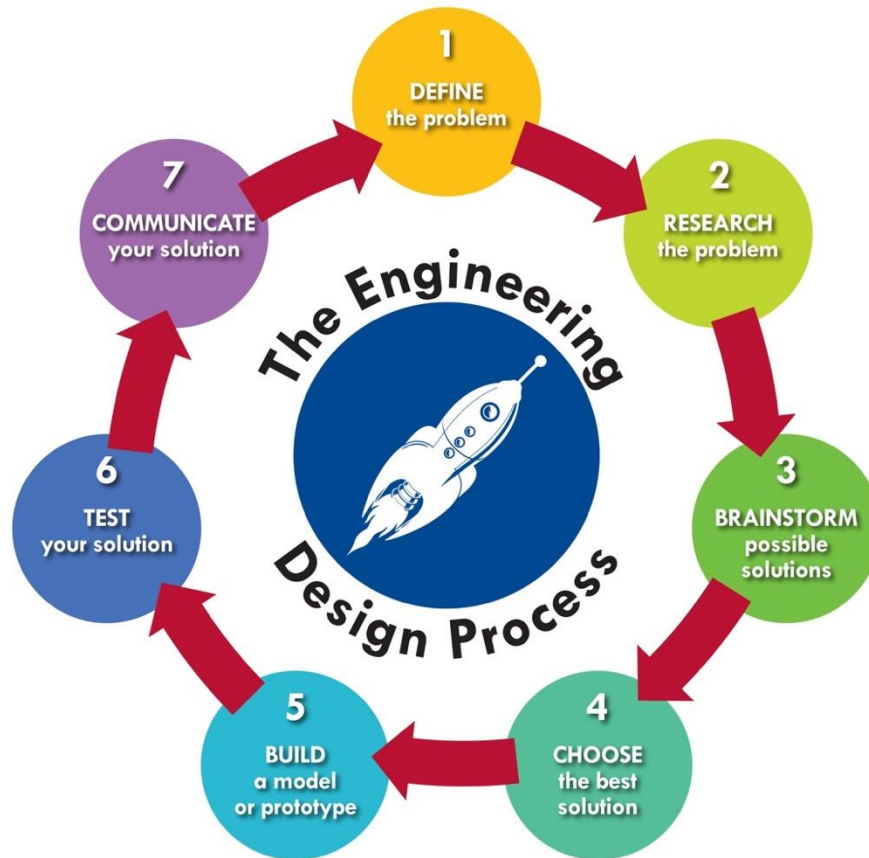


Solve It: A Student STEM Challenge



<p>Topic: Food Waste</p>	<p>Materials for Demo shown in Teacher video:</p> <ul style="list-style-type: none"> • Computers for research • Goggles • Apron • Gloves • Food Coloring • Dry Yeast packets • 3% Hydrogen Peroxide • Warm water • 500ml Beakers • 100ml Graduated cylinder • Erlenmeyer Flasks (optional) • Plastic tray or tub
<p>Challenge:</p> <p>To research the type and amount of food currently being thrown away at your school and design a solution that helps to reduce, re-use, or recycle the waste to minimize how much is going to a landfill.</p>	
<p>Real World Connection:</p> <ul style="list-style-type: none"> • Benefits of Community Gardens: https://greenleafcommunities.org/the-many-benefits-of-community-gardens/ • Great website which talks about the 3 problems that composting solves: http://thecoastalhomestead.com/composting-solving-the-worlds-problems/ • Website on the impact of Food waste: http://www.triplepundit.com/story/2013/food-waste-has-big-impact-climate-water-land-and-biodiversity/48866 • Video: Food Waste- A story of Excess: https://www.youtube.com/watch?time_continue=85&v=EwVuz0UJl2A • Food decomposition time lapse video: https://www.youtube.com/watch?v=c0En-BVbGc • Maricopa Department of Environmental Quality report on landfills: https://azdeq.gov/node/2353 	

- Video examples of the Elephant Toothpaste demo:
<https://www.youtube.com/watch?v=3Tn-7JcZJuQ>
https://www.youtube.com/watch?v=edEfc_fiGXs
- Flinn Scientific- instructions, explanations, and safety precautions: <https://www.flinnsci.com/elephant-toothpaste/dc91098/>
- STEM Pro Live! with Steadfast Farms: <https://schoolsup.org/stemprolive/>

Define the Problem:

Guided Questions	Teacher Notes
<ul style="list-style-type: none"> • What do you have available to work with when designing your solution? • What would a successful solution look like? How will you know if your design is successful? • What are your constraints or limitations? 	<ul style="list-style-type: none"> • Establish your parameters (groups, roles, time limit, # of trials, amount of material allowed to use, etc.). • Taking your students through the Engineering Design Process will vary depending on what problems you identify that will need a solution: <ul style="list-style-type: none"> • Can the food that is prepared and provided at your school be re-sold or distributed in other ways to prevent waste? • Can the food be re-used or recycled in other ways to benefit other programs?

Research the Problem:

Guided Questions	Teacher Notes
<ul style="list-style-type: none"> • What is already known about the problem? • What are some current solutions that can be built upon/improved? • What technology is available to help you understand the problem better? • What are some obstacles, challenges connected to your problem? 	<p>Once you have narrowed down the problem you want to solve you will want to identify what solutions currently exist to decide how to implement or improve a solution.</p>

Brainstorm Possible Solutions:

Guided Questions	Teacher Notes
<ul style="list-style-type: none"> • How many ideas can you come up with individually? • How many ideas can you come up with as a group? • How can you use/build on the groups ideas to refine your own? 	<ul style="list-style-type: none"> • Have students individually come up with at least 4 possible designs that they could use in their solution • Have students share designs with a group. <i>*Encourage a variety of ideas and a safe environment.</i> • Encourage reflection and refinement of ideas

Choose the Best Solution:

Guided Questions	Teacher Notes
<ul style="list-style-type: none"> • Which solution(s) could you build using the materials/time you have available? • Which solution(s) could you build considering the constraints/ limitations? • Which solution do you think has the best chance to be successful? 	<ul style="list-style-type: none"> • Have students choose an idea to design and make a plan to build/create (*even if you have no intention to actually build). • Have students draw a model of their prototype and label the parts (*if applicable). • List the materials that will be needed to build (*if applicable). • Describe how the materials will be used.
Build a Model or Prototype:	
Guided Questions	Teacher Notes
<ul style="list-style-type: none"> • What materials will you need? • Does your design meet the lesson objective? • Does your design clearly communicate your selected solution to the problem? 	<ul style="list-style-type: none"> • Revisit the objective and make sure the student's design matches what they chose for their solution to the problem.
Test your Solution:	
Guided Questions	Teacher Notes
<ul style="list-style-type: none"> • Did you record your observations? • How will you know if your design worked as intended? • How will you know if your design was successful? 	<ul style="list-style-type: none"> • Have students make and record observations during their trial(s). • Encourage students to stay true to their design and not make modifications while testing.
Communicate your Solution:	
Guided Questions	Teacher Notes
<ul style="list-style-type: none"> • Did your design work as intended? How do you know? • Did it solve the problem that you identified? How do you know? • Do you still think your solution is the best one for the problem? Why or why not? • What would you different if you could do it again? Why? 	<ul style="list-style-type: none"> • <i>Have students reflect individually first and record responses.</i> • <i>Have students share responses with their group then whole class.</i> • <i>To make iterations, you will want to re-enter the Engineering Design Process and begin thinking about defining the problem(s) they had with the initial idea.</i> • <i>The purpose is to provide a process for them to formalize their thinking and not rely on trial and error to merely accomplish a task.</i> • <i>Share your students' designs and ideas with us at: stem@maricopa.gov</i>

