5.2 DATA COLLECTION TECHNIQUES

Lesson Summary

Students will be able to describe and compare different approaches to data collection to measure the impact of their project. They will explore different types of data (quantitative and qualitative) and various data collection strategies (counting, interviews) that can be used to evaluate the impact of their service-learning project. They will decide what kind of data they will collect to understand the impact of their project.

(Approx. total time: 35 minutes)

Standards

NGSS Disciplinary Core Ideas

Asking Questions and Designing Problems
Identify scientific (testable) and non-scientific (non-testable) questions

Planning and Carrying out Investigations
Evaluate appropriate methods and/or tools for collecting data.

Using Mathematics and Computational Thinking
Decide if qualitative or quantitative data are best to determine whether a proposed object or tool meets criteria for success.
Describe, measure, estimate, and/or graph quantities (e.g., area, volume, weight, time) to address scientific and engineering questions and problems.

Objectives

By the end of the lesson students will

Know (facts/information):
- Qualitative or quantitative data can be collected to understand patterns and problems.
- Anyone can collect data. There are many different types of data that can be collected.
- Data can be used to measure progress toward a goal.
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**Understand (concepts, big ideas):**

- Every citizen has a responsibility to find creative solutions to problems they notice in the world around them.
- Kids can use their skills and knowledge to improve their community and our world by engaging in a service-learning project.

**Be able to do (skills/behaviors/scientific and engineering practices):**

- Describe and compare different approaches to data collection to measure the impact of their project.
- Decide what kind of data they will collect to understand the impact of their project.

**Vocabulary**

- **data:** a collection of facts from which conclusions may be drawn
- **quantitative data:** information that can be counted or measured with numbers
- **qualitative data:** information that describes something, often with words instead of numbers

**Materials**

- **Teacher Materials:**
  - Chart paper or white/chalk board
  - Computer and/or projector to show online video
    - [https://youtu.be/EHlghk3U5JU](https://youtu.be/EHlghk3U5JU)

**Instructional Strategies**

**Link to Prior Knowledge (10 minutes)**

Share the solution that was chosen based on student votes. Generate enthusiasm and, if needed, acknowledge frustration.

*I am so excited to share with you the solution YOU all chose for our service-learning project. I was looking at your decision-making matrices and determining the solution that the most people chose before the last bus left yesterday. I am just so excited that we now have a solution to help address our energy problem. (Reveal a sign or unveil a portion of your board that lists the solution.)*

If some students show disappointment, add the following:
While I know some of you may have cared more about another solution or felt it would make a bigger impact, this is the solution that had the largest totals on your handouts yesterday. I know that together we can make a difference on our energy problem. [Insert problem.]

**Have students summarize the problem they have decided to solve and help them think about how they will know that their solution was effective.**

Elicit student ideas about the problem they selected. Help them think about the ways that they can measure whether the solution to their problem has been effective.

The language here may need to be modified depending on the problem your class chose and solution they identified.

**Let’s review. What’s the problem we’ve identified?**

**How will we know if our solution worked or didn’t work? Remember that we want to impact our community in a positive way. How will we measure that impact?**

**Instruction (15 minutes)**

**Discuss and define data.**

We can use data to measure whether our solution worked or not. When scientists want to make changes in a system, they often collect data before and after the change to see if and how it changed. What is data?

Jot down notes about student ideas on the board. Probe thinking and see if anyone has something to add or change. Either use your co-constructed definition, or this: **Data is a collection of facts from which conclusions may be drawn.**

**Describe the difference between quantitative and qualitative data. Give examples of each.**

When Kate Sessions was trying to improve her city park, what did she do? (Plant trees). What is the evidence that she made a difference?

Kate planted trees and plants all over the park. We could COUNT the number of plants and trees that were planted, and that would one type of evidence of her impact. This is called quantitative data. **Quantitative data is information that can be counted or measured with numbers.**

Add this term to the word wall: **Quantitative data is information that can be counted or measured with numbers.** Highlight the “N” in quaNtitative data as a way for students to remember that this type of data includes numbers.
She also could have surveyed or interviewed people who visited the park. A survey would be on a piece of paper that visitors fill out when they leave. An interview would be meeting people and asking them what they think. For a survey or interview, you could ask: Do you think the park has improved? If so, how? And then make a list of people’s comments.

Some people might say they like the shade from the trees. Some people might notice that the flowers on some trees are pretty. Some visitors might comment that the gardens were magnificent. This is called qualitative data. *Qualitative data is information that describes something, often with words instead of numbers.*

Add this term to the word wall: **Qualitative data is information that describes something, often with words instead of numbers.** Highlight the “L” in qualitative data as a way for students to remember that this type of data includes letters or words. Teach students about different ways to collect data and explain that a single method (such as an interview) can be used to collect either quantitative or qualitative data.

There are many different ways to collect data. In the first example, we counted the number of trees and plants in the park. This gave us quantitative data to show the impact of Kate’s work. In the second example, people were asked questions in interviews. They responded in words. This gave us qualitative data.

In these examples, we used counting, interviews and surveys. There are other ways of collecting data too. For example, we could take pictures of something before and after our project and describe the differences.

Ask students for examples of data they have collected. Show a video example of a service-learning project involving data collection to evaluate impact.

Have you ever collected data to gather information about a topic you care about?

Was that data quantitative or qualitative? If you can graph the data in a chart, it’s always quantitative. If you have a lot of words that you are reading to understand what people said, it’s qualitative.

For all these ways of collecting information, the data that we gather can be either quantitative or qualitative data. Turn and talk to your partner about the difference between quantitative and qualitative data.

Let’s watch a video to see how one class collected data to measure the impact of their project: http://tinyurl.com/measuring-trash-reduction

What kind of data did the students at Fisher School collect? What evidence did they have that the project made an impact?
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Closing (10 minutes)

Have students think about what data collection approach and type of data they would like to use to measure the impact of their service-learning project. Place their responses on a chart under quantitative or qualitative data.

Now that we’ve decided on a problem and determined our solution we want to work on, let’s think about what type of data we might want to collect to understand the impact of our project on the community. What impact do we hope to see? Are we trying to change something people do? Will this change improve our community or the environment? How?

What kind of data do you think we should collect to measure our impact? Describe one idea and a reason for your suggestion. As you share your ideas, I am going to be placing them into the categories of quantitative or qualitative.

Ask students to share a few ideas before class ends. Make a list on chart paper or a white board of ideas that students share. Categorize their ideas into two groups: quantitative or qualitative data. Don’t let students get too concerned about the categories. Keep their focus on the variety of ways they can measure impact.

Have students complete one or both of the reflection questions in their science journals, on exit slips, or orally with a partner. Ask them to share their responses if time permits.

We generated a lot of ideas to measure the impact of our work. Please answer these questions in your science journal (or on the exit slip I pass out).

Which ideas do you think will work the best for our project? Why?

Review the list of ways the class can measure impact. Consider the feedback students have given about the ideas they like best. You can then decide if there is a clear majority or if an additional vote needs to be taken to determine how your class will measure impact. Be sure to take into account what is most feasible for you and your class.

As you write your project description (in a future lesson), make a final decision about how you will collect data to assess impact - surveys, interviews, quantifying a change in energy use, etc.

Assessment

Have students write a reflective journal entry. Consider questions such as: What impact do we hope to see? What kind of data do you think we should collect to measure our impact? Describe one idea and a reason for your suggestion. Which ideas do you think will work the best for our project? Why?

Note that this information will be included in their Project Descriptions (Lesson 6.3).
Optional Extensions

Make a connection to CCSS mathematics standards. Any recently collected or analyzed data from a math lesson can be connected back to a discussion of data collection strategies or measures.

References


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Planning Page

Students will be able to describe and compare different approaches to data collection to measure the impact of their project.

Link to Prior Knowledge (5 minutes)

Share the solution that was chosen based on student votes. Generate enthusiasm and, if needed, acknowledge frustration.

Have students summarize the problem they have decided to solve and help them think about how they will know that their solution was effective.

Instruction (15 minutes)

Discuss and define data.

Describe the difference between quantitative and qualitative data. Give examples of each.

Ask students for examples of data they have collected. Show a video example of a service-learning project involving data collection to evaluate impact.
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