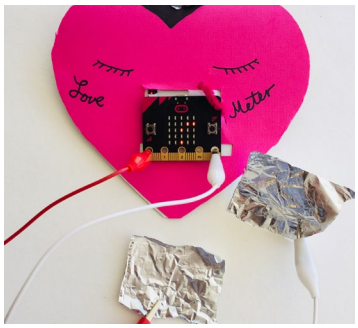
WEEK 4 DAY 1: UI/UX OF MICRO:BIT GAMES



INTRODUCTION

In this session, makers learn how to design and code new ways of interacting with the Micro:bit microcontroller.

ESSENTIAL QUESTIONS

- How can we design a fun, interactive game experience?
- How do artists, engineers, and makers solve problems when they're working?

LEARNING OUTCOMES

1. Learn how to code the external pins on the Micro:bit and work with conductive materials.
2. Explore how design and user interface influence how successful or fun a game is.
3. Engage in project-based learning through problem-solving and troubleshooting by creating a game with a Micro:bit and code.

VOCABULARY

User: People playing/interacting with the game

User interface (UI): Physical and digital "interface" of a game or device

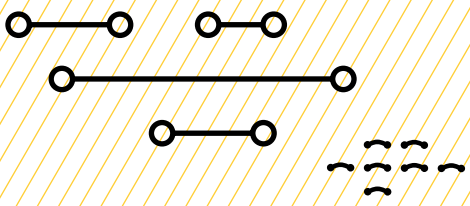
User experience (UX): How natural and enjoyable a game or device is to use

Switch: Device for making and breaking the connection in an electric circuit

Buttons: Device for making and breaking the connection in a circuit, similar to a switch but can be either momentary or can lock into place

Remix: To reuse but make changes to

Conductive materials: Materials that allow electricity to flow through them



MATERIALS LIST

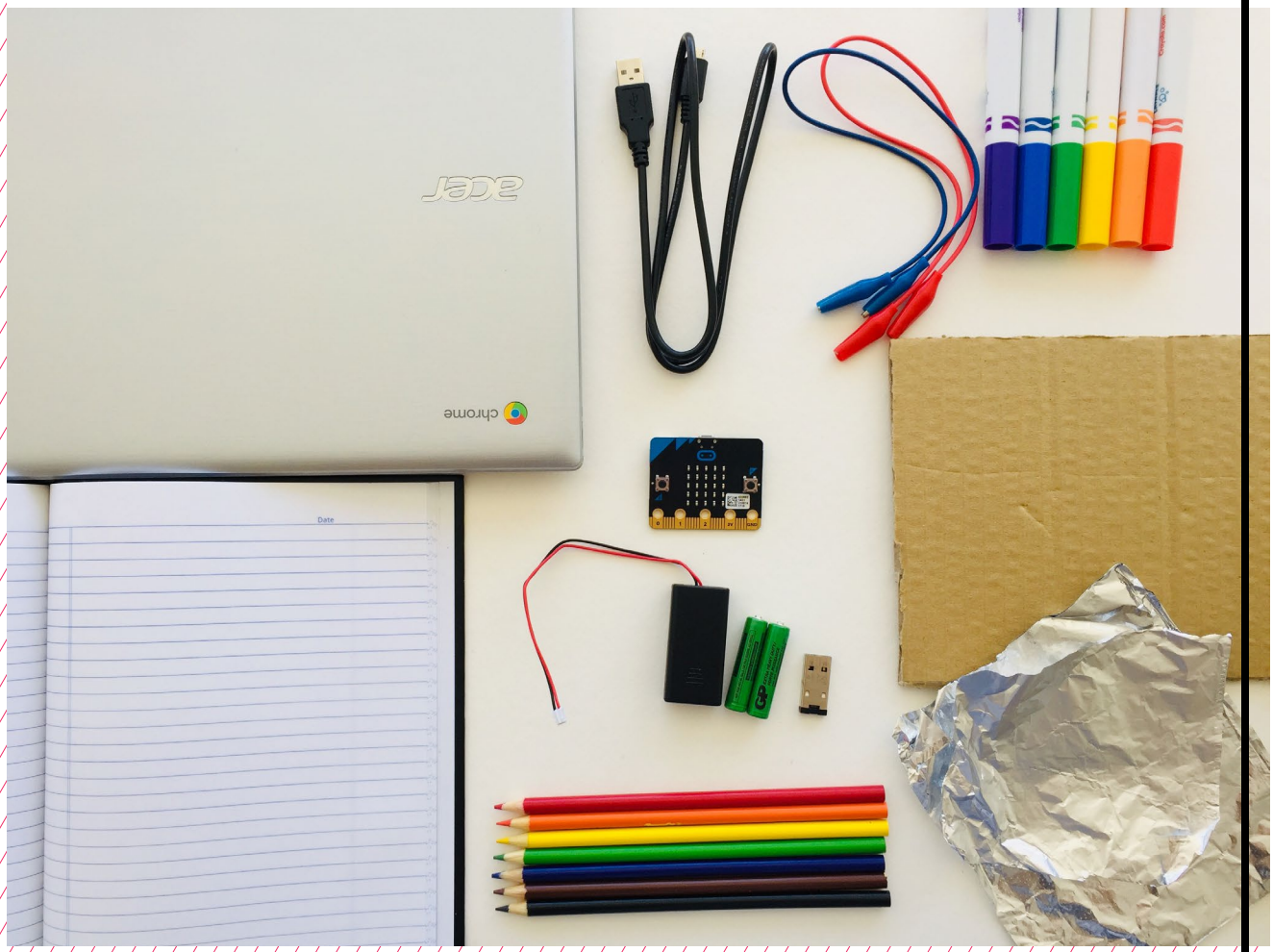
EACH PAIR OF MAKERS NEEDS:

- Micro:bit microcontroller
- Laptop with internet connection
- USB to micro-USB cord
- USB flash drive
- Alligator clips (2)
- Notebook

ALL MAKERS NEED ACCESS TO:

- Cardboard
- Aluminum foil
- Markers
- Colored pencils

Items can be portioned out per table or set up in an area where students can access them freely.



TEACHER PREP WORK

1. Ensure the internet connection is working and connect your laptop to a projector or screen.
2. Preload videos and slideshow to save time.
3. Code the Love Meter game and upload it to a Micro:bit as an example.
4. Arrange maker materials: aluminum foil, alligator clips, cardboard, and markers.
5. Print the **Troubleshooting Tips** at the end of the lesson and post in the classroom.

FACILITATION TIPS

Electronics: Tinkering with electrical connections can be a bit tricky and may not work when things aren't securely connected. If students get frustrated, encourage them to check their connections, check the troubleshooting guide, ask a classmate for help, and take breaks.

Inspiring creativity: Take note and celebrate surprising discoveries. Give makers opportunities to share the cool things they figure out with the rest of the class.

Collaboration: Let smaller issues work themselves out. Record specific positive examples that you can share with makers in the moment or at the end of the project. These examples provide models for all learners.

Frustration: When frustration levels aren't high, let learners figure it out or keep facilitation low touch by asking a question and walking away. When frustration levels are high, intervene more directly to help makers find some success.

Circulate among the makers and monitor for both collaboration and frustration.

ADDITIONAL RESOURCES

How Do Game Controllers Work?

BBC Micro:bit Love Meter

About Buttons

UI/UX OF MICRO:BIT GAMES

STEP 1 (10 MINUTES)

Introduce user interface/ user experience (UI/UX).

Ask makers:

- How many of you have used a game controller to play a video game?
- What are some of the game controllers/games you've played?

EXPLAIN

Did you know that designing a game experience (both the game itself and the controller) is a job? **User interface (UI)/user experience (UX)** designers and engineers are people who get paid to design and code ways in which **users** interact with games.

One of the coolest features of the Micro:bit is that you can connect alligator clips or other **conductive materials** to change the UI and UX.

In this next activity, we'll experiment with various ways to change the UI/UX of some simple games.

Either on a projector or shared slideshow, show this **video**, which explains how game controllers use circuits to control how the player interacts with the game software.

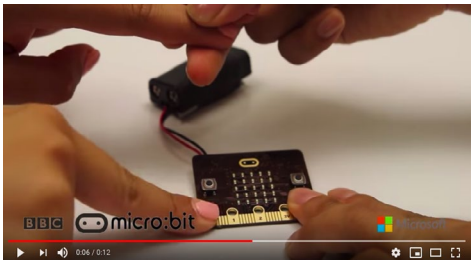
"**How Do Game Controllers Work?**" on YouTube, uploaded by Fun Kids Learn, 1/3/2017

After watching, ask makers to answer the following in their journals and then share out loud:

- What do all **buttons** have in common? *(A: They're* **switches***.)*
- How does the computer know what to do when a button is pressed? *(A: The code is activated by the button.)*

STEP 2 (5 MINUTES)

Introduce how to program the Love Meter game.



"**BBC: Micro:bit Love Meter"** on YouTube, uploaded by Touch Develop, 11/11/2015

EXPLAIN

Now that we know game controllers use switches, we'll code a simple game called Love Meter and add a switch to it.

Note: There's a guided tutorial for the Love Meter game on the MakeCode website.

Ask for two volunteers to play the game that you prepared as an example, or show this video if unable to prepare the example:

- Instruct one person to touch Pin 0 (zero) and the other to touch GND.
- Next, instruct them to touch hands.
- The LED display should read "Love Meter" and display a number.

EXPLAIN

This game works because the contacts on the Micro:bit and our skin are both conductive. When one person touches the metallic area under Pin 0 and another person touches GND, they become part of the circuit. When they touch each other's skin, this acts like a switch—just like the switch mentioned in the video. Now it's your turn to code the Love Meter game.

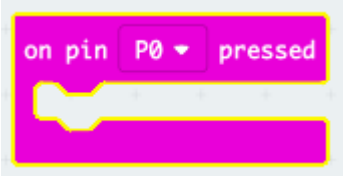
STEP 3 20 MINUTES

Program and remix the Love Meter game.

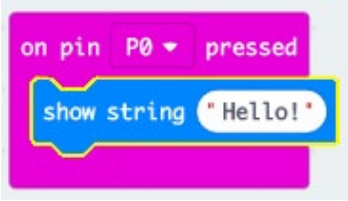
Next, makers will code and **remix** the Love Meter game to create their own version of the game.

DEMONSTRATE AND HAVE MAKERS FOLLOW ALONG:

1. Drag over an **on pin P0 pressed** block from the **Input** menu.

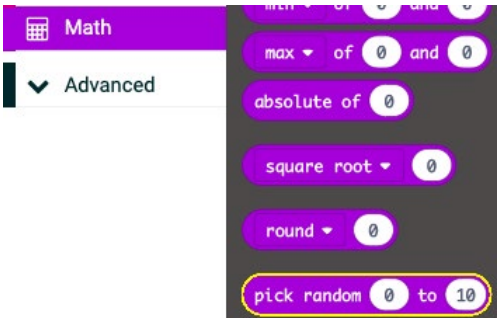


2. Drag over a **show string** block from the **Basic** menu. Type in "Love Meter" where it says "Hello".



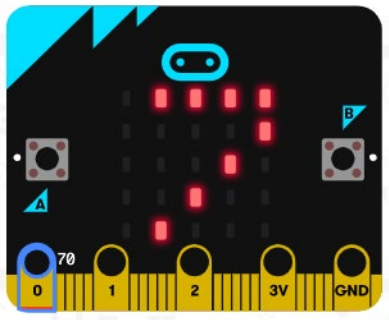
3. Drag over a **show number** block from the **Basic** menu.

4. Drag over a **pick random** block from the **Math** menu and put it into the oval in the **show number** block.



5. Change the values to be **pick random 0 to 100**.

6. Test the code in the simulator by clicking on **Pin 0.** The words "Love Meter" should scroll across the screen followed by a number between 0–100.



7. Once the code works, makers will save and upload the code to their Micro:bit and connect to their battery pack.

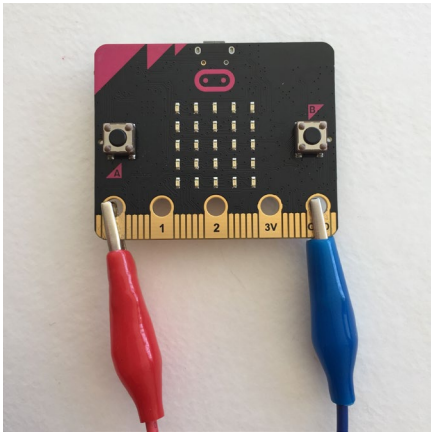
Note: If makers have extra time, they can edit the code to display different text and animations. Everyone should include **Pin 0**, **display**, **show number**, and **pick random**.

STEP 4 (15 MINUTES)

Add alligator clips and foil.

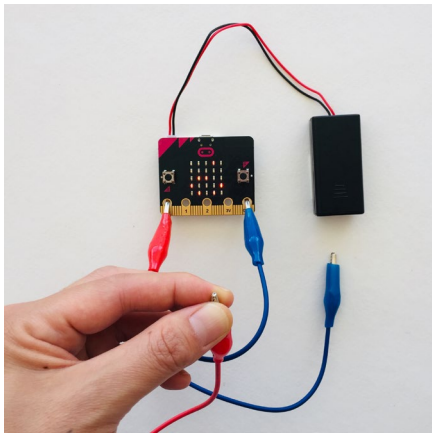
Using the same code from the Love Meter in Step 3, instruct makers to:

1. Connect alligator clips to **Pin 0** and **GND**.



2. Try playing the Love Meter again, but this time makers each hold a metal end of one alligator clip instead of directly touching the board. If working correctly, makers will be able to activate the Love Meter game code by touching one end of the metal alligator clip and then making contact

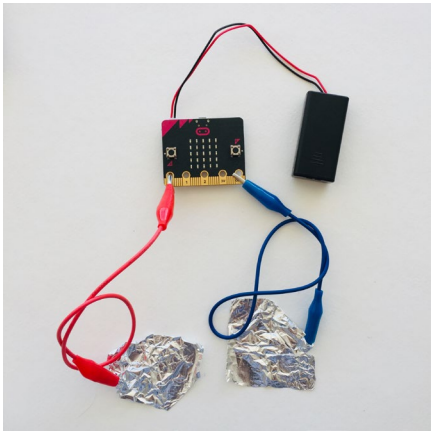
with the other person holding the other alligator clip.

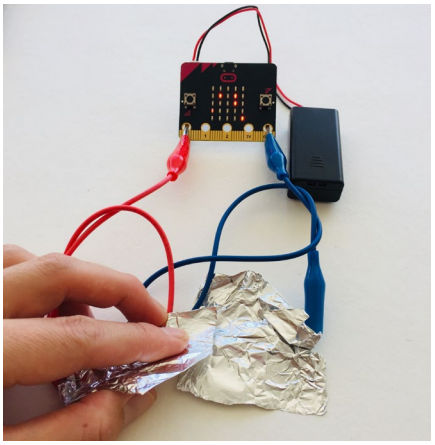


EXPLAIN

Aluminum foil is conductive. By touching two pieces of foil together, it creates a switch. If we attach foil to the alligator clips, we can touch the pieces of foil together to activate the Love Meter.

3. Demonstrate using aluminum foil connected to the alligator clips. Let makers experiment with UI/UX design by exploring different ways of positioning and interacting with the foil (two pieces, on hands, etc.).





STEP 5

5 MINUTES

Share and reflect.

Ask if any groups want to volunteer to demonstrate their UI/UX.

Ask them to share:

- What changes did you make to the original code?
- How does your UI/UX make the interaction more fun?

STEP 6

Clean up.

Makers will:

- Disconnect the battery pack.
- Put any materials they want to keep to use in their bin.
- Put away technology and make sure laptops are charging.
- Return tools and materials that can be used again to the right place.
- Clear tables of garbage and recycling.

WEEK 4 DAY 2: UI/UX WITH HOMEMADE SWITCHES

INTRODUCTION

This week makers continue learning about UI/UX and make homemade switches to design new ways of interacting with the Micro:bit microcontroller.

ESSENTIAL QUESTIONS

- How can we connect homemade buttons and switches for a fun, interactive game experience?
- How do artists, engineers, and makers solve problems when they're working?

LEARNING OUTCOMES

1. Learn how to connect switches and buttons to the Micro:bit.
2. Explore how design and user interface influence how successful or fun a game is.
3. Engage in project-based learning through problem-solving and troubleshooting by creating a game with a Micro:bit and code.

VOCABULARY

User: People playing/interacting with the game

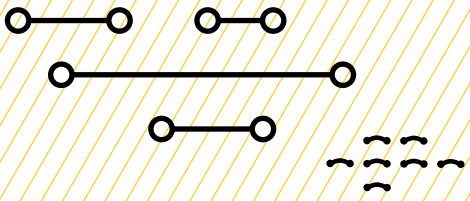
User interface (UI): Physical and digital "interface" or method of how the user interacts with the game

User experience (UX): How natural, intuitive, and enjoyable those interactions are

Switch: Device for making and breaking the connection in an electric circuit

Buttons: Device for making and breaking the connection in a circuit, similar to a switch but can be either momentary or can lock into place

Troubleshooting: Using resources to solve issues as they arise



MATERIALS LIST

EACH PAIR OF MAKERS NEEDS:

- Micro:bit microcontroller
- Laptop with internet
- USB to micro-USB cord
- Notebook

ALL MAKERS NEED ACCESS TO:

- Alligator clips
- Markers or colored pencils
- Cardboard
- Pipe cleaners
- Aluminum foil
- Paper clips, metal fasteners
- Metal containers, silverware, play dough (optional)

Items can be portioned out per table or set up in an area where students can access them freely.

TEACHER PREP WORK

1. Ensure the internet connection is working and connect your laptop to a projector or screen.
2. Preload videos and slideshow to save time.
3. Code the button keyboard in Step 2 and upload it to a Micro:bit as an example.
4. Arrange maker materials: foil, paper clips, metal lids, and 3–4 alligator clips per pair of makers.
5. Print the Troubleshooting Tips at the end of the lesson and post in the classroom.

FACILITATION TIPS

Inspiring creativity: Take note and celebrate surprising discoveries. Bringing in optional materials—like silverware, play dough, and other conductive objects—can inspire creativity and excitement when making homemade switches. Give makers opportunities to share the cool things they figure out with the rest of the class.

In Step 2, encourage makers to remix their code from past sessions and include concepts of conditionals and number ranges. Their previous code should be saved on their USB flash drives.

Materials management: It's up to you as the educator to decide what works best for your class. You can portion out maker materials into paper trays for each table, or have a dedicated area where makers can access materials freely as needed.

Collaboration: Let smaller issues work themselves out. Record specific positive examples that you can share with makers in the moment or at the end of the project. These examples provide models for all learners.

Frustration: When frustration levels aren't high, let learners figure it out or keep facilitation low touch by asking a question and walking away. When frustration levels are high, intervene more directly to help makers find some success.

Circulate among the makers and monitor for both collaboration and frustration.

ADDITIONAL RESOURCES

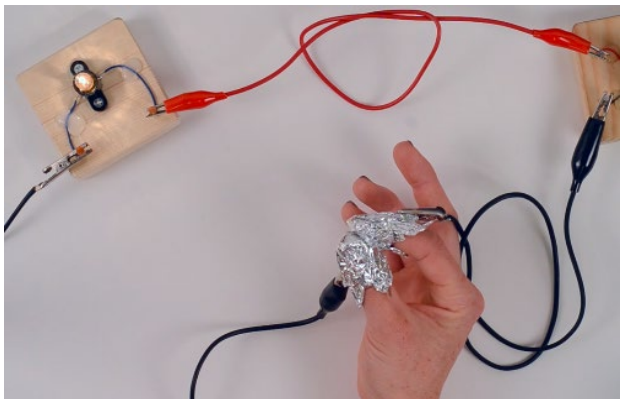
How Do Game Controllers Work?

About Buttons

UI/UX WITH HOMEMADE SWITCHES

STEP 1 10 MINUTES

Introduce homemade switches.



"Switches!" on Vimeo, uploaded by The Tinkering Studio, 8/27/2015

Ask makers to recall what they did last session:

- Programmed the Love Meter game
- Connected wires to Pin 0 and GND
- Made a human switch using hands and foil as a switch

Next, show this video (up to 2:24) that demonstrates a variety of homemade switches.

EXPLAIN

Now it's time to dive deeper into playing with different UI/UX of games. You can use various making materials to create a switch. As long as there's some conductive material connected to the alligator clips, the possibilities are endless.

Some examples of homemade switches shown in the video that we can use with the Micro:bit are:

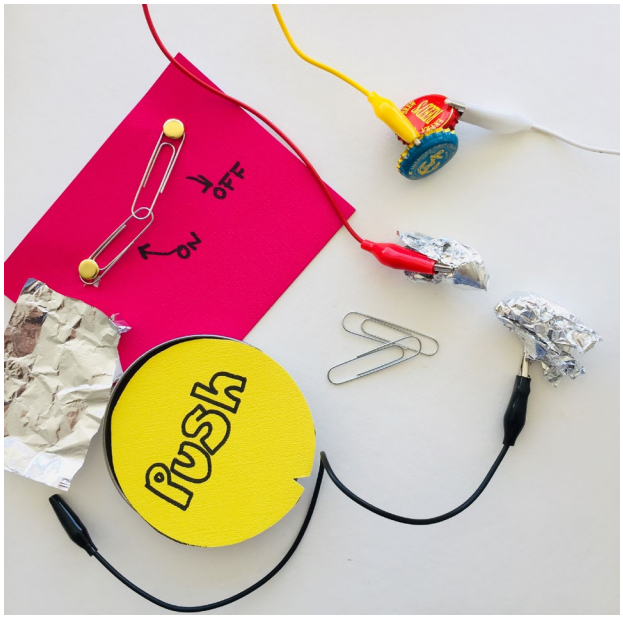
Using 2 pieces of foil with a metal object that bridges the circuit:

Making a pushbutton with foam or cardboard:

Using aluminum foil on fingers or hands to make a wearable switch:

STEP 2 30 MINUTES

Tinker with homemade switches and code.



Makers will now experiment with making homemade switches with materials such as: foil, copper tape, paper clips, metal lids, playdough, forks, spoons, etc.

They can also remix their code from past sessions using conditionals and number ranges saved on their USB flash drives.

STEP 3 15 MINUTES

Share and reflect.

Pair up two separate groups to demonstrate the UI/UX of their game, or set up gallery-style so makers can play each other's games and see the variety of switches and code.

Ask them to share:

1. How does the user interface and code affect the experience?
2. What would you like to add or change next time?

STEP 4 5 MINUTES

Clean up.

Makers will:

- Disconnect their battery pack.
- Put any materials they want to keep to use in their bin.
- Put away technology and make sure laptops are charging.
- Return tools and materials that can be used again to the right place.
- Clear tables of garbage and recycling.

TROUBLESHOOTING TIPS

The board isn't showing what we coded.	**File version check** • Check to see that you've uploaded the most recent copy of the code. • Resave the latest version and drag and drop onto the Micro:bit.
The code isn't doing what we expected.	**Check for bugs** • Read through the code. • Read it out to a friend. • Check to see if there are extra blocks that aren't supposed to be there.
The LED on the Micro:bit isn't flashing when we click Upload.	**Bad cable or port** • If the Micro:bit isn't showing up in the computer menu, try a different cable. • Try a different USB port on the laptop.
Our code isn't uploading correctly to the board. The board feels hotter than usual.	**Burnt board** • Try pressing the reset button on the board. • Try uploading to a new Micro:bit board.
The board isn't turning on when connected to the battery pack.	**Battery** • Check the batteries to see if they're charged. • Check to see if the batteries are flipped.
We have alligator clips connected to the board, but the code isn't running.	**Alligator clips** • Make sure alligator clips are secure on the correct pins and are touching the metallic parts. • Try switching alligator clips.

TROUBLESHOOTING TIPS

Print and use the empty rows to fill in with other problems and solutions that can be shared.