

TOPIC

Life Sciences – Epidemiology

LEARNING OBJECTIVES

- Learn about how infections spread through a population.
- Learn what factors affect the rate at which infections spread.

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At the Whyville Center for Disease Control (CDC) students learn about epidemiology. This is a great activity for those exploring the life sciences or for career exploration.

The CDC is an area where students can learn about the basics of epidemiology, including researching historical data, tracking new infections, and using simulations to predict the impact of infections and epidemics on the population.

At the Outbreak Headquarters students can review case histories of Whyville viruses, submit new infections, and discuss the cases on the bulletin boards. In the Why-Pox History area students can see how Whyvillians have responded to past epidemics. Viewing the data at Virus Graphs allows the students to study the durations and infection rates of Whyville viruses. At the Why-Pox Lab students can use the Infection Simulator and the Epidemic Simulator to make predictions. The Infection Simulator shows how quickly an infection will spread through a geographically distributed population. The Epidemic Simulator shows if an infection will escalate into an epidemic.

MATERIALS

- Properly configured computers. See our Technical Guide for more information.
- Student handout for daily grade, included in this lesson plan.

WHAT TO DO BEFORE CLASS

- 1) Watch the associated WhyPak CDC Video Walkthrough.
- 2) Navigate through Whyville and find the CDC activity at City Hall.
- 3) Browse through the information at Outbreak Headquarters, the bulletin boards, Why-Pox History, and the Virus Graphs to learn about contagions in Whyville.
- 4) Determine whether additional epidemiology content is needed, based on your particular class's needs.
- 5) Once you feel comfortable with the background information provided, play through the Infection and Epidemic Simulations found in the Why-Pox Lab.
- 6) Skim through the attached worksheet. Decide if it is applicable for your class.

SAMPLE LESSON OUTLINE

- 1) Conduct a short class discussion on what the students know about infectious diseases, epidemics, and how to inhibit their spread. Hand out the student worksheet. [Recall]
- 2) Have your students log into Whyville and direct them to the CDC through City Hall.
- 3) Students should browse through the information at Outbreak Headquarters, the bulletin boards, Why-Pox History, and the Virus Graphs prior to playing the Infection and Epidemic Simulators. It's OK if students do more during the exploration. [Explore]
- 4) Conduct a short discussion on what students learned about infectious diseases, epidemics, and the factors that escalate or inhibit their spreading. [Reflect]
- 5) Have students play through the Infection and Epidemic Simulators to gain understanding about the factors that affect the spread of diseases. The student worksheet presents a series of scenarios that will help guide them to these insights. [Accomplish]

WhyPaks Lesson Guide Framework

Recall – Ask the students what they already know about the subject.

Explore – The students self-direct themselves through the activity. Teacher facilitates.

Reflect – Refine the students' understanding by using directed inquiries.

Accomplish – The students are presented with a goal to achieve.

Connect – Connect what was learned to standards-based content.

6) Have students complete the attached worksheet for a daily grade. [Connect]

WHERE TO NEXT? RELATED CONTENT WITHIN WHYVILLE

SUBJECT MATTER	WHYVILLE DESTINATION
Immunology, Epidemiology, Virology	BioPlex – Make-A-Virus, Pharmacy, BioPlex – Vaccine Lab, BioPlex – Whack-A-Virus
Public Health & Safety	Wilson City Rescue, Raven Island, City Hall
Health, Wellness, Nutrition	WhyEat, Cafeteria, Fitzone

Next Generation Science Standards (NGSS)

NGSS Subcategory	Standard ID	Standard Description
Developing and Using Models	MS-PS1-1, MS-PS1-4	Develop a model to predict and/or describe phenomena.
Developing and Using Models	MS-PS1-5	Develop a model to describe unobservable mechanisms.
Engaging in Argument from Evidence	MS-PS3-5	Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon.
Analyzing and Interpreting Data	MS-PS1-2	Analyze and interpret data to determine similarities and differences in findings.
Analyzing and Interpreting Data	MS-PS3-1	Construct and interpret graphical displays of data to identify linear and nonlinear relationships.
Planning and Carrying Out Investigations	MS-PS3-4	Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.
Systems and System Models	MS-PS3-2	Models can be used to represent systems and their interactions – such as inputs, processes, and outputs – and energy and matter flows within systems.
Constructing Explanations and Designing Solutions	MS-LS2-2	Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena.
Constructing Explanations and Designing Solutions	MS-PS3-3	Constructing Explanations and Designing Solutions - Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process or system.
ETS1.B: Developing Possible Solutions	MS-ETS1-2, MS-ETS1-3	There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.

NGSS Subcategory	Standard ID	Standard Description
ETS1.B: Developing Possible Solutions	MS-ETS1-4	A solution needs to be tested, and then modified on the basis of the test results, in order to improve it.
ETS1.C: Optimizing the Design Solution	MS-ETS1-3	Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design.
ETS1.C: Optimizing the Design Solution	MS-ETS1-4	The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.

Common Core – ELA: Science and Technical Subjects (CC-ELA)

CC Subcategory	Standard ID	Standard Description
Writing for History/Social Studies, Science and Technical Subjects	WHST.6-8.1	Write arguments focused on discipline content.
Writing for History/Social Studies, Science and Technical Subjects	WHST.6-8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
Reading for Science and Technical Subjects	RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
Speaking & Listening	SL.8.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
Speaking & Listening	SL.8.1.c	Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.

Texas Essential Knowledge & Skills (TEKS)

TEKS Category	Chapter	Standard ID	Standard Description
Science – Scientific Investigation and Reasoning	112.18 112.19 112.20	6.2.B 7.2.B 8.2.B	Design and implement experimental investigations by making observations, asking well-defined questions, formulating testable hypotheses, and using appropriate equipment and technology.
CTE – Career Portals	127.4	1.A	The student explores one or more career clusters of interest. The student is expected to: (A) identify the various career opportunities within one or more career clusters.
CTE – Career Portals	127.4	2.A	The student explores pathways of interest within one or more career clusters. The student is expected to: (A) investigate career opportunities within the pathways.
CTE – Exploring Careers	127.3	4.A	The student evaluates skills for personal success. The student is expected to: (A) implement effective study skills for academic success.
CTE – Exploring Careers	127.3	4.C	Use a problem-solving model and critical-thinking skills to make informed decisions.
CTE – Exploring Careers	127.3	4.D	Use effective time-management and goal-setting strategies.
CTE – Exploring Careers	127.3	4.E	Effectively use information and communication technology tools.
CTE – Exploring Careers	127.3	7.E	The student develops skills for professional success. The student is expected to: (E) explore and model characteristics necessary for professional success such as work ethics, integrity, dedication, perseverance, and the ability to interact with a diverse population.
CTE – Exploring Careers	127.3	7.F	Complete activities using project- and time-management techniques.

<i>TEKS Category</i>	<i>Chapter</i>	<i>Standard ID</i>	<i>Standard Description</i>
CTE – Exploring Careers	127.3	8.A	The student identifies and explores technical skills essential to careers in multiple occupations, including those that are high skill, high wage, or high demand. The student is expected to: (A) complete actual or virtual labs to simulate the technical skills required in various occupations