

# Computer Programmer: Vehicles and Technology

**NGSS Standard: 4-PS3-1**



## Adventure Description:

In this adventure, you will think like a computer programmer and create an airbag for a self-driving car.



## Activity

### Step 1: Background on Computer Programmers and Car Safety (5-8 minutes)

- Ask students if they know what a computer programmer does. As the class brainstorms, write down their ideas. If they do not know what a computer programmer does, talk about what the two words mean separately. After students have brainstormed the meanings of the words separately, create a class definition of what a computer programmer would do in his or her job.
- After creating a class definition, explain to students that a computer programmer is someone who uses special codes and computer languages to give specific instructions for a computer to follow.
- Show [Video: Vehicles and Technology](#).
- After showing students the video, discuss and brainstorm things in a self-driving car that would require a computer programmer to create a code for the car to perform a certain action. Discuss with students what problems computer programmers might run into when creating these “instructions” for self-driving cars.

### Step 2: Building a prototype of an airbag in a car (10-15 minutes)

- Explain to students that they will think like computer programmers and design a new airbag for a self-driving car. As computer programmers, they need to write the code for how the airbag will deploy in different kinds of crashes. Today, they will be testing the airbag in different crash scenarios. They will collect data that will tell them how to program the airbag to deploy.

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- Shows students [Handout: Airbags](#). Explain to students that airbags inside of cars are kind of like big, sturdy balloons that inflate as a crash is happening. Airbags are in many places inside cars. They are in the steering wheel, the dashboard, and even the doors. The goal of an airbag is to stop the passengers from hitting their heads during a crash. This means that an airbag has to quickly fill with air and be sturdy enough not to pop when a person hits it quickly.
- Explain to students that they will now create a prototype (small example) of an airbag that could be used inside of a self-driving car. They will then test the airbag to see if it works.
- Students will use an inflated balloon as the base of their airbag, but because balloons pop very easily, the students will need to engineer a better design for the outside of the bag. The design should be sturdy enough that it can withstand large amounts of force without popping, but also soft and safe enough that the person who hits the airbag isn't hurt.
- Divide students into pairs. Provide each pair with the following materials: 2 balloons, art supplies, and building materials. Explain to students that they will receive 2 balloons. However, they should only use 1 to start. One will be a backup in case their balloon pops. View [Handout: Teacher Page: Airbag Examples](#) for reference.
- Have students build their airbags for 10 minutes. They should use a variety of materials, including the balloon, to build their airbag. Note: Students may need help inflating their balloons. Show students how to tie the ends off.
- As students are working, ask the following questions:
  - Do you think that a car has more energy the faster it moves? Why or why not?
  - How could this play into the decisions that a computer programmer would make when designing his or her instructions for the computer in the car?

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## Step 3: Testing the airbags (10–15 minutes)

- Explain to students that they will now test their airbag to see how the speed of an object relates to the energy of the object.
- Show [Handout: Testing an Airbag for a Self Driving Car](#). As a class, read through the steps.
- Have students set up a testing station. Each testing station should be a few feet (or more!) apart from each other.
- Provide students with [Handout: Airbag Testing Sign](#). Have students hang up their signs while they test their airbags.
- Have students follow the directions on the handout to test their airbags.

## Step 4: Discussion (5–10 minutes)

- Have the whole class come back together to discuss the results. You can also divide students into small groups to compare results.
- As a class, discuss how the speed of the crash is related to the success of the airbag. For example, ask students the following questions:
  - Was your airbag able to cushion the blow of a slow crash?
  - What about a high-speed crash?
  - Why do you think more of our airbags were unsuccessful at protecting from the high-speed crash?  
(lead students to the fact that increased speed = increased force)
- After discussing how the speed related to the energy, talk with students about how Gianna's job as a computer programmer would play into this situation when she is programming the self-driving cars. For example, ask students the following:

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- As a computer programmer, how would you program the airbag to deploy in a low-speed crash compared to a high-speed crash?
- Why is it important for a computer programmer to test their programs?
- How does the safety of the car relate to Gianna's job?

## Materials List

### Provided online:

- Video: Vehicles and Technology
- Handout: Airbags
- Handout: Testing an Airbag for a Self-Driving Car
- Handout: Airbag Testing Sign
- Teacher Page: Airbag Examples

### Not provided (each group needs):

- 2 Balloons
- Art Supplies
- Building Materials
- Eraser, paperclip, pen

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