



3D Print a Team Logo

2-hour Student Workshop

3D printing has revolutionized prototyping and manufacturing, and as the technology advances, access to these machines becomes increasingly available and more affordable. Students with knowledge of these systems are able to leverage their skills to utilize 3D printing's potential to create better opportunities for themselves, their communities, and the world. This 2 hour workshop introduces students to a variety of 3D printers, their applications, and the design process of creating files suitable for printing.

Objectives

Understand the basic functions and operations of a 3d printer.

Describe the different types of 3D printing technology and their materials.

Use collaborative strategies to participate in a construction project and to design and model a team logo

Materials

10 Student Laptops

Pencils /paper

Dry erase board

Dry erase markers

Electrical tape rolls

3D printing pens

Key Terminology

Fabricate

Additive Manufacturing

Fused Deposition Modeling

Stereolithography

Filament

Extruder

X,Y,Z Axis

Cad

3d File

Primitive Shapes

Work plane

TEKS Alignment

§110.15. English Language Arts and Reading, Grade 4, Beginning with School Year 2009-2010.

(b) Knowledge and skills.

(2) Reading/Vocabulary Development. Students understand new vocabulary and use it when reading and writing. __

(28) Listening and Speaking/Speaking. Students speak clearly and to the point, using the conventions of language. Students continue to apply earlier standards with greater complexity. Students are expected to express an opinion supported by accurate information, employing eye contact, speaking rate, volume, and enunciation, and the conventions of language to communicate ideas effectively.

(29) Listening and Speaking/Teamwork. Students work productively with others in teams. Students continue to apply earlier standards with greater complexity. Students are expected to participate in teacher- and student-led discussions by posing and answering questions with appropriate detail and by providing suggestions that build upon the ideas of others.

§111.7. Grade 5, Adopted 2012.

(b) Knowledge and skills

(7) Geometry and measurement. The student applies mathematical process standards to select appropriate units, strategies, and tools to solve problems involving measurement. The student is expected to solve problems by calculating conversions within a measurement system, customary or metric.

§126.7. Technology Applications, Grades 3-5, Beginning with School Year 2012-2013.

(b) Knowledge and skills

(1) Creativity and innovation. The student uses creative thinking and innovative processes to construct knowledge and develop digital products.

(2) Communication and collaboration. The student collaborates and communicates both locally and globally using digital tools and resources to reinforce and promote learning

(5) Digital citizenship. The student practices safe, responsible, legal, and ethical behavior while using digital tools and resources.

6) Technology operations and concepts. The student demonstrates knowledge and appropriate use of technology systems, concepts, and operations.

Lesson Outline

5 minutes

Welcome to the Fab Lab /lesson introduction

- a. Explain what a makerspace is, learn what our makerspace contains, and how they can bring their own ideas to life with a maker mentality
- b. Provide an overview of the lessons to be taught

15 Minutes

Students will be instructed to observe the 3d printers printing and note the movements that are happening as the machine works. This movement is along an X,Y,Z axis, which differs from drawing 2D on a paper, the 3rd axis Z, allows the printer to build vertically, thus creating in 3D space.

To demo the complexities of a 3D printer, students will be given 10 minutes to complete a simple task; create a team name, and write the team name along with “3D Printing is Cool” on their dry erase boards. Each team member must have a hand in writing the text, however team members cannot physically touch the dry erase marker while they write. Team members will need to create a way to control and maneuver the marker that allows each team member to simultaneously control the marker only using the materials provided. Also the marker must be easily removable. Team members must not lean over the edge of the table and therefore must create their device with enough slack to reach the dry erase board placed in the middle of the table. At the end of the ten minutes, teams will bring up their dry erase boards and vote for the best one.

20 Minutes

Students will then be introduced to the principles of Additive Manufacturing through a powerpoint presentation and video demos of specific types of 3d printers. Topics to be discussed will include the main types of 3D printer technologies available today, their applications and limitations, and what is needed to operate them.

20 Minutes

The online Cad software Tinkercad will be introduced to the students, and basic operational functions demoed.

10 Minutes

Students will be given the task to create a team/table identity, and a logo to represent them. Students will sketch a draft on pencil and paper of what that logo would look like. Criteria will be given to help shape the dimensions of the logo.

20 Minutes

Student teams will then begin the process of creating the logo in Tinkercad.

25 Minutes

Teams will be instructed on the process of saving their files in preparation for 3D printing. Students will then be shown how to import their files into Cura, a 3D Slicing software that converts the 3D file into code that the 3D printer can read. Some general settings to pay attention to and how they affect the outcome of a print will be addressed as well.

5 Minutes

Wrap up and clean up.

Assessment opportunities

Formative observations of team working throughout the initial, and logo designing challenges. Ongoing observations through different challenges using Tinkercad and the appropriate use of 3D printers in the classroom

Summative assessment in the form of vocabulary questionnaire, and Rubric to score their logo designs based on the criteria given.