

Lesson 3: The Circuit Playground

Overview

In this lesson students get their first opportunity to write programs that use the Circuit Playground. After first inspecting the board visually and hypothesizing possibly functionalities, students move online where they will learn to write applications that control an LED. By combining App Lab screens with the Circuit Playgrounds, students can gradually start to integrate elements of the board as an output device while relying on App Lab for user input.

Purpose

As the first introduction to using the Circuit Playground, this lesson leaves time for students to get comfortable with getting the hardware plugged in. By leveraging students' existing knowledge of event handling in App Lab, we can quickly get an app up and running that shows the potential of physical computing with little more than a single red LED.

Assessment Opportunities

1. Connect and troubleshoot external devices

At the beginning of the online activity, students should connect the boards themselves, using the setup page to troubleshoot common problems.

2. Turn on and off an LED with code

Code Studio: See rubric on bubble 7.

3. Use code to control a physical device

Code Studio: see rubric on bubble 12.

Standards

Full Course Alignment

CSTA K-12 Computer Science Standards (2017)

- ▶ **AP** - Algorithms & Programming
- ▶ **CS** - Computing Systems

Agenda

Warm Up (5 minutes)

Board Inspection

Activity (35 minutes)

Objectives

Students will be able to:

- Connect and troubleshoot external devices
- Turn on and off an LED with code
- Use code to control a physical device

Preparation

- Make sure that student computers have the drivers and software necessary to connect to the Circuit Playground (**details here**)
- Prepare a board and USB cable for each pair of students

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
- **Circuit Playground** - Resource

For the students

- **How Computers Work: Hardware & Software** - Video (**Download**)

Introduced Code

- `led.blink(interval)`
- `led.off`
- `led.on`
- `led.pulse(interval)`
- `led.toggle`

Teaching Guide

Warm Up (5 minutes)

Board Inspection

Distribute: Pass out a board and USB cable to each pair of students. Let students know that they should not yet plug the boards in.

Prompt: Ask pairs to spend one minute looking over the board, focusing on the details. What do you think this board does (or could do) and why?

Share: Have groups share back their thoughts to the whole group, keeping track of ideas on the board. Push students to support their ideas with evidence from reviewing the board, but don't worry about ensuring correctness at this point. As students go through this unit, they can refer back and refine this list.

Activity (35 minutes)

Connecting the Board

Transition: Ask students to plug their boards in and head to **the Maker Toolkit setup page** to confirm that the software has been correctly configured.

✓ Assessment Opportunity ▲

Ensure that all students are able to set up their boards correctly. If they have trouble, encourage them to work with peers to solve the problem with the help of the setup page. Students should be able to read through the page and follow the instructions on their own. If not, walk them through the process, but encourage them to troubleshoot their own boards in subsequent lessons.

Programming on Hardware

Transition: Send students to Code Studio

Questions to Consider with Video:

- What's the difference between hardware and software?
- What does the operating system of a computer do?



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Hardware and Software

Goal: The goal of this discussion is to highlight the difference between hardware and software. Students should understand that hardware is the physical part of the computer, such as the chips and the wires, and the software is the programs that are running on the computer. The operating system of the computer allows all the software on the computer to run at the same time, deciding how the different hardware resources will be shared.



2-7

Using the LED

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7

✓ Assessment Opportunity ▲

Level 7 You can use this level as a formative assessment for students. Click inside the level to view a rubric and leave feedback to your students



8-12

LED Apps

8

9

10

11

12

✓ Assessment Opportunity ▲

Level 12 You can use this level as a formative assessment for students. Click inside the level to view a rubric and leave feedback to your students

Wrap Up (5 minutes)

What's in a Board

Journal: Ask students to reflect on their introduction to the Circuit Playground. What did they think it was at first inspection? How did those expectations change after having programmed on the board?