Plastic Oceans

Adrift in a sea of plastic

Lesson #1: TinkerCAD: Introduction to 3D Printing

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DESCRIPTION

This lesson is designed to span 5 days with 50-minute sections. After the introduction day, each day the students work toward mastery on the TinkerCAD tutorial online to learn how to create printable 3D models. At the end of the 4 days the students will have created a small 3D model to specifications to print on the 3D printer.

GRADE LEVEL(S)

5th- 8th

SUBJECT AREA(S)

TinkerCAD, 3D Printing, modeling, Computer Aligned Design, G-code, Kura, functional prototype, slice, plastic, building,

ACTIVITY LENGTH

5, 50-minute classes

## LEARNING GOAL(S)

1. Students will complete several computer aligned design tutorials, lessons, and one project to fully understand and implement unique 3D printed designs.

# CONTENT BACKGROUND

## STUDENT BACKGROUND

* Students should be familiar with logging into new apps on-line.
* Students should be familiar with using the computer keyboard, mouse, and/or cursor pad.
* Students should be familiar with common 3D Shapes, such as, cubes, spheres, cylinders, pyramids, etc.

## EDUCATOR BACKGROUND

The educator should log into TinkerCAD and complete all 7, starter tutorials, 2 or 3 lessons, and 1 project before teaching this lesson. The educator should also print several of their own 3D designs on the printer to showcase during the unit. The more you work in the 3D plane the easier it is, so just put as much time in as possible before logging the students in.

The educator needs to set up a class in TinkerCAD at <https://www.tinkercad.com/join> for students to join during Day 1 of Lesson 1. Educators should also familiarize themselves with the moderator tools for how to help students set up their projects and how to monitor student progress on their projects.

# MATERIALS NEEDED

Technology:

* Educator must have previously set up a class in TinkerCAD at <https://www.tinkercad.com/join> for students to join

Classroom Supplies

* Personal computer for each student or pair of students.
* 3D printer
* PLA material for printer

Handouts/Paper Materials

* None: Everything is online here <https://www.tinkercad.com/>

# Activity Supplies

* Computers, Chromebook, or tablets for each student or pair of students each day.
* Intro video for the kids about 3D printing, <https://youtu.be/Vx0Z6LplaMU>
* This video is information on how to take the students 3D designs and transform them into printable designs using Cura Slicer, <https://youtu.be/eUNTlb5pEWA>

# LESSON PROGRESSION

## PLANNING AND PREP

This lesson is designed to span 5 days. Students need an electronic device each day. Each student will get a student account on TinkerCAD for completing each day’s activities.

Day 1: **Intro to 3D Printing Video,** watch video about 3D printing and sign into student accounts on TinkerCAD. Students will begin working on the seven starters on TinkerCAD to learn to navigate the application and begin designing 3D objects. [www.tinkercad.com](http://www.tinkercad.com)

Day 2: **The Seven Starters,** students will work independently on TinkerCAD and complete the Place it, View it, Move it, Rotate it, Size it, Group it, and Align it starters. Have the students log-in information from the last lesson ready to help students log in today.

Day 3: **Lesson on TinkerCAD**, student will complete a lesson on TinkerCAD and print a 3D object. After day 3 and before Day 4 the educator will need to download and print the students completed lessons using whatever 3D printing software came with their model of 3D printer.

Day 4: **Design a Sea Craft,** students will start working on the project Explore Buoyancy: Design a Sea craft <https://www.tinkercad.com/learn/overview/OGGLXOCIRXTM0OB;collectionId=OY5L5E8IRXTI47Z> on TinkerCAD. Educator will need to print any completed projects and/or lessons between Day 4 and 5.

Day 5: **Complete Projects,** students will complete their sea crafts.

## LESSON SEQUENCE

Day 1: background Information

1. (10 min) Warm-up: Have students share what they know about 3D printing and 3 dimensional shapes.
2. (5 min) Watch YouTube video about 3D printing and pass around some 3D printed objects.
3. (10 min) Have the students join the previously set-up (see above) TinkerCAD classroom using the class code you create in your account through <https://www.tinkercad.com/joinclass>. This will give the teacher the ability to moderate the student accounts and download the objects for printing.
4. (25 min) Have students start working on the seven starters to learn how to navigate and design 3D shapes in the app. It is a good idea to have a para or a parent volunteer this day to go around and help students who are challenged in the beginning. If some students pick it up quickly you can also have them assist others on day one.

Day 2: The Seven Starters

1. (5 min) Help students log into the TinkerCAD site.
2. (30 min) Have students complete the Seven Starters, Place it, View it, Move it, Rotate it, Size it, Group it, and Align it.
3. (10 min) Share out tips and tricks for using the TinkerCAD platform.
4. (10 min) Have students explore the lessons, <https://www.tinkercad.com/learn/project-gallery;collectionId=O2C1PXBIQ2KHCOD>

available on TinkerCAD and start one to finish on Day 3.

Day 3: Lesson on TinkerCAD

1. (5 min) Help students log into TinkerCAD
2. (40 min) Have students complete the lesson they chose on Day 2.
3. (5 min) Share the students completed lessons on the projector or in small groups.

Day 4: Design a Sea Craft

1. (5 min) Have student log into TinkerCAD
2. (45 min) Students will begin working on the project Explore Buoyancy: Design a Sea craft. <https://www.tinkercad.com/learn/overview/OGGLXOCIRXTM0OB;collectionId=OY5L5E8IRXTI47Z>

Day 5: Complete Projects

1. (5 min) Students log into TinkerCAD
2. (30 min) Students will complete their sea craft projects.
3. (15 min) Students will share their completed projects and discuss practical uses for the technology.

# ASSESSMENT AND EXTENSIONS

## FORMATIVE ASSESSMENT

* On day 1 the educator should pay careful attention to the vocabulary the students use when discussing 3D shapes. The students may need scaffolds if they are unfamiliar with the names of 3D shapes.
* At the end of Day 1 the educator can use the moderator tools on TinkerCAD to explore the progress each student is making with the seven starters.
* While the students are working the educator will be observing the students’ progress and level of proficiency as well. The students completed lessons and 3D object files from the lesson will serve as a formative assessment of the students’ progression toward mastery of the TinkerCAD Application.
* Group discussion can serve as formative assessments.

## SUMMATIVE ASSESSMENT

The Sea Craft each student designs will be the summative assessment for this lesson. In order to complete the project, the students will need all the skills they learned in the seven starters and the lesson they chose.

## LESSON EXTENSIONS

* Educator will need access to the internet and TinkerCAD.com. A 3D printer is not imperative to completing this lesson. If you do not have one, the files can be sent to a local 3D printer and printed for a small cost, depending on availability. TinkerCAD offers printing as well through their site at a cost.
* Another possible extension would be to have a plastic recycling device on hand and use recycled plastic in the 3D printer.
* At the end of this lesson the students could engage in a Socratic seminar or debate and discuss the practical uses of 3D technology versus the harm done by plastic to our planet. This would be a good Social Studies-STEM connection.
* There is another STEM project, <https://www.tinkercad.com/learn/overview/OHEOOINJ7QGENIP;collectionId=OY5L5E8IRXTI47Z> on TinkerCAD about buoyancy that the students could do instead or in addition to the one highlighted in the lesson. If you have more time or early finishers. It is a 9th grade lesson, however, the intermediate students should be able to work through it especially if they have completed all the other parts of this lessons with mastery.