

INTRODUCTION TO 3D PRINTING CONCEPTS

***Note:** This is an introductory lesson to 3D printing where kids will be observing the 3D printer in action, while their team is creating an object using the Design Process that could later be designed and printed.

OVERALL TIME 60-minute lesson

GROUPS Three to four kids

Next Generation Science Standards

MS-ETS1-4

Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

3-5-ETS1-1

Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

OBJECTIVE

- **Gain a better understanding of how 3D printing works.**
- **Design and sketch an object that solves a problem.**

OVERVIEW

Kids will learn how a 3D printer works, and what a 3D printer is capable of printing. Kids will design and sketch an object that would be useful to solve a problem in their school using 3D printing to create. Kids will also observe a 3D object being printed.

MATERIALS

- **3D printer**
- **Downloaded .stl file to print**
- **Playdoh**
- **Paper**

PREPARATION

- Be sure to prepare files for printing using a slicing software such as Cura or Matter Control. The slicing process is an essential part of the printing process to establish the settings for the printer. When you are ready to print, download an object file compatible with your 3D printer.
- Warm up the printer prior to starting the printing process. Be sure the printer is calibrated and the filament is properly fed to the print nozzle.

LAUNCH 10 to 15 minutes

Bring kids together in a large group. Have them choose a partner and share what they know about 3D printing. After a minute of discussion, have a few pairs share aloud in a large group. Then have the kids choose a different partner and *ask where do we see 3D printing in real life?* Give a minute for discussion, and then ask a few pairs to share with the group. Some examples might be: prosthetic limbs, toys, vases, replacement parts, prototypes, etc.

Have the kids pair up with a third partner. To begin exploration into 3D printing, have kids take 5 to 10 minutes using the STEM Lab computers to research what can be printed using a 3D printer.

We have several .stl files located on the materials page of the portal.

To download, visit:

<http://www.ripkenfoundation.org>

EXPLORATION 35 to 40 minutes

Kids will partner up in groups of 3 to 4, to brainstorm and create a useful object that would be helpful in school such as a door stop, sign holder, or picture frame. Then kids will sketch the design on paper noting different angles of the object (top, bottom, side, etc.). After making the sketches, kids will use Playdoh to create the 3D object.

While kids are working on their design, print an object using the 3D printer. Many of the .stl files found on RipkenFoundation.org only take about 15 minutes, depending on the printer settings.

Have groups come up one at a time to observe the 3D printer in action.



CLOSING 5 to 10 minutes

Bring everyone back together. Have groups share their 3D design and how it would be helpful in school.

Pass around the object that was printed. Have kids share any interesting observations. Take time for teams to thank each other for being a part of their learning community.

ENRICHMENT AND NEXT STEPS

For kids interested in creating their own 3D designs, TinkerCAD is a great website for beginners. TinkerCAD is a free website that allows anyone to learn how to design and print simple or intricate 3D objects. TinkerCAD offers lessons on how to use the controls for the website, as well as how to create designs and objects! Visit <http://www.tinkercad.com> for more information and to access the lessons and design tools.

For additional training and resources, visit <http://www.mystemkits.com>. Your Robo 3D printer comes with a free, two-hour online training session.

POSSIBLE YOUTUBE VIDEOS

What is 3D printing and how does it work?

- ▶ https://www.youtube.com/watch?v=Llgko_GpXbl

3D Printing in the Elementary School

- ▶ <https://www.youtube.com/watch?v=QTW4r4qfHys>

3D Printing in the Middle School Science Classroom

- ▶ https://www.youtube.com/watch?v=1jp-RemY-_4

Kids Learn 3D Design and Printing

- ▶ <https://www.youtube.com/watch?v=nHgY947uCbU>