

PUZZLERS

#46 | BUILD A BIOREACTOR



Puzzle

Create a bioreactor to investigate how various types of food commonly found in school lunch can be broken down into compost.

Standards & Connections

NGSS.HS-ETS1-1-4, NGSS.MS-ETS1-1-4, NGSS.3-5-ETS1-1-3 3, NGSS.5-LS2-1, NGSS.ESS2-1

Background:

It is estimated that “plate waste” in schools participating in the National School Lunch Program through the USDA yields losses of over \$600 million dollars per year.¹ Schools face many challenges in minimizing waste. Students may not be hungry that day; students may not be able to eat the foods they prefer; or they simply may not realize they were taking too much food. To limit the amount of food wasted and assist in reduction of cost, schools can audit waste and look into unique ways to use food waste. Several schools across the country have developed composting programs to help eliminate waste from lunch. Investigate what types of lunch foods make for good composting material.

Suggested Materials:

2-L plastic soda bottle, a small container to fit inside it, nail, tape, knife, insulation materials, mesh screen, thermometer (long), food waste scraps, cardboard or wood shavings, plastic tubing



IDENTIFY

Share the background information with the students, then share the puzzle to be solved. Determine constraints (e.g., time allotted, space, materials provided, etc.) and divide students into small groups.



IMAGINE

Ask a series of questions to help students brainstorm solutions to the puzzle. Encourage students to list all ideas – don’t hold back! Before moving on, make sure each group selects a solution that fits within the constraints.

Ask: How can you solve this puzzle? Which of your ideas can you build a prototype for given the constraints?



DESIGN

Students diagram the prototype, identify the materials needed to build the prototype, and write out the steps to take. Students describe the expected outcomes.

Ask: What steps will you take to create your solution? What do you expect your solution to look like and be able to do?





CREATE

Students follow their design plan and build their prototypes. Monitor their progress and remind them about how much time they have.



TEST & IMPROVE

Students evaluate their creation and compare it with the expected outcomes. Students seek areas of improvement and make changes where needed.



SHARE

Students share their solution to the puzzle and communicate lessons learned.

Ask: What was your biggest takeaway? What would you do differently?

Additional Resources:

For more background information on this topic, please visit www.purpleplow.org.



Conduct a food waste audit at your school. Come up with possible solutions to reduce food waste and share this plan with your administration. Set up a composting program with the help of local area business or agriculture professionals.

¹ https://www.ers.usda.gov/webdocs/publications/43131/31216_efan02009.pdf?v=41423

<https://www.lifelab.org/composting/school-composting/>

<http://greenmountainfarmtoschool.org/wp-content/uploads/2016/01/Guide-to-Starting-a-School-Compost-Program.pdf>

<https://frac.org/programs/national-school-lunch-program>

<https://www.usda.gov/foodlossandwaste/schools>

<https://www.cbsnews.com/news/school-lunch-fruits-and-veggies-often-tossed-in-trash-study-finds/>