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Create a SMILE
3-D Style!

STEAM DIGITAL LITERACY

CREATE A SMILE ....3D STYLE!

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Goals & Objectives

Goals:

To allow creative students the opportunity to become innovative in building their very own digital camera using a 3D Printing machine. Teaching about imperfections and the beauty behind designing and building is important in Technology and Design. Implementing Project Based Learning in the traditional classroom helps students prepare better for the real world.

Objectives:

- Students will learn how to code.

- Design a camera frame using 3D Print Software and Adobe Creative Cloud

- Interworking of 3D Print software.

- Engineering parts to produce a 3D digital camera.

- Students will be able to critically think, and problem solve with technology device.

Florida Standards

Math Standard:

MA.912.DP.5.6 Determine the appropriate design, survey, experiment or observational study, based on the purpose. Articulate the types of questions appropriate for each type of design.

MAFS.912.S-MD.2.7: Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game.

Science Standard:

SC.912.CS-CP.3.1 Create a computational artifact, individually and collaboratively, followed by reflection, analysis, and iteration (e.g., data-set analysis program for science and engineering fair, capstone project that includes a program, term research project based on program data)

SC.912.CS-CP.2.4: Facilitate programming solutions using application programming interfaces (APIs) and libraries.

Visual Arts Standard:

VA.912.F.1.4 Use technological tools to create art with varying effects and outcomes.

Enduring Understanding 1 **VA.912.F.1 :** Creating, interpreting, and responding in the arts stimulate the imagination and encourage innovation and creative risk-taking.

Standard 02 **CTE-TECED.68.ENTECH.02 :** Demonstrate proper and safe procedures while working with technological tools, apparatus, equipment, systems, and materials.

Standard 13 **CTE-TECED.68.ENTECH.13 :** Demonstrate the abilities to apply the design process.

CTE-TECED.68.ENTECH.13.01: Apply a design process to solve problems in and beyond the laboratory-classroom.

Overview

The STEAM Digital Literacy curriculum resource packet is appropriate for secondary Business, Information Technology, and Computer Science courses. Any K-12 course can adapt this curriculum to their course using STEAM strategies. STEAM Literacy and implementation are critical for students to gain the knowledge and hands-on experience to compete in the global market today. Creating a camera from scratch allows students to take ownership of their creation and apply custom designs they believe will improve their product. Every student takes pictures, and building a device that will allow you to capture your valuable moments from start to end will be a learning experience they will never forget. Teachers will use two different software to accomplish this project; TinkerCad and Ultimaker Cura.

Terms

- Digital Camera

- Slicer

- Iteration

- Arduino

- SD Card

- Tactile Switch

- Battery

- STLs

- 3D Printer

- Hinge

- SD Shield

- Solder

- Cooper pads

- Camera Trigger

- Trim

- Camera lens

- Programming

Lesson Plans/ Step by Step Guide

Lesson Overview:

Students will learn about 3D Printing and creating a digital camera from scratch. Students will explore different coding techniques, design strategies and critical thinking skills to master their picture-perfect 3D digital camera.

Essential Question: How can 3D Printing inspire and innovate the creative thinkers of our future?

Opening Activity:

Students will watch a video on how to use the TinkerCad software. TinkerCad is a web based software used to equip the next generation of designers and engineers with the foundational skills for innovation: 3D design, electronics, and coding! Have the students to Join your Tinkercad class and design a basic design. Have the students to take notes to utilize for their practice activity. After the students create a basic design have them to save their design as an STL file.

Teachers can also use StemFuse intro Project for 3D Printing found in the Science Category > Structural Engineering> CREATE : IT 3D PRINT PROJECT "Bird Feeder" found in the student and teacher dadeschools portal. Completing this intro project with students will give them more practice on how to design, create and engineer an object using a 3d Printer. They will need to slice this design in an online slicer called Ultmaker Cura in order for your 3D Printer to read the file.

Video Prep: How to Use TinkerCad: https://youtu.be/gOs6Mdj7y_4

TinkerCad website: https://www.tinkercad.com/

Hook:

Students will begin by watching the following video "Ultimaker Cura Tutorial and Basics (Beginner's Tutorial) in class and taking notes about using the Ultimate Cura software. This video will provide students with a beginners understanding of how to slice files for 3D Printing. Cura is a basic slicing software for 3D printing and is great for beginners and veterans alike. In this tutorial, I will be going over downloading Cura, selecting a printer, layer height, infill, speed, temperature, supports, plate adhesion, travel, downloading the finished .gcode, and previewing prints.

Students should be directed to take step by step notes from the video to reference during the process of 3D Printing.

Video Prep: https://youtu.be/NsGOoi3677M

Have the students take their Tinkercad STL file and place inside of the Ultimaker Cura software and save the file for the approicate file name for your 3D Printer.

Place the sliced file on a jump drive or storage device that your 3d Printer is compatible with.

Turn on your 3D Printer for warming purposes and when ready load your filament.

3D Print the students file and when complete have the students reflect on the entire process from start to finish of engineering a decision and bring their imagination to reality.

Activities:

For the 3D Printer Digital Camera I used the <u>instructional sheet</u> by Randofo. Teachers should watch this video prior to attempting this lesson. Video: https://youtu.be/WCA60FrIxcE

Step 1: Gather all of the required materials (Found on the Resource List shet)

Step 2: You can use the provided <u>STLs files</u> designed to work with high-end printers (Object Connex in particular), a set of simple STLs is provided as well that should work better with consumer-level printers, and 123D Design build files so that you can modify the camera yourself. Place your files in the Ultimaker Cura for slicing. 3D Print all of your needed files.
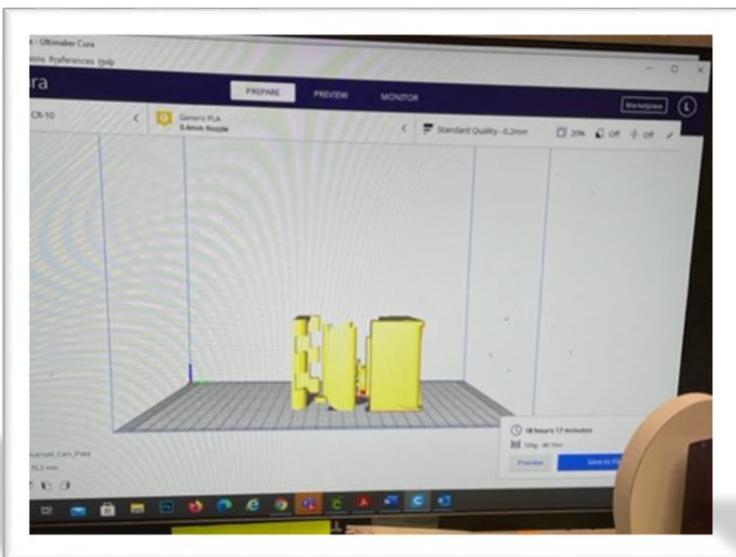
Step 3: Line up the lid with the body of the camera. Applying gentle and even force, push the pin into the socket for the camera's hinge until it is ☐ush with the camera body.

Step 4: Insert the SD card into the socket on the SD shield.

Step 5: Solder

Solder the tactile switch to the center of the copper pads of the 0.63" diameter round PCB.

Solder a red wire to one side of the switch, and a black wire to the other side of the switch. If you are unsure which side is which, you can check with the continuity tester on a multimeter.

Step 6: Assemble Button

Slide the camera's trigger button into place from inside the camera.

Insert the round PCB into the track below the button, such that the top of the tactile switch is directly below the trigger button. They should be touching, but the trigger button should not be applying force on the switch. The switch needs to be able to bounce back after it has been depressed (as we all do).

Step 7: Trim and Solder

Trim the camera module's male header pins in half. Solder a 6" red wire to power, a 6" black wire to ground, and 6" colored wires of your choice to both RXD, and TXD. In this example, white is connected to RXD and green to TXD.

Step 8: Install

Take the lens cap of the camera module. Insert the camera through the lens hole in the camera body. Using the corner mounting holes, fasten the camera module to the camera body with 1/4" x 4-40 bolts.

Step 9: Program

Program the Arduino with the following code:

/****************** (C) COPYRIGHT 2012 RadioSHack ******************

* Copyright© 2012 RadioShack Corporation (written by RadioShack Corporation)

* Modified by Randy Sarafan 9/5/13

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* File Name : camsd.pde

* Author : TRS

* Version : V1.0

* Date : 28/05/2012

* Description : Main program body

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CODING

* INFORMATION CONTAINED HEREIN IN CONNECTION WITH THEIR PRODUCTS.

Refer to [3D Camera Print document](#) pages 9-20 for the Arduino codes for this project.

Step 10: Arduino

Fasten the arduino to the mounting holes on the inside of the camera lid using 1/4" x 4-40 bolts.

Step 11: Shield

Insert the SD shield into the appropriate Arduino sockets.

Step 12: Plug In

Plug the red wire from the camera module into the 5V socket on the SD shield. Plug the black

wire into the ground socket. Plug the TXD wire into pin D0. Plug the RXD wire into pin D1.

Step 13: Solder

Solder a red wire to the backside of the Arduino power jack.

Step 14:

Trim one of the leads of a 10K resistor in half, and plug it into the ground socket that is on the same side as the digital pins. Bend the lead over, and solder the opposite lead to the solder pad that is electrically connected to Arduino pin D7.

Step 15: Switch

Plug the black wire from the switch PCB into the socket for Arduino pin D7. Solder the red wire from the switch to the 5V pin on the SD shield.

Step 16: 9V Clip

Slide a piece of heat shrink tubing onto the red wire connected to the Arduino's power jack. Solder the red wire from the power jack to the red wire from the 9V battery clip.

Cover this connection with heat shrink tubing and secure it in place with a heat gun.

Plug the black wire from the battery snap into the remaining ground socket on the SD shield.

Step 17: Battery

Plug the battery in, and then slide the battery into place snugly below the switch assembly.

Hold it in place by slide the battery holder plate between the battery and the holder tabs on the top and bottom of the case.

Step 18: Close It Up

Shut the lid and press down on the locking tab to close the case. The camera should now be ready for use.
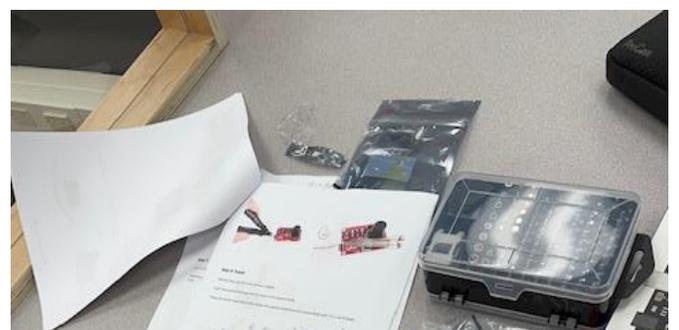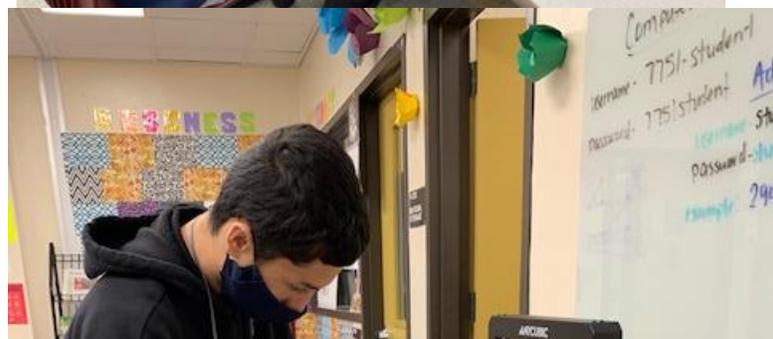
Resource List

Download Ultimaker Cura HERE: https://ultimaker.com/software/ultima...

A 3-D printer

Filament

Arduino Uno R3

camera shield

micro push button switch

shrink tube set combo

9v battery clip type

9v alkaline battery

pan head machine screws

round PC board

electronic tool kit screwdriver

filament

digital camera

step-by-step guide

STL Files for Camera Case