

This facilitator guide is a companion to the step-by-step directions for the **Robot Customization Project**. It is intended to guide the facilitator through setting up, introducing some great robots in real life and the popular imagination, guiding participants through the project, and holding a class critique at the end. This project is best offered as part of a larger curriculum that will provide some prerequisite skills as well as further stepped learning.

**Robot Project Two: Robot Customization Project** is designed to follow **Robot Project One: Building A Robot** and to allow participants to use and explore the skills and tools they already have while adding a few new ones that let them create a truly unique robot of their own design.



---

## LEARNING OBJECTIVES

- Learn the Rotate Tool
- Learn the Tweak Tool to Manipulate Object Faces
- Learn the Chamfer + Fillet Tools to Manipulate Edges
- Build Original Work Objects in 3D
- Incorporate Different Styles Into Original Work

---

## PROJECT OVERVIEW

- Introduction
  - Overview of Robots in Popular Culture (Optional)
  - Skills Lesson
  - Project Work Round
  - Class Share + Critique
  - Debrief + Class Summary
-

# SKILLS OVERVIEW

This project was designed to introduce several new tools and to challenge participants to use both the new tools and existing tools and skills to create original work. Module 3, Share + Critique is an optional but important skill in and of itself, representing a critical part of the professional creative process. The following skills will be learned through the introduction and/or repeated use of the relevant tools, available for view in the Tutorials included in the step-by-step.

## SHAPING + MODIFYING

### TWEAK TOOL

Modify Faces, Edges, Corners

- [Tool Tip: 123D Design Tweak Tool](#)

### FILLET TOOL

Modify Corners with Rounded Edges

- [Tool Tip: 123D Design Fillet Tool](#)

### CHAMFER TOOL

Modify Corners with Straight Edges

- [Tool Tip: 123d Design Chamfer Tool](#)

## VIEWING + MOVING

### ROTATE TOOL

Rotate Objects In Any Direction

- [Tool Tip: 123D Design Rotate Tool](#)

## PRESENTATION

### CREATIVE PROCESS

Use New + Existing Skills to Create Original Work

### CONSTRUCTIVE FEEDBACK

Discuss Peer Work, Offer Suggestions, Encouragement

### PRESENTATION

Present Ideas in a Coherent Fashion, Accept Feedback

# PREP + MATERIALS

## CLASSROOM RESOURCES

### COMPUTER ACCESS:

Each participant should have his or her own computer for the duration of the project.

### PRESENTATION + LECTURING:

Ideally, you should be able to play the Tutorials videos and walk the class through each Module by demonstration on a projector that all participants can see.

### SOFTWARE REQUIREMENTS:

This project requires each computer to have 123D Design installed and available.

### ACCESS REQUIREMENT:

This projects requires each student to have the ability to access the saved files and the internet.

### PRINTING REQUIREMENT:

Currently, this project outlines the process for printing using the MakerBot Printer.

## TIME

The lesson is designed to take 30-45m, depending on:

- The inclusion of the introduction
- Time spent on going over skills training
- Time spent debriefing

## PRINT TIME

The objects in the Additive Collection on Thingiverse have been tested to create a viable object with possible print times of 20m or less (after scaling). This can be done at the end of the lesson or during another class period. The size and duration of the print is flexible and based on your access to printers.



# SUGGESTED PROCESS

## INTRODUCTION

### MEDIA

Play video or slides relating to robots in popular culture.

### TALKING POINTS

As we start to think about building our own robots, here are some that you may have seen on TV or in the movies. We'll be going over some new tools which will help you shape your robot parts just about any way you need to, so use these as inspiration or let your imaginations go wild as you start to think of ideas for how your robots will look.

## MODULE 1: MOVING, TWEAKING, MODIFYING

### MEDIA

- Play the Tutorial for Step 1
- **OR** Demonstrate the Rotate Tool

### TALKING POINTS

- One simple tool that has a lot of value as you begin to think about customization is the Rotate Tool.
- This is actually part of the Move Tool and can be accessed once you have selected a whole object. If you place a simple shape on the screen, highlight it, and select Move, you will see a compass appear as part of the tool.
- The Rotate Tool appears as a set of three dials.
- By using your cursor to grab a dial, you can change the orientation of the object. As usual, there is also a numeric field in which you may type the exact number of degrees you would like to rotate the object in any direction.
- Remember that 360 degrees makes a full circle, which will rotate the object back into its original orientation. 90 degrees is one quarter turn, a right angle, which will sit an object perpendicular to its original orientation. 180 degrees will turn it around so that it is backwards or upside down from its original orientation.
- This tool can be very helpful if you are designing multiple pieces and decide to change the way they are oriented to one another.

### MEDIA

- Play the Tutorial video for Step 2
- **OR** Demonstrate the Tweak Tool

### TALKING POINTS

- The Tweak Tool is another useful object that allows you to change the shape of an ob-

# FACILITATOR STEP-BY-STEP

ject in subtle ways.

- You can select a point, edge or face of an object and move it in different directions. Hover over the object and click on the element you wish to tweak. it will turn a darker color and have a highlight.
- With any selection, you have a version of the Move Tool to play with again. Also, to deselect, click elsewhere on the grid plane or hit escape.
- By selecting a point, you can draw that point up, down, or to the sides and the point exerts equal pull on all angles, edges and faces that it is a part of.
- Likewise with an edge, pulling or turning it pulls or turns all faces with it.
- Tweaking the face of a solid can be a simple way to extend its length, width or height, or to create an angle.
- It adds more flexibility to changing the object. Note that often the tweak tool creates new faces on the object.
- If you wish to make the same adjustment to two edges, select one and hold shift while selecting the other. The tool will then perform on both in exactly the same way.

## MEDIA

- Play the Tutorial video for Step 3
- **OR** Demonstrate the Fillet Tool

## TALKING POINTS

- The Fillet Tool allows you to create soft edges. This can be very useful but in this program, the tool has its limitations.
- Select an edge and use the fillet tool. Notice that the edge has a nice, uniform convex curve. This curve does not have any new lines. Therefore, once the operation is complete, there is limited capacity to further modify the edge.
- The Fillet Tool is very useful when used on multiple edges to soften them equally and simultaneously. Once again, this can be done by selecting one edge and then holding shift while selecting another.

## MEDIA

- Play the Tutorial video for Step 4
- **OR** Demonstrate the Chamfer Tool

## TALKING POINTS

- The Chamfer Tool allows you to create softened edges in increments.
- Each time you press an edge inwards, it creates an expanding bevel. if you zoom in and take your time, you can create intricate, soft edges with much more complexity.

# FACILITATOR STEP-BY-STEP

- Note that each time its used, the tool creates new points and edges, which can in turn be further modified.

## MODULE 2: CUSTOMIZATION PRIMER

### MEDIA

- Play the Tutorial video for Rotate, Tweak, Fillet + Chamfer Examples
- **OR** Demonstrate using the tools on the robot

### TALKING POINTS

- Now that we have added these finishing tools to our repertoire, let's try a few of them on our saved, un-merged robot file.
- We can begin by deleting the cube head and replacing it with a sphere, which can then be selected and rotated. Remember, while it will often easier to center objects or check symmetry from the top view, it is necessary when using rotate, tweak, fillet + chamfer to rotate the view of the object itself quite a bit.
- Try tweaking the hips by selecting two points on the same plane. Arms, knees + shoulders are great places to try the fillet and chamfer tools.
- An additional strategy is to create composite objects using primitive shapes and then employ the chamfer, fillet, tweak and rotate tools on them.

### MEDIA

- Play the Tutorial video Draw Tool + Import SVG Examples
- **OR** Demonstrate the drawing and importing

### TALKING POINTS

- While thinking about customizing your robot, feel free to revisit other tools from previous projects.
- Delete out components and draw shapes that you would like to see in the robot and then extrude them to create new 3D components.
- If you had SVG files you found or liked from any previous exercise, you can also use the main menu to select Import SVG and extrude, scale and change the image there.
- So, let your imagination run wild and see what kind of new robot you can come up with.
- *Walk around the room, assisting participants as they begin to create their robots. Make suggestions and remind them of the basics like ctrl +z for undo, escape to release a tool etc.*

## MODULE 3: PRESENTATION + CRITIQUE

### TALKING POINTS

# FACILITATOR STEP-BY-STEP

- Ask each participant to take some time to share with the others a few pieces of information behind his or her robot design.

## **SOME QUESTIONS FOR THE PRESENTER MIGHT INCLUDE:**

- What was the inspiration or influence behind the design?
- What combination of tools did you use to customize your robot?
- What's the robot's name?
- What tools were more challenging?
- How did the design change as you explored the combination of different tools + techniques?
- What does your robot do?

## **QUESTIONS FOR THE CLASS MIGHT INCLUDE:**

- How successful do you think the design is?
- Given the purpose of the robot, what suggestions do you have regarding its design?
- Where are some areas that might have benefited from more or different tools?