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ASU Micro bit Project Prototype User Guide

Verizon Innovative Learning Lab Program
Smart Solutions
Lesson Facilitator Guide:
Micro: bit Project: Prototype

Contents

Overview

This lesson should take 2-3 class periods, or about 100-150 minutes to complete. In this lesson, students will use Micro: bits and Make Code to create a prototype of their wearable.
Note: Students will all be working on their prototypes during this lesson, regardless of project choice.
Lesson objectives
Students will be able to:

- Write a Make Code program for your Micro: bit prototype.

- Build a prototype using the materials you listed in your budget.

Materials

To complete this Lesson, students will need:

- A laptop or tablet
- Access to **Make Code**
- Access to your budget and final sketch from Lesson 3
- 1 BBC Micro: bit
- 1 micro-USB cable
- Prototyping materials (you will have to "buy" them with your budget)

Standards

- **Common Core State Standards (CCSS) – ELA Anchors** : L.6
- **Common Core State Standards (CCSS) – Mathematical Practice:** 2
- **Next Generation Science Standards (NGSS)** – Science and Engineering Practices: 1, 6
- **International Society for Technology in Education (ISTE)**: 1, 3, 4
- **National Content Standards for Entrepreneurship Education (NCEE)** : 1, 5

Key Vocabulary.

- Prototype: Simple, quick-made models used to test out an idea

Before you begin

- Students will all be completing similar tasks in this lesson, but their prototypes will be different depending on their user. Familiarize yourself with all three projects!
- Review the "Lesson 4: Prototype" presentations, rubric, and/or lesson modules. Note that the presentation and module is the same for all three projects.
- Ensure students have access to their sketches and budgets from the previous lesson.
- Facilitation Tip: Set up a "shop" in your classroom with all the prototyping materials. Students must present their completed budgets to purchase items from the shop! This teaches planning, budgeting, and material management. It also pushes students to finish their plan before they start building.

Lesson Procedures

Welcome and Introductions (2 mins)
Welcome students to class. Use the included presentations, or direct students to the self-guided SCORM module if you chose to post it on your Learning Management System.
In this lesson, students will create functional prototypes of their Micro: bits wearables by using Make Code. It will likely take multiple class periods of work time to accomplish this!
Warm-up, Projects A, B, and C (2 mins each)
The warm-up question is identical for all three projects. Allow students time to answer the question on their own, then discuss it as a class.
Warm up: The Image below is an example of a micro: bit prototype. In this case, a student designed a duct-tape watch. Here is how they describe the watch: "When you press the "A" button, the current time appears." The prototype is very good, but it is missing something…

○ The prototype only has one input (the "A" button). It should have two inputs!

○ The prototype is not perfect and does not look like a watch.

○ The battery pack is too bulky.

After reviewing the warm-up question, review the lesson objectives and materials as a class.

Review your Project Requirements (5 minutes)

In this section, students will quickly review their project requirements. Based on their project choice, students will be creating one of nine different possible items. Regardless of project choice, each student will need to: Choose a user and create an empathy map and problem statement.

- Brainstorm ideas for your product and put together a budget for your prototype.

- Use Micro: bits to build a prototype (rough model) of your wearable. Your Micro: bit prototype must include at last two inputs and one output.

- Create a logo and advertisement for your product to present to other students.

- Turn in a photo or video of your project with completed reflection questions and a link to your project's Make Code. It may also be a good time to print out and review the rubric with your students. Feel free to make any changes this rubric as you fit.

Programming: Write your Make Code! (50-100 Minutes)

Students will spend this section writing the program for their Micro: bit in Make Code. It's important for them to get their code working correctly before adding any physical prototyping features!

Review the following steps and resources with students:

The first step in your Micro: bit prototype is to program your Make Code. Go to the **Make Code Homepage** and click on "New Project"

- Program your Micro: bit to solve your user's problem

- Remember to use at least two inputs and one output.

- Upload your code to your Micro: bit and test it out! Don't worry if it doesn't work on the first try.

- When you are done, make sure to click "share" and keep the link to your Make Code in a safe place. You will turn this in at the end of the project. Don't know where to start? Look at the examples below for help!

a Buttons: Buttons are a very simple and easy to code input. **Learn how to program them here**.

b Shake Sensor: The shake sensor, or accelerometer, is great for detecting vibrations, collisions, and steps. **See how to program a step counter here!**

c Pins: Pins are an awesome input. You can touch the pins themselves, or wire them to a conductor like aluminum foil to detect human touch! **Learn more here.**

d Light Sensor: Need to detect brightness and sunlight? The light sensor is your input! **Lear how to program a dark-activated night light here.**

e Temperature Sensor: Do you need to alert someone if it's too hot, too cold, or just right? Then the temperature sensor is a great input. **Here is a tutorial on how to program a thermometer.**

f Compass: Do you need to find out a direction, or detect a change of direction? The compass is an input that can do both of those things **Learn how to program a simple compass here.**

g LEDs: The LEDs are your main output. You can show pictures, numbers, and information! **Review how to program the LEDs here.**

h Sound: Sound is a great output for the Micro: bit. You'll have to wire your Micro: bit to headphones or a speaker. **Learn how to send sound here.**

i Radio: The radio works as both an input AND output. You will need to two Micro: bits to use this function. **Learn how to send and receive secret messages with the radio here**.

Build Your Prototype! (50-100 mins)

Now students will use their prototyping materials to construct their wearables. Explain the following process to students:

1. **Buy Your Materials:**

   a. Use your budget to purchase prototyping materials. Remember: you only have 100 Vil Coins to spend, so purchase wisely!

   b. If you are using the pins or sound inputs, you may need to purchase alligator clips.

2. **Build Your Prototype:**

   a. Measure, cut, and glue! Use your prototyping materials to turn your Micro: bit into a wearable.

   Here are some helpful tutorials to give you some ideas:

   i. **How to make a duct tape wallet with Micro: bit**

   ii. **Make a watch with Micro: bit**

   iii. **How to make a "smart bracelet"**

   iv. **Make a necklace name badge**

3. **Test and Modify:** Test out your prototype. Can you wear it? Does the code work how you want it to? Spend some time "tweaking" your design to get it just right.

Wrap up, deliverable, and Assessment (5 mins)

- **Wrap up:** If time permits, review the rubric as a class and allow students to double check that their prototypes are meeting the requirements.

- **Deliverable:** There is no deliverable for this lesson. Students will submit their projects in the following lesson along with reflection questions.

- **Assessment:** There is no quiz or assessment for this lesson. However, if time allows, having students reflect on the lesson can increase depth of knowledge. Some possible reflection questions: What was the most challenging part of this lesson? Why? Did it help to make a sketch and budget before creating your Micro: bits prototype? Explain.

Differentiation

- **Additional Support #1:** If students are working on the same project choice, allow them to share and compare their features lists before beginning the prototyping process.

- **Additional Support #2:** Pair students with strong computer skills with students who need additional support. Encourage the strong student to guide and teach rather than do.
- **Extension:** Could students create a second version of their wearable? Perhaps a "deluxe" version that has even more bells and whistles than the first version!

Documents / Resources

Verizon Innovative Learning Lab Program **Smart Solutions** Lesson Facilitator Guide: Micro:bit Project: Prototype verizon✓ ASU	**ASU Micro bit Project Prototype** [pdf] User Guide Micro bit Project Prototype, Micro bit, Project Prototype, Prototype

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