

**STEAM Subject:** 3D printing

**Lab:** Racing Car Part 1

**Grades:** 3-6

**Learning objective:**

Students will be able to:

- explore the real applications of 3D printing.
- identify basic design-criteria about 3D design and 3D printing.
- practice techniques and skills used in the field of rapid-prototyping.

**ENGAGE:**

Ask students the following questions:

- What's the difference between the two bears? Make a list of all the details you can observe in the drawing and the 3D printing model.



3D Teddy Bear by EIS student Antoine Quiñones-Lebrón

- What is 3D Design?
  - In 3D design, a designer uses all three axes (x, y, and z) to interpret and develop a realistic figure of the desired object. Designers can use a computer, tablet, and even phones to create 3D objects.
- What is 3D printing?
  - 3D printing refers to using a 3D printer to make an object previously designed on a computer. The object is typically made by laying down many thin layers of a material in succession, but other methods can also be used.

To explore the basic components of a 3D design, you will need the following:

- Access to a computer
- Access to a mouse
- Access to Tinkercad
- Tinkercad Account (free)

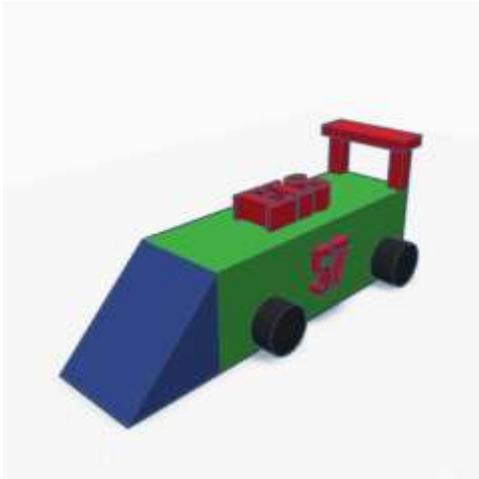


Figure 1: Model made on Tinkercad

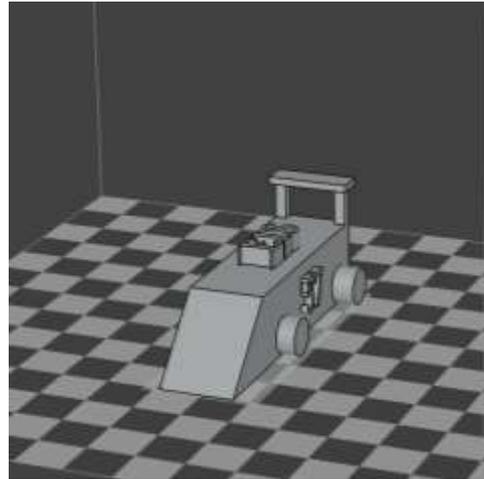


Figure 2: Model ready for 3D printing

## EXPLORE:

**Science Question:** Is it possible to make a simple prototype of a car?

### Activity: Racing Car – Part 1

Students will design a car. Follow the steps below along with the video found here:  
<https://youtu.be/ghA6d-Z-EUQ>

### Materials needed per student:

- Desktop or laptop with a moveable mouse
- Internet access
- Tinkercad account (free)  
No prior experience with Tinkercad is required for this activity
- Optional: Access to a 3D printer.

**Directions:** Turn on the computer and go to [www.Tinkercad.com](http://www.Tinkercad.com)

1. Click on “Sign in.” If you do not have an account, click on “Join Now” and follow the instructions to make a new account.

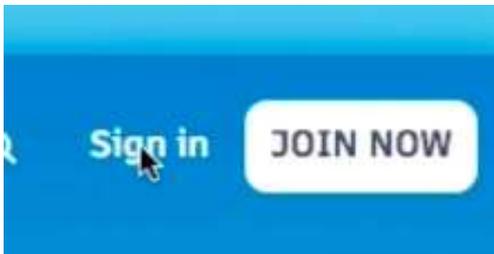


Figure 3: Sign in/Join Now

2. After clicking “Sign in,” click on “Email or Username.” Follow the instructions and enter your email / password.

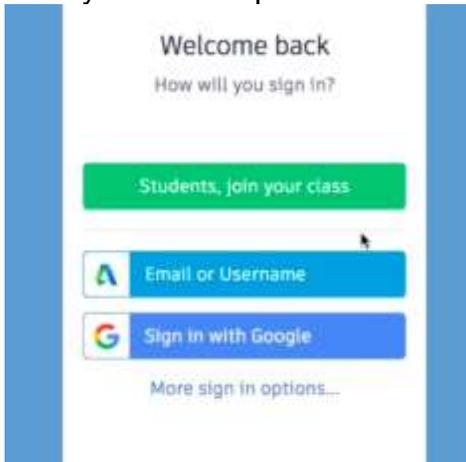


Figure 4: Email/Username

3. Click on “Create a new design”

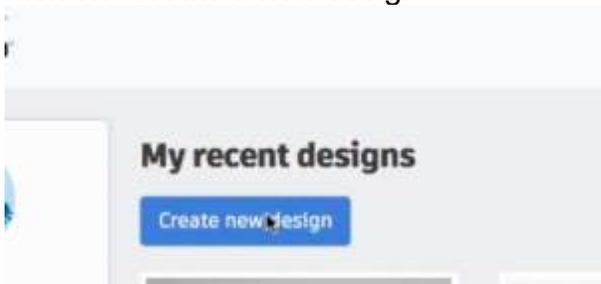


Figure 5: Create a new design

4. Change the name of the design to “EIS Racing Car” by left-clicking the name of the top-left and inputting the new name. Then click “Enter” or “Return” on your keyboard.



Figure 6: Change the name of the file

5. Left-click “ruler” on the top-right corner and place the ruler at the bottom-left corner of the “workplane” by left-clicking the mouse at that location.

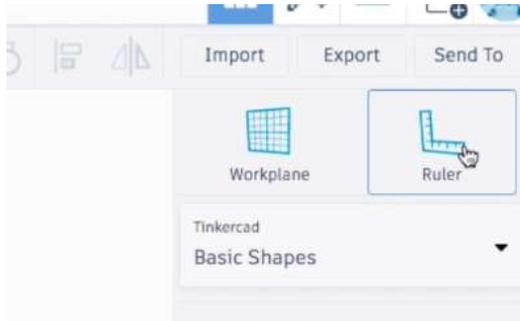


Figure 7: Ruler location on Tinkercad

6. Left-click on “Box,” which is the red box located on the right panel called basic shapes. When you click on it, put it at the center of the workplane.



Figure 8: Object labeled “Box”

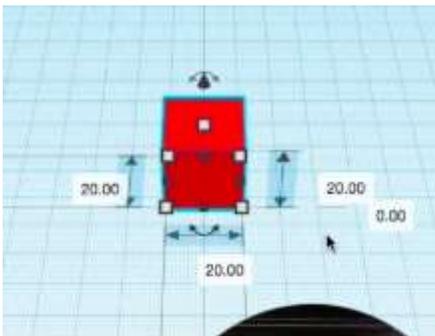


Figure 9: “Box” placed at the center of the workplane

7. Left-click on the “20.00” on the left of the object, erase the 20.00 and type 60 to make the object longer.

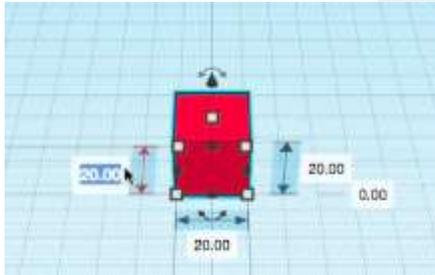


Figure 10: Measurements on the object

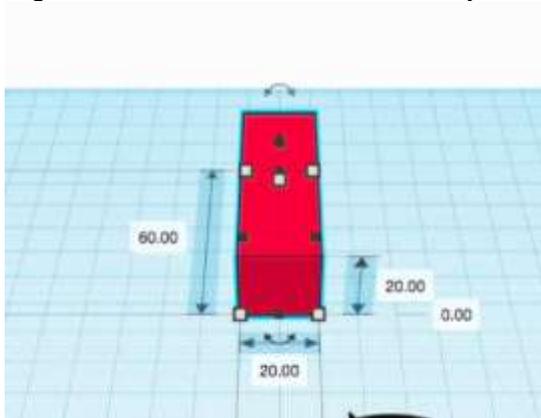


Figure 11: Object with left measurement changed to 60

8. Right-click on any empty space in the workplane, hold the click and move the mouse to see different angles/views of the object.

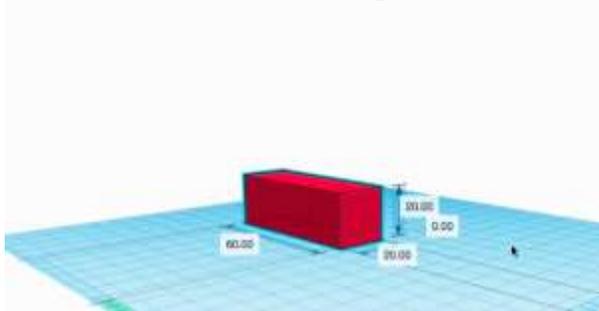


Figure 12: Different view of the object'

9. Left-click on the blue sphere in the basic shapes panel and add it to one of the corners of the red box.



Figure 13: Click on "Sphere"

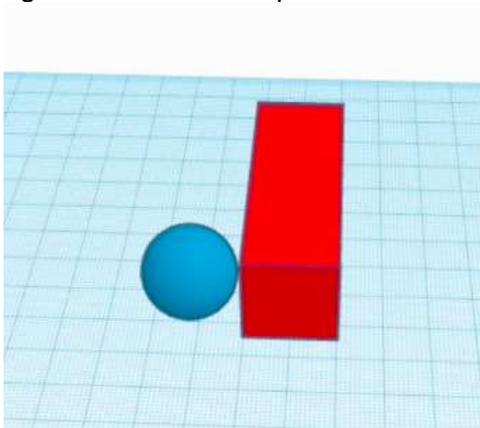


Figure 14: Sphere added to the corner of the box

10. Change the color of the sphere to black. Left-click on the sphere, click on "solid," then choose the color black.

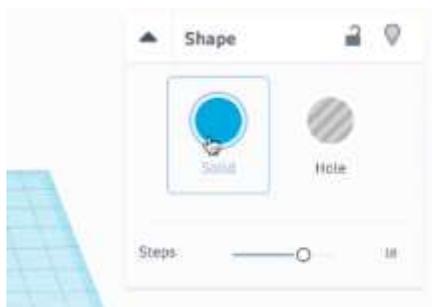


Figure 15: Click on solid to change color

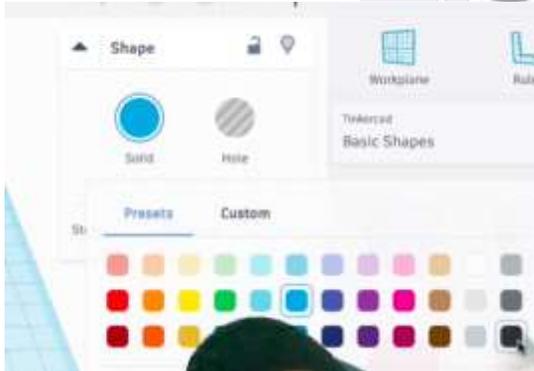


Figure 16: Choose the color black

11. Repeat steps 9 and 10 three more times to add 4 wheels to the car.

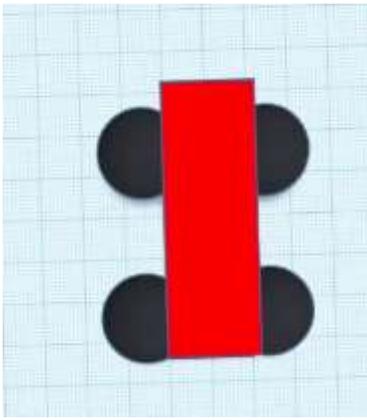


Figure 17: Frame of car with 4 wheels

12. This concludes part 1 of the lesson!

Watch the videos of parts 2 and 3 of this 3D printing Racing Car to learn how to add the missing parts and prepare the model for 3D printing.

You can find our lessons at <https://eisca.org/science-at-home/> and watch our videos when you follow @EISsandiego on [Facebook](#) and [Instagram](#). Check out the next two #3DPrintingFridays on May 29 and June 5.

### **EXPLAIN:**

Have students add different objects at the end of the lesson to modify and personalize the car. The students can also start a new project and design their own car from scratch using the techniques they learned in this lesson.

### **Review 3D Design Vocabulary:**

- **CAD:** computer-aided-design. A design or object made using a computer.
- **Tinkercad:** software web-based used to design 3D objects online.

- **Workplane:** the area in which objects are added to Tinkercad.
- **3D Design:** in 3D design, a designer uses all three axes (x, y, and z) to interpret and develop a realistic figure of the desired object
- **3D Printing:** using a 3D printer to make an object previously designed on a computer.
- **Rapid prototyping:** is a group of techniques used to quickly fabricate a scale model of a physical part or assembly using three-dimensional computer aided design (CAD) data.

### Extension/Elaborate

Questions:

- What are the benefits of 3D design?
  - <https://www.flatworldsolutions.com/engineering/articles/3d-cad-modeling-benefits.php>

### EVALUATE:

Ask students to

- Compare and contrast 3D design and 3D printing.
- Identify a simple object they could make using a 3D printer.
- Elaborate on how they can improve the car they made today.

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