Educator's Guide to Google Sketchup and 3D Printing

Overview:

This lesson will introduce students to the world of 3d printing through Google Sketchup.

Grades and Subject Areas:

Grades 7-8

Objectives:

- Student can recognize and use Google Sketchup tools
- Student can create a 3d model with certain size parameters
- Student can apply parts of the design process for creating a 3d model.

I Can Statements:

- I can use the pan, orbit, move tools for moving around my 3-d model.
- I can use shapes, pencil, eraser, push-pull tool to make a dog house.
- I can use the tape measure to measure for size
- I can design a 3d model for printing.

Curriculum Connections:

Alaska Content Standards:

Arts:

1. 3) appropriately use new and traditional materials, tools, techniques, and processes in the arts;
2. 4) demonstrate the creativity and imagination necessary for innovative thinking and problem solving;

CTE Middle School Standards:

- Student will understand the design process.
- Students will use measuring, sketching and other manual and computer drawing techniques while solving problems.
- Students will use CAD software and hardware.

ISTE Student Standards:

- 6.a Technology Operations and Concepts
  - Understand and use technology systems.
  - Troubleshoot systems and applications

ISTE Teacher Standards:

- 1. Facilitate and inspire student learning and creativity
  - a. Promote, support, and model creative and innovative thinking and inventiveness
  - b. Engage students in exploring real-world issues and solving authentic problems using digital tools and resources.

Technology Integration:

Hardware and Software Needs

Student: Google Sketchup

Teacher: Google Sketchup, STL Extension, Afinia Software

Tips and tricks

- Go through the tutorials prior to class
- Be sure 3d printer has gone through a test print (in working order)

Resources:

Handouts or Downloads

- http://commondatastorage.googleapis.com/support-kms-prod/SNP_2576338_en_v1
- http://aisdmsteched.wikispaces.com/Google+Sketchup

Links to teaching resources

- http://commondatastorage.googleapis.com/support-kms-prod/SNP_2576338_en_v1
- http://aisdmsteched.wikispaces.com/Google+Sketchup

Web resources

- http://support.google.com/sketchup/bin/answer.py?hl=en&answer=36207
- http://www.3dvinci.net/teacherguide/teacherguide.pdf

Lesson Directions

Prep Time:

30 minutes

Prior to Lesson:

Teacher Prep:
- Schedule computer lab
- Schedule Printer
- Be sure you have Afinia Software on your computer (work order)

Student Prep:
- none

Time Needed for Lesson:

3 days

Directions:

Day 1:

Step 1: Have students participate in a Peardeck or Kahoot! review to experience the different ways that 3d printing is used today.

Step 2: Have students open Google Sketchup and choose Product in MM. Begin by having students practice using the movement tools. (Zooming in with two fingers, space bar to select tool, orbiting and hand tool (Command-B)

Step 3: Have students make a cube by drawing with line tool. Then make a cube by drawing with square tool.

Step 4: Show students how edges are different than faces, select by clicking (1, 2, 3 times)

Step 5: Have students practice making a cube by using the push/pull tool.

Step 6: Show student the importance of grouping, (Right click)

Step 7: Create a Dog House.
- Draw a box
- Push pull the box up
- Draw a line on the roof from midpoint to midpoint
- Using move tool, pull the line up to make the roof
- Using the square tool make a door. Use the arc tool to make half-circle above the door. Delete the door.

- Using the Octagonal tool create a window. Delete the window.
- Measure the size of the house and shrink it down to 5 cm by 5 cm (50 mm by 50 mm)

Step 8: Have students draw a chair.

Day 2: Have students do project design and planning
- Have students design a solution for an iPhone stand.
- Have students design a block print for making wallpaper
- Have students design a game piece for a game that they create

Day 3: Have students take sketches and move to Google Sketchup
- In google Sketchup students design should contain:
  - 3 different shapes
  - Fit 1.5 cm by 1.5cm
  - Fits theme for color, shape

Day 4: Have students save their sketchup files to Google Drive or thumb drive and turn in
- Students upload file to Google Drive
- Teacher converts file with Google Sketchup to .stl
- Teacher starts to print .stl files

Day 5: Print .stl files
- Teacher will need to print the files while other activities are being completed.

Extension / Challenge:

Idea 1: Keychain Fob
Idea 2: Miniature Furniture