

One Problem, Many Solutions

OBJECTIVES

During this lesson, students will:

- explore the importance of developing multiple solutions to global problems
- research disease transmission and determine its implications for public settings
- create multiple classroom designs that could help slow the spread of COVID-19

OVERARCHING QUESTION

Is it beneficial to develop multiple solutions when solving a problem?

STANDARDS

Next Generation Science Standards

- Engineering Design
 - MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
 - Disciplinary Core Idea:
 - ETS1.B: Developing Possible Solutions: Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)

Common Core English Language Arts

- Writing:
 - W.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- Speaking and Listening:
 - SL.2: Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

Instructional Note:

The following activity has been designed so you can tailor it to your current mode of instruction.

- The *Introduce*, *View & Reflect*, and *Conclude* sections can be presented virtually, by video, or through a shared document.
- The *Challenge* section is designed for students to complete independently at home using the accompanying Challenge handout. Students can fill either print and fill out the handout or answer the questions separately in a format that can be shared with you.

ACTIVITY OVERVIEW

Introduce

1. Begin by sharing that engineers use their background in math, technology, and science to solve problems and prevent them from occurring. Thanks to engineers, our world has developed countless solutions to diverse problems.
2. Share the following categories and invite students to brainstorm different solutions that have already been developed in the following areas:
 - Automobile safety
 - Sports safety
 - Aviation safety
 - Internet safety
3. Ask students to consider the following questions:
 - Is there more than one “right” way to solve a problem?
 - Is it important to consider different possible solutions before selecting one? Why or why?
4. Explain that, ideally, engineers can proactively design solutions that prevent problems from occurring. However, sometimes—such as in the case of COVID-19—the world needs to respond reactively and develop solutions for problems after they occur.
5. Tell students that they are about to watch a short video that highlights how one engineer is helping Microsoft develop solutions to help employees return to work while maintaining a safe working environment.

View & Reflect

1. Before viewing the Microsoft Career Profile video, instruct each student to fold a piece of paper in half so two columns are formed. Have them label the left column *Pictures* and the right column *Words*.
2. Tell students that as they watch the video, they will be responsible for taking notes on the different solutions that are proposed. They may jot their notes as sketches or words. They do not need to fill in both columns as they watch.
3. Share the Microsoft Career Profile Video. Students may find it helpful to view the video more than once.

4. When the video is complete, instruct students to go back to their notes and fill in the opposite column for each idea. For instance, if they sketched a picture to represent one idea, they should now further describe the idea in words and vice versa.
5. Encourage the class to share their notes to ensure each student captured the range of solutions that Microsoft is considering.

CHALLENGE

1. Explain that the class will now be challenged to take on the role of health and safety engineers as they work to develop multiple solutions to a significant problem.
2. Share the *Challenge* handout and review the instructions. Remind students that while they may not have a health and safety engineering background, they do have many other STEM skills that can be transferred to tackle this challenge!

Note: To make the Create portion of this activity more challenging, provide students additional criteria such as classroom dimensions, required furniture, class size, etc.

CONCLUDE

- Encourage students to share their creative classroom redesigns once the Challenge activity is complete, including the key differences between their two designs and the reasoning behind their design choices.
- If possible, facilitate a discussion in which students consider the strongest elements of their peers' designs. If this is not possible, ask students to explain what they believe are the strongest and weakest elements of their designs.
- Wrap up by asking students to again consider the benefit of designing multiple solutions by answering the following questions:
 - As our understanding of COVID-19 continues to develop and change, why may these varied options be helpful?
 - How could collaboration yield the most effective solutions?

CHALLENGE

Directions: Read the Background section below to prepare for taking on the role of a health and safety engineer. Then complete Steps 1–4 as you consider how classrooms could be redesigned to deal with COVID-19. Any question with a requires a written response.

Health and Safety Engineering Background

Health and safety engineers develop procedures and systems to protect people from illness and injury, as well as prevent property from damage. They must stay up-to-date on current health and safety policies, regulations, and recommendations. With these in mind, they evaluate facilities, machinery, and equipment to ensure they comply. If problems exist, they recommend improvements and will monitor the situation as changes are made.

Health and safety engineers are just one type of STEM professional who will be needed as schools consider how to re-open while COVID-19 remains a threat. In collaboration with medical experts and education professionals, engineers can play a vital role in ensuring that classrooms are designed as safely as possible.

Step 1—Educate

Take a moment to read through this CDC [factsheet](#), which explains what scientists currently know and understand about COVID-19. You will need this information as you begin to develop possible solutions for living and learning with COVID-19.

As you read, use the chart below to note what is known about COVID-19 transmission.

How is COVID-19 spread?	What precautions can help prevent COVID-19 from spreading in public settings?

Step 2—Analyze & Apply

Just as Dr. Huynh is working to model and evaluate different scenarios that may enable Microsoft employees to return to work, you will help consider different scenarios in which students can return to school.

Picture one of your school's classrooms and consider the information you recorded in Step 1. Then, use the chart below to brainstorm what design changes could be made to reduce the risk of classroom transmission.

Where do the biggest risks for transmission exist in a classroom?	What changes could be implemented to reduce these risks?

Step 3—Create

Bring your ideas to life! Use the grid paper on the following pages (or your own blank paper) to create at least two different classroom designs that could help combat the spread of COVID-19. You may be creative, but be sure to keep learning in mind. The following classroom elements must be included:

- somewhere for students to sit
- desks or other surfaces for students to use while writing
- a whiteboard or SMARTboard
- bookshelves

Step 4—Explain

Explain the reasoning behind each of your designs by answering the following questions:

- What specific decisions did you make to help prevent the spread of COVID-19?
- What are the strongest elements of each design? The weakest elements?
- What challenges do you anticipate?
- Would you recommend that the teacher or students take any other steps or measures to enhance this classroom's safety?

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