



## PLTW Engineering

### Computer Science for Innovators and Makers | Unit Outline

*Have you ever wondered how code can be used in wearable tech, art exhibits, or mechanical devices?*

*Students learn about programming for the physical world by blending hardware design and software development. Using microcontrollers with inputs and outputs, they develop code that brings their physical designs to life. It's time to become an innovator and maker using physical computing!*

Computer Science for Innovators and Makers teaches students that programming goes beyond the virtual world into the physical world. Students are challenged to creatively use sensors and actuators to develop systems that interact with their environment. Designing algorithms and using computational thinking practices, they code and upload programs to microcontrollers that perform a variety of authentic tasks. The unit broadens students' understanding of computer science concepts through meaningful applications. Teams select and solve a personally relevant problem related to wearable technology, interactive art, or mechanical devices.

#### **Computer Science for Innovators and Makers Lesson Summary**

Lesson 1	Blink!
Lesson 2	The Ins and Outs
Lesson 3	Program the Physical World

#### **Lesson 1: Blink!**

Students begin to explore the capabilities of physical computing systems with The Digital Dive game, an engaging, live-action activity where students “become” computer parts and transmit commands. They learn to use algorithmic thinking as they prepare to code. Students use block-based coding to create, download, and upload programs to the micro:bit microcontroller. They learn processes and gain skills to debug programs starting with pre-bugged programs. They apply these skills to their own project where they code a blinking message that includes text, images such as emojis, and animation.

#### **Lesson 2: The Ins and Outs**

In this lesson, students explore a variety of sensors and actuators to use as inputs and outputs in physical computing projects. Using different materials to transfer electrical signals, such as conductive thread, alligator clips, conductive paint, and copper tape, students create their own input device—a sensor or switch—to interact with a program they develop on the microcontroller. They use these skills in the lesson's project to design, develop, and program a system to protect safes and secrets.

#### **Lesson 3: Program the Physical World**

Within teams, students become innovators and makers. Teams apply their physical computing knowledge and skills as they design and create one of three problem options:

- A wearable safety device someone might use when completing a physical activity outside at night
- An engaging art installation to help improve a community space
- A useful mechanical dispenser for a person or animal who needs assistance to retrieve an object

Teams collaborate and learn that solving authentic problems involves the unit content knowledge, as well as skills from other disciplines, such as communications, mathematics, and science.