03_Unit 3 Physical Computing

Content Area: **Math**
Course(s):
Time Period: **Cycle**
Length: **7 lessons (22 lesson marking period cycle; 1 of 3 units)**
Status: **Published**

General Overview, Course Description or Course Philosophy

Computer Programming 8

Computer science and design thinking education prepares students to succeed in today's knowledge-based economy by providing equitable and expanded access to high-quality, standards-based computer science and technological design education. During 8th grade, students will focus on the core ideas of computing systems, networks, impacts of computing and data analysis, programming, engineering design, ethics and culture of technology, and the interaction and effects of technology with and on humans and the natural world. They do so by completing three specific units entitled "The Design Process", "Data and Society", and "Physical Computing". These follow a logical sequence and come AFTER the 7th grade units (entitled "Problem Solving and Computing", "Web Development", and "Interactive Animation and Games").

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Unit Summary:

People interact with a wide variety of computing devices that collect, store, analyze, and act upon information in ways that can affect human capabilities both positively and negatively. The physical components (hardware) and instructions (software) that make up a computing system communicate and process information in digital form. Computing devices typically do not operate in isolation. Networks connect computing devices to share information and resources and are an increasingly integral part of computing. Networks and communication systems provide greater connectivity in the computing world.

Essential Question(s):

- How do computers communicate and interact with software and hardware?
- How do computers help collect, store, and analyze data to help human capabilities in the world?
- What role do networks have in sharing information to connect users?

Enduring Understandings:

- The study of human-computer interaction can improve the design of devices and extend the abilities of humans.
- Software and hardware determine a computing system's capability to store and process information. The design or selection of a computing system involves multiple considerations and potential trade-offs.
- Troubleshooting a problem is more effective when knowledge of the specific device along with a systematic process is used to identify the source of a problem.
- Protocols, packets and addressing are the key components for reliable delivery of information across networks.
- The information sent and received across networks can be protected from unauthorized access and modification in a variety of ways.
- The evolution of malware leads to understanding the key security measures and best practices needed to proactively address the threat to digital data.

CONTENT AREA STANDARDS

CS.6-8.8.1.8.CS.1	Recommend improvements to computing devices in order to improve the ways users interact with the devices.
CS.6-8.8.1.8.CS.2	Design a system that combines hardware and software components to process data.
CS.6-8.8.1.8.CS.3	Justify design decisions and explain potential system trade-offs.
CS.6-8.8.1.8.CS.4	Systematically apply troubleshooting strategies to identify and resolve hardware and software problems in computing systems.
CS.6-8.8.1.8.NI.1	Model how information is broken down into smaller pieces, transmitted as addressed packets through multiple devices over networks and the Internet, and reassembled at the destination.
CS.6-8.8.1.8.NI.2	Model the role of protocols in transmitting data across networks and the Internet and how they enable secure and errorless communication.
CS.6-8.8.1.8.NI.3	Explain how network security depends on a combination of hardware, software, and practices that control access to data and systems.
CS.6-8.8.1.8.NI.4	Explain how new security measures have been created in response to key malware events.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

LA.RI.7.10	By the end of the year read and comprehend literary nonfiction at grade level text-complexity or above, with scaffolding as needed.
LA.L.7.1	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
TECH.9.4.2.CT.1	Gather information about an issue, such as climate change, and collaboratively brainstorm ways to solve the problem (e.g., K-2-ETS1-1, 6.3.2.GeoGI.2).
TECH.9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).

STUDENT LEARNING TARGETS

Refer to the 'Declarative Knowledge' and 'Procedural Knowledge sections.

Declarative Knowledge

Students will understand that:

- Anyone can contribute to innovation.

- Hardware and software communication leads to patterns which help understand the needs of users

- Hardware platforms play a critical role in computing.

- Non-traditional computing platforms take input and provide output in ways which cannot be done with the traditional keyboard, mouse, and monitor.

- A rough prototype can lead to a finished product.

Procedural Knowledge

Students will be able to:

- Demonstrate use/knowledge of physical computing to solve problems.

- Develop programs that utilize the same hardware inputs and outputs that we see in many modern smart devices.

- Explain the difference between software and hardware and the interdependent relationship they have in computer programming.

- Identify the role networks have in sharing information to connect users

EVIDENCE OF LEARNING

Refer to the 'Formative Assessments' and 'Summative Assessments' sections.

Formative Assessments

For this unit, formative assessments may include:

- observation
- one-on-one assistance
- questioning skills
- graphic organizers
- anecdotal notes
- exit tickets
- student interviews and check-ins

Summative Assessments

For this unit, summative assessments may include:

- graphic organizers
- homework, when applicable
- mini projects at the end of units
- culminating activities in the code.org units

RESOURCES (Instructional, Supplemental, Intervention Materials)

Code.org Website

All lessons and resources can be accessed via this website.

INTERDISCIPLINARY CONNECTIONS

English/Language Arts - implementation of conventions of Standard English

Technology/Multi-Media - audio/visual media analysis

Math - computations

Visual and Performing Arts- presentations on app lab and website design

Social Studies - ethical codes of components of technology

Science- computer science, physics

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.