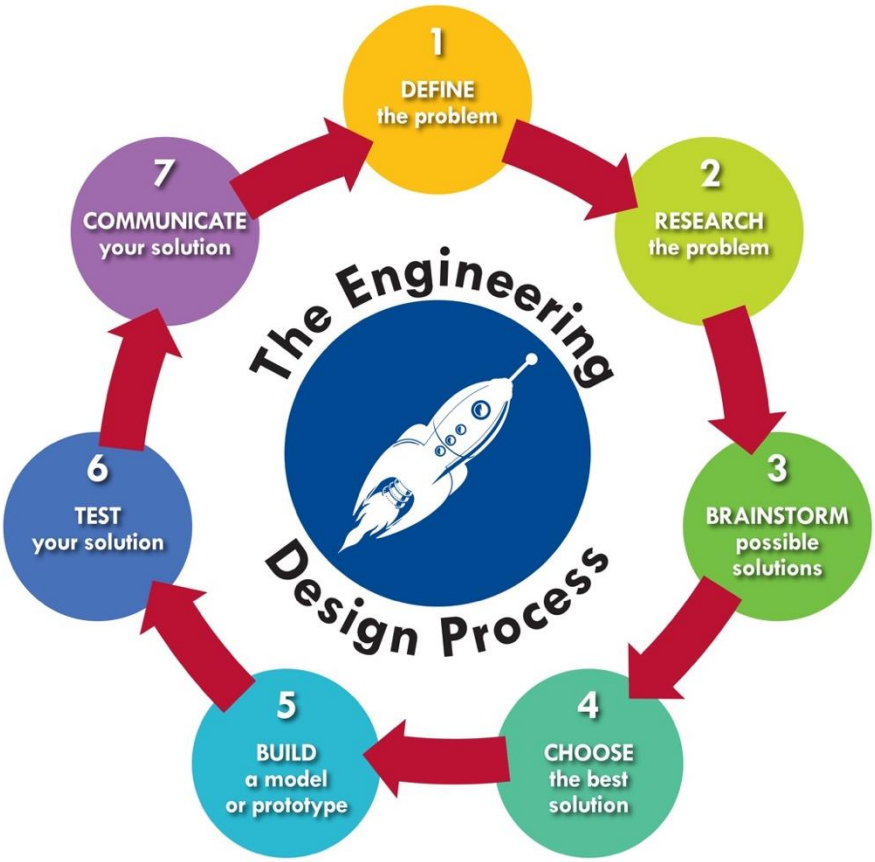
Solve It: A Student STEM Challenge



Topic: Student Drop-off/Pick-up Safety	**Materials:** • Timers • Computers or print out of campus from Google Earth • *potential video cameras to record before and after school event • Optional-Drone with camera
Challenge: To think like a surveyor and research the challenges and obstacles with improving the drop off and pick up system at your school and then suggest a solution using a 2D or 3D model of your school parking lot.	

Real World Connection:

- Google Earth: https://www.google.com/earth/
- Hands on activity- Math Relationships: Scale Model Building Project: https://www.teachengineering.org/activities/view/cub_scale_model_lesson01_activity2
- Know before you Fly: http://knowbeforeyoufly.org/
- Drone Deploy: https://www.dronedeploy.com/
- DJI Waypoints Mode explained: https://www.tomstechtime.com/waypoints-mode
- PIX4D- Measure from Images: https://www.pix4d.com/
- Guide to DJI drone basics: https://www.heliguy.com/blog/guide-to-dji-go-4-the-basics/
- STEM Pro Live! with DBE surveying: https://schoolsup.org/stemprolive/

Define the Problem:	
Guided Questions	Teacher Notes
• 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?	• Have students make observations of cars during drop-off/pick-up time. • Have students make a scaled map of their school including surrounding streets that provide entrance/exits. • Have students define what they think the problem is. • 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:
Research the Problem:	
Guided Questions	Teacher Notes
• 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?	• Taking your students through the Engineering Design Process will vary depending on what problems you identify related to parking lot safety that will need a solution. • 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	Teacher Notes
• 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?	• 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	Teacher Notes

• 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?	• 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
• What materials will you need? • Does your design meet the lesson objective? • Does your design clearly communicate your selected solution to the problem?	• 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
• Did you record your observations? • How will you know if your design worked as intended? • How will you know if your design was successful?	• 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
• 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?	• *Have students reflect individually first and record responses.* • *Have students share responses with their group then whole class.* • *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.* • *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.* • *Share your students' designs and ideas with us at: stem@maricopa.gov*