

Flashlight Housing

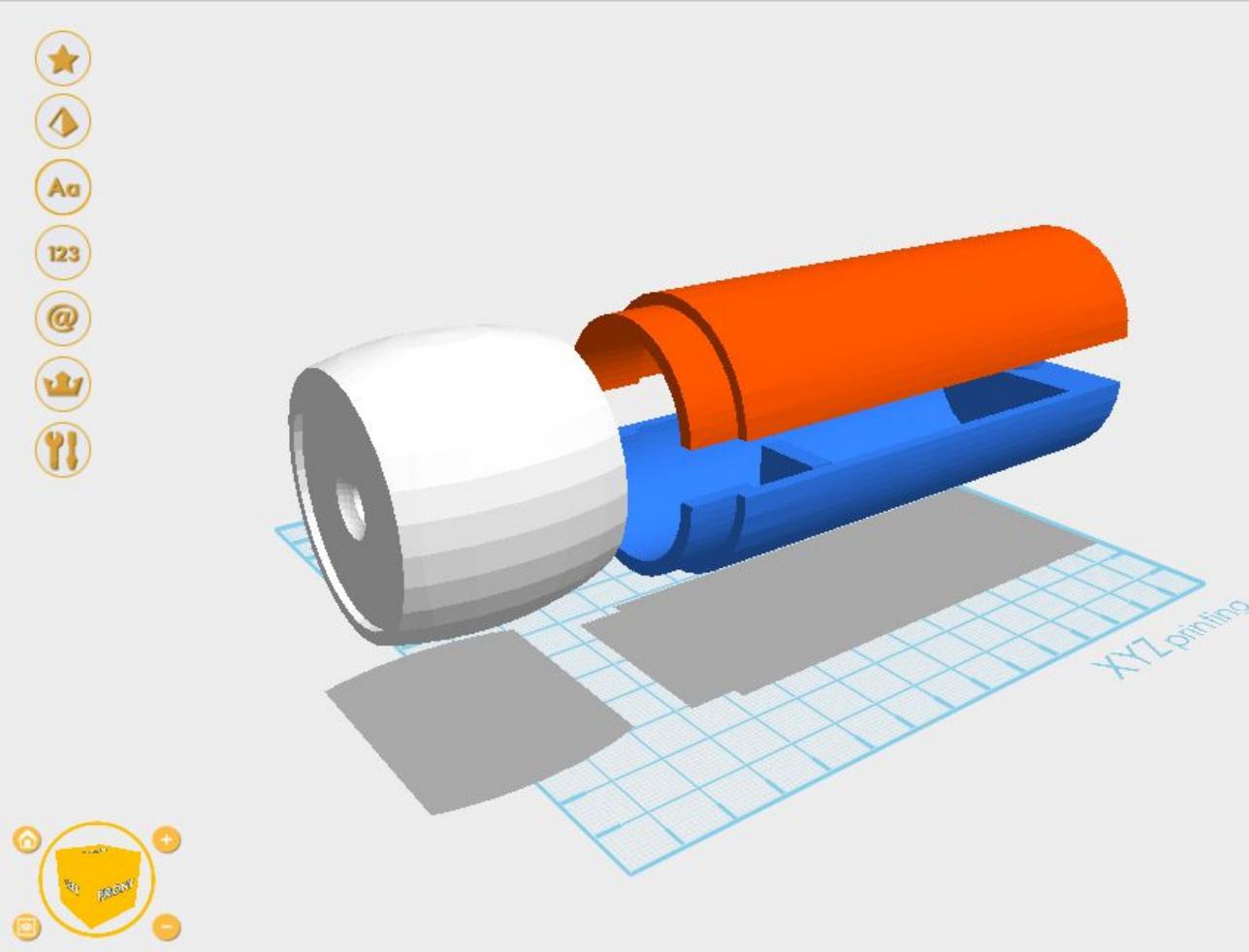
Create a 3D printed light housing



Grades 9-12

Time 3 x 2 hours

Standard NGSS
HS-PS2-6, HS-PS3-3



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Lesson Format - Teacher's Guide

Hi there,

Welcome to XYZ printing themed lessons. These lesson plans will help you to teach STEAM-based lessons and provide tips for teaching along the way. The module has been split into three sections and includes lesson handouts for students to work through. At the end of each section we have included an evaluation criteria to grade your student's progress against.

Lesson Information

This section contains a brief introduction to the lesson, the NGSS standards, goals and the target age group. Read this section to get a rough idea of what the lesson entails.

Lesson Sections

This document has been broken into 3 different lesson sections, each taking roughly 120 minutes to teach. These sections make it easier to stage the lesson over a week long period. Each lesson sections has its own content, activity and evaluation criteria.

Lesson Section Structure

Each lesson section can be divided into three different phases. These are explained below.

Engage

Helps the teacher to set up the class in the beginning, the questions or group discussion will build up students' ideas to deepen understanding and connect with lesson content.

Activity

All the activities are based off the principles learnt in the engage phase, and are meant to encourage students to explore the new concept and in a practical setting.

Wrap up

When students have finished each section, the teacher will invite all the students to share and discuss what they learnt. During the discussion, the students are encouraged to talk about their experiences, and what was successful or not? Self-reflection will help the students to improve next time.

Evaluation

This phase provides an evaluation criteria for the teacher to evaluate the work done in the activity phase against.

Lesson Information



Lesson Information

Grade Levels

9-12

Lesson Description

In this lesson students will learn about how 3D printing can be used to create precision objects that are both functional and useful. Students will learn about how current flows through a circuit and how symbols (i.e., circuit diagrams) can be used to explain different types of circuit configurations. Students will use their understanding of circuit diagrams to design their own circuit that will be used to create a flashlight design that utilizes off the shelf components such as LED, battery, battery holder, wiring, battery contacts, etc. These components will be integrated into a custom housing that the students design. Each design must integrate these components and fit with precision in order to make the parts function correctly.

Lesson Topic

Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

Lesson Sections

Total time frame: 360 minutes

1. Circuits lab - 120mins
2. Create a switch - 120mins
3. 3D Printer Flashlight Housing - 120mins

Learning Goals

1. Students will learn about circuitry, amperage, voltage and currents while being able to design their own circuit that will be used to create a flashlight design.
2. Understand how 3D Printing can be integrated into the engineering/design process.
3. Electro-Mechanical integration.
4. Setup and operate a 3D Printer.

Learning Outcomes

1. 3D Printed flashlight case: Off the shelf components such as LED, battery, battery holder, wiring, battery contacts, etc. will be integrated into a custom housing that the students design. Each design must integrate these components and fit with precision in order to make the parts function correctly.
2. Understand how amperage and voltage affect circuit design.

Essential Questions

- What is electricity?
- How does a switch control the current going to a device?
- What is electricity and how do we control it?
- What are the components of a circuit, and what does it mean to complete a circuit?

Standards

HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.

HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

Assessment

Performance Tasks for Students:

- Circuits Lab
- Circuit Diagram Notes
- Create A Switch Introduction Activity
- Project 3D Printed Flashlight Housing

Active Learning Plan

Resources Needed:

- [Circuits Lab Handout](#)
- [Create a Switch Handout](#)
- [3D Printed Flashlight Housing Project Handout](#)

Differentiation Strategies:

For students struggling with the **Create A Switch** lesson, the following videos can be shown:

<https://www.youtube.com/watch?v=78avG5oVILc>

Lesson 1

Circuits Lab

120 mins



Students will learn the difference between a series circuit and parallel circuit as well as create circuit diagrams.



Engage

Essential Questions

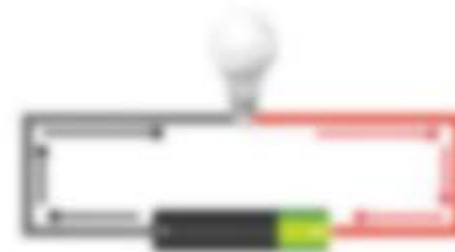
- What is a circuit?
- What is a battery?
- How is a circuit created?

Introduction

A battery has positive and negative ends. It is created by creating a path for electrons to flow into other parts of the circuit.

The figure to the right shows a general schematic of a complete circuit. The arrows indicate the flow of electrons, from the negative to positive terminal of the battery. Current, however, flows in the opposite direction.

This is a preview
To view the whole lesson, please become a paying member.



Lesson 2

Create a switch

120 mins



In groups of 2-3, students will learn about the different types of switches and apply this knowledge to build a circuit.



Create A Switch | Lesson 2

STEAM

Engage

Essential questions

- What is a switch?
- What are the different types of switches?
- How do switches work?

Introduction

Switches connect or disconnect a circuit (closed or open) and when the circuit is closed or open, the current flows or stops flowing.

There are

activated by light, light, temperature and pressure. Some of the more common types of switches are:

Type of Switch ¹	Schematic Symbol
Toggle Toggle switches are the most common type of	
	
	
	
SPDT Single pole double throw switches are commonly referred to as two-way switches. The circuit can be controlled by two different signals.	

This is a preview

To view the whole lesson, please become a paying member.

¹Images taken from:

<https://www.electronicshobby.org/2014/11/types-of-switches-electrical.html>

Lesson 3

Flashlight Housing

120 mins



Students will apply knowledge from the previous sections to design and 3D print housing for a flashlight.



3D Printed Flashlight Housing | Lesson 3

3D printing STEAM

Engage

Essential questions
What is electricity?
What is engineering?
How does a switch work?

Introduction

Flashlights are typical
source that utilizes an
diode (LED). Typical
bulb, light reflector, or
or mounted inside a p
become a part of our
applications and used
computers, helmets
Read more about flash

<https://www.energyschool.com/flashlight-how-does-it-work>

Activity

For this activity, you will need a 3D printer, filament, and a 3D model of a flashlight housing.

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This is a preview

To view the whole lesson, please become a paying member.

Teacher Notes



Teacher Notes

XYZprinting STEAM

Introduction

These notes detail the steps involved in creating the 3D printed flashlight housing from lesson 3.

Using the XYZmaker CAD software, create your own unique flashlight housing design. Use the dimensions of the

Project goal

For this project, you will create a design that will house the LED. A sample design is included as a reference. Students can create their own unique design for the flashlight housing.

Process

Using the XYZmaker CAD software, create your own unique design for the flashlight housing. This design may help your student create their design on paper before printing.

The XYZmaker software allows you to start creating 3D designs for you to 3D Print.

This is a preview

To view the whole lesson, please become a paying member.