

Tech for Global Good Data Challenge

Grade Levels: 7-12

Duration: 90 min

In this lesson, students will analyze how The Tech for Global Good laureates use data as a tool to solve problems and effect change. Students will then work in groups to create a plan for collecting and using data to address a problem in their own sphere of influence.



Outline

Frame the Challenge	25 min
Activate Prior Knowledge	5 min
Introduce The Tech for Global Good Laureates	20 min
Systems Design Challenge	65 min
Introduce the Challenge	5 min
Brainstorm Problems	20 min
Create a Data Plan	20 min
Share-out	15 min
Debrief	5 min

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Concepts/Skills

Data literacy, social impact, brainstorming

Objectives

Students will:

- Identify an issue existing in their immediate lives or community that could be addressed using data.
- Create a plan for collecting data that can aid in solving an issue.
- Explore how data analysis helps to inform solutions and measure their success.



Materials and Preparation

Materials

The Tech for Global Good Laureate “Innovator Story” videos	Materials
<ul style="list-style-type: none"> □ Chipsafer □ Destination Home □ Opportunity Insights □ UNICEF's Magicbox <p>Note: This lesson focuses on the “Innovator Story” videos for each laureate. See adaptations in the lesson for using other videos in the series.</p>	<ul style="list-style-type: none"> □ Device to watch videos (1 per class) □ Data Plan Handout (1 per student) □ Writing utensil (1 per student) • Materials for brainstorming (1 set per team) <ul style="list-style-type: none"> □ Sticky notes (20-30) □ Markers (3-5) □ Large chart paper (1-2 sheets)



Preparation

1. Watch all of the [Tech for Global Good 2020-21 videos](#) yourself or with other educators.
 - Consider the Adaptations below when preparing devices and video links.
2. Collect and prepare brainstorming materials and [Data Plan Handouts](#).



Video Adaptations

Try one of these approaches for an extended look at the laureates.

- **Content Connection:** Choose one laureate to focus on and have the whole class watch [all four videos](#) about them: *Innovator Story, The Problem, The Solution, What Can I Do?* (10-15 min total)
- **Jigsaw Research:** Assign each group a different laureate to investigate. Have these teams watch all of the videos about that laureate and report back on what they have learned to the rest of the class. (approximately 20 min)
- **Virtual Field Trip:** Watch [The Tech for Global Good Virtual Field Trip](#) as a class for an overview of all of the laureates. (22:38 min)



Adaptations for Distance Learning

- Introduce the laureate videos and have students watch asynchronously before coming together for brainstorming in a live video session.
- Have students brainstorm and create their plans using online tools (Jamboard, Mural, Slides etc).

For more tips on adapting Design Challenges to a virtual setting see our [Educator Tips for Remote STEM Learning](#).

Background Information

Tech for Global Good

[The Tech for Global Good](#) is an initiative to create the next generation of problem-solvers ready to tackle the toughest challenges facing our planet. The program recognizes innovators who use technology to improve lives and their stories inspire us to create design challenges that embolden students to address complex issues around the world.



**The Tech
for Global Good**

In 2020-21, The Tech for Global Good recognized four laureates who, through the constructive use of data, enable people to access healthier and more prosperous lives.

- **Chipsafer** equips farmers with data to help identify and isolate irregularities for the protection of their herds. Data is gathered with sensors and transformed into actionable information.
- **Destination Home** uses data to track progress toward permanent housing for vulnerable populations at risk of becoming homeless in Santa Clara County.
- **Opportunity Insights** uses data to uncover and understand the potential of our society to improve economic outcomes for all Americans. They work to identify barriers to economic opportunity and develop scalable solutions that will empower people throughout the United States to rise out of poverty and achieve better life outcomes.
- **UNICEF's** Innovations team created the Magicbox technology platform to track and help predict the spread of diseases such as Ebola, Zika, and COVID-19. The information empowers global and community leaders to make data-driven decisions towards prevention and containment of disease.

Systems Design Challenges

Systems Design Challenges present students with a real-world problem that is part of a complex system. Students examine the intricate parts of that problem as they design potential solutions. By the end of a systems design challenge, students will be able to articulate a potential solution, the real-world problem it addresses, and the effects their idea might have on other components of that larger system. In this lesson students choose an issue that they care about and investigate the context and complexities of that problem through the lens of data. Since the issue they are considering has personal relevance, they will examine their own role as problem-solvers and the impact they can create in their own communities.



Frame the Challenge

Activate Prior Knowledge (5 min)

1. Lead students in a discussion about data and its uses.
2. Use some of these **Guiding Questions**:
 - *What do you already know about data?*
 - *How have you seen data used?*
 - *What are some ways that you use data in your everyday life?*
 - *What are some of the ways that collecting or using data can be intrusive?*
 - *What are ways you have heard of data being used for good?*

Note: Use the initial discussion and videos to build excitement before jumping into the challenge itself. Connect with student interests and even controversy about data collection and use.



Data 101

What is **data**? At its simplest, data is information that can be collected, analyzed and used to inform decisions.

- **Quantitative data:** can be measured numerically.
Ex. I ate pizza 7 times last month. My family ordered 21 pizzas last month. 
- **Qualitative data:** is descriptive. It can be observed or collected in a survey or interview.
Ex. I love pepperoni and mushroom pizza. No one else in my family likes mushrooms. 
- In this lesson students are likely to focus on these standard types, but as they investigate complex problems they will notice more nuanced types of data such as multidimensional and interactive data. *For example*, data from social media might include sounds, pictures and videos.
- **Data literacy** is the ability to interpret, understand and utilize data. At the heart of data literacy is the ability to identify patterns and discrepancies and draw conclusions. When building this skill, students should ask themselves:
 - What am I noticing? What patterns do I see? What seems out of place?
 - What conclusions can I draw?
 - What additional questions come up when I look at this data?
 - What is the right data to answer my questions? Are there other options?
- As the ability to collect large amounts of data grows, the ability to navigate and understand data becomes more relevant. **Data science** is a field that focuses on collecting, processing, analyzing and utilizing data to understand and solve problems with both humans and automated computers performing the analysis.

Resources

- [Data Science 4 Everyone](#): This coalition maintains a list of resources for educators interested in introducing data science into their classrooms.
- [The Concord Consortium: Dynamic Data Science](#): A number of games and activities including data science modeling tools.
- [Youcubed: K12 Data Science](#): A list of resources including videos, lessons and other tools to introduce students of all ages to data science.

Introduce The Tech for Global Good Laureates (20 min)

1. Introduce The Tech for Global Good program and the laureates who are using data to solve complex problems.
2. Play the *Innovator Story* video for each laureate.
 - [Chipsafer](#) (3:07 min)
 - [Destination Home](#) (3:10 min)
 - [Opportunity Insights](#) (3:33 min)
 - [UNICEF's Magicbox](#) (3:42 min)
3. Make sure each student has a copy of the [Data Plan Handout](#). Students will take notes on their first page in response to the **Reflection Questions**:
 - *What problem is the laureate trying to address?*
 - *What data did they collect?*
 - *How did they use that data?*
4. Following the videos, lead the class in a brief discussion about the laureates and the role of data in their innovative solutions:
 - *How did data help these laureates create change?*
 - *How was data important to their solution?*

Systems Design Challenge

Introduce the Design Challenge (5 min)

1. Introduce the design problem.
 - Note that this challenge focuses on the creation of a plan, but not the actual data collection and analysis.

Design Problem	Design a plan to use data to address a problem in your life or community.	
Criteria	<ul style="list-style-type: none"> • Clearly define the problem. • Create a plan to use data to inform solutions. 	 

2. If you have not already done so, group students in teams of 3-6 and distribute brainstorming materials (sticky notes, markers, chart paper, etc).

Brainstorm Problems (20 min)

1. Now that students have seen some examples of innovators who used data to solve problems, invite them to think of issues that they care about.
2. Let students know they are going to be thinking about problems that exist within their sphere of influence. In other words, the area where they have the power to have an effect or create change.
3. **Individual Brainstorm (2 min)**
 - On their [Data Plan Handout](#): First have them reflect and record individually.
 - *What are some problems and issues you care about in your own sphere of influence? Problems that affect you and your community (friends, school, city)?*
 - Challenge students to consider how their sphere of influence could connect with state, national or global problems.
 - *For example:* Recycling is a global problem that students can tackle on a personal level.
 - Similarly, an idea that helps one family build wealth might be useful for other families as well.

Tech Tips

See our [educator guides and videos](#) for more design challenge facilitation techniques.

For this lesson check out:

- Data Collection
- Innovator Mindsets
- Brainstorming

4. Team Brainstorm (8 min)

- Next, ask students to share their ideas and brainstorm as a group.
- Have them record ideas on sticky notes spread over a chart paper.
- For this initial brainstorm, encourage them to include all ideas without judgment.
- Have them think about issues that they can address using data.
 - They can also think about problems that spark their curiosity and lead to questions that could be investigated with data.

5. Define the Problem (10 min)

- Now that teams have many ideas, it is time to narrow them down to 1-2 problems to explore further. Depending on the scale and complexity of an initial idea, they might also need to focus in on a more specific aspect of it.
- Have them use the **Problem Questions** below to break the problem down into the component they want to examine with data.
 - It may be useful to sort the problems into categories or similar ideas first before choosing.
 - They can use sticky notes to capture their ideas.

Problem Questions:

- *Who is affected by this problem?*
- *What solutions currently exist? What is preventing them from solving the problem?*
- *What else do we need to know about this problem?*



Create a Data Plan (20 min)

1. Have students choose one problem to focus on.
2. They will now create a plan to collect data about this problem
 - First they will need to focus on what data they need.
 - Next, they will consider how they will gather that data.
3. They can use the questions from the [Data Plan Handout](#) to guide their thinking.

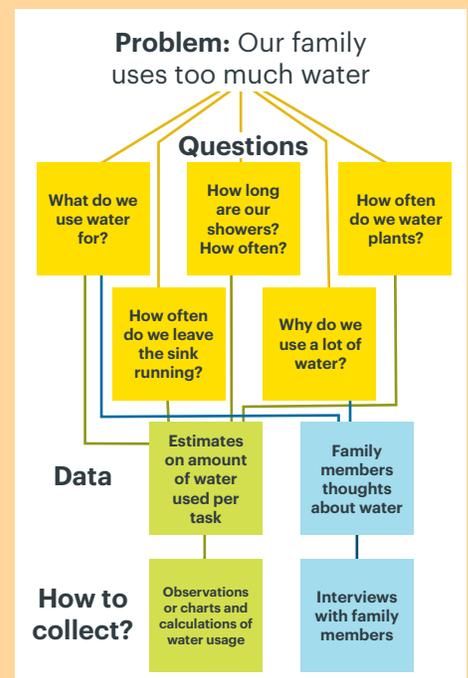
What:

- *What parts of this problem are we interested in?*
- *What questions do we have? What information do we need?*
- *What types of data could be collected that relate to this problem?*

How:

- *How could each piece of data be collected? What tools and strategies could we use?*
 - *How do these types of data relate to and affect the problem?*
4. Encourage them to create a visual representation of their plan on chart paper using flowcharts, mind maps or other tools.
 - These types of tools will help make connections between ideas as they plan and also share their ideas with others later.
 5. If students have time they can also show how their data might lead to or influence potential solutions.

Flowchart Example:





Share-out (15 min)

1. Have teams share their plans and receive feedback.
2. Before sharing, outline the structure and timing and provide constructive feedback process for students to use.
 - Consider sharing sentence frames to support this, such as “I like” and “I wonder.”
3. Provide some initial **Sharing Questions** such as:
 - *Describe your problem and why it is important.*
 - *What is your data collection plan?*
 - *What data would you need to collect?*
 - *How would you collect this data?*
 - *How could this data inform your solutions or be part of a solution?*

Options for Sharing Solutions

- **Gallery Walk:** Have teams post their charts around the space. Students can walk around for 10 minutes and provide structured feedback using sticky notes. Give each team 5 minutes at the end to reflect on the feedback they received.
- **Team Share:** Pair up teams and have them share their Data Plans with each other. Provide reminders of timing so each team has about 5 minutes to share and receive feedback.
- **Presentations:** Give each team 1-2 minutes to share their Data Plans with the rest of the class. Students can provide written or verbal feedback after each presentation.



Debrief (5 min)

1. After students share their work, bring the conversation back to the concepts and what they learned.
2. Lead a short discussion and guide student reflection.
3. Possible **Debrief Questions** include:
 - *What did you notice about the different problems that the teams considered?*
 - *What did you notice about the types of data they wanted to collect?*
 - *What did you notice about how teams were planning to use data to affect change?*
 - *Are there any ethical considerations you would need to make when collecting the data, especially around consent and privacy?*
 - *For example: Do the people involved know you are collecting and using data? How are you keeping the information safe?*
 - *How has your understanding of data in your own life changed after considering these problems?*



Extensions

This data lesson can be the starting point of a longer term project.

Data Collection and Analysis

- Students gather data as outlined in their plans (this may take several days or weeks and take place outside of class time).
- Student groups analyze the collected data and brainstorm potential solutions. Once they have decided on a solution, groups will develop a plan to implement this solution and measure its success.

Implementing Solutions

- Students make a plan to implement solutions they developed in class.
- After implementing their solutions, students will observe and analyze the effects.
- Groups will present their results and lessons learned to the class. (If possible, invite community stakeholders.)

Next Generation Science Standards

Grades		Description
6-8	MS-ETS1-4.	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
9-12	HS-ETS1-1.	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Common Core State Standards: English Language Arts

Grades	Standard	Description
6-12	CCSS.ELA-LITERACY.SL.6-12.5	Using visual/digital presentations to support claims and add interest: Ex: (11-12) Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.

Vocabulary

- **Data:** Information that can be collected, analyzed and used to inform decisions.
- **Data Literacy:** The ability to interpret, understand and utilize data. At the heart of data literacy is the ability to identify patterns and discrepancies and draw conclusions.
- **Data Science:** A field that focuses on collecting, processing, analyzing and utilizing data to understand and solve problems with both humans and automated computers performing the analysis.
- **Qualitative Data:** is descriptive. It can be observed or collected in a survey or interview. *Ex.* I love pepperoni and mushroom pizza. No one else in my family likes mushrooms.
- **Quantitative Data:** Can be measured numerically. *Ex.* I ate pizza 7 times last month. My family ordered 21 pizzas last month.
- **Sphere of Influence:** The area of one's life or community where a person or organization can have an effect or create change. *For example:* A student's sphere of influence may include themselves, their family and friends, school, and some aspects of their local community. A student with international friends may even be able to affect change at a global level.

Resources and References

1. "Teaching Data." Data Science 4 Everyone, <https://www.datascience4everyone.org/resources>
2. "Dynamic Data Science." The Concord Consortium, <https://learn.concord.org/dynamic-data-science>
3. "youcubed K12 Data Science." Youcubed, <https://www.youcubed.org/resource/data-literacy/>

Data Plan

Name(s):

Date:

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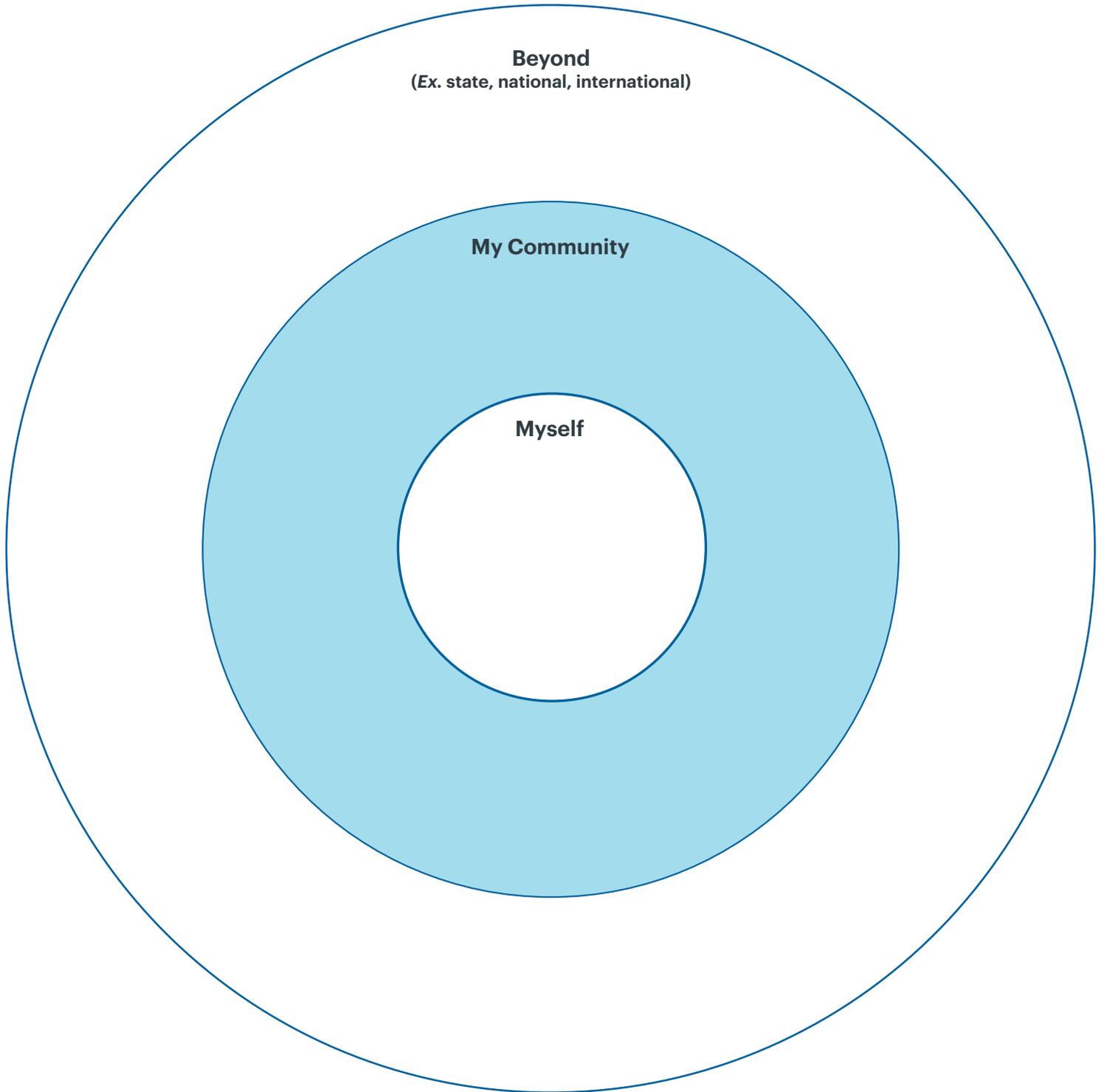
**The Tech
for Global Good**

As you watch videos of The Tech for Global Good laureates, consider:

	What problems are they trying to address?	What data did they collect?	How did they use that data?
Chipsafer			
Destination Home			
Opportunity Insights			
UNICEF's Magicbox			

Brainstorm Problems

Think about: What are some problems and issues I care about in my own sphere of influence?



As you think about problems, consider:

- *Who is affected by this problem?*
- *What solutions currently exist? What is preventing them from solving the problem?*
- *What else do we need to know about this problem?*



Create a Data Plan

As a team, choose one problem to focus on. Use these questions below to guide your planning. Create a visual representation of your plan and be prepared to share your ideas.

The Problem <i>What data would we collect?</i>	The Data <i>How would we collect it?</i>
<ul style="list-style-type: none">• What parts of this problem are we interested in?• What questions do we have? What information do we need?• What types of data could be collected that relate to this problem?	<ul style="list-style-type: none">• How could each piece of data be collected? What tools and strategies could we use?• How do these types of data relate to and affect the problem?



Sharing Questions:

- Describe your problem and why it is important.
- What is your data collection plan?
 - What data would you need to collect?
 - How would you collect this data?
- How could this data inform your solutions or be part of a solution?