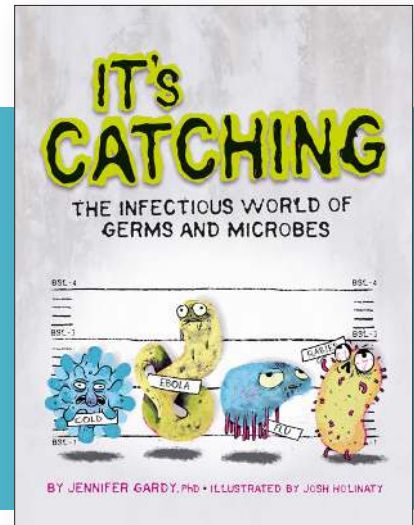


It's Catching: The Infectious World of Germs and Microbes

BY DR. JENNIFER GARDY

Target grade: 6
Reading levels: Fountas & Pinnell: W
Lexile® Measure: 1150L

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INTRODUCTION

Who better than Dr. Jennifer Gardy — a scientist, lecturer and “disease detective” — to introduce your students to the world of bacteria, viruses and other bugs that make us sick? In addition to her obvious qualifications, she’s got a great sense of humor and a genuine understanding of the way middle-school students think, balancing the yucky with the fascinating, the historical with the everyday, and the scientific with the commonplace. As your students read *It's Catching*, they’ll learn the scientific terms for the “rude dudes” that can make them sick, the ways vaccines and antibiotics work, and the dramatic stories of epidemics. They will also develop a proper respect for microbes and learn how they can help themselves stay healthier.

This guide is designed to take advantage of the teaching and learning opportunities in *It's Catching*, with questions that help you monitor your students’ understanding of the ideas presented, and with activities and discussions that connect the book across curriculums. You’ll find those curriculum areas delineated alongside each activity. You’ll see Common Core State Standards noted. At the end of the guide, there is a list of the Common Core State Standards cited, for your reference.

BEFORE READING

As an introduction to germs and microbes, watch with your class a short video titled *The A–Z of Epidemiology: Germs from Anthrax to Zoonoses*, created by the author of *It's Catching*, Jennifer Gardy: www.youtube.com/watch?v=P2C4U624Y6o

Which germs are your students familiar with? Discuss what they know about them. Students should recall a time they were stricken by a bug. What were the symptoms, what measures were taken, and how long did it take for them to get better?

QUESTIONS OF FACT

These questions will help your students review what they have read and help you be certain they are retaining and understanding what they are reading.

1. Name and describe the four categories of germs.
2. Explain the differences between an epidemic and a pandemic.
3. What is the World Health Organization? What role does it play in the detection and prevention of disease?

Curriculum Connections:
Speaking and Listening; Science

Common Core State
Standards: **RI 6.4, SL 6.1, 6.2**

Curriculum Connections:
Language Arts: Reading, Critical
Thinking; Science; Social Studies

Common Core State
Standards: **RI 6.1, 6.2, 6.3, 6.4**

It's Catching: The Infectious World of Germs and Microbes

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4. The use of antibiotics is a mainstay in the fight against disease, but it has a down side. Explain.
5. How did Ireland's potato blight of 1845 have a major societal impact on the United States?
6. Given what you've read, what is the most effective tool in the fight against the spread of disease: sanitation, vaccines or antibiotics? Explain.
7. Scientists have defined four Biosafety Levels (BSLs). What are they? Based on what you have read, place each of the following diseases in a Biosafety Level: Ebola, bird flu, malaria, rabies, SARS, common cold, H. pylori.
8. What efforts have been made to control and prevent malaria?
9. In July 2014, some vials of the smallpox virus were found in a laboratory storeroom near Washington, DC. Based on what you have read, what is the significance of this find?

ACTIVITIES AND DISCUSSIONS

(1) Curriculum Connections:
Language Arts: Vocabulary

Common Core State
Standards: **RI 6.4**

(2) Curriculum Connections:
Language Arts: Reading; Science

Common Core State Standards:
RI 6.1, 6.2; W 6.4, 6.7

(3) Curriculum Connections:
Language Arts: Reading, Writing,
Critical Thinking; Speaking and
Listening; Social Studies; Science;
Research; Cooperative Learning

Common Core State Standards:
W 6.2, 6.4, 6.7, 6.8, 6.9; SL 6.1, 6.2, 6.5

1. In *It's Catching*, your students are going to be introduced to many new words that are specific to the field of epidemiology. Ask your students to create a glossary of words and terms that are related to the subject. They should write each word and its definition on an index card. In addition to the definition, your students can create an illustration that explains the word or term on a separate piece of paper, with text if necessary. For example, for the word *synthesis*, the picture could be of a scientist mixing chemicals to create a new substance. The illustrations can be placed around the classroom, and the cards can be kept in an alphabetical file for future reference.
2. There are four categories of microbes (bacteria, viruses, fungi and parasites). Have your students make a chart comparing them.
3. After reading *It's Catching*, your students should be well aware that microbes and germs have a major impact on the societies of developing countries around the world. Identify with your class ten areas around the globe where large numbers of people fall victim to microbial diseases. Discuss with the class what all of these countries have in common that contributes to the problem. Then divide the class into research teams to investigate particular countries. The research should include diseases that are endemic to that area, the causes, methods of transmission, fatality rates, and what if anything is being done to combat those diseases. Reports should include visuals (charts and graphs) as well as text.

Websites that will be useful are:

- www.who.int/en/
- www.theguardian.com/science/infectiousdiseases
- www.infoplease.com/ipa/A0903696.html
- www.ncbi.nlm.nih.gov/books/NBK9956
- needtoknow.nas.edu/id/threats/global-killers

(4) Curriculum Connections:
Language Arts: Reading, Writing; Science;
Research; Speaking and Listening

Common Core State
Standards: **W 6.1, 6.4, 6.7, 6.8**

(5) Curriculum Connections:
Language Arts: Reading, Writing; Social
Studies; Speaking and Listening

Common Core State Standards:
W 6.2, 6.4; SL 6.1, 6.3

It's Catching: The Infectious World of Germs and Microbes

BY DR. JENNIFER GARDY

4. Survey the cleanliness of your school. Bacteria lurk everywhere. Even places that look clean can be teeming with them. Set your class on a project to find which surfaces in the school are prone to bacterial contamination. Brainstorm with your students and develop a list of at least ten surfaces in the school that they think are the most vulnerable. Be sure they include: desktops, drinking fountains, cafeteria tables, doorknobs, chalkboards, students' lockers and gym floors. They should rate the areas on a scale of 1–10, where 1 indicates the least amount of bacteria and 10 is a full-fledged “danger zone.” Your students should give the rationale for why they assigned each area its rating.

Then divide the class into inspection teams and assign each team a surface to investigate. Each team will need a labeled Petri dish with agar, saline solution, latex or nitrile disposable gloves, and a cotton swab. Teams will take samples at their assigned areas. Disposable gloves should be worn so that the samples are not contaminated.

Instructions:

- Carefully wet the cotton swab with the saline solution and squeeze out the excess.
- Swipe the surface in question with the cotton swab.
- Rub the cotton swab over the surface of the agar several times, making sure not to breathe directly onto the dish.
- Place all of the labeled Petri dishes in a warm closet for up two days to incubate.
- Inspect the dishes and manually count the number of bacteria colonies that have grown.

What conclusions can your students make? Your students should present, in writing and in oral presentations, recommendations they have for the school administration and for their fellow students.

The following websites are sources for premade dishes with nutrient agar:

- www.hometrainingtools.com/bacteria-experiment-kit/p/BE-BACKKIT
- landing.carolina.com/agar/agar-604H-11317G.html

5. Your students have just acted as disease detectives. Every community has an organization whose task it is to prevent outbreaks of diseases and to keep the population healthy. Invite a representative from your local health department or public health service to talk to your students about what they do and what careers are available in the field of public health. In preparation for the visit, have your students come up with at least ten questions they would like to ask. Questions can include:
- How did they become interested in public health?
 - What kind of education do you need to pursue a career in that field?
 - How successful are they in preventing disease?
 - Did they ever have to deal with a major health emergency, and how was it resolved?
 - How do they use technology in healthcare?

(6) Curriculum Connections:
Language Arts: Reading, Writing; Speaking
and Listening; Cooperative Learning

Common Core State Standards:
W 6.1, 6.2, 6.3, 6.4, 6.7,
6.8, SL 6.1, 6.4, 6.5

(7) Curriculum Connections:
Language Arts: Writing; Research;
Speaking and Listening; Science

Common Core State Standards:
RI 6.1, 6.2, 6.6, 6.7; W 6.1,
6.4, 6.7, 6.8, 6.9

(8) Curriculum Connections:
Language Arts: Reading, Writing;
Social Studies; Science; Research;
Speaking and Listening; Theater Arts

Common Core State Standards:
RI 6.1, 6.2, 6.3, 6.7, 6.9; W 6.3,
6.4, 6.7, 6.8, 6.9; SL 6.1, 6.4

(9) Curriculum Connections:
Language Arts: Reading, Vocabulary,
Writing; Social Studies; Research

Common Core State Standards:
RI 6.4, 6.6, W 6.7, 6.8, SL 6.1, 6.2, 6.3

6. Recently, scientists have expressed concern that we are overzealous in our desire to be germ-free. They have advised a more judicious use of antibacterial cleaning agents. That being said, it is essential that we don't make it easy for germs to make us sick. We have to do our best to ensure that anything we put in our mouths is not contaminated by what we touch. For young children, this is especially a problem.

Your students can view a variety of videos for children and adults on the need to wash hands (see below). They range from simple instructions to humorous song-and-dance productions. Using these as inspiration, engage your class in creating their own instructional videos. Divide your students into creative work teams. Each team will write a script with dialog, songs, choreography and visuals that will entertain young children as they teach the proper way to wash hands.

Hold a mini-film-festival of your students' work. Awards can be given for the best instructional, most entertaining, best acted, and most creative presentations.

Visit these links for inspiration:

- www.youtube.com/watch?v=yJeh2fPzfVE&list=PL47CC6930CA64644B&index=2
- www.youtube.com/watch?v=vYwypSLiaTU
- www.healthcarecommunication.com/Main/Articles/6_mustsee_hand_hygiene_music_videos_8973.aspx

7. Eliminating microorganisms has become a national obsession. There seems to be an antimicrobial station in almost every public building. And parents are constantly swabbing their children with antimicrobial wipes and liquids. All of this "cleanliness" comes with a price: widespread use of some antimicrobial chemicals can have negative effects on our health and the environment. Have your students research two of these antimicrobial agents: triclosan and triclocarban. Their reports should include the products these chemicals are found in, the controversy surrounding them, and what alternatives, if any, are safer and more effective.

8. In the pantheon of great disease-fighting scientists, six key names are Louis Pasteur, Alexander Fleming, Edward Jenner, Robert Koch, Joseph Lister and John Snow. Divide your class into teams to learn more about each of these scientists and their contributions to modern science. Based on what they have learned, each group should write and perform a short skit that depicts a moment of great discovery. The scripts should be historically accurate, but your students should use artistic license to make the skit enjoyable to the audience.

9. At the turn of the twentieth century, immunologist Paul Ehrlich popularized the concept of the "magic bullet" to treat diseases. Discuss what your students think he meant by that expression. After the discussion, have your students research the meaning of Dr. Ehrlich's magic bullet and how it is being applied today. They can report on their research with essays or one-panel graphic political cartoons that depict Dr. Ehrlich's meaning. (Web searching the "magic bullet" might not yield its intended meaning unless you include Dr. Ehrlich's name in the search.)

Teaching guide prepared by Clifford Wohl, Educational Consultant.

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COMMON CORE STATE STANDARDS – GRADE 6

CODE:

RI: Reading Information

W: Writing

SL: Speaking and Listening

READING INFORMATION

RI 6.1

Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

RI 6.2

Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.

RI 6.3

Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated on in a text (e.g., through examples or anecdotes).

RI 6.4

Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.

RI 6.5

Analyze how a particular sentence, paragraph, chapter, or section fits into the overall structure of a text and contributes to the development of the ideas.

RI 6.6

Determine an author's point of view or purpose in a text and explain how it is conveyed in the text.

RI 6.7

Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.

RI 6.8

Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.

RI 6.9

Compare and contrast one author's presentation of events with that of another (e.g., a memoir written by and a biography on the same person).

WRITING:

W 6.1

Write arguments to support claims with clear reasons and relevant evidence.

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W 6.2

Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

W 6.3

Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

W 6.4

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

W 6.7

Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

W 6.8

Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.

W 6.9

Draw evidence from literary or informational texts to support analysis, reflection, and research.

SPEAKING AND LISTENING

SL 6.1

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.

SL 6.2

Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.

SL 6.3

Delineate a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.

SL 6.4

Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.

SL 6.5

Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.