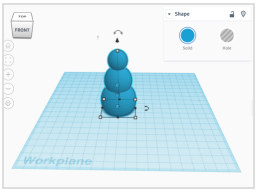
BBB Workshop: Introduction to TinkerCAD



This element helps students think of designing in three dimensions. Students will not only learn the ins and outs of one specific 3D design software (TinkerCAD) but they will work on their spatial skills.

Tags: 3-D Printing Maker Education

Grades: 4 to 12+ | **Duration**: Up To 1 Hour

Supplies: Computer with internet access, TinkerCAD class access code, clay, tray or kitchen cutting mat to model on, clay tools

Step #1: Why Designing in 3D is Important

This video will give you one example of 3D printing being used in industry but can you think of your own list?

YouTube video: https://youtu.be/ywMIdRh5Y18

Instructor Tip:

You can choose your own video. This is a way to put what they are going to do into context in terms of career skills.

Step #2: Decide on what object you are going to model

There are many ways to do this section of the class. One idea would be to pick a book as a class and everyone pick a different element of the book to model. Another idea would be for each student pick their own book. You could also have the class choose a theme (underwater, space, chemistry...) and have them all pick something from that genre to model.

Step #3: Pre-computer Design Task

Have students sketch out some designs on paper and talk about how their design with the class. Then use the clay to model the object they would like to model in TinkerCAD. Use the clay and kitchen mats to model your design.

> **Instructor Tip:**
>
> If you have access to a 3D scanner, you could choose to scan the students clay figures as a starting point to work in the 3D modeling world. It is likely that they will be able to model more detail out of clay than they can reasonably get from starting from scratch in TinkerCAD. However, I would only offer this option after they have learned the basic moves in TinkerCAD.

Step #4: Log into TinkerCAD

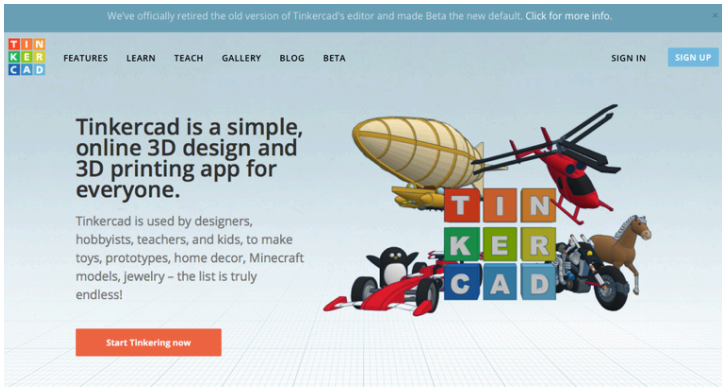
Show students how to log into TinkerCAD and get

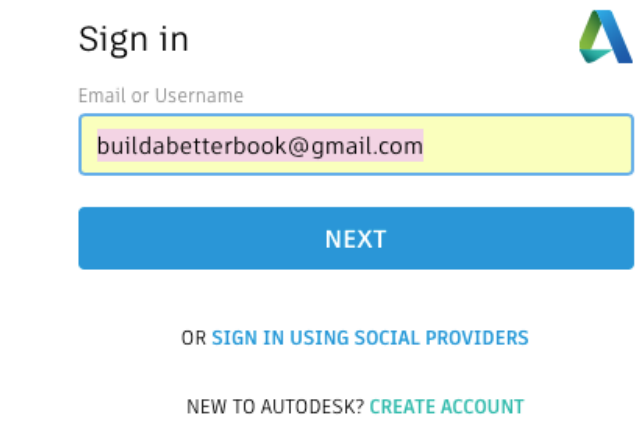
connected with the class code.

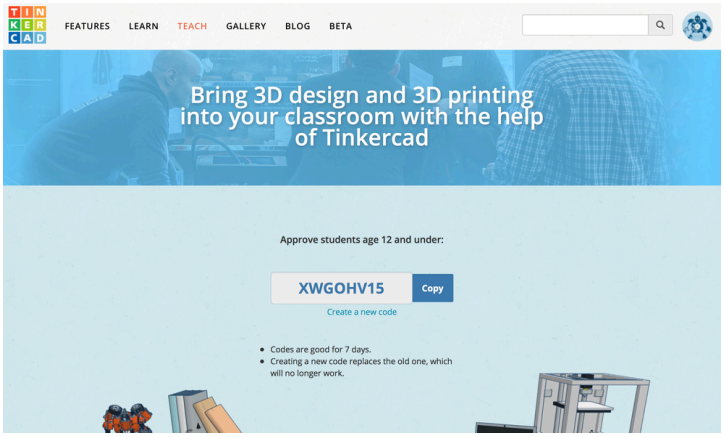
Instructor: You will need an account to get started. Accounts are free and can be set up in a matter of minutes. Once logged in, you will click on the 'Teach' tab to obtain your class code. This will allow you to 'Moderate' your studetns (i.e. see their work, edit their work if necessary, and be able to downlowad their STL files for printing)

Students under 13 years of age: You can create a log in using whatever email you would like and then when it askes you for verificaiton of your account, just enter the class code that your instructor has provided and you will have instant access to TinkerCAD.

Students over 13 years of age: You can create a log in using whatever email you would like and you will instantly have a TinkerCAD account. In order to be connected to the class with the class code you will go into your profile in the upper right of the screen, select Profile and click 'Enter invitation code'. This will link you with the class and allow your instructor to see your work.







Instructor Tip:

Using the class code to link you students together will be a great help when you are editing and printing their final models. It also allows you to Tinker their designs and have a copy after the class is over.

Step #5: Create a new file and get familiar with TinkerCAD

Click “Create New Design” Button in the upper left of the screen. This will open a new Workplane.

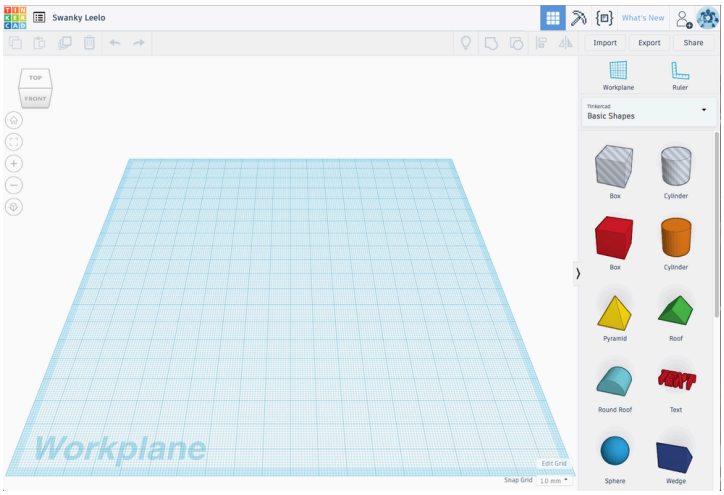
Orient the students to the Wrokplane::

A: The Workplane (the blue area in the middle with the crosshatched space)

B: The Navigation Cube (upper left cube that has 'top', 'bottom', 'right' and 'left' written on the face)

C: The Shapes Bar (the right hand side bar that has shows different geometric shapes)

D: The Tool Bar (along the top of the screen)



Step #6: Adding Objects to your Workplane

Grab a sphere and bring it to the workplane.

YouTube video: https://youtu.be/fLCx0KuBDFg

Step #7: Resize Object

Resize your sphere to be the base of the snowman

YouTube video: https://youtu.be/f9EV9ywrgmo

Step #8: Copy and Paste Objects

Copy and Paste your sphere to make the three sections of the snowman.

You can use the Command+C (copy) and Command+V (paste), or the Duplicate button at the top of the screen.

YouTube video: https://youtu.be/UhWDdwnmzBc

Step #9: Resize Spheres to make Snowman

Resize two of the spheres to make the smaller secitons of the snowman. I used 40x40x40 for the base, 30x30x30 for the midsection and 20x20x20 for the head.

YouTube video: https://youtu.be/TxvGNjLiMFM

Step #10: Raise Object off Surface

Use the black arrow to move two of your spheres off the surface to place them on top of the base sphere.

YouTube video: https://youtu.be/4e2UNRhqzdg

Step #11: Using the Align Tool

Use the Align tool to make sure your spheres are exactly on top of eachother. You can also use the view cube to see if your spheres are in the correct Z position and use this time to adjust them if needed.

YouTube video: https://youtu.be/53zwze7d2F4

Step #12: Create Holes

Use a solid shape to make 'buttons' on your snowman. Practice making your solid button a 'hole' and place them on the Snowman.

YouTube video: https://youtu.be/qrcGzsnuC2o

Step #13: Group Objects

To group objects, you first need to select the objects you would like to group. I use click and drag to select all the objects I'd like to group (however, you can select them individually using the Command button to select multiple shapes) and then use the group button at the top of the page to group them together.

YouTube video: https://youtu.be/gD1_mdA4bao

Step #14: Give Your Object a Flat Surface to Print from

In order to print your object successfully you will want to make sure that it has enough connection to the surface. This is also a good technique to make sure that you have all pieces of your base on the same plane (this will help with printing). Bring in a cube hole, make it bigger than your object and lower it to the desired height. Group your object and the hole and then lower your object to the surface once again.

YouTube video: https://youtu.be/I9Htz91iWQs

Step #15: View your object from different angles

Use the view cube to rotate your object. Use the zoom buttons or two finger motion to zoom in and out of your object. Practice moving your camera around by using Shift+Alt combination with your mouse.

Make sure you do not have floating objects that will cause printing problems and that everthing looks the way you had envisioned.

YouTube video: https://youtu.be/eFh8W9h2K9M

Step #16: Save your Work

If you'd like to change the name of your file just click on the name and type your new name.

Have the students save their Snowpeople by clicking on the TinkerCAD logo in the upper left of the screen.

Step #17: Create a new design and start to model

As students work on their models, here are some things to keep in mind:

A: You can't 3D print over empty space...make sure that your model starts on the zero plane (not below or above) and take note of any portion of your model that would have to be printed above nothing. You might be able to fix this with support material or changing the orientation of the print. You can print at about a 45deg angle from the surface without support.

B. Make sure to look around your object often so you know if things are really attached to eachother and not floating in space

C. Printing large flat pages takes a lot of time. Try to minimize large flat objects. If you want, you can attach pieces to large flat surfaces later when the printing is done.

D: Continue checking in with students during the design process to make sure they are on track

Step #18: Alternate Activity

If students are done designing they can have the option to use the 3D doodler pens to create a 3D structure or design.

Step #19: Wrap Up

A: Have students critique one of the others designs and help make them printable.

B: Discuss how this technology might be useful in STEM careers.

C: Have the students come up with a list of possible jobs where 3D design and building could be useful (examples: architecture, medicine, prosthetics design, rapid prototyping, fixing common household items or hard to find products, 3D artist, 3D animation, engineering, problem solving...)

D: Print the files for the students to pick up, one week from the session.