

3D Printing

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County: Hardee

Subject: Reading, Math, Science

Grade(s): 3

Instructional Time: 6- 45 minute sessions

Suggested or Required Technology: Computers/I pads, 3-D Printer

BRIEF DESCRIPTION

In this lesson, students will read the book “Melia and Jo” and participate in a discussion about STEM and how STEM and STEAM can be used to solve real world problems. Students will then explore STEM and how each student is an inventor and can use technology to solve real world problems. Students will learn how trial and error is an essential part of the learning process as it relates to STEM. Students will explore STEM with a specific emphasis on 3D printing. Students will learn how 3D printing has evolved and the history of 3D printing. Students will learn to use Tinkercad and learn about the parts of a 3D printer as well as the 3D printing process. Students will then use all of this knowledge to create a 3D printed design using Tinkercad. Students will begin with manipulating an object that has already been designed in order to learn the Tinkercad program. Students will create a 3D printed object and then through trial and error design an object that can be printed.

STANDARDS

LAFS.3.SL.1.2

Determine the main ideas and supporting details of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

LAFS.3.SL.1.1

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 *topics and texts*, building on others’ ideas and expressing their own clearly.

SC.3.N.1.1

Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.

MAFS.3.MD.3

Recognize area as an attribute of plane figures and understand concepts of area measurement.

SC.35.CS-CS.2.2

Describe how computational thinking can be used to solve real life issues in science and engineering.

SC.35.CS-CC.1.3

Identify ways that technology can foster teamwork, and collaboration can support problem solving and innovation.

SC.35.CS-PC.2.7

Identify and describe how computing knowledge is essential to performing important tasks and functions.

LEARNING OBJECTIVES

Students will:

- Read and explain grade level text
- Define STEM and explain why STEM is an important part of today's society
- Identify careers that use STEM
- Define engineer/inventor
- Compare and contrast an engineer and a scientist
- Identify the benefits of 3D printing
- Explain the ways that 3D printing can be used to solve a real world problem
- Explain the general process of 3D printing
- Design a 3D object using Tinkercad
- Explain the connection between an object and how the object can be used to solve a real-world problem
- Design a 3D printer design sheet and use the sheet to create a shape in Tinkercad
- Make design decisions when creating a 3D object

GUIDING QUESTIONS

- How can we use technology to make our lives simpler and more productive?
- How can STEM help us to
- What is the difference between a scientist and an engineer?
- Who is an inventor and what do they do?
- What is a problem that you have that you want to solve?
- How can 3D printing aid in solving real world problems?

FORMATIVE ASSESSMENT

Students will create a 3D printed object and then through trial and error design an object that can be printed.

SUMMATIVE ASSESSMENT

Final Product- Student created nameplate

LESSONS

SESSION 1 Read Aloud and Book Discussion

MATERIALS AND SUPPLIES

- Book- “Melia and Jo” by Billy Arnson and Jennifer Oxley
- Padlet App- Free to download
- I-pads or another device to access Padlet app

ACTIVITIES AND INSTRUCTIONS

Teacher will read aloud the book “Melia and Jo” by Billy Anderson and Jennifer Oxley. Students will then participate in a class discussion about the book as well as retell key details about the book. Students will then participate in a discussion on how STEAM skills were used in the book and identify the different types of STEAM skills. Students will also discuss how Melia measured, tested and observed over and over again until she came up with the solution.

Discussion posts: Done through Padlet app

RESOURCES

Book- “Melia and Jo” by Billy Arnson and Jennifer Oxley

Padlet App- <https://padlet.com>

ACCOMMODATIONS FOR INCLUDING ALL CHILDREN

Use images and allow students to participate in discussions using Padlet with an I-pad or participate verbally

SESSION 2 What is STEM?

MATERIALS AND SUPPLIES

- Paper and Pencil

ACTIVITIES AND INSTRUCTIONS

Discussion-Who is an inventor?

There are different types of inventors and using STEAM students can become inventors themselves.

Think of a real world problem that you have? What could you do, or what could you invent that would solve the problem?

In groups of two, students will work together on this question and come up with ideas that will solve a real world problem and then blue print their ideas on a sheet of paper to share those ideas out loud with the class.

RESOURCES

Background Knowledge: Book- "Melia and Jo" by Billy Arnson and Jennifer Oxley

ACCOMMODATIONS FOR INCLUDING ALL CHILDREN

Students can draw pictures for blueprint and work with a peer buddy.

SESSION 3 3D printing and solving real world problems

MATERIALS AND SUPPLIES

- Computer with internet access
- 3D printer parts sheet

ACTIVITIES AND INSTRUCTIONS

3D printing and how it has helped solve real world problems

Students will watch the video about enable and then discuss how the use of 3D printing has helped solve the problem of missing limbs for those who are missing them. Students will then participate in an out loud class discussion about how 3D printing can help solve real world problems and how enable has done this.

Students will then watch video about how 3D printing works and go over the basic parts of a 3D printer using the printer itself as an example and using the sheet provided.

RESOURCES

Video: Enable https://www.youtube.com/watch?v=Cl8ijPGEKO8&t=73s&disable_polymer=true

Video: 3D printing process <https://www.youtube.com/watch?v=Vx0Z6LplaMU>

3D printing parts sheet (included at end of lessons)

ACCOMMODATIONS FOR INCLUDING ALL CHILDREN

Videos on the 3D printing process and handouts in which students can label the parts of a 3D printer

SESSION 4 Basics of Tinkercad

MATERIALS AND SUPPLIES

- Computer with internet access
- Paper and Pencil

ACTIVITIES AND INSTRUCTIONS

Introduction to Tinkercad

Students will learn how to log in to Tinkercad and will learn the basic interface of the programs. Students will work hands on with the program and explore the program independently. Students will work on the direct starter tutorials in the Tinkercad program in order to learn the basics of 3D printing. Students will work with the Introduction to 3D shapes and the primitive shapes lessons

RESOURCES

Tinkercad website- <https://www.tinkercad.com>

Introduction to 3D shapes and the primitive shapes lessons in Tinkercad- **NEED LINK**

ACCOMMODATIONS FOR INCLUDING ALL CHILDREN

Teacher will model lessons on smartboard and assist students as needed. Teacher will point at the pictures and use color names to help students recognize the correct shapes.

SESSION 5 Manipulating files in Tinkercad

MATERIALS AND SUPPLIES

- Computer with internet access

ACTIVITIES AND INSTRUCTIONS

Same Design File- Nameplate

Students will be working on the teacher-made nameplate file in Tinkercad. Students will learn the plane views, workspace, measurements and interface of Tinkercad. Students will add their name to the nameplate in order to customize the file. Students will use the directions sheet to ensure that all of the parts necessary for the nameplate are included in the final product.

RESOURCES

Tinkercad website- <https://www.tinkercad.com>

Directions sheet (included at end of lessons)

ACCOMMODATIONS FOR INCLUDING ALL CHILDREN

Students will be given a sheet of paper in which they can draw what they want to include in their nameplate and another student will assist in creating the object on the computer. Students can also participate in hand over hand where the student places their hand over the mouse while the other student creates the object on the computer.

SESSION 6 3D printing design with Tinkercad

MATERIALS AND SUPPLIES

- 3D printing filament
- 3D printer
- Computer with internet connection
- Slicing software

ACTIVITIES AND INSTRUCTIONS

Creating first 3D printed object

Students will create their first 3D printed object in Tinkercad. Students will design the object in Tinkercad and then through trial and error will create a file that can be printed. Students will learn about the splicing software and how the slicing software is needed in order to create a finished product in Tinkercad. Students will watch the video on slicing software and how slicing software is necessary when 3D printing. Students will be assisting each other through the process and will obtain help from the teacher when needed. All files will be reviewed by the teacher before printing.

RESOURCES (include URLs, background information, required/suggested readings, student sheets, etc.)

3D printing slicing software video <https://www.youtube.com/watch?v=Bsj3Q4TECQ4>

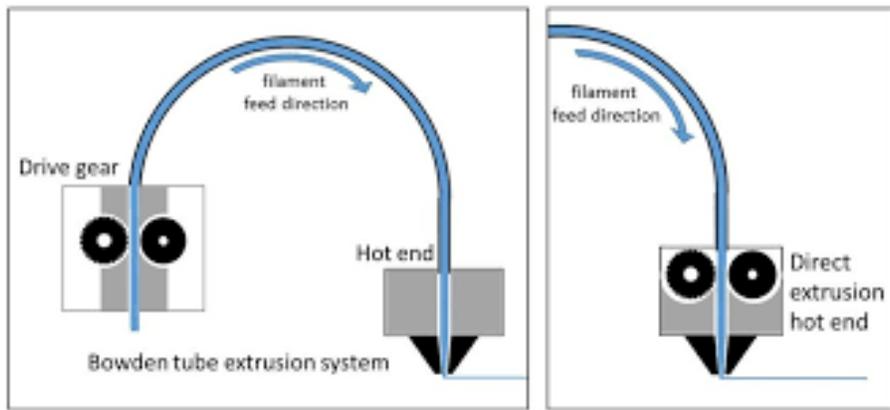
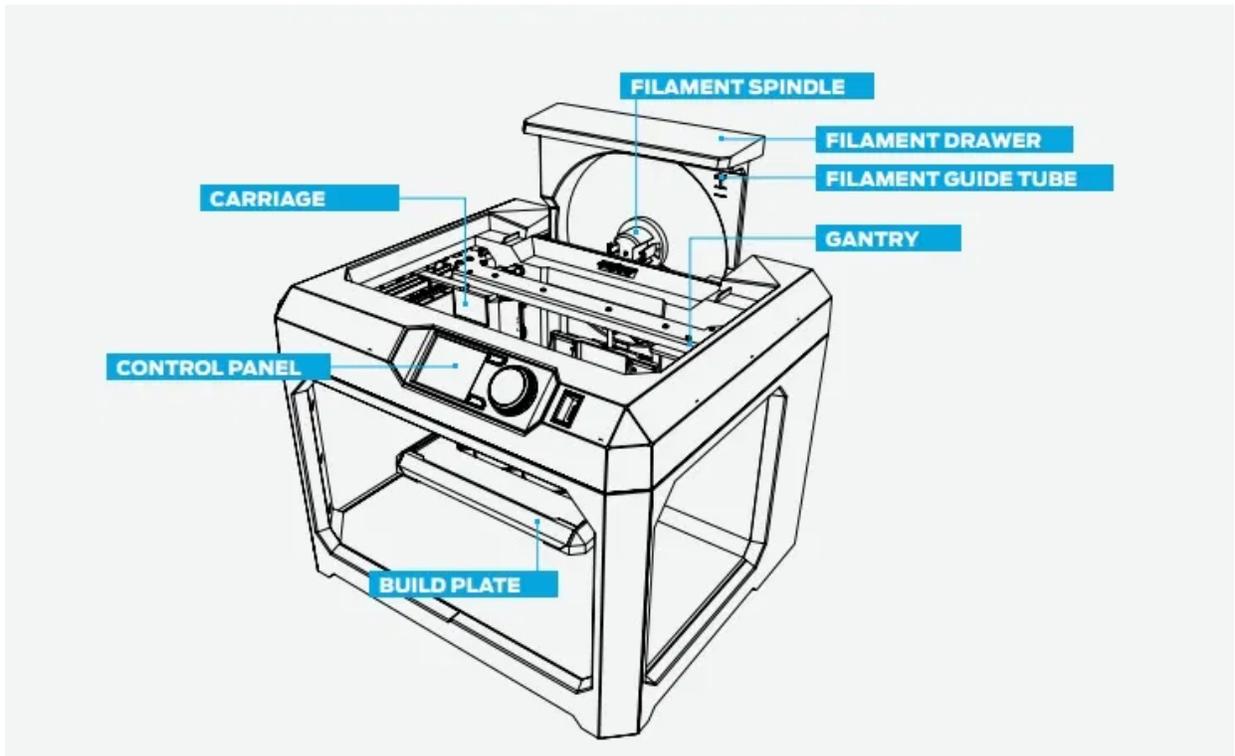
ACCOMMODATIONS FOR INCLUDING ALL CHILDREN (what changes can you make so all students can meet the learning objectives?)

Video explaining how slicing software works

COMMENTS OR GENERAL NOTES

This lesson will require lots of hands on one on one help for some students. Students will have questions when working in Tinkercad. I allowed students to work together and help each other. Additional lessons in Tinkercad can be added for students who finish early.

3D Printing Parts



DIRECTION SHEET