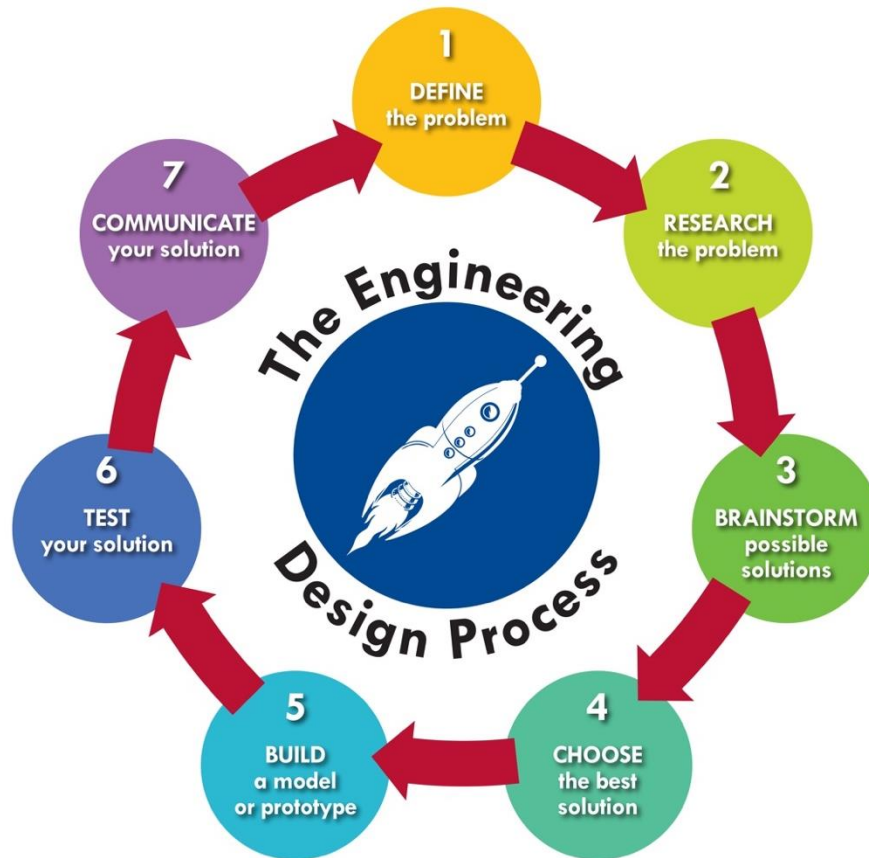


Solve It: A Student **STEM** Challenge



<p>Topic: Natural Gas Awareness Contest</p>	<p>Materials for Activities found in <u>Teacher Materials</u> link:</p>
<p>Challenge: To research the obstacles and challenges related to the lack of public awareness about the dangers of digging without knowing what types of utilities pipes are buried underground and then design a solution to increase public awareness.</p>	<ul style="list-style-type: none"> Computers for research Where do Fossil Fuels Come From? Container to represent the ocean, preferably clear Sand or dirt Baking soda "plankton" Vinegar (20%) and water (80%) "ocean" mixture Cup or scoop Safety glasses Natural Gas Geology Three sponges Clay Food coloring Water
<p>Real World Connection:</p> <ul style="list-style-type: none"> Call 811: https://call811.com/ Common Ground Alliance: https://commongroundalliance.com/ MSDS Sheet on Natural Gas: https://www.swgas.com/7200000200622/Natural-Gas-MSDS_English.pdf Southwest Gas safety resources: https://www.swgas.com/en/safety-resources Energy Safe Kids: http://energysafekids.org/swgas/ Teacher Materials: http://energysafekids.org/swgas/teachers/ Interactive Natural Gas Poster: http://energysafekids.org/natural-gas-poster/ 	

- STEM Pro Live! with Southwest Gas: <https://schoolsup.org/stemprolive/>

Define the Problem:

Guided Questions

- 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?

Teacher Notes

- 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:
 - How can you promote the importance of calling 811 before you dig?
 - How can you promote a solution related to the lack of public awareness about the dangers of digging without calling 811?

Research the Problem:

Guided Questions

- 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?

Teacher Notes

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.

Brainstorm Possible Solutions:

Guided Questions

- 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?

Teacher Notes

- 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. **Encourage a variety of ideas and a safe environment.*
- Encourage reflection and refinement of ideas

Choose the Best Solution:

Guided Questions

- Which solution(s) could you build using the materials/time you have available?
- Which solution(s) could you build considering the constraints/ limitations?

Teacher Notes

- Have students choose an idea to design and make a plan to build/create (*even if you

<ul style="list-style-type: none"> Which solution do you think has the best chance to be successful? 	<p>have no intention to actually build).</p> <ul style="list-style-type: none"> 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:	
<u>Guided Questions</u>	<u>Teacher Notes</u>
<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:	
<u>Guided Questions</u>	<u>Teacher Notes</u>
<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:	
<u>Guided Questions</u>	<u>Teacher Notes</u>
<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>