

Collecting Data About Food Waste at School

STEM: Science, Technology, Engineering, Mathematics



STEM Classroom Series

The STEM Classroom Series features lessons that promote understanding of STEM content knowledge, integrate STEM with non-STEM subjects, and increase students' exposure to STEM-related career options.

About This Segment

Students in Ms. Monica Marsing's 6th grade class at Neil Armstrong Academy track food waste in their school cafeteria in order to create solutions for reducing the waste and reusing the rest as compost. Students will compile their data, find the mean and the median of the data, and create a graph to display their findings.

Application activities (complete all that meet your goals for viewing this segment)

A. Learn more about STEM education

1. Use the table on the next page to identify the elements of effective instruction, as well as the elements of effective STEM instruction, that you observed in this lesson.
2. How could the teacher enhance or add to the elements of instruction in her lesson?
3. How could the teacher enhance or add to the elements of STEM instruction?

C. Infuse STEM principles into your own lessons

1. Apply the six questions in the "Replicate this lesson" activity to one of your own lessons.
2. Determine challenges you might face in applying these STEM concepts to your own lesson. How can you overcome these challenges?

B. Replicate this lesson

1. *What are the learning objectives you want your students to achieve?*
How would you modify the lesson's objectives, outlined in the Lesson Plan below, for your own students and curriculum? What other objectives, if any, will you set?
2. *What content knowledge do you need to acquire or expand?*
This lesson concerns itself with finding the mean and median of a data set. Which of these concepts do you need to learn more about? Visit the Resources to Support Content Knowledge links in the Lesson Plan section of this guidebook.
3. *How will you create the time and space to engage students in this lesson?*
How much time will this learning activity take to plan and carry out? How can you integrate the activity into your current curriculum map?
4. *What materials and other resources do you need for this lesson?*
What materials are needed for this lesson? See the Materials section of the Lesson Plan. What collaboration is necessary with administrators and other teachers?
5. *How will you assess student learning?*
In this lesson, students present their findings and explain their graphs to the class. What are some ways you could assess student learning for this lesson?
6. *How can you promote a STEM focus in your instruction?*
What STEM experiences were students engaged in during this lesson? (See the "Elements of Effective STEM Instruction" below.) What are some others that you could include?

Guidebook – Collecting Data About Food Waste at School (cont.)

Elements of Effective Instruction	Elements of Effective STEM Instruction
<ul style="list-style-type: none">- High expectations for all students- Rigorous content- Authentic performance tasks- Real-time assessment adapted to student needs- Student-driven learning- Strong relationships among students and between teacher and students- Equitable, culturally relevant content and practices- Evidence of 21st century skills, e.g. critical thinking, problem solving, collaboration, creativity, communication- Technology that enhances learning- Cross-curricular (interdisciplinary) integration	<p><i>In addition to the Elements of Effective Instruction left, effective STEM instruction can include:</i></p> <ul style="list-style-type: none">- Teachers who develop solid STEM-related content knowledge- Hands-on problem-solving activities that have real-world relevance- Integration of STEM into non-STEM subjects, especially art and design- Use of industry-standard software, tools, and procedures such as the engineering design cycle- Increased awareness of STEM fields and occupations, especially among underrepresented populations- Enthusiasm about further STEM-related learning- Connections between in-school and out-of-school learning opportunities- Industry and higher-ed partnerships that encourage hands-on student exploration of STEM-related careers
<p>Sources: California Dept. of Education. (2015). Science, technology, engineering, & mathematics. Retrieved February 21st, 2015, from http://www.cde.ca.gov/pd/ca/sc/stemintrod.asp President's Council of Advisors on Science and Technology (PCAST). (2010). Prepare and inspire: K-12 education in science, technology, engineering, and math (STEM) for America's future. Retrieved from the Whitehouse.gov website: http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast-stemed-report.pdf</p>	

General STEM Information and Resources

Utah STEM Action Center (n.d.). STEM Utah. Retrieved January 22, 2015, from <http://stem.utah.gov/>

California Department of Education (n.d.). Science, technology, engineering, and mathematics. Retrieved January 22, 2015, from <http://www.cde.ca.gov/pd/ca/sc/stemintrod.asp>

National Education Association. (n.d.). The 10 best STEM resources: Science, technology, engineering & mathematics resources for preK-12. Retrieved March 23, 2015, from <http://www.pbs.org/teachers/stem/>

National Research Council. (2011). Successful K-12 STEM Education: Identifying Effective Approaches in Science, Technology, Engineering, and Mathematics. Retrieved March 23, 2015, from http://www.stemreports.com/wp-content/uploads/2011/06/NRC_STEM_2.pdf

PBS Teachers. (n.d.). STEM education resource center. Retrieved March 23, 2015, from <http://www.pbs.org/teachers/stem/>

STEM Education Coalition (n.d.). Home page. Retrieved January 22, 2015, from <http://www.stemedcoalition.org/>

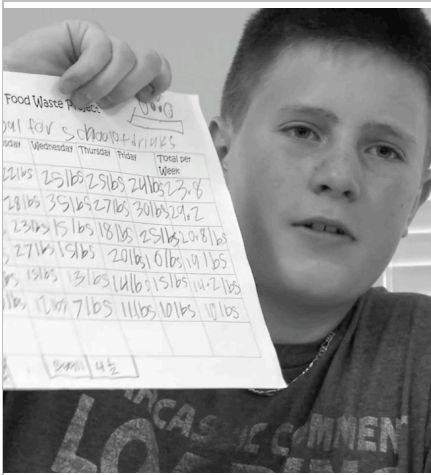


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Lesson Plan

Teacher: Monica Marsing	Grade/Content Area: 6th grade science
School: Neil Armstrong Academy, West Valley, Utah	Lesson Duration: 60 min.



Lesson Objective(s)

This lesson is a continuation project that tracks food waste in the school cafeteria. In this lesson, students will describe their data collection process, including units and methods of measurement. Students will graph their data and find the median and mean of their data. They will describe overall patterns and striking deviations in the data.

Key Concepts and Vocabulary

(See below for online resources that support content knowledge)

- Mean or Average
- Median
- Graph

Standards Addressed in the Lesson

- Use ratios to explore and solve real-world problems.
- Find the mean of a data set, describe overall patterns, and identify deviations from the overall pattern.
- Analyze and interpret data.

Assessment

Students present their data, graphs, observations, and conclusions to the class.

Prior Knowledge and Skills

Knowledge: How to find the median and the mean of a set of data (basic addition, subtraction, multiplication, division)

Skills: Entering data and creating graphs on Google Docs (or another online document collaboration)

Materials

- Data collected in the cafeteria during the previous week
- Paper and pencil
- Calculator
- Google Docs spreadsheet (or other graphing organizer)
- iPad, tablet, or computer



Collecting Data About Food Waste at School (cont.)



Differentiating the Instruction

Students will support each other in their peer groups through their collaborative efforts. Students who are ready for increased rigor may take their grade-level data and break it down per class and find the median, mean, mode, maximum, and minimum. Student groups may extend the activity by brainstorming and researching solutions for cafeteria food waste.

Lesson Procedures

Launch, Explore, Discuss Model

- **Launch:** “How much food did our school waste and what are some observations about what food was thrown out?” Discuss, as a team, what observations you made. Each team will find the mean of the data for each grade level.
- **Explore:** Students will work in collaborative groups to create a graph that best represents the data they have collected.
- **Discuss:** Students will present their graph to the class and discuss overall patterns, and any deviations, they observe from their data set.

Resources to Support Content Knowledge

Khan Academy. Finding mean, median, and mode. Retrieved May 19, 2015, from

https://www.khanacademy.org/math/probability/descriptive-statistics/central_tendency/v/mean-median-and-mode

Math Is Fun. Make your own graphs. Retrieved May 20, 2015, from <http://www.mathsisfun.com/data/graphs-index.html>

Related Video Lessons and Resources

Monroe, E.E. (2006). Math dictionary: The easy, simple, fun guide to help math phobics become math lovers. Honesdale, PA: Boyd Mills Press.

NCES Kids' Zone. Create a graph. Retrieved May 20, 2015, from <http://nces.ed.gov/nceskids/createagraph/>

6th Grade: Statistics stations. Edivate. <https://www.pd360.com/#resources/videos/8351>