

# Lesson 1: Innovations in Computing

## Overview

To kick off the final unit of this course, students will do some research into interesting innovations in computing. This lesson will expose students to wider variety of computing form factors (what a computer looks like) and fields that are impacted by computing. Later in this unit students will look back on the devices they encountered in this lesson as they develop their own physical computing devices.

## Purpose

This lesson will lay the groundwork for students' understanding of how their Circuit Board could be used to model an innovative computing device. The goal is to get them thinking about how computers can be embedded into just about anything, and to start considering the potential impacts of such applications.

## Assessment Opportunities

### 1. Identify computing innovations within a given field

Activity Guide, page 2: The description of the device, its purpose, and the type of innovation should clearly demonstrate what it does and why it is innovative.

### 2. For a given device, articulate the likely inputs and outputs

Activity Guide, page 2: The description of the user interaction should identify multiple possible inputs and outputs for the device.

### 3. Suggest improvements to help a device better solve a specific problem

Activity Guide, page 2: The suggested improvements should relate to the purpose of the device and how it is used.

## Standards

Full Course Alignment

### CSTA K-12 Computer Science Standards (2017)

- **IC** - Impacts of Computing

## Agenda

## Objectives

Students will be able to:

- For a given device, articulate the likely inputs and outputs
- Identify computing innovations within a given field
- Suggest improvements to help a device better solve a specific problem

## Preparation

- Review the resource pages linked in Code Studio
- Cue up **The Internet of Things - Video** or **Computer Science is Changing Everything - Video**
- Print out a copy of the activity guide for each student

## Links

**Heads Up!** Please make a copy of any documents you plan to share with students.

For the teachers

- **CSD Unit 6 - Physical Computing** - Slides

For the students

- **Computer Science is Changing Everything** - Video (**Download**)
- **Computing Innovations** - Activity Guide
- **The Internet of Things** - Video

## Vocabulary

- **Innovation** - A new or improved idea, device, product, etc, or the development thereof

### Warm Up (5 minutes)

#### Get Inspired

### Activity (35 minutes)

#### Innovation Research

### Wrap Up (5 minutes)

#### Journaling

### Extensions

#### Innovation Posters

#### Innovation Websites

## Teaching Guide

### Warm Up (5 minutes)

#### 💡 Teaching Tip

This unit requires the Adafruit Circuit Playground. You can read more about this microcontroller board at <https://code.org/circuitplayground>

### Get Inspired

**Video:** Watch either **The Internet of Things - Video** or **Computer Science is Changing Everything - Video** as a class.

### Activity (35 minutes)

#### Innovation Research

**Group:** Place students in groups of 3-4

**Distribute:** Hand out copies of the activity guide

**Discuss:** What is an innovation? What does it mean for something to be innovative?

#### 💬 Discussion Goal

This should be a quick discussion. The primary goal is for the class to come to a common understanding of what it means for something to be innovative. That it's not enough for a product to look sleeker than the last version, but that innovation means to really do something better than it's been done before, or to do things that have *never* been done before.

### Computing Innovations

During this activity student groups will research the recent technological innovations related to a chosen topic. Once they have identified a few interesting innovations, they will choose one to analyze in greater depths and report back to the class about.

#### Innovation Research

- **Introduce the topics:** Make sure that students understand the scope of each of the potential topics.
  - Wearable Technology (eg. clothing, jewelry, or accessories with built-in computers)
  - Health and Safety (eg. devices that treat disease, track your health, or protect users from danger)
  - Agriculture (eg. technology to improve the effectiveness, sustainability, or efficiency of farming)
  - Manufacturing (eg. advancements in rapid prototyping, industrial robotics, and the production of goods)
  - Art and Design (eg. interactive art or public installations)
  - Smart Home (eg. devices that allow you to interact with your thermostat, locks, or lights using computers)
- **Explain the research task:** The goal of this research is twofold:
  - First, develop a deeper understanding of your chosen topic. How is computer technology changing this field, what are some of the problems that people are trying to solve with technology?
  - Second, identify a handful of innovative devices within this topic. Students should focus on finding *hardware* devices that demonstrate unique or novel *form factors*. That is to say, computers that don't *look* like computers.
- **Send to Code Studio for resource links:** On Code Studio we have compiled more detailed descriptions of the topics as well as couple of recommended sites to learn more about each topic. Use this as a jumping off point for student research.



## Innovation Research

### 💡 Teaching Tip

Here are some recommended sites for students to start their research. Although these sites are generally appropriate for school, the content within them changes frequently, so **we strongly suggest you check each site for inappropriate content before sharing it with students.**

### Wearable Technology

- **Warable.com**

### Health and Safety

- **Modern Healthcare**
- **Medstart**

### Agriculture

- **National Institute of Food and Agriculture**
- **Farm Industry News**

### Manufacturing

- **Industry Week**
- **3D Printing**

### Art and Design

- **ArtFab**
- **Instructables**

## Smart Home

- **CNet**
- **IoT Evolution**

## An Innovative Solution

Once groups have selected a specific innovative device, they can complete the second page of this activity guide, which asks them to do the following:

- **What Problem Does It Solve?:** For some topics this may be more clear (for example healthcare devices typically have a very specific goal), but for others students may need to think more broadly about what they consider problems. More frivolous wearables or digital art installations may be more concerned with personal expression than solving a specific problem.
- **What Is Innovative About It?:** Encourage students to refer back to the earlier discussion about innovation for this. It can also be useful to compare against other devices found during the research phase.
- **How Do You Interact With It?:** Ask students to think back to the *Input, Output, Storage, Processing* model that was introduced way back in Unit 1. The goal here is to identify specifically the Inputs and Outputs provided by a given device - the more specific these are, the more easily students will be able to connect elements of the Circuit Playground to these devices.
- **How Could You Improve It?:** Feel free to make this as realistic or aspirational as you like. The goal here is just to get students thinking about how they might develop an innovation of their own by using an existing product as a jumping off point.

**Share:** Give groups a minute each to share their findings. See the extension activities for alternate ways to share.

## Wrap Up (5 minutes)

### Journaling

**Journal:** What was the most surprising, cool, or impressive thing that you found in your research? If you could develop an innovation of your own, what would it be?

## Extensions

### Innovation Posters

Ask groups to create a poster that shares the innovate device that they researched. Posters should include:

- Who invented the device
- What problem they were trying to solve
- Why it is unique or innovative
- How users interact with it (specifically, what Inputs does it take and how does it provide Output)

Keep these posters up throughout the unit for students to refer back to as they start to develop physical computing devices of their own.

## Innovation Websites

Instead of (or in addition to) you posters, have students develop websites in Web Lab that include the same required content. Make sure that students include links to their source websites.