

## **STEAM Subject:** 3D printing

### **Lab:** Racing Car Part 3

**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 did you learn in Parts 1 and 2 of this lesson?
  - Review PDFs of the lessons:
    - Part 1 found [here](#)
    - Part 2 found [here](#)
  - Watch the step-by-step videos:
    - Part 1: <https://youtu.be/ghA6d-Z-EUQ>
    - Part 2: <https://youtu.be/9JPXIUpCro0>
- What elements of your 3D design were the most difficult to complete? What elements were the easiest?

#### **EXPLORE:**

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

#### **Activity:** Racing Car – Part 3

In Part 3, we will learn how to add the missing parts and prepare the model for 3D printing. Follow the steps below along with the video found here:

<https://youtu.be/JVmJ0pnd9bl>

#### **Materials** needed per student:

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

**Directions:**

1. Turn on the computer and go to [www.Tinkercad.com](http://www.Tinkercad.com). Click on “Sign in” to access your account.
2. Click on the picture of the “Racing Car EIS” to open the previous workspace you were working on for Part 2.

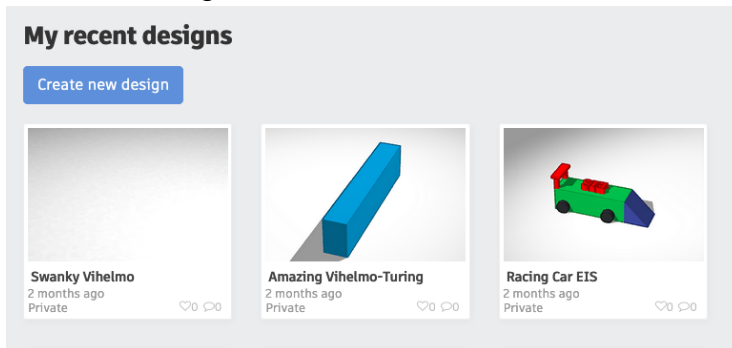


Figure 1: Racing Car EIS – Model

3. Click on “Workplane” on the right side of the screen and add it to the side of the car.

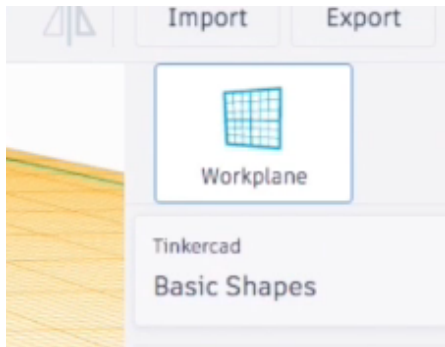


Figure 2: Add Workplane

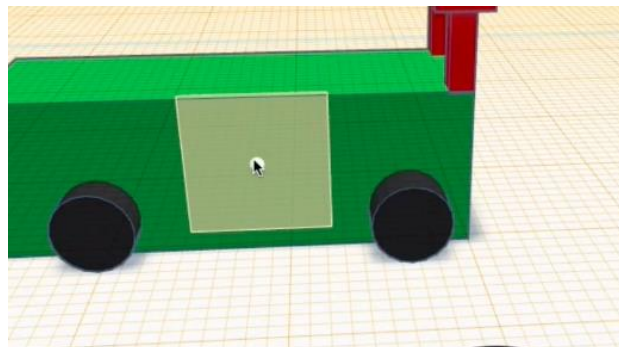


Figure 3: Workplane added to the side of the car

4. Now go to “Basic Shapes” on the right side, click on “Text”, and place the text on the side Workplane.

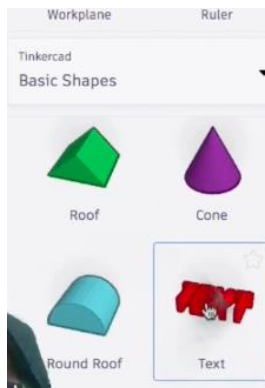


Figure 4: Add Text

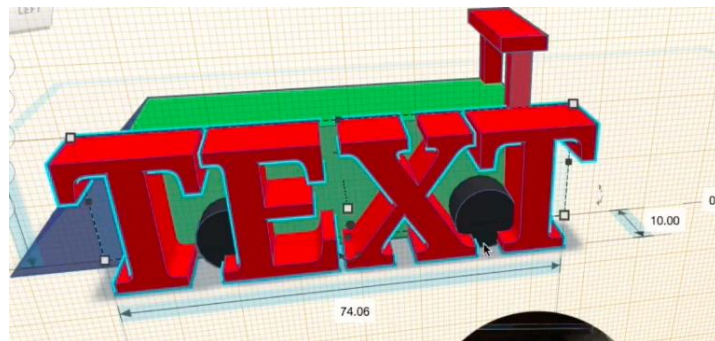


Figure 5: Text placed on the side of the car

5. Click on the "TEXT" added. A window will appear. In the window, select the section called "TEXT," delete the word and type "57"

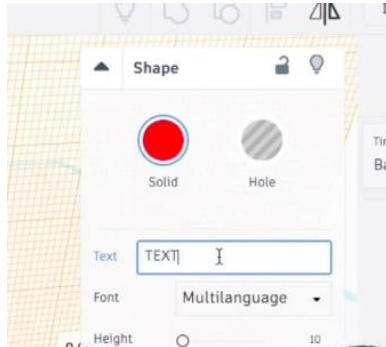


Figure 6: Text options

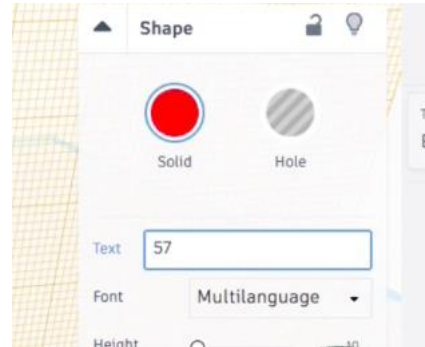


Figure 7: Type 57

6. Click on the "57" that appeared on the side of the car. Several measurements will appear. Change the bottom number (length) to 10. Change the left number (height) to 10. Change the right number (depth) to 2.

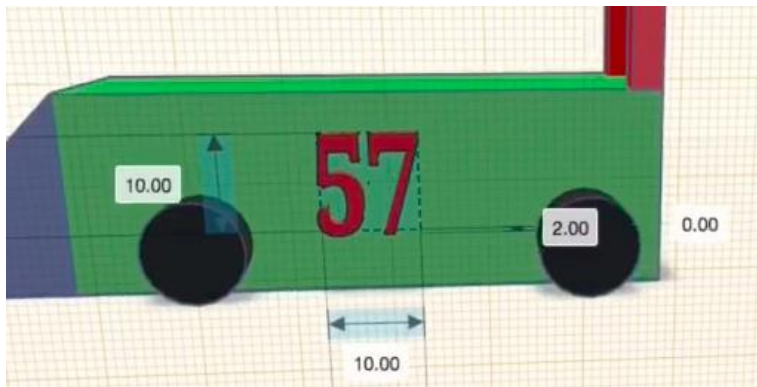


Figure 8: Number measurements changed

7. Select "Workplane" one more time, but this time add it to the top of the car.



Figure 9: New Workplane added to the top of the car

- Click on "TEXT" under Basic Shapes one more time, but this time add it to the top of the car.

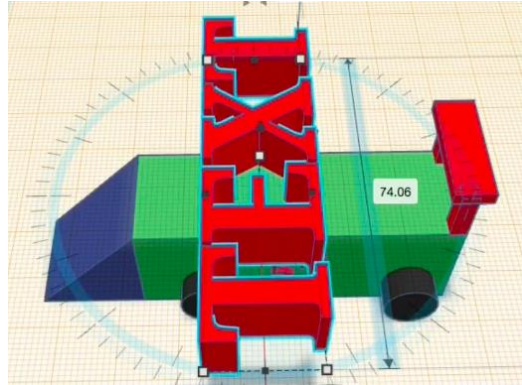


Figure 10: Text added to the top of the car

- Click on the "double arrow" that appears next to the first "T" in "TEXT" in order to rotate the object 90 degrees. Click on the arrow, hold it, and drag it until you see the 90.



Figure 11: Double arrow next to the "T"



Figure 12: Text rotated 90°

- Click on the "TEXT," a window will appear. In this window, delete the text in there and type "EIS."

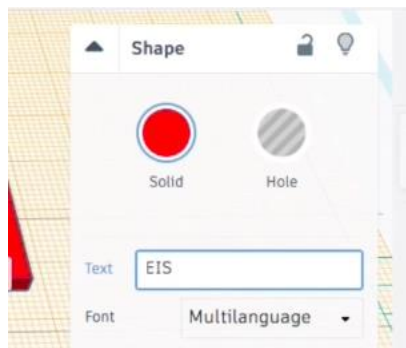


Figure 13: Change text to EIS

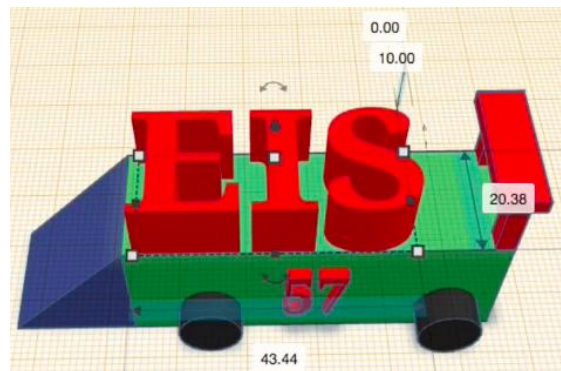


Figure 14: Text changed to EIS

11. Click on “EIS” to reveal the measurements. Change the bottom number (length) to 20. Change the left number (height) to 10. Change the right number (depth) to 5.



Figure 15: EIS with new measurements

12. Prepare the model for 3D printing: Left-click on an empty space in your work area, hold it, drag it, and select the whole car. Then click on group at the top right of the screen. A new window will appear. Click on solid and select “multicolor” at the bottom.

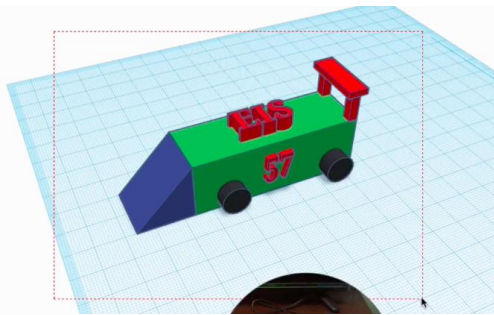


Figure 16: Select the entire car

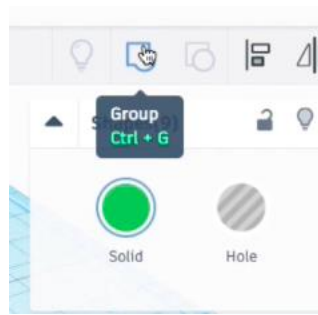


Figure 17: “Group” the car

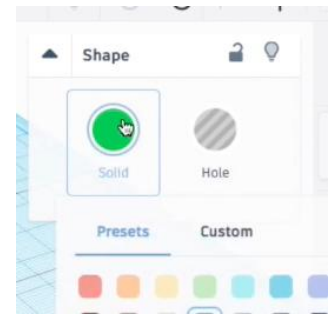


Figure 18: Change to multicolor

13. Click on “Export” on the top right side of the screen. Select “STL” in the new window that appeared. Then save the file to your computer. You can add this file to your favorite 3D printing software and have your own EIS racing car. If you do print it, make sure to share it with us by tagging @EISSanDiego.

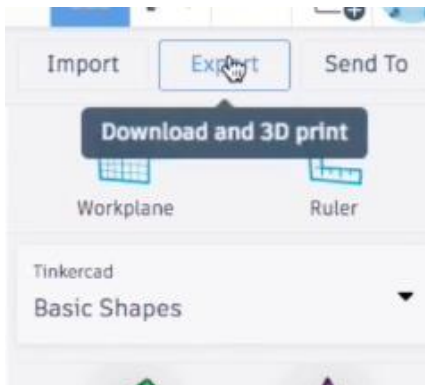


Figure 19: Export the model

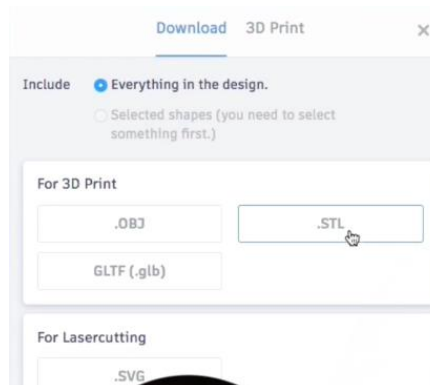


Figure 20: Select STL



Figure 21: Save file to your computer

### 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 STEAM 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:** 3D printing refers to using a 3D printer to make an object previously designed in a computer.

### Extension/Elaborate

Design and build other objects using the skills you learn and share with us in social media @EISSanDiego

Watch the videos found at Elementary Institute of Science [YouTube](#) channel and don't forget to subscribe!

### EVALUATE:

Ask students to:

- Explain the difference between 3D design and 3D printing
- Mention a simple object they could make using a 3D printer
- Suggest how can they improve the car we made today
- Explore the benefits of 3D design
  - <https://www.flatworldsolutions.com/engineering/articles/3d-cad-modeling-benefits.php>

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