



TEACHER LESSONS

The Tech for Global Good: Medical Supply Availability

Objectives

Students will be able to:

- Perform research to deconstruct causes and effects of the medical supply availability problem.
- Design a creative and empathetic solution for medical supply access.
- Develop a realistic plan to influence tangible change connected to the overall problem and take action in their community.

Overview

Around the world, nearly two billion people lack access to basic medicine¹—and even more have trouble obtaining other important aspects of healthcare. In this lesson, students will explore the problem of medical supply availability through design activities and a series of video clips featuring [Zipline](#), a company whose mission is to “provide every human on Earth with instant access to vital medical supplies.”

To gain empathy and a stronger understanding of the problem, students will first perform research to deconstruct the causes of the medical supply problem and the effect it has on citizens and communities. Students will then use design thinking to brainstorm how technology could be used to contribute positively to this widespread problem, and they will consider the potential impact of their solution. The lesson will culminate as students bring the problem closer to home and brainstorm realistic actions connected to the overall problem that they could spearhead to create tangible change, and they will create a brief plan that details how they could influence this change and take action in their community.

This lesson focuses on

Design Process

- Defining the Problem
- Designing Solutions

21st Century Skills

- Communication
- Collaboration
- Critical thinking
- Creativity

Grades

6–8

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Timing

180 minutes

Materials

All sessions:

- Device with the ability to project video, one for the teacher

Problem

- Images to project: [28–32](#)
- *Problem* video clip
- Handout 1: Research the Problem (two pages), one per student
- Devices with Internet access, one per student (or at least enough for half the class)

Solution & Impact

- Handout 2: Design Thinking (three pages), enough for one-quarter of the class
- Handout 3: Solution Storyboard (two pages), enough for one-quarter of the class
- Handout 4: Imagine the Impact, enough for one-quarter of the class
- *Solution and Impact* video clips

What Can I Do?

- Sticky notes, about 100
 - *What Can I Do?* video clip
 - Handout 5: Create Change (two pages) one per student
- Scrap paper, one per student

Background Information

The following section provides background on topics covered in this lesson. While it is designed for educators, this information may also be shared to supplement students' understanding as needed, *after* the lesson's Problem section has been completed.

Have you ever wondered...

Do people around the world have access to adequate medical services and supplies?

In 2017, more than 5 million children died before they reached their fifth birthday and the majority of these deaths occurred in Sub-Saharan Africa and Southern Asia.¹ One reason for these deaths is lack of treatment: The World Health Organization reports that nearly two billion people globally have no access to basic medicine, which causes a “cascade of preventable misery and suffering.”² According to the United Nations, people living in rural areas suffer the most. More than half of citizens living in rural areas around the world lack access to critical health care, and the most affected countries are those who suffer

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from the most poverty.³ However, the problem also exists globally: Around the world, close to half of the Earth's population is not receiving essential health services.²

Have technologies been developed to help solve this problem?

While there is currently no global solution, various technologies have been developed and are in the process of development. In the United States, for example, UPS is conducting a trial program that uses autonomous drones to deliver medical supplies between hospitals. The program has seen success so far and will expand to 20 hospitals over the next two years.⁴ In the eastern African country of Malawi, phone-based health centers help patients exchange information over text with their doctor without going to a clinic. The centers also send notifications such as medication reminders, tips for preventing HIV transmission, and how to use mosquito nets to prevent malaria.⁵ In addition, as students will learn in this lesson, doctors in Rwanda and Ghana are able to place on-demand orders for medicine and blood through an app—thanks to a company called Zipline. The medical supplies, which are stored in distribution centers, are flown quickly by drone to where they are needed. The drones currently make over 500 deliveries a day.⁶ While these are just some of the innovations in development, governments, corporations, and people around the world must further unite in their efforts to find a widespread and sustainable solution.

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Make Connections

How does this connect to students?

Health is a fundamental human right and people of all ages need healthcare. This healthcare is easier to access in some locations than in others. Consumers in the United States make an average of 26 trips each year to purchase over-the-counter medical products.⁷ And in the past year, approximately 93 percent of American children had contact with a healthcare professional.

However, while healthcare may be accessible to many Americans, it's important to remember that this is not the case for everyone. In the United States, barriers to care include healthcare's high cost, inadequate or no insurance coverage, and lack of care availability. Millions of Americans who live in rural areas don't have access to primary care services due to a lack of providers in their region.⁸ These inequities in healthcare access exist in varying degrees around the world.

Awareness is an important first step in helping change this problem for the better. Students can then take action to contribute to change—such as donating blood once they are of age or learning important STEM skills that can later be applied to develop solutions.

How does this connect to careers?

Pharmaceutical Scientist:

Pharmaceutical scientists research how different compounds interact with both the human body and disease-causing cells in order to develop, test, and eventually manufacture new medications.

Software Engineer: Software engineers apply their background in computer science and their math analysis skills to design computer software. Software engineers specialize in different types of programming, which can be used to power operating systems, computer games, or even geospatial mapping systems that can be used to determine flight paths.

Drone Flight Operator: These specialized flight operators are responsible for everything from drone take-off to drone maintenance. They work with flight controllers to prepare the ground equipment and launch the drones, and they collaborate with engineers to troubleshoot issues and optimize performance.

How does this connect to our world?

There continues to be a global disparity in access to healthcare between those who live in rural areas and more developed urban communities.

In the United States, the shortage of doctors in rural America is increasing. Today, only one percent of doctors in their final year of medical school say that they hope to live in communities of under ten thousand.⁹

The president of England's Royal College of Physicians made a similar acknowledgement: "The results of our census are an incredibly alarming indication of the huge disparities in care across the country. Some rural areas are so severely 'under-doctored' that patient lives could potentially be at risk."¹⁰

In lower-income countries around the world, healthcare problems span from healthcare facility access to the availability of medical treatments and supplies. In African countries, the World Health Organization attributes this to a variety of factors—including shortage of resources and personnel, poor drug procurement processes, poor transportation systems and infrastructure, a lack of storage facilities, and weak manufacturing abilities.¹¹

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Sources

1. Sustainable Development Goals. United Nations. un.org/sustainabledevelopment/health/.
2. "Access to medicines: making market forces serve the poor" World Health Organization. who.int/publications/10-year-review/medicines/en/.
3. "New UN report finds bulk of world's rural populations excluded from healthcare access." United Nations. un.org/sustainabledevelopment/blog/2015/04/new-un-report-finds-bulk-of-worlds-rural-populations-excluded-from-healthcare-access/.
4. 12 Innovations That Will Change Health Care and Medicine in the 2020s. Time. time.com/5710295/top-health-innovations/.
5. Taking Healthcare to Remote Areas. African Renewal: United Nations. un.org/africarenewal/magazine/december-2016-march-2017/taking-health-services-remote-areas.
6. Zipline. flyzipline.com.
7. "Statistics on OTC Use." Consumer Healthcare Products Association. chpa.org/StatsNR.aspx.
8. "Access to Health Services." Office of Disease Prevention and Health Promotion. healthypeople.gov/2020/topics-objectives/topic/Access-to-Health-Services.
9. "The Struggle to Hire and Keep Doctors in Rural Areas Means Patients Go Without Care NPS." npr.org/sections/health-shots/2019/05/21/725118232/the-struggle-to-hire-and-keep-doctors-in-rural-areas-means-patients-go-without-c.
10. "New report reveals alarming shortage of country doctors." The Guardian. theguardian.com/society/2019/oct/13/nhs-consultant-shortage-rural-coastal-areas.
11. "Dying from Lack of Medicines." African Renewal: United Nations. un.org/africarenewal/magazine/december-2016-march-2017/dying-lack-medicines.

Blueprint for Discovery

PROBLEM: 50 minutes

1. Begin class by projecting [images 28 through 32](#). Observe the images together and click through them two different times:
 - As you go click through the images the first time, ask students to pretend they are visiting this community in real life. What would they think as they observe their surroundings?
 - Then click through the images one more time. Instruct students to imagine that they are in this region and need to either get somewhere quickly or have something delivered to them. What do they think now?
(5 minutes)
2. Share that these photographs were taken in rural Rwanda. Ask students to discuss: How do you think access to medical care and treatment (such as visiting a doctor or getting medicine) in these regions may compare to your own access to medical care and treatment? Why do you think this? (5 minutes)

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3. Encourage students to keep this question in mind as you show *The Problem* video segment. When the video is complete, instruct students to discuss with a partner: Did your opinion change about whether access to medical care and treatment in rural regions of the world may be different from your own access? Why or why not?
(5 minutes)
4. Lead the class in a full-group discussion around the following questions:
 - If you were sick and your doctor gave you a prescription for medicine, where would an adult get it from?
 - If you were *really* sick or hurt and needed to go to the hospital, would you feel confident that the hospital would have the treatment and/or supplies that you need to get well? Why or why not?
 - Do people who live in regions like those you saw in the video have access to the same level of care? How may this affect them?
(5 minutes)
5. Take a moment to connect this problem closer to home and explain that millions of Americans also have problems accessing basic medical care. Explain that in rural areas, this problem often occurs because medical facilities and doctors are too far away. Throughout the country, the high cost of medical care is also a cause.

Then ask: How would your life be impacted if you had trouble accessing medical care? How would you feel? (5 minutes)
6. Explain that before the class tries to develop a solution to help this problem, as the video clip challenged them to, they will conduct Internet research to deepen their understanding of the issue.
7. Divide students into pairs, and pass out one copy of Handout 1: Research the Problem to each student. Each student will also need a device.* Explain that students will follow the step-by-step directions on the handout in order to research the problem. Allow students about 25 minutes to complete their research.

*If 1:1 devices are not available, students may share a device and read both articles together or the articles may be printed in advance.

SOLUTION & IMPACT: 70 minutes

1. Now that students have a more thorough understanding of the medical supply problem, explain that they are ready to tackle the question that the video clip presented: How would you solve this problem?
2. Pair partners from the last session together, and distribute one copy of Handout 2: Design Thinking to each group of four. Review the handout's directions and explain that students will be collaborating to brainstorm solutions to the medical supply problem. Students should be creative as they ideate. If technology is part of their solution, they don't need to know if their alternative tech functionality is currently possible as long as it could potentially help solve the problem.
(15 minutes)

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3. Distribute one copy of Handout 3: Solution Storyboard and Handout 4: Imagine the Impact to each group.

First, review the instructions on Handout 3 and explain that the next step in the design process will be to select one solution that they think will have the largest positive impact on people affected by the medical supply problem.

Then review Handout 4's instructions, and reiterate the importance of designing a solution that considers the needs of the people affected. If needed, walk through the handout's layout and the way in which it demonstrates a solution's ripple effects. For instance: Easier access to medical supplies may help doctors treat more patients, which could improve health in a community, which could then help the area's economy, etc.

Allow groups about 30 minutes to work.

4. Bring the class back together to show the *Solution* and *Impact* video segments. Instruct students to think about how their solution and impact compares to the solution presented as they watch. (5 minutes)
5. When the video viewing is complete, ask each group to compare and contrast the actual solution and impact with their own ideas, and challenge them to optimize their own solution in at least one way. Allow groups about 10 minutes to make edits directly to their storyboard.
6. For the time remaining in the session, guide students in forming new groups of three or four. Encourage group members to share their solutions with each other. Then present the following questions, allowing a few minutes for small-group discussion between each one:
 - How does your solution consider the conditions and needs (such as infrastructure or climate) of the regions it will serve?
 - Zipline's drones use parachutes to create air resistance, which work against the force of gravity and help cushion its fall. Considering the conditions of the regions it may serve, how does your innovation ensure a safe delivery?
 - Could your innovation work around the world, including in the United States? Why or why not?
 - Who would need to collaborate in order for your innovation to be successful?

WHAT CAN I DO?: 60 minutes

1. Begin this session by writing *Educate*, *Empathize*, and *Act* on the board in large letters. Explain (or—if one or more of the other Tech for Global Good lessons have already been completed—review) that these are three different steps that they, as students, can take to help create change. Today, students will consider how these steps could effect local change related to the medical supply problem.
2. Guide students in re-forming their groups of four, and distribute about ten sticky notes to each group. As you point to *Educate*, *Empathize*, and *Act*, ask the corresponding question below and challenge groups to brainstorm two or three different answers. They should jot each answer in a few words on separate sticky notes.

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- Educate: How can you help others learn more about the medical supply problem in order to better understand why people don't have access to medical supplies?
 - Empathize: How can you help others understand what it's like to be in the shoes of someone affected by this problem?
 - Act: What actions could you and other students take to make a difference and contribute toward solving the medical supply problem?
(10 minutes)
3. Once each group has brainstormed ways to Educate, Empathize, and Act, call student groups up one at a time to post their sticky notes by the appropriate words. As each group adds their sticky notes, instruct them to demonstrate similarities and differences among their ideas by their sticky note placement: Similar answers should be placed next to each other and different answers should be spaced further apart. When each group has posted their answers, review what the class has brainstormed. (5 minutes)
 4. Then show the *What Can I Do?* video segment. As students watch, encourage them to listen for additional ideas that can be added to these three categories, and add these ideas when the clip is complete. (5 minutes)
 5. Challenge students to consider what they can personally do now to help the medical supply problem. Distribute one Handout 5: Create Change to each student, and review the step-by-step directions. Explain that individual students or pairs are about to select one way they can take action in their own community and create a plan for carrying it out. As they develop their plan, they should consider if it could be strengthened by including technology* that already exists. If so, they should incorporate this technology into their action plan. (20 minutes)

*If your students would benefit from technology suggestions, you may share the list below. Alternatively, students could also perform their own Internet research to find tech resources or products that align with their change idea.

- Educate:
 - Informative websites about the state of global health: [United Nations](#), [World Health Organization](#), [Doctors Without Borders](#)
 - Online news sources: [Newsela](#), [The Learning Network](#)
 - Videos: [World Health Organization](#), [United Nations](#), [Zipline's Video Gallery](#) or keyword searches on [YouTube](#)
 - Learn more about STEM with the [Khan Academy](#)
- Empathize:
 - The *Educate* websites from above can be used to better understand the state of health inequalities.
 - Use [Skype in the Classroom](#) to connect and talk with classrooms in rural communities.
 - Use [YouTube](#) and other search engines to watch videos and/or read articles that portray a day in the life of rural communities around the world.

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- Use [Google Images](#) to search for photographs of specific regions around the world.
 - Further connect global health access problems to problems faced by Americans through Internet research, such as this [article](#) from the Association of American Medical Colleges.
 - Act:
 - Use a relevant social media platform(s) to create a targeted campaign.
 - Create a presentation for a target audience that promotes a specific action using [PowerPoint](#), [Google Slides](#), [Prezi](#), [iMovie](#), etc.
 - Share the work of [Zipline](#) and other innovative tech solutions.
 - Participate in a [STEM competition](#).
 - Inspire others to [give blood](#).
 - Inspire others to [register to vote](#), so they can voice their opinion about healthcare issues they care about.
 - Research [careers](#) that could positively affect the medical supply problem and inspire others to consider these career paths.
 - Learn to code with [Hour of Code](#).
6. For the time remaining, encourage students to present their ideas to each other. Before students present, write the following sentence stems on the board:
- I could collaborate with _____ to...
 - _____'s idea was most different from mine because...
 - I think _____'s idea has the potential to have the biggest impact because....

Then distribute a piece of scrap paper to each student. Challenge the class to complete at least two of the three sentence stems as they listen to their peers' ideas.

Finally, explain that each presentation should share the action they selected, how this change will make an impact, and the first step they will take toward achieving it. Then kick off the presentations!

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National 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.

Forces and Interactions:

- Disciplinary Core Ideas:
 - PS2.A: Forces and Motion: The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. (MS-PS2-2)
- Crosscutting Concepts:
 - Influence of Science, Engineering, and Technology on Society and the Natural World: The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. (MS-PS2-1)

Common Core English Language Arts Standards

Reading:

- R.1: Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
- R.7: Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.

Writing:

- W.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- W.7: Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

Speaking & Listening:

- SL.1: Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

Standards for Technological Literacy (ITEEA Standards)

Standard 1: Students will develop an understanding of the characteristics and scope of technology. In order to comprehend the scope of technology, students should learn that:

- F. New products and systems can be developed to solve problems or to help do things that could not be done without the help of technology.
- G. The development of technology is a human activity and is the result of individual or collective needs and the ability to be creative.

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Standard 4: Students will develop an understanding of the cultural, social, economic and political effects of technology. In order to recognize the changes in society caused by the use of technology, students should learn that:

- D: The use of technology affects humans in various ways, including their safety, comfort, choices, and attitudes about technology's development and use.

Standard 8: Students will develop an understanding of the attributes of design. In order to comprehend the attributes of design, students should learn that:

- E. Design is a creative planning process that leads to useful products and systems.
- G. Requirements for a design are made up of criteria and constraints.

Standard 11: Students will develop abilities to apply the design process. As part of learning how to apply design processes, student should be able to:

- H: Apply a design process to solve problems in and beyond the laboratory-classroom.
- J: Make two-dimensional and three-dimensional representations of the designed solution

1. Open your Internet browser twice (create two separate tabs) and type maps.google.com into each tab:
 - In one window, type your state's name into the *Search Google Maps* search bar.
 - In the other window, type either "Rwanda" or "Ghana" into the *Search Google Maps* search bar.
 - Zoom in using the "+" button until the state and the country each take up most of the screen.
2. The white and yellow lines that you see on both maps represent roads. The thicker yellow lines indicate highways and main roads. The thinner white lines indicate local roads, which may be paved or unpaved. Compare the network of roads in both areas, and consider how this may affect the people who live there. Record your thoughts below:

3. Learn more about the medical supply issue that affects rural areas:

- One partner should visit bit.ly/bloodshortsupply and read the entire article.
- The other partner should visit bit.ly/bridgesandroads and read the information under the *Abroad, substandard infrastructure kills* header and the *Improving infrastructure, improving health* header.

As you each read, jot notes in the chart below. (If you are unsure of any words or terms in your article, take a moment to look up the meaning!) Then share your notes with your partner.

What is the problem(s)?	What is causing the problem(s)?	How does this problem affect people?

4. Lastly, visit bit.ly/remotearias with your partner and learn how some communities are trying to solve these problems. Summarize below two of the solutions that you read about and list their pros and cons. (You may need to *infer* these!)

Empathize & Define

Use what you learned from your research to summarize *why* people around the world have trouble accessing important medicine and medical supplies. What are the causes and effects of this problem? Think about *who* this problem affects and *what* these people need.

Ideate

In order to solve this problem, what barriers would the solution have to overcome? Think about infrastructure (such as roads, bridges, etc.), the area's overall development, weather/climate, etc.

Sketch: In the following boxes, illustrate two potential ideas that could solve the problem you just described. Try to design at least one solution that uses some form of technology. This could be an improvement to a product that already exists or an entirely new tech product.

Be sure to label important parts! Continue to brainstorm on a separate piece of paper if you have more than two ideas.

Solution A:

Solution B:

A large empty rectangular box for drawing or writing.

Solution Storyboard, page 1 of 2

STUDENT HANDOUT 3

Directions: Use this storyboard to explain how your solution could be used to help people affected by the medical supply problem. Clearly show how your solution could be used to help solve this problem, as well as who this solution would affect. Each square should show one step, and the end result should be illustrated in the final square. You may use as many squares as needed.

1	2	3
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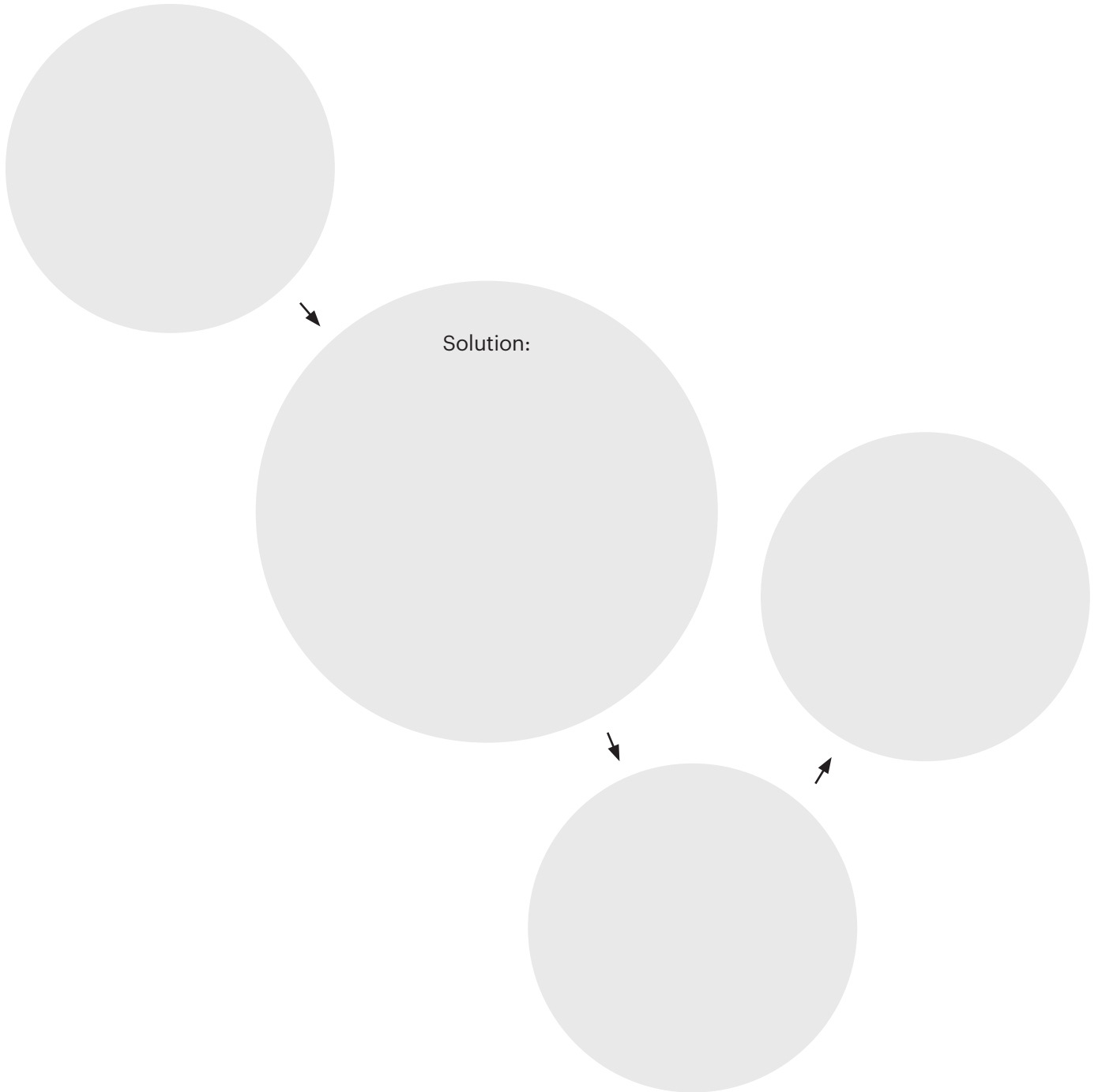
4	5	6
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Imagine the Impact

A solution to a large problem can have a ripple effect: It not only solves the problem at hand but can positively affect people's lives in many other ways as well.

Fill in the diagram below as you consider the effects of your medical supply solution. Be sure to think about the different people (doctors, patients, families, etc.) that this solution would affect.

Use the circles provided as a starting point, and then continue to add your own!



Step 1: Choose an Action

Select one action you can take in your community that will positively impact the medical supply problem. This action may fall into the *Educate*, *Empathize*, or *Act* categories. It may be an idea from the video, one that you or your classmates developed, or an entirely new idea.

I will create change by inspiring my community to:

Then explain: Why is this action important? How will it help the medical supply problem?

Step 2: Create a Plan

Break your idea into at least three smaller steps. As you do, try to include an existing tech resource or innovation that you could use to achieve your change.

1.

2.

3.

4.

Step 3: Begin!

Now that you have a plan in place, get started on your first step and begin creating change.