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LESSON

Tiny Germs and Big Feelings

Students share their sick-day experiences. They draw a picture of themselves when they're sick and make connections to the final product of the unit project. Students discuss a story about someone who is sick. Students share their ideas about what makes people sick. Using the See, Think, Wonder thinking routine, students make sense of images of microbes responsible for illnesses.

GRADES

1, 2

SUBJECTS

Biology, Health, Engineering

CONTENTS

2 Activities

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ACTIVITY 1: FEELING YUCKY | 45 MINS

DIRECTIONS

This activity is part of the *Germ-Problem Solvers: Using Engineering to Develop Solutions* unit.

1. **Launch the unit by leading a drawing activity and class discussion about being sick.**

- Distribute the *When I'm Sick* handout to each student.

- Have students draw a picture of themselves when they don't feel well and write words that describe how they feel.
- Next, ask how friends or family support us or care for us when we are sick.
- Ask students to add images or words to their picture that shows how they feel supported or taken care of when they are not feeling well.
- Ask students to share their ideas with the class.

2. **Orient students to the unit project by introducing the driving question and final product.**

- Share the driving question for the *Germ-Problem Solvers: Using Engineering to Develop Solutions* unit: How can we design a way to stop germs from spreading?
- Let students know that in this unit, they will be designing a solution to stop the spread of germs that cause illness.
    - Note that they will learn more specifics about the process, product, and what germs are in the next activity, *Getting to Know Germs*.
- Segue to the next step by explaining that, next, they will read a story about someone who felt sick and will consider how germs play a role in making someone feel bad and how people helped solve the main character's problems.

3. **Connect to students' experiences of being sick by leading a read-aloud and text analysis of a children's book.**

- Lead students in a read-aloud of a text in which a child (or other character) is sick and is cared for by others. This activity uses the children's book *Bob, Not Bob!* (4:16) by Liz Garton Scanlon and Audrey Vernick. (See Tips for other possible options.)
- Before reading the text, let students know that you will be looking for key details. Write "Who, What, Where, When, Why, and How" on the board.
    - You might say, *"Sometimes readers look for key details in a text by looking for answers to the 'Five Ws and H'—the Who, What, Where, When, Why, and How. Let's keep those questions in mind as we listen to the story and look at the pictures."*
- Conduct a class read-aloud of *Bob, Not Bob!* or other similar book in which a child (or other character) is sick and cared for by others.

- Lead students in a discussion about the details of the text using the who/what/where/when/why/how format. Sample questions can include:

  - *Who was sick? Who helped?*
  - *What was the problem in the story?*
  - *Where did the story take place?*
  - *When did the story take place?*
  - *Why do you think Little Louie was sick? Why do you think he felt so bad?*
  - *How did Little Louie's family help him? How did Little Louie get sick? How does Louie's experience connect to yours?*
  - This will help students demonstrate understanding of the key details of the text as well as connect it to their own sick-day experience.
  - Keep track of student responses on the whiteboard/smartboard or chart paper for reference in later lessons.
  - Let students know that in the next activity, *Getting to Know Germs*, students will learn more about the kinds of things that made Louie sick and what makes us sick.

Tip

Step 1: You may decide to have students work in pairs or small groups to generate discussion before they begin drawing and writing.

Step 3: Additional texts that you could use in a read-aloud include: *The Sniffles for Bear* (6:16) by Bonny Becker, *When Vera Was Sick* (6:25) by Vera Rosenberry, or *Llama Llama Home With Mama* (5:55) by Anna Dewdney.

Informal Assessment

Drawing: Use students' drawings of themselves when they don't feel well (with words that describe how they feel, and images/words that show how they feel supported or taken care of when they are not feeling well) to pre-assess students' ability to address CCSS W.2.8 and CCSS SL.2.5.

Discussion: Use students' responses to the questions about the read-aloud text to demonstrate their ability to "ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text." (CCSS RI.2.1)

Extending the Learning

Additional texts that could be used in a read-aloud include: *The Sniffles for Bear* (6:16) by Bonny Becker, *When Vera Was Sick* (6:25) by Vera Rosenberry, or *Llama Llama Home With Mama* (5:55) by Anna Dewdney.

OBJECTIVES

Subjects & Disciplines

- **Biology**
  - Health
- Engineering

Teaching Approach

- Project-based learning

Teaching Methods

- Discussions
- Reading
- Writing

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Learning and Innovation Skills
    - Communication and Collaboration
- 21st Century Themes
  - Health Literacy
- Critical Thinking Skills
  - Remembering

- Understanding
- Science and Engineering Practices
  - Asking questions (for science) and defining problems (for engineering)
  - Obtaining, evaluating, and communicating information

National Standards, Principles, and Practices

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

• **Reading Standards for Informational Text K-5:**
Key Ideas and Details, RI.1.1
• **Reading Standards for Informational Text K-5:**
Key Ideas and Details, RI.2.1
• **Speaking and Listening Standards K-5:**
Comprehension and Collaboration, SL.1.2
• **Speaking and Listening Standards K-5:**
Presentation of Knowledge and Ideas, SL.1.5
• **Speaking and Listening Standards K-5:**
Comprehension and Collaboration, SL.2.2
• **Writing Standards K-5:**
Research to Build and Present Knowledge, W.2.8
• **Writing Standards K-5:**
Research to Build and Present Knowledge, W.1.8

NEXT GENERATION SCIENCE STANDARDS

• **Science and Engineering Practice 1:**
Asking questions and defining problems
• **Science and Engineering Practice 8:**
Obtaining, evaluating, and communicating information.

Preparation

BACKGROUND & VOCABULARY

Background Information

This activity centers on the social-emotional impact of sickness on children and draws on student's individual experiences. Additionally, this activity exposes students to the perspective of another child in the read-aloud text. Reading stories can help students develop empathy for other peoples' feelings and experiences. Once students have developed a foundation for their own feelings and the feelings of others, they will be better able to design solutions for problems related to sickness in future lessons.

Prior Knowledge

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Recommended Prior Activities

- None

Vocabulary

TermPart of SpeechDefinition

ACTIVITY 2: GETTING TO KNOW GERMS | 30 MINS

DIRECTIONS

This activity is part of the Germ Problem-Solvers: Using Engineering to Develop Solutions unit.

1. **Connect students' responses about what they think makes people sick to real microbes through a See, Think, Wonder thinking routine.**

- Review students' responses to the read-aloud discussion questions, "*Why do you think Little Louie was sick?"* and *"How did Louie get sick?"* that were recorded during the previous activity, *Feeling Yucky*. Ask if students have any additional ideas to add to the existing hypotheses.
- Next, write down the names of common infectious illnesses on the board ("stomach bug"; common cold, flu, strep throat; etc.). Elicit students' ideas about what they think causes these illnesses, building on their previous responses about what makes us sick.
- Show students images of the viruses and bacteria responsible for these illnesses with the *Introducing Microbes and Germs Image Gallery*. Explain the following key ideas:

- Germs belong to a group of tiny living things called *microbes*.
- There are many kinds of microbes, and not all of them make us sick— some even help us! For example, show students a picture of intestinal bacteria (i.e. *Lactobacillus, Bifidobacteria*) from the *Introducing Microbes and Germs Image Gallery* and explain that we have microbes inside of us that help us digest food and absorb nutrients (these good gut microbes are also called *probiotics*).
- Microbes that make us sick are called *germs*. Sometimes microbes can help protect us from germs by serving as a barrier. For example, we have microbes on our skin that help protect us from germs (an example of a good skin microbe is *Vitreoscilla* bacteria that can help reduce water loss and could aid with eczema; an example of bad skin germs includes the antibiotic-resistant *Staphylococcus aureus* which can cause staph infections such as a boil). Another example of microbes that help protect us from germs includes the good microbes in our mouths (i.e. *Lactobacillus)* that help fight off bad breath-causing bacteria and gingivitis (i.e. *Bacteroides* spp.*)*.

- As you show students the images of microbes and germs, use the See, Think, Wonder thinking routine as explained in resource, *See, Think, Wonder*, by Project Zero. Ask:

  - *What do you see?*
  - *What do you think about that?*
  - *What does it make you wonder?*

- Students may recognize familiar images of microbes they have seen on signage, on the news, or online. However, many images may be new. Use students' observations and questions to inform how you introduce the ideas about where germs are found in the next step.

2. **Help students make connections between the driving question, the unit challenge, and students' experiences with germs.**

- Remind students of the unit driving question: How can we design a way to stop germs from spreading?
- Remind students that in this unit, they will be working in small groups to design a solution to keep themselves and others healthy by stopping the spread of germs, so considering where the most "bad" germs are will help us find helpful solutions. You might say, "*We can't see individual germs with our naked eyes, but we can find out where they are by growing samples of the germs so there are enough of them to see without a microscope. You will*

watch a video of an investigation today to better understand where bad germs live so we can help stop the spread of germs."

- Ask students if they think they have germs in their classroom. Where could they be hiding? What do they look like if enough of them grow together?
- Build on students' responses to elicit their ideas about where the most germ-filled place in the classroom or school might be.

3. **Show a video and lead a discussion to help students determine where germs are found in their classroom or school.**

- Show students the video *Growing Bacteria* (2:11) by Sick Science! so they can see one way to visualize germs. Pause before the results are shown (at 1:28 into the video).

  - Ask students to brainstorm where they would want to collect germs from inside their classroom or school if they were going to do this investigation. Collect student responses on the whiteboard or chart paper. (Student responses may include: keyboards or tablet surfaces, desks, pencils, doorknobs, railings, library books, playground equipment, water fountains, skin, hair, pets, etc).
  - Show the rest of the video to share the results of the investigation.
  - Ask students which surfaces in their classroom might be similar to a TV remote, cell phone, or soap dispenser, in terms of the presence of germs. (Possible responses: Students might say that a hand sanitizer pump might be as highly used as a soap dispenser, or that a light switch, hall pass, or doorknob might be as high-touch as a TV remote, or that their laptops or other digital devices might be similar to a cell phone).
  - Lead students to the idea that surfaces that are often touched by people tend to have high numbers of germs, both good and bad.
  - Have students make a prediction about the most high-touch places in their classroom or school. Record students' responses on the chalkboard or whiteboard.
  - Ask students to note the difference in the number of germs growing in the samples that were not disinfected as opposed to the samples that were disinfected (at 1:33 into the video). Prompt students to make the connection that using disinfectants on surfaces is one way to help slow the spread of germs in our environment. Note for students that we still need good germs to help our bodies and the environment, so it's important to consider other ways to avoid illness caused by bad germs while not killing off all of the germs in an area—like maintaining a balanced diet (i.e. consuming naturally-derived

probiotics) to sustain a positive gut microbiome environment that can fight off infections caused by bad germs.

- Please note: the EPA (United States Environmental Protection Agency) recommends that kids *not* use disinfectants, including wipes, as these kind of products typically contain a label that says "keep out of reach of children." This is mostly out of concern that they would use them incorrectly and use them on their skin rather than surfaces. Educators may show the correct procedure for disinfecting surfaces, and explain why students shouldn't do it themselves yet.
- Let students know that in the next activity, *Invisible Villains*, they will learn more ways to slow the spread of germs.

Informal Assessment

Discussion: In class discussions, students will show their ability to participate in collaborative conversations about germs in small and larger groups to make connections, ask questions, and track the cause and effect of germs growing in high-touch places.

Extending the Learning

Build on the ideas in this activity by reading an age-appropriate text that introduces the different types and distinctions between microbes and germs. One option is the book *Tiny: The Invisible World of Microbes* by Nicola Davies (7:25).

OBJECTIVES

Subjects & Disciplines

Biology

- Health
- Engineering

Teaching Approach

- Project-based learning

Teaching Methods

- Brainstorming
- Demonstrations
- Discussions

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Learning and Innovation Skills
    - Communication and Collaboration
    - Creativity and Innovation
    - Critical Thinking and Problem Solving
- 21st Century Themes
  - Health Literacy
- Critical Thinking Skills
  - Understanding
- Science and Engineering Practices
  - Asking questions (for science) and defining problems (for engineering)

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• **Speaking and Listening Standards K-5:**
Comprehension and Collaboration, SL.1.1
• **Speaking and Listening Standards K-5:**
Presentation of Knowledge and Ideas, SL.1.6
• **Speaking and Listening Standards K-5:**
Comprehension and Collaboration, SL.2.1
• **Speaking and Listening Standards K-5:**
Presentation of Knowledge and Ideas, SL.2.6

NEXT GENERATION SCIENCE STANDARDS

• **Crosscutting Concept 2: Cause and Effect:**
Cause and effect relationships may be used to predict phenomena in natural or designed systems.
• **Science and Engineering Practice 1:**
Asking questions and defining problems

Preparation

BACKGROUND & VOCABULARY

Background Information

Microbes are organisms that are too small to be seen by the naked human eye and include bacteria, archaea, protists, viruses, and fungi. Although some microbes cause disease, they are also crucial to the functioning of human bodies through processes such as digestion and strengthening of the immune system (collectively called the "human microbiome"), and terrestrial and aquatic ecosystems on Earth through processes such as nutrient and energy cycling.

In the video, the microbes that are growing in the petri dishes are fungi or bacteria and not necessarily the microbes that make students sick. The video is a model to help students think about where germs are found in their classroom environment and can help students identify specific problems as they connect to the project.

Prior Knowledge

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Recommended Prior Activities

- Feeling Yucky

Vocabulary

Term	Part of Speech	Definition
agar	*noun*	gelatinous extract of red algae used especially for growing cultures

Term	Part of Speech	Definition
germ	*noun*	disease-producing microbe.
petri dish	*noun*	small, shallow dish made of glass or plastic with a loose cover used for growing bacteria cultures
prediction	*noun*	forecast or projected outcome of a situation.

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