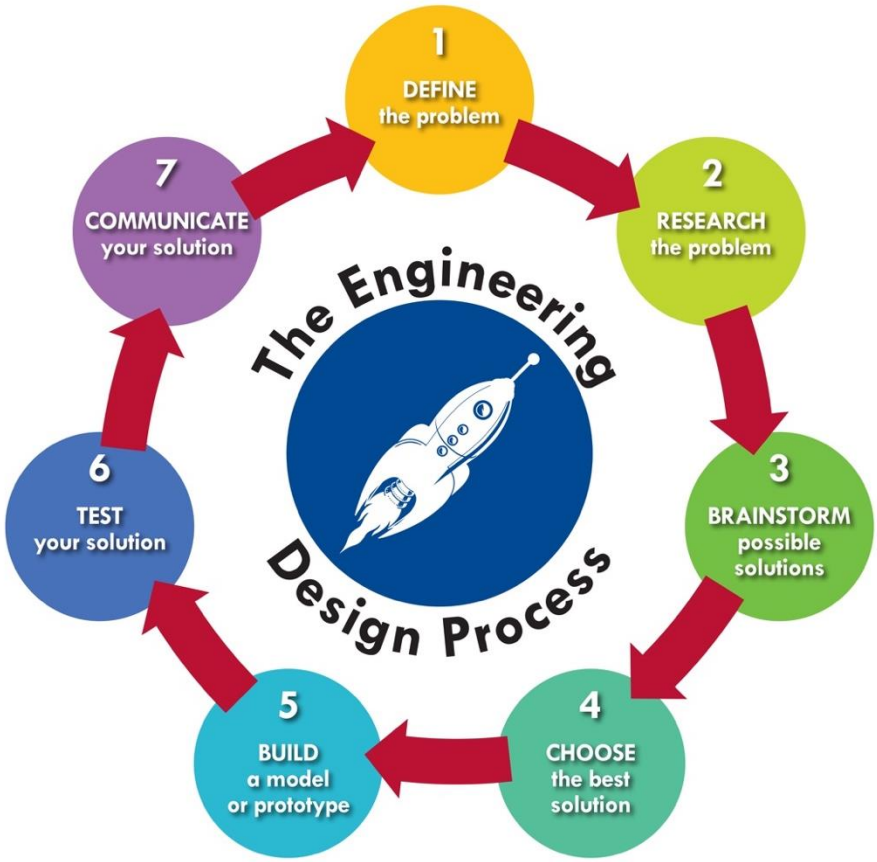
Solve It: A Student STEM Challenge



Topic: Distracted Driving	**Materials:** • Computers for research • RC car • Timers • Flash Cards
Challenge: To design a solution to reduce the number of accidents caused by distracted driving and texting.	

Real World Connection:

- Arizona department of transportation statistics: https://www.azdot.gov/motor-vehicles/Statistics/arizona-motor-vehicle-crash-facts
- 360 Video Driving Experience: It can wait: https://www.youtube.com/watch?v=gOc1dAcfCfk
- PEW Research Center: Teens and Distracted Driving: http://www.pewinternet.org/2009/11/16/teens-and-distracted-driving/
- National Highway Traffic Safety Administration: https://www.nhtsa.gov/risky-driving/distracted-driving
- Distracted Driving Activity: http://sciencenetlinks.com/esheets/distracted-driving/
- Monkey Business distraction video: https://www.youtube.com/watch?v=IGQmdoK_ZfY
- STEM Pro Live! with Motorsports professionals: https://schoolsup.org/stemprolive/

Office of the Maricopa County
School Superintendent

Intro Activity: To get started, you want to give your students an experience with understanding how distracted driving impacts your ability to accomplish a task. *If you decide to take on this challenge and need an RC car to test. We have several that were donated to the office that we will be giving out to teachers to use to test. Please email us at STEM@maricopa.gov to request one.	
Possible Activity	Teacher Notes
Video	Start by showing them the video of the Monkey Business Illusion *show video loading/playing and include link on screen* (https://www.youtube.com/watch?v=IGQmdoK_ZfY) which demonstrates how challenging it is to see unexpected events if we are focusing on something else.
Activity: Round 1	Using an RC car have 1 group of students come up with a task that needs to get completed using the RC car. *The task can be as simple as driving a lap around the room or can be more elaborate. Once the task has been identified, have the group communicate the goal to a second group or individual who will then try to complete the task while the initial group makes and records observations.
Activity: Round 2	After the task is completed, have the group/individual attempt to complete the task a second time…but this time with some unexpected events. (Group 1 will think of some obstacles they can place in the way or can add new visual/audio signals that require the driver to stop or change direction). Have group 1 make and record observations about the 2nd attempt
Activity: Round 3	Finally, have the group/individual complete the task a third time this time while being distracted by something else in the room. *The distraction can be a video playing on a screen, pictures or flash cards that are being held up, or any number of ideas your class can come up with. Have your students replicate the unexpected events and make and record your observations as the driver responds to them while being distracted.

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?	• 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:
	  • Are there students in your school who are currently driving? What is the most common distraction they face?
	  • Ask students who ride with someone: What is the most common distraction they see?
	  • If you used the RC cars to test how distraction impacts the ability to take on a task:
	  • Determine the ratio of the scaled car to cars you observe in your parking lot.
	  • Calculate the cars speed and compare that to the speed limits in your neighborhoods.
	  • Predict what the distractions you observed in your experiment would look like in a real car.

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?	Once you have narrowed down the problem you want to solve (cell phones, eating, passengers, etc.) 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*