UMB CURE Connections (C2)

Robotics Track Syllabus

2020-2021

Developed by: Madeline Nuñez, M. Ed. For the UMB CURE Connections curriculum tracks

This project was supported by the National Institute of General Medical Sciences, the National Institutes of Health (NIH) under Award Number R25GM129875. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

Track Overview

Course Description and Track Rationale:	The C2 Robotics curriculum track provides students with an understanding of how robotics and technology can be used in the field of healthcare, while also equipping them with the skills required for coding, programming, web development, and app development. Scholars will demonstrate the engineering design process and high-level problem solving skills as they develop an app that addresses a health issue in our society for JHU APL's Mobile App Challenge.

Course Learning Objectives

After completing this course, students will able to:

- Develop strategies and processes that can be used to demonstrate effective problem solving.
- Design an app that inputs, outputs, stores, and processes information in order to solve a problem.
- Analyze feedback to improve a computing artifact.
- Develop a personal webpage/digital artifact.
- Create programmatic images, animations, interactive art, and games in Studio Code's Game Lab.
- Prototype technological solutions to a problem both on paper and in Studio Code's App Lab.
- Analyze user feedback to make improvements to a design.
- Explain how different systems are used to represent information in a computer.
- Evaluate collections of data gathered from a computer to solve problems.
- Develop programs that utilize the same hardware inputs and outputs found in modern smart technology.
- Experiment with the Adafruit Circuit Playground to innovate their own design.
- Apply knowledge from learning modules to develop an app that addresses a health concern within their community.

Unit Learning Objectives

UNIT 1 – Problem Solving and Computing

Module 1: The Problem Solving Process – 1 week

After completing this module, students will be able to:

- Develop strategies and processes that can be used to demonstrate effective problem solving.
- Communicate and collaborate with classmates in order to solve a problem.
- Improve a solution to a problem.

- Apply the problem-solving process to approach a variety of problems.
- Assess how well-defined a problem is and use strategies to define the problem more precisely.

Module 2: Computers and Problem Solving – 2 weeks
After completing this module, students will be able to:

- Identify a computer as a machine that works with information.
- Reason about whether particular objects are or are not computers.
- Select the inputs and outputs used to perform common computing tasks.
- Explain the role that input and output take when computers are used to solve information problems.
- Determine which types of processing are appropriate for a particular computing problem.
- Identify guidelines regarding what information should and should not be stored as part of the computing process.
- Use the input-output-storage-processing model to describe a computing process.
- Design an app that inputs, outputs, stores, and processes information in order to solve a problem.
- Analyze feedback to improve a computing artifact.

UNIT 2 – Web Development

Module 3: Creating Webpages – 4 weeks
After completing this module, students will be able to:

- Explain that the HTML allows a programmer to communicate the way content should be structured on a web page.
- Develop a simple HTML document that uses opening and closing tags to structure content.
- Use a structured practice to collaboratively create a digital artifact.
- Understand and justify guidelines for safely publishing information online.
- Explain the differences between HTML and CSS in both use and syntax.
- Explain the purpose of copyright.
- Follow copyright law, accurately attributing others when using their work.
- Create a CSS rule-set for the body element that impacts all elements on the page.
- Create documentation that explains the design decisions of an artifact.
- Develop a personal webpage/digital artifact.

UNIT 3 – Interactive Animations and Games

Module 4: Images and Animations – 5 weeks
After completing this module, students will be able to:

- Communicate how to draw an image in Game Lab, accounting for shape position, color, and order.
- Use a coordinate system to place elements on the screen.

- Sequence code correctly to overlay shapes.
- Use variables in a program to store a piece of information that is used multiple times.
- Create and use a sprite.
- Implement dot notation to update a sprite's properties.
- Use arguments to control how text is displayed on a screen.
- Plan and develop a program.
- Use the draw loop in combination with the randomNumber() command, shapes, and sprites to make simple animations.
- Implement conditionals to react to changes in variables and sprite properties.
- Analyze and respond to a variety of types of user input.
- Apply an iterator pattern to variables or properties in a loop.

UNIT 4 – The Design Process

Module 5: User-Centered Design – 2 weeks

After completing this module, students will be able to:

- Evaluate an object for how well its design meets a given set of needs.
- Identify empathy for the user as an important component of the design process.
- Critique a design through the perspective of a user profile.
- Design improvements to a product based on a user profile.
- Generate multiple strategies for meeting user needs.
- Analyze and select the most appropriate strategies to meet user needs.
- Use a paper prototype to test the design of an app.
- Collect and analyze feedback from user testing with a paper prototype.
- Categorize and prioritize user feedback for an app.
- Improve a screen design based on user feedback.
- Conduct an interview to collect information about user needs.
- Analyze interview notes to identify specific user needs.
- Design the functionality of an app to address the specific needs of a user.
- Identify improvements to an app based on user testing.
- Design the user interface of an app.

UNIT 5 – Data and Society

Module 6: Representing Information – 2 weeks
After completing this module, students will be able to:

- Provide examples of how representing data in different ways can affect its ability to solve different problems.
- Choose the best way to represent some information based on how it will be used.
- Create and use a system for representing information.
- Use the ASCII system to encode and decode text information in binary.
- Create and manipulate binary patterns to represent black and white images.
- Use a binary system to represent numbers.
- Extend a representation system based on patterns.
- Apply a method of encryption to ensure the secure transmission of data.
- Determine the most appropriate coding system for a given piece of information.
- Justify the use of different binary representation systems depending on the information being represented
- Encode and decode information represented in binary numbers and ASCII text.
- Create a generalized representation system for many instances of a complex type of information.

UNIT 6 – Physical Computing

Module 7: Programming with Hardware – 3 weeks
After completing this module, students will be able to:

- Identify computing innovations within a given field.
- Articulate the likely inputs and outputs of a given device.
- Suggest improvements to help a device better solve a specific problem.
- Develop programs that change multiple elements on a single screen instead of changing screens.
- Use code to control a physical device.
- Compare and contrast multiple ways to take input.
- Model different methods for taking user input.
- Develop programs that respond to analog input.
- Represent a sensor value in a variety of ways.
- Develop a program that responds to events from a hardware input.
- Create a function that uses parameters to generalize behavior.
- Design a piece of software that uses hardware for non-traditional input and output.
- Prototype a program that integrates software and hardware.

Module 8: Building Physical Prototypes – 3 weeks

After completing this module, students will be able to:

- Access an element in an array using its index.
- Create and modify and array.
- Produce sequences of notes using a buzzer.
- Modify the exit condition of a for loop to control how many times it repeats.
- Analyze data events to continually update an element's properties.
- Create and debug simple circuits.
- Develop an interactive physical prototype that combines software and hardware.
- Consider the needs of diverse users when designing a product.
- Prototype a physical computing device.
- Implement a plan for developing a piece of software that integrates hardware inputs and outputs.

Module 9: STEM Integrated Track Challenge
After completing this module, students will be able to:

JHU APL MOBILE APP CHALLENGE

Registration Fee: $99

Material Costs: $0

Mobile technology, like smartphones, is changing the way we live. Apps let us watch videos, share pictures, play games, and even order dinner with a phone. Engineers are always looking for ways to help people, and mobile technology has given them a whole new set of tools. In this MESA challenge, teams will use Android Studio to develop an app that can improve people's lives by addressing a health issue in our society.

Theme for 2020–21: Using Mobile Apps to Benefit People: Addressing Health Issues in our Society

Challenge Components: The primary focus of this challenge is the mobile app that students design and create. However, there is much more to this challenge than just writing the code for the app. Teams will submit several items, all designed to show off their hard work, creativity, and approach to designing the app. Each component of the competition allows the team to shine in a different way!

- **Video-Recorded Presentation and Demonstration:** Each team will produce a video-recorded presentation describing their app and their design process. This presentation will provide judges with insight into each team's approach to developing a solution to the challenge. The presentation component is a great way for students to show off their creativity!
- **Electronic Informational Brochure:** Each team will design an electronic brochure about the app they created. Think of the documentation that typically accompanies a tech product.
- **Electronic Display Board:** Using PowerPoint, each team will create an electronic display board to showcase their project.
- **App Design and Code Implementation:** The code files for the app will be submitted in advance of the competition. STEM professionals will evaluate the code as well as the overall design of the app.

Scoring: All entries will be submitted electronically in February. Projects will be scored by teams of APL staff. Results of the competition will be announced during an awards ceremony in March.

Competition rules and requirements will be released to registered teams in October 2020.

Course Schedule

Module / Start Date	Topic	Lessons, Discussions, Activities, and Assignments
Module 1 Starts _____ *(about 1 week)*	Unit 1: Problem Solving and Computing **The Problem Solving Process**	*1.1 – Intro to Problem Solving* • Create a Code Studio account at https://studio.code.org • CSD Pre-Course Survey • Discussion: What makes a good problem solver? • Activity: Building an Aluminum Boat (Goals and Rules, Develop a Plan, Test Your Boat, Evaluate and Improve, Develop New Plan, Test Your Boat, Reflect) • Discussion Post 1.1 – Reflecting on Aluminum Boat Challenges *1.2 - The Problem Solving Process* • Problems Brainstorming • Video: The Problem Solving Process (on Code Studio) • Problem Solving Posters • Discussion Post 1.2: "You Are Solving the Wrong Problem" Article *1.3 – Exploring Problem Solving* • Silliest Problem Warm-Up • Activity 1: Tangrams • Activity 2: Choose a Pet • Activity 3: Plan a Pet Adoption • Discussion 1.3 – How can we apply the problem solving process to many different kinds of problems?

Module 2 Starts _____ *(about 2 weeks)*	Unit 1: Problem Solving and Computing **Computers and Problem Solving**	*1.4 – What is a Computer?* • Journal Prompt: Computers Now and Then • Activity: Computer or Not? Posters • Poster Presentations • Discussion 1.4 – What is a computer? *1.5 – Input and Output* • Recommending a Pet Warm-Up (Journal Prompt) • Vocab: *Input and Output* • Activity: Inputs and Outputs • Code Studio App: Pet Chooser • Code Studio App: Story Creator • Student Apps • Improved Pet App • Discussion Post 1.5 – How do computers use input and output to get and give the information that they need to solve problems? *1.6 – Processing* • Warm-Up: Analyzing an App (Birthday App) • Teacher Demonstrations: “National Park” app and “How Many Countries…” app • Vocab: *Processing* • Activity: Types of Processing • Student App ideas • Discussion Post 1.6 – We saw four different types of processing today, but there are many more. What’s another type of processing that you think would be useful? What kind of app might use it? *1.7 – Storage* • Warm Up: Analyzing an App (Outfit Picker) • Vocab: *Storage* • Activity: Apps with Storage (Outfit Picker, Friend Finder, Choose a Kid’s Movie) • Introducing the IOSP Model • Discussion Post 1.7 – Think of an app you would like to make. What information would it store? *1.8 – Project: Propose an App*

Module / Start Date	Topic	Lessons, Discussions, Activities, and Assignments
		• Warm Up: Introduce the Project • Activity 1: Project Guide • Activity 2: Presenting Apps • Discussion Post 1.8 – How can the IOSP model help us to design an app that solves a problem? JHU APL Mobile App Challenge – • Introduction to the challenge. • Students begin to brainstorm ideas of potential health issues in society. • Students can use this time to research health concerns specific to Baltimore City. • When proposing an app, students will make suggestions about apps that could support the health within their community.

Module 3 Starts _____ *(about 4 weeks)*	Unit 2: Web Development	*2.1 – Exploring Web Pages* • Warm Up: Journal Discussion – What do you want to say to the world? • Activity: Personal Web Pages/Exploring Websites • Discussion Post 2.1 – Why do people create web pages? Journal Problem *2.2 – Intro to HTML* • Warm Up: The Need for HTML • Vocab: *Website content, website structure* • Activity: Exploring HTML • Discussion Post 2.2 – In your own words, how does HTML help solve the problem of telling a computer what a web page looks like, not just what content is on it? *2.3 – Headings* • Warm Up: Tags Poster and prompt • Vocab: *Heading* • Activity: Pair Programming • Discussion Post 2.3 – How can we work together to fix problems with our website? *2.4 – Mini-Project: HTML Web Page* • Warm Up: Journal Prompt – What is one personal value you would like to share with the world? • Activity/Project: Define, Prepare, Try, Reflect, Peer Feedback • Discussion Post 2.4 – What's one thing that would make your web page better that you don't know how to do yet? *2.5 – Digital Footprint* • Warm Up: Your Digital Footprint • Vocab: *Digital footprint* • Activity: Investigating Social Profiles • Discussion Post 2.5 – Come up with a checklist that you can use to determine what should, and shouldn't, be posted online. *2.6 – Styling Text with CSS* • Warm Up: Journal – HTML Appearance • Vocab: *CSS, CSS Selector* • Activity: Web Lab – Introduction to CSS • Discussion Post 2.6 - How can we change the style of text on a webpage?

		2.7 – Mini Project: Your Personal Style • Warm Up: Journal • Activity/Project: Define, Prepare, Try, Reflect, Peer Feedback • Discussion Post 2.7 – How can you express your personal style on a webpage? *2.8 – Intellectual Property* • Warm Up: Use of Your Work • Vocab: *Copyright* • Activity: The Creative Commons Solution • Discussion Post 2.8 – Think about some of the photos, drawings, and written work that you have created in the past, or even the website that you will create in this course. Without a clear license, all of those things are covered under the full restrictive copyright. Which Creative Commons license would you rather use and why? *2.9 – Using Images* • Warm Up: Using Images • Activity: Adding Images • Discussion Post 2.9 – How can we add images on our websites, while making sure we respect everyone's rights? *2.10 – Websites for Expression* • Warm Up: Express Yourself • Activity: Problem-Solving Process Review (brainstorming content, personal website planning guide, view personal web page examples) • Discussion Post 2.10 – List 3 reasons why your website will be special and personal to you. *2.11 – Styling Elements with CSS* • Warm Up: What Styles Do You Want? • Activity: Web Lab – Styling Elements with CSS • Discussion Post 2.11 – How can you use these new styles in your personal web page? *2.12 – Your Web Page: Prepare* • Warm Up: Journal Prompt • Activity: Describe Your Page, Describe Your Style, Find Your Images • Discussion Post 2.12 – Explain two ways that your plan will make your personal web page successful. *2.13 – Project: Personal Web Page*

Module / Start Date	Topic	Lessons, Discussions, Activities, and Assignments
		• Warm Up: Debugging 3-2-1 • Activity: Personal Websites • Peer Review • Discussion Post 2.13 – How did you use the problem-solving process in creating your site? What other skills and practices were helpful as you made your web page?

Module 4 Starts _____ *(about 5 weeks)*	Images and Animations	*3.1 – Programming for Entertainment* • Warm Up: The Entertainment Problem • Activity 1: CS in Entertainment • Activity 2: Researching Your Topic • Activity 3: Research Notes • Activity 4: Exploring Games with Game Lab • Discussion Post 3.1 – Based on what you saw today, both in your research and the example apps, what kind of programs are you most interested in learning to create? *3.2 – Plotting Shapes* • Warm Up: Communicating Drawing Information • Activity: Drawing with a Computer • Discussion Post 3.2 – What things were important in communicating about position, color, and order of the shapes in this activity? What's a way you have seen similar problems solved in the past? *3.3 – Drawing in Game Lab* • Warm Up: Programming Images • Activity 1: Simple Drawing in Game Lab • Activity 2: Share Drawings • Discussion Post 3.3 – What type of advice would you share with a friend who was going to learn about drawing in Game Lab to make it easier for them? *3.4 – Shapes and Parameters* • Warm Up: Shapes of Different Sizes • Vocab: *Parameter* • Activity: Programming with Parameters • Discussion Post 3.4 – You can use parameters to control your shape's location and size. Can you think of any other situations in which parameters might be useful? *3.5 – Variables* • Warm Up: Input-Output-Storage-Processing • Vocab: *Variable* • Activity: Programming with Variables • Discussion Post 3.5 – What is your own definition of a variable? Why are variables useful in programs?

		3.6 – Random Numbers • Warm Up: Journal Prompt • Activity: Programming Images • Discussion Post 3.6 – So far, we've only looked at random numbers. Are there any other things that you might like to be random in your program? *3.7 – Sprites* • Warm Up: How Much Information • Vocab: *Sprite, property, dot notation* • Activity: Introduction to Sprites • Discussion Post 3.7 – So far we've been able to change a sprite's location and image. What else might you want to change about your sprites? *3.8 – Sprite Properties* • Warm Up: Journal Prompt • Activity: Sprite Properties • Discussion Post 3.8 – What is one way sprite properties are the same as variables? What's one way that sprite properties are different from variables? *3.9 – Text* • Warm Up: Cartoon Journal Prompt • Activity: Using text to improve scenes and animations • Discussion Post 3.9 – You've drawn with both text and shapes on the screen. What are two ways drawing with text is similar to drawing shapes? What is one way drawing with text is different from drawing with shapes? *3.10 – Mini-Project: Captioned Screens* • Warm Up: Block Review • Activity: Coded Classmate Pictures, Gallery Walk • Discussion Post 3.10 – What was one especially creative way you saw someone else use blocks today? *3.11 – The Draw Loop* • Warm Up: Flipbook Example • Activity: Draw Loop Challenges • Discussion Post 3.11 – How does the draw loop help us to make animations?

		3.12 – Sprite Movement • Warm Up: Reviewing Sprite Properties • Activity: Levels – Sprites and Images • Discussion Post 3.12 – You've seen two ways to create animations with the draw loop: random numbers and the counter pattern. What is one type of movement that you'd want to use random numbers for? What is one type of movement that you would want to use the counter pattern for? Are there any movements that might combine the counter pattern and random numbers? *3.13 – Mini-Project: Animation* • Warm Up: Review • Activity 1: Building an Animated Scene • Activity 2: Peer Gallery Walk • Discussion Post 3.13 – What was one interesting way that you saw sprite movement used in this lesson? *3.14 – Conditionals* • Warm Up: Introduction Conditionals • Vocab: *Condition, conditionals, Boolean Expression* • Activity: Conditionals • Discussion Post 3.14 – Now that you know how conditionals work, where do you think that they are used in games or other programs and apps that you already use? *3.15 – Keyboard Input* • Warm Up: Taking Input • Activity: Keyboard Input • Discussion Post 3.15 – Think back to all of the programs you've written so far; how might you use user interactions to improve one of your programs from past lessons? What condition would you check, and how would you respond to it? *3.16 – Mouse Input* • Warm Up: 3-2-1 Review • Activity: If/Else and More Input • Discussion Post 3.16 – You now have many different ways to detect user input. Choose three different user input commands and think of an example of when you might use them. *3.17 – Project: Interactive Card* • Warm Up: Journal Prompt

Module / Start Date	Topic	Lessons, Discussions, Activities, and Assignments
		• Activity 1: Demo Project Exemplars • Activity 2: Unplugged – Interactive Card Planning • Activity 3: Levels – Implementing Interactive Card (Level 3-7) • Activity 4: Peer Review • Activity 5: Iterate – Update Code • Activity 6: Reflect • Discussion Post 3.17 - Reflect on your development of the five practices of CS Discoveries (Problem Solving, Persistence, Creativity, Collaboration, Communication). Choose one of the five practices which you demonstrated growth in during this lesson. Write something you did that showed this practice.

Module 5 Starts _____ *(about 2 weeks)*	User-Centered Design	*4.1 – Analysis of Design* • Warm Up: What does it mean to empathize? How might the concept of empathizing in a problem-solving process be different from in other places you've heard of empathy? • Activity 1: Who Was this Designed For? • Activity 2: Discussing Design Choices • Discussion Post 4.1 – Pick one or two of the objects you analyzed in this lesson. What could you change to make this object more usable for you? • *Extension Activities:* Exploring Everyday Things; Poorly Designed Products *4.2 – Understanding Your User* • Warm Up: Usability vs Aesthetics; Who Am I? • Activity 1: Looking Through a User's Eyes • Activity 2: Responding to Products • Activity 3: Find a Seat • Discussion Post 4.2 - Paste or copy your designed object into your journal. Take 1-2 minutes to write about what was easy and what was difficult for you to empathize with your user about. *4.3 – User-Centered Design Micro-Activity* • Warm Up: Designing for Others • Activity: User-Centered Design (Define, Prepare, Try, Reflect) • Discussion Post 4.3 – Based on this lesson's activities, what challenges do you foresee in designing software for others? *4.4 – User Interfaces* • Warm Up: What is an App? • Activity 1: Reading and Using a Paper Prototype • Activity 2: Prototype Debrief • Discussion Post 4.4 – What user need does this app address well? What user need could this app do a better job of addressing? *4.5 – Feedback and Testing* • Warm Up: Journal Prompt • Activity 1: Making Sense of User Feedback • Activity 2: Responding to Feedback

Module / Start Date	Topic	Lessons, Discussions, Activities, and Assignments
		• Discussion 4.5 – Students will share the screen that they have updated. Each students will describe the category of needs they chose to address, different ways they considered to address those needs, and changes to the user interface and user experience they designed to address those needs. *4.6 – Identifying User Needs* • Warm Up: Personal Goal • Activity 1: Listening to Users • Activity 2: Brainstorming Solutions • Discussion Post 4.6 – Project Preparation *4.7 – Project: Paper Prototype* • Warm Up: What Makes a Good User Interface • Activity 1: Getting Started • Activity 2: Paper Prototyping • Activity 3: Prototype Testing • Discussion Post 4.7 – Project Reflection

Module 6 Starts _____ *(about 2 weeks)*	Representing Information	*5.1 – Representation Matters* • Warm Up: What is data? How do you use data in your life? How can data help you solve problems? • Activity: Four People Representations • Discussion Post 5.1 - Today, you saw four different ways of representing a meal, and how those different representations were useful for solving different problems. Why were some representations more useful than others? If you were to create a way of representing a meal, what would be the most important things for you to think about? *5.2 – Patterns and Representation* • Warm Up: Systems to Answer Yes-No Questions • Vocab: *Encode, decode* • Activity: Representing the Alphabet • Discussion Post 5.2 – What was the same and what was different about the different sets of rules you saw? Are there some things that every group needed to account for to complete the challenge? *5.3 – ASCII and Binary Representation* • Warm Up: Review Binary Cards Activity • Activity: Using ASCII • Vocab: *Bit* • Discussion Post 5.3 – What symbols did you use for your binary system? Why do you think that we sometimes hear people say computer science is "0's and 1's"? Does it need to be 0's and 1's? *5.4 – Representing Images* • Warm Up: Journal Prompt • Vocab: *Pixel* • Activity: Pixelation Widget • Discussion Post 5.4 - Think about the ASCII system we learned yesterday and the image representation system we learned today. How are both examples of breaking down big problems into small ones that we are able to solve? What information BESIDES the 0s and 1s do you need in order to decode a binary message? *5.5 – Representing Numbers* • Warm Up: Journal Prompt • Activity: Using the Pattern (Binary Cards) • Discussion Post 5.5 - So far, we've looked at how we could represent text, images, and numbers in binary. What are three ways that the binary representation systems are all the same? What are two

Module / Start Date	Topic	Lessons, Discussions, Activities, and Assignments
		things that are special about the way we represent numbers in binary? What is one challenge in representing information on a computer? *5.6 – Keeping Data Secret* • Warm Up: Binary String Decoding • Vocab: *Encrypt, decrypt* • Activity 1: Encoding and Decoding • Activity 2: Encryption and Decryption • Activity 3: Encrypt Your Own Message • Activity 4: Reflection • Discussion Post 5.6 - When people communicate on the Internet, they cannot rely on physical security to keep their keys safe. Try to think of a way that they could still communicate securely, even if someone could read everything that they sent. *5.7 – Combining Representations* • Warm Up: Journal Prompt • Activity: Student Record • Discussion Post 5.7 – Which type of information (number, character, image) did you find most useful? What made it so useful? *5.8 – Create a Representation* • Warm Up: Representation Systems Review • Activity: Project – Create a Representation • Discussion Post 5.8 – If you had been given another byte of information (another line on the punch card), how would you have wanted to use it? If you could move one byte from one category (numbers, images, characters) to another, which would you switch?

Module 7 Starts _____ *(about 3 weeks)*	Programming with Hardware	*6.1 – Innovations in Computing* • Warm Up: Get Inspired • Activity: Innovation Research (medical technology focus) • Discussion Post 6.1 - 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? • *Extension:* Innovation Posters *6.2 – Designing Screens with Code* • Warm Up: UI Element Properties Refresher • Activity: Designing with setProperty() • Discussion Post 6.2 - Think back to the app you prototyped in Unit 4. Knowing what you know about using setProperty() to change UI elements, how might you change your app prototype? *6.3 – The Circuit Playground* • Warm Up: Board Inspection • Activity 1: Connecting the Board • Activity 2: Programming on Hardware • Discussion Post 6.3 - 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? *6.4 – Input Unplugged* • Warm Up: Comparing Input Methods • Activity 1: Input Unplugged • Activity 2: Debrief • Discussion Post 6.4 – What's the difference between the way that Game Lab and App Lab handle inputs? *6.5 – Board Events* • Warm Up: Board Inspection – Inputs • Activity: Taking Input from the Board • Discussion Post 6.5 – What are three types of board events you have seen so far? Describe two different situations and how they would need to different events. *6.6 – Getting Properties* • Warm Up: What information can we get from our board?

Module / Start Date	Topic	Lessons, Discussions, Activities, and Assignments
		• Activity: getProperty, Event Types • Discussion Post 6.6 - So far, you've seen several different types of input, some from the screen, and some from the circuit playground. Choose one type of input and answer the following questions about it. What code do you need to get information from this input? What's one example of when you would want to use this input? What's an example of when you wouldn't want to use this input? *6.7 – Analog Input* • Warm Up: Analog and Digital • Activity: Analog Inputs • Discussion Post 6.7 - Considering all of the computing devices that you interact with on a regular basis, identify as many potential analog sensors as you can. Where do your computing devices take a continuously changing signal and convert it into digital data? *6.8 – The Program Design Process* • Warm Up: Play Emoji Race; Stop: Review Project Guide • Activity: Implement Project Guide • Discussion Post 6.8 – Make it Your Own *6.9 – Project: Make a Game* • Warm Up: Demo Project Exemplars • Activity: Unplugged – Program Planning • Activity: Prototyping the Program • Discussion Post: Project Self-Assessment

Module 8 Starts _____ *(about 3 weeks)*	Building Physical Prototypes	*6.10 – Arrays and Color LEDs* • Warm Up: What is a List? • Vocab: *Arrays, LEDs* • Activity: Arrays and Color LEDs • Discussion Post 6.10 - You have now seen both objects, such as the Sprite object, and arrays. How is an array different from the attributes of an object? When would you use an array? When would you use an object? *6.11 – Making Music* • Warm Up: Color LEDs vs the Buzzer • Activity: Making Music • Discussion Post 6.11 - Instead of just choosing one element from an array, we used the *playNotes* block to do something to every element. Think back to the other arrays you have seen. How might doing something to every element in an array be useful there? *6.12 – Arrays and For Loops* • Warm Up: Run Code on All Elements of an Array • Vocab: *For Loops* • Activity: Arrays and For Loops • Discussion Post 6.12 - Have students reflect on their development of the five practices of CS Discoveries (Problem Solving, Persistence, Creativity, Collaboration, Communication). Choose one of the five practices in which you believe you demonstrated growth in this lesson. Write something you did that exemplified this practice. Choose one practice you think you can continue to grow in. What's one thing you'd like to do better? Choose one practice you thought was especially important for the activity we completed today. What made it so important? *6.13 – Accelerometer* • Warm Up: What Makes a Sensor • Activity: Accelerometer • Discussion Post: What are some uses for pitch and roll in an everyday app? *6.14 – Functions with Parameters* • Warm Up: Journal Prompt • Activity: Functions with Parameters

Module / Start Date	Topic	Lessons, Discussions, Activities, and Assignments
		• Discussion Post 6.14 - Think back to some of the programs that you have made before. What are two times that you could have used functions with parameters? What would the parameter be? How should the function's behavior change when the parameter changes? *6.15 – Circuits and Physical Prototypes* • Warm Up: Designing a Physical Device • Activity 1: Introducing a Smart Bike • Activity 2: Building the Prototype • Activity 3: Adding Inputs • Discussion Post 6.15 – Design Reflection *6.16 – Project: Prototype an Innovation (medical technology focus)* • Warm Up: Review Project Guide • Activity: Prototype and Innovation (Scope innovation, complete Project Guide, develop prototypes, peer review, revise prototypes) • Discussion Post 6.16 – Project Reflections • *Extensions:* Pitch Video, Marketing Website, Crowdfunding Campaign