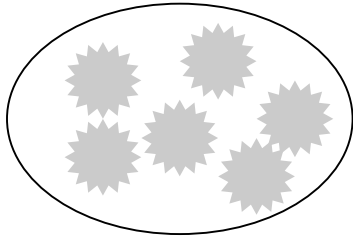
- tiny
- protruding structures to attach to host

Ask students to review what happens when a virus reproduces.



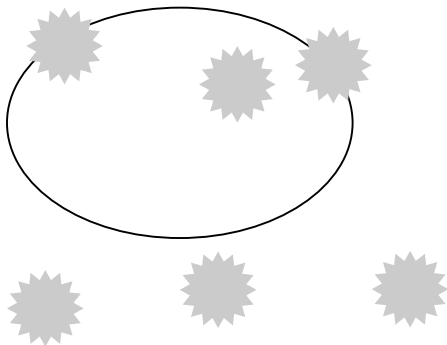
- Show the virus attaching to the host cell and injecting the nucleic acid.

Ask students what happens when the viral nucleic acid takes over the host's reproductive machinery.



- Show newly formed viruses inside the host cell.

Have students describe the final stage of viral reproduction.



- Description should include viruses leaving host cell to infect new host cells.

Culminating Activity

End of Session 1:

Accessing materials such as foam balls, toothpicks, golf tees, etc., students will use information from their class review diagrams and science journals to create a three-dimensional virus model and to explain the steps in viral infection. Models should include the target cell the virus needs for reproduction, method of attachment to host cell and possible end results of the infection (skin cell infection may result in rash, itching, scabs). Steps to viral infection of a cell should be recorded on the bottom half of page five.

Session 2:

Tell students that they will be giving a presentation to the class on a specific virus. Have students spend the first half of the period researching an actual virus of their choice from the bookmarked Web site, All the Virology on the WWW. Students should be instructed to select the “List of Virus Families” choice from the Web site, All the Virology on the WWW and find a virus that interests them. Students’ presentations need to include virus name, structure, target cells, end results of infection, type of nucleic acid and geographic location of the virus for their presentations. Information is to be recorded on page six of their science journals. Students will present their findings to the class during the second half of the period.

Cross-Curricular Extensions

Mathematics

- Many viruses have regular geometric shapes. Identify some of these shapes (isohedron, polyhedron) and fold paper to make models of them.

Language Arts

- Students may create a science fiction story about an unknown viral infection.
- Read a book about viruses.

Social Science

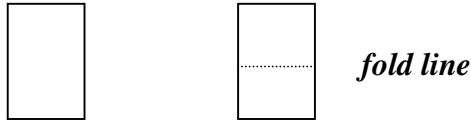
- Have students investigate the role of geography in virology. Where do viruses call home? Why? What natural barriers have historically limited the scope of viruses? How has modern transportation impacted the spread of viruses throughout the global community?

Community Connections

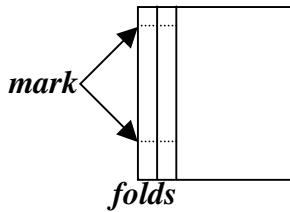
- Contact the local Health Department and invite a health care worker to speak and provide information about common viral infections in their geographic area.
- Invite the school nurse to speak and answer questions about viruses.

Making a Four-Page Science Journal

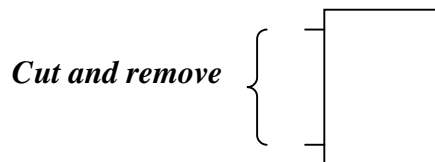
1. Take two pieces of 8- by 11-inch computer paper and fold with a hamburger fold.



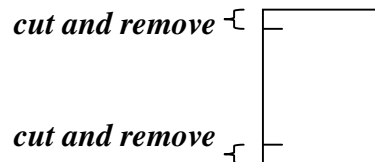
2. Place the folded papers on top of each other with the folds about 1/16th apart. Make a mark about one inch down from the top.



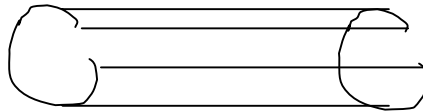
3. Use scissors to cut and remove the folded edge from one of the sheets.



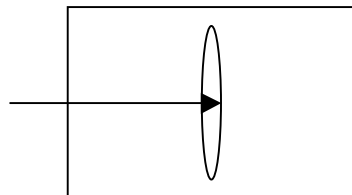
4. On the remaining folded sheet, cut and remove the fold from the mark to the top of the paper.



5. Take the sheet from step 4 and roll it like a hot dog.



6. Placed the rolled sheet through the center cut of the paper from step 3.



7. Open the rolled sheet and fit the slits together to form the booklet.

Example Booklet — Virus: Cell Hostage Taker

Page 1:

Virus Definition: A bug that gets into your body and causes you to throw up and have a temperature.

Three Questions:

What does the virus look like?

How does the virus make you sick?

How can we get rid of viruses?

Page 2:

New Questions About Viruses:

Why are viruses harmless outside the host cell?

How does the virus get into the host cell?

Page 3:

Video Clip Color Key

“The Body’s Defenses Against Disease” (23:46); Clip: “Viruses” (01:04)

“Life Science: Viruses” (20:00); Clip: “Introduction to Viruses” (02:58)

“Understanding: Viruses” (54:00); Clip: “How Viruses Work?” (02:25)

Virus Size:

Smaller than bacteria

Electron microscope to see them

Tiny/simple

Very simple with few pieces of nucleic acid

Structure:

Not Cells

Capsid coat made of protein with nucleic acid inside

Studded with molecules to dock with host cell, “lock and key”

Protein coat with nucleic acid

Reproduction:

Take over other cells and instruct them to make new viruses

New viruses invade new host cells and repeat the process

Harmless outside the host cell

Hook onto living host cells and inject nucleic acid into host cell

Page 4:

Nucleic Acid:

DNA - changes slowly, if at all

RNA - changes quickly, creating new viral nucleic acid

Target Cells:

Skin Cells - measles

Respiratory Cells - flu

Salivary Glands - mumps

Brain - rabies

Liver - hepatitis

Result of Infection:

Measles - rash

Flu - malaise, muscle aches

Herpes - chicken pox

Mumps - swelling of salivary glands

Rabies - muscle convulsions

Hepatitis - liver

Cold - runny nose, sinus problems.

HIV/AIDS

Page 5:

Definition of a Virus:

Nonliving, tiny organisms that must attach to and take over a host cell to reproduce

Viral Model:

The three-dimensional model of the virus should consist of a main body with projecting structures that are used by the virus to attach to a host cell.

Step to viral infection:

1. Virus must find the correct host cell and attach to it.
2. Virus injects its nucleic acid into the host cell.
3. Virus' nucleic acid takes over the host cell and causes it to reproduce hundreds of new viruses.
4. New viruses destroy the host cell as they leave through the cell membrane.
5. New viruses attach to new host cells and repeat the process.

Page 6:

Students complete the following information about their virus:

Virus:

Name:

Structure:

Target Cells:

Results of Infection:

Type of Nucleic Acid:

Geographic Location: