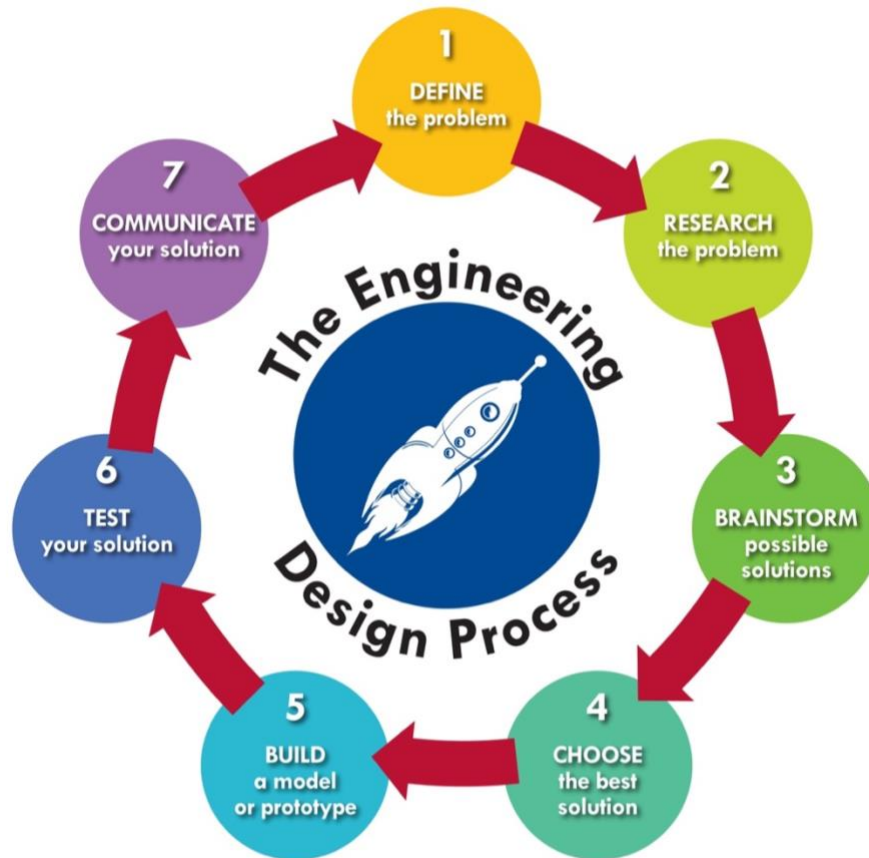


# Solve It: A Student STEM Challenge



**Topic:** Lunch Distribution

**Materials:**

- Timers
- Computers for research
- Scaled graph paper and/or print out of cafeteria/lunch area
- \*Potential video cameras to record before and after school event

**Challenge:**

To research the process food is currently delivered to students during lunch time and improve or design a better system.

**Real World Connection:**

- US Dept. of Agriculture: Food and Nutrition Service has a division called the Child Nutrition Division which describes the benefits provided under school meal programs- <https://www.fns.usda.gov/school-meals/faqs>
- The National School Lunch Act (42 U.S.C. 1751)- <https://www.fns.usda.gov/part-210%E2%80%94national-school-lunch-program>
- The Healthy Hunger-Free Kids Act- <https://www.fns.usda.gov/school-meals/healthy-hunger-free-kids-act>
- Catered lunch options like NutritionOne- <http://nutritiononeslp.com/>
- Google Drone delivery- <http://www.newsweek.com/google-drones-future-drugs-burritos-and-disaster-relief-686604>
- STEM Pro Live! with Amazon Fulfillment Center:

<b>Sequence of Instruction</b>	
<b>Define the Problem:</b>	
<u>Guided Questions</u>	<u>Teacher Notes</u>
<ul style="list-style-type: none"> <li>• What do you have available to work with when designing your solution?</li> <li>• What would a successful solution look like? How will you know if your design is successful?</li> <li>• What are your constraints or limitations?</li> </ul>	<ul style="list-style-type: none"> <li>• Begin by trying to understand what the opportunities for improvement at your school are. Some ways you can have students do this include: <ul style="list-style-type: none"> <li>• Creating a questionnaire or interviewing the food service providers.</li> <li>• Collecting real time data by observing the entire process during a lunch period. *This is an opportunity to use technology if you wish to record the food line for the students to observe later in the classroom.</li> <li>• Determining the number of students in the school and conducting a survey on how often and how many students will eat the cafeteria food compared to those students who bring their food. *You can poll all students or a portion of the population to determine ratios.</li> <li>• Creating a scaled map of the cafeteria, including the areas where students will pick up their food and sit down to eat.</li> <li>• Calculating the number of students that could move through the lines in a given period of time under ideal conditions and compare that to the actual number and time it takes.</li> </ul> </li> <li>• Establish your parameters (groups, roles, time limit, # of trials, amount of material allowed to use, etc.).</li> </ul>
<b>Research the Problem:</b>	
<u>Guided Questions</u>	<u>Teacher Notes</u>
<ul style="list-style-type: none"> <li>• What is already known about the problem?</li> <li>• What are some current solutions that can be built upon/improved?</li> </ul>	<ul style="list-style-type: none"> <li>• Have students research what others schools are doing during school meals- social media and virtual meetings</li> </ul>

<ul style="list-style-type: none"> <li>• What technology is available to help you understand the problem better?</li> <li>• What are some obstacles, challenges connected to your problem?</li> </ul>	<p>can be a great way for students to interact.</p> <ul style="list-style-type: none"> <li>• Look at what other big businesses do to efficiently feed their employees during meals/breaks.</li> <li>• Have students research current innovative ideas like: catered meals, Uber eats, Door dash, Google drone delivery, etc. for food delivery.</li> </ul>
<b>Brainstorm Possible Solutions:</b>	
<u>Guided Questions</u>	<u>Teacher Notes</u>
<ul style="list-style-type: none"> <li>• How many ideas can you come up with individually?</li> <li>• How many ideas can you come up with as a group?</li> <li>• How can you use/build on the groups ideas to refine your own?</li> </ul>	<ul style="list-style-type: none"> <li>• Have students individually come up with at least 4 possible designs that they could use in their solution</li> <li>• Have students share designs with a group. <i>*Encourage a variety of ideas and a safe environment.</i></li> <li>• Encourage reflection and refinement of ideas</li> </ul>
<b>Choose the Best Solution:</b>	
<u>Guided Questions</u>	<u>Teacher Notes</u>
<ul style="list-style-type: none"> <li>• Which solution(s) could you build using the materials/time you have available?</li> <li>• Which solution(s) could you build considering the constraints/ limitations?</li> <li>• Which solution do you think has the best chance to be successful?</li> </ul>	<ul style="list-style-type: none"> <li>• Have students choose a design to make a plan to build.</li> <li>• Have students draw a model of their prototype and label the parts.</li> <li>• List the materials that will be needed to build.</li> <li>• Describe how the materials will be used.</li> </ul>
<b>Build a Model or Prototype:</b>	
<u>Guided Questions</u>	<u>Teacher Notes</u>
<ul style="list-style-type: none"> <li>• What materials will you need?</li> <li>• Does your design meet the lesson objective?</li> <li>• Does your design clearly communicate your selected solution to the problem?</li> </ul>	<ul style="list-style-type: none"> <li>• Revisit the objective and make sure the student's design matches what they chose for their solution to the problem.</li> </ul>
<b>Test your Solution:</b>	
<u>Guided Questions</u>	<u>Teacher Notes</u>
<ul style="list-style-type: none"> <li>• Did you record your observations?</li> <li>• How will you know if your design worked as intended?</li> <li>• How will you know if your design was successful?</li> </ul>	<ul style="list-style-type: none"> <li>• Have students make and record observations during their trial(s).</li> <li>• Encourage students to stay true to their design and not make modifications while testing.</li> <li>•</li> </ul>

<b>Communicate your Solution:</b>	
<u>Guided Questions</u>	<u>Teacher Notes</u>
<ul style="list-style-type: none"> <li>Did your design work as intended? How do you know?</li> <li>Did it solve the problem that you identified? How do you know?</li> <li>Do you still think your solution is the best one for the problem? Why or why not?</li> <li>What would you do differently if you could do it again? Why?</li> </ul>	<ul style="list-style-type: none"> <li><i>Have students reflect individually first and record responses.</i></li> <li><i>Have students share responses with their group then whole class.</i></li> <li><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></li> <li><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></li> <li><i>Share your students' designs and ideas with us at: <a href="mailto:info@mcesa.maricopa.gov">info@mcesa.maricopa.gov</a></i></li> </ul>