This curriculum unit is designed to be used in conjunction with the PDA participatory simulation, Virus, created by the Teacher Education Department at MIT.
For more information about participatory simulations please visit http://education.mit.edu/pda/index.htm.

In this unit.....

For Teachers

Curriculum/Learning Objectives

General Information about the curriculum unit.

Instructions for the Virus Illness Simulator (for teachers)

Extensions and Web Resources

For Students

Future Crime Scene Investigation Handout
includes Experiment Archive Sheet and healthy/sick tags

curriculum/learning objectives:

Objectives are written in the format of:
Students will get better at… OR Students will…

- Understand Latency period: during this period you can still transmit the disease
- Probability of transmission
- Immunity and also immune carriers
- Trace things back to patient zero—isolating initial cause of virus
- How diseases are spread: notion of disease dynamics
- Generate hypothesis from observed information
- Design an experiment to test hypotheses
- Collect data to support hypothesis
- Make predictions about possible outcomes of experiment
- Organize data into tables and charts
- Analyze results and draw conclusions from their own data and research
- Collaborating with peers to solve scientific problems

state standards:

The Massachusetts Department of Education Science and Technology/ Engineering Curriculum Framework is based on 10 guiding principles; many of these are addressed in this curriculum unit.
http://www.doe.mass.edu/frameworks/scitech/2001/principles/prin_1.html

Specifically the unit addresses Genetics > The Chemistry of Life > Grades 9-10 > Strand 2: Life Science (Biology) of the Science and Technology/ Engineering Learning Standards, PreK-High School.
http://www.doe.mass.edu/frameworks/scitech/2001/standards/ls9_103.html

General Information about this Curriculum Unit

future crime scene:

Students are presented with varying scenerios for the viral outbreak. One of these hints at bioterrorism. As the instructional leader who is most familiar with your students' concerns and sensibilities, you can be the judge of playing up that angle. If you would like more information about such a scenerio check out the recent FX program about smallpox.
http://www.fxnetworks.com/shows/originals/smallpox/main.html
A recent episode of NBC's Medical Investigation dealt with the same subject matter. http://www.nbc.com/Medical_Investigation/episode_guide/4.shtml

initial investigation:

Students will play a round or two of the Virus game to get an idea of how the game works. They might also make some initial assumptions of how to "solve" the game.

briefing room:

A series of questions are posed. Students can recall prior knowledge as well as develop a line of thought in relation to the curriculum unit.
Introduce the topic of viruses by starting a discussion about what virus's students have had. They will likely be confused about what illnesses/diseases are actually caused by viruses. This site has an extensive list of viral diseases as well as many other diseases caused by pathogens.
(http://www.virology.net/Big_Virology/BVDiseaseList.html)
Besides, viruses, other common organisms that are pathogens include bacteria, fungi, protozoa and parasitic worms.

crime lab specialists assignment:

There is some flexibility built into this assignment as far as grouping and reporting. Students could be in pairs or in small groups, reports could be oral or written. The final report on particular viruses could be a formal written report, a brochure or a poster.
The "how stuff works" site is awesome. I haven't seen a better overview of viruses in any textbook. It is brief enough to hold students attention but covers all the essential basics.

further investigation:

Have the students run as many rounds of Virus as necessary answer all their questions. Utilize the Experiment Archive sheet to guide experiments.

final briefing room:

This provides an opportunity for discussion of procedures and process and closure.

VIS instructions (for teachers):

Players in this game are told to meet as many people as possible without getting sick. You can only meet each other player one time. The catch is that no one knows how you get sick. Start the game by entering your name in the start screen. You can do this by using graffiti or by touching the “abc” button at the bottom of the screen. This will give you a small keyboard to use. It is critical that everyone start the game at the same time, so after entering your name, wait for the rest of the class to start (the instructor may want to prompt everyone to start). You can meet other players by lining up your Palms and having ONE player hit the Meet button (one person is the sender and the other is the receiver). The machine will keep track of your meetings (make sure everyone enters a unique name), and the number of meetings. Only the initial meeting with a person counts. At any point in time if you don’t want other people to meet you, you can press the READY button, which will toggle to say LOCKED. In this mode you can neither send or receive meetings.

If and when you get sick your machine will beep a few times and your happy face will turn to a sad face that says SICK.

To start a game, go to the virus menu in the upper left, and click on new game. It will kick you back out to the name screen with your name already filled in. Everyone should start the second round together. You cannot play with other players if you restart your game while other people are playing the first game, your machine will not communicate with theirs. (If students restart on their own, they will be in a different mode. They will need to wait until the other students get to the same mode to continue playing.)

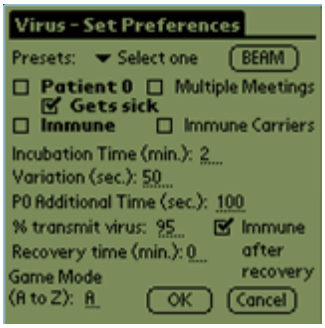
Game Parameters

There are many parameters that you can set in this game. Some are optional and others are mandatory. In order for the game to work well you will need to create three kinds of people ? Regular, Immune and Patient Zero.? The regular people should be all set by default.? But remember that you?ll need to make sure that all of the players play in the same mode. You should designate one player as Patient 0 (the person that starts with the virus) by checking the appropriate box. Patient 0 has some extra incubation time that you can set below. Patient 0 also gets sick by default, but you can uncheck this box so that they don’t. You also should check one or more players to have Immunity. By

default immune players do not carry the virus either. You can change this if you'd like.

A complete explanation of the parameters is given here:

- **Patient 0** - determines if the player starts with the virus
  - **Gets Sick** - determines if patient 0 every shows "SICK"
- **Multiple Meetings** - allows players to meet other players more than once
- **Immune** - determines if the player is immune to the virus
  - Immune Carriers - allows immune people to pass the virus along to others
- **Incubation Time** - how long on average it takes from getting the virus to showing sick
  - **Variation** - how much (random) extra time it could take before showing sick
  - **PO Additional Time** - how many extra seconds it takes for Patient 0 to get sick



- **% transmit virus** - the probability of passing the virus from an infected person to a healthy person
- **Recover time** - time it takes to recover from being sick (0 means there is no recovery)
  - **Immune after recovery**- if people recover determines if they are immune afterwards
- **Game mode** - which round the game is in

More Information for Instructors

In facilitating, remember that less is more. Don't give out any information in the beginning (e.g. Can immune people pass the disease? Is the first person immune? Can we meet people after getting sick? even if the answers seem obvious.

People should wear red/green nametags if possible and turn them to red when they are told that they are sick.? This will be indicated by a sick display on your screen and an alarm.

By default the rules are as follows:

- There is a 2 minute incubation time with a variability of 50 seconds.
- Patient zero takes an extra 100 seconds to get sick.
- Long haired people are immune
- Immune people can?t pass the disease.
- There is a 95% probability of transmission.

When playing the game we usually have the first round simply meeting people and seeing what happens. After the first round we ask, "What Happened?"

Then do some probing and ask some more directed questions like “Why didn’t some people get sick?” sometimes this is directed at the few people that don’t get sick, or the whole group.

Then we coax them towards “What do you want to figure out?” And write those things down.

Then we say “If I could reset everyone and play again what would you do to figure this out?” We try not to steer the group towards any particular experiment, but after some time (10-15 min) we try to steer them towards getting some sort of consensus on an experiment to run.

We then tell them how to play a second game (go to the menu in the upper left and select new game). After that game we again ask “so what happened?” “what did you learn?”

If there is time for one more experiment we go through a second iteration.

Discussion in the end can be based on specific diseases (what disease does this represent and why?), epidemics, scientific method, population growth, and many other topics.

If and when you get sick your machine will beep a few times and your happy face will turn to a sad face that says SICK.

To start a new game, go to the virus menu in the upper left, and click on new game. It will kick you back out to the name screen with your name already filled in. Everyone should start the second round together. You cannot play with other players if you restart your game while other people are playing the first game, your machine will not communicate with theirs. Remember, you must all be in the same mode to communicate.

Extensions and Web Resources for this Curriculum Unit

Have students read THE HOT ZONE by Richard Preston or THE ANDROMEDA STRAIN by Michael Crichton and relate the issues in those books to everyday life.

Watch the movie (or portions of) Outbreak
Find a short review at this site
http://movies.yahoo.com shop?d=hv&cf=info&id=1800230976&intl=us
An excerpt from the site...

"In director Wolfgang Petersen's fast-paced, intelligently written thriller, Dustin Hoffman plays Col. Sam Daniels, an expert on infectious diseases who is called in to study the outbreak of a deadly illness in Zaire. He finds a virus that spreads so quickly it could wipe out an entire nation in just a few weeks, and he believes that it might have spread to the United States. With the help of his ex-wife (Rene Russo), who works at the Centers for Disease Control, Daniels tracks the virus to the quiet seaside town of Cedar Creek, California. His superiors' reticence to help begins to raise questions in Daniels's mind, and he must find a cure before a panicky U.S. army general decides to kill the town's populace in order to save the world. The all-star cast includes Hoffman, Russo, Kevin Spacey, Donald Sutherland, Morgan Freeman, and Cuba Gooding, Jr."

Infection Detection Protection (play infection game)
http://www.amnh.org/nationalcenter/infection/03_inf/03_inf.html

Centers for Disease Control
http://www.cdc.gov

Health: Diseases and Conditions
http://www.yahoo.com/Health/Diseases_and_Conditions/

The Why Files
http://whyfiles.news.wisc.edu/index.html

Overview of HIV
http://www.cellsalive.com/hiv0.htm

What the heck is a virus?
http://people.ku.edu/~jbrown/virus.html

Glossary of Virology
http://www-micro.msb.le.ac.uk/mbchb/VirGloss.html

Online Virus Tutorials
http://www-micro.msb.le.ac.uk/Tutorials/default.html

The Next Influenza Pandemic?
http://www.utoronto.ca/kids/influnza.html

Also Check out

"Viruses"

Peter Jaret, National Geographic, July 1994
Virus-related catastrophes and research triumphs are told in this illustrated article that examines viruses' vast capabilities.