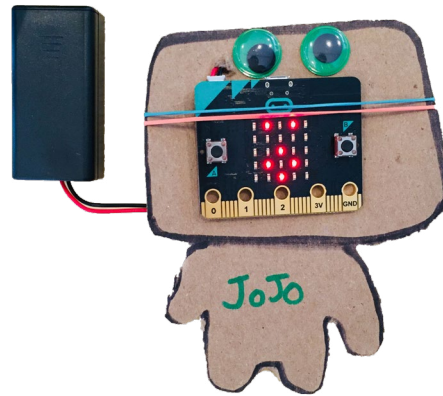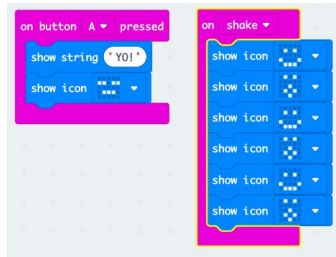# WEEK 2   CREATE A MICRO:BIT CHARACTER

INTRODUCTION

Now that makers have been introduced to the basics of the Micro:bit microcontroller, it's time to get creative with making a Micro:bit character. Makers work in pairs to co-design a character using maker supplies. Then, they will experiment with writing code to give the character a personality and make it interactive.

ESSENTIAL QUESTIONS

- What are inputs and outputs?
- How can we program them to tell stories or create personality characteristics?
- How do artists, engineers, and makers solve problems when they're working/inventing?

LEARNING OUTCOMES

1. Learn how to code both inputs and outputs in the MakeCode software.
2. Engage in project-based learning through problem-solving and troubleshooting by creating a character with a microcontroller and digital code.

VOCABULARY

Microcontroller: Small device (similar to a mini computer) used to control other devices and machines

Pair programming: Method of working in pairs where one person drives the laptop while the other navigates or instructs the driver

Software: Term used to describe computer programs

Code: Set of instructions that a computer understands

Input: Place where information enters a system

Output: Place where power or information leaves a system

Upload: Sending information or data to a device or computer

USB to micro-USB cable: Cord that transfers data and information from the computer to a device

USB flash drive: Portable storage device that can store and move files

Troubleshooting: Using resources to solve issues as they arise

MATERIALS LIST

EACH PAIR OF MAKERS NEEDS:

- Laptop with internet connection
- USB to micro-USB cord
- USB flash drive
- External battery pack
- AAA batteries (2)
- Notebook

ALL MAKERS NEED ACCESS TO:

- Cardboard
- Glue stick
- Markers
- Colored pencils
- Scissors
- Rubber bands
- Assorted paper
- Assorted maker supplies (pipe cleaners, pom-poms, googly eyes, etc.)

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.

2. Connect your laptop to a projector or screen.

3. Preload videos and slideshow.

4. Organize maker supplies (pipe cleaners, pom-poms, googly eyes, etc.) into paper trays.

5. Go through the lesson and create your own example of a Micro:bit character to share as a helpful reference for makers troubleshooting their own projects.

6. Print the **Troubleshooting Tips** at the end of the lesson and post in the classroom.

FACILITATION TIPS

Make sure that you're comfortable with the save/download/upload process so you can help makers going through this process.

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 are not high, let learners figure it out on their own or keep facilitation at a minimum 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

Micro:bit Project Tutorials

Wonderful Idea Co: Micro:bit Mutants

Micro:bit Tutorial on YouTube

CREATE A MICRO:BIT CHARACTER

STEP 1 — 10 MINUTES

Code a character demonstration.

Gather makers around to view the projector as you demonstrate one possibility of coding a character in the **software**. Show them your example character that has the **code** below uploaded to the board.

EXPLAIN

This code could be an example for a character named Jojo. When you meet Jojo, instead of shaking hands or a fist bump, you press **Button A** and Jojo says "Yo!" and the LED grid displays a neutral face.
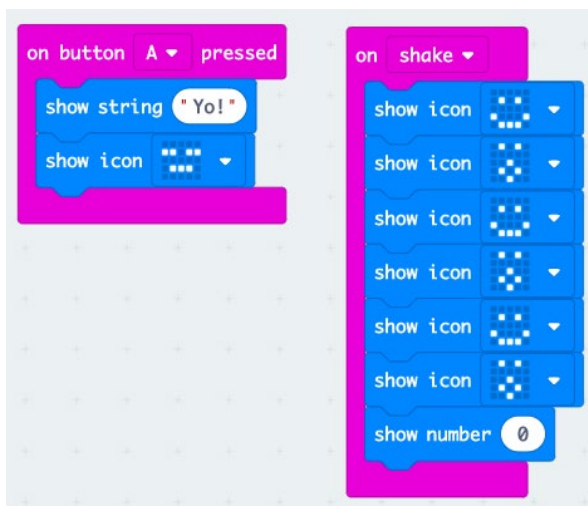
Jojo is a pretty cool and normal bot, but Jojo is also ticklish. When you **shake** Jojo, it "giggles" and shows a laughing animated facial expression on the LED grid.

Button A and **shake** are both examples of **Input** blocks from the **Input** blocks menu. You can program them to cause various reactions, or outputs. These can be used in creative ways to code a character with personality.

STEP 2 — 35 MINUTES

Tinker with project-based coding and making.

Next, makers work on designing their own characters. While tinkering and experimenting with code, makers can use the maker supplies (cardboard, rubber bands, markers, googly eyes, etc.) to turn the Micro:bit **microcontroller** itself into a fun physical character with personality.

Note: Advise makers not to apply glue directly to the Micro:bit board.

Their design should include:

- 3 **inputs** that cause at least 3 different **outputs**
- A short story about their character— including name, personality, etc.—and how it relates to their programming
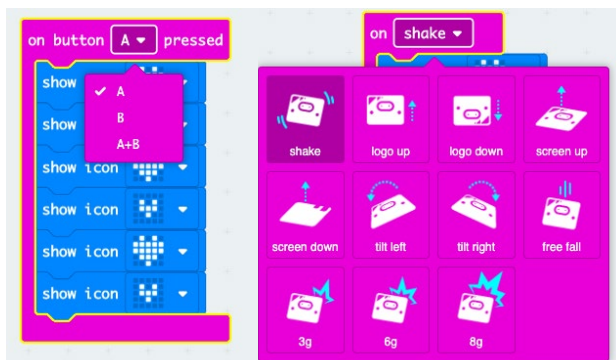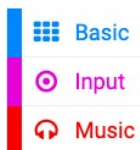
Makers will:

- Get their laptop and bins.

- Choose their **pair programming** navigator and driver roles (time for 15 min each).

- Tinker and explore programming various inputs and outputs in the software and simulator before connecting the Micro:bit to the computer.

Encourage makers to explore and experiment with other blocks within the **Basic** and **Input** blocks.

Remind makers to save changes to the code they want to keep onto their **USB flash drive**.

When they're ready to upload to the Micro:bit, support makers in connecting the **USB to micro-USB cable** to the computer to **upload** their code and connecting the external battery pack to the board to see their code working on the Micro:bit independently from the laptop.

STEP 3 5 MINUTES

Document.

Makers will now spend a few minutes writing down their character features in their notebook. Here are examples of a character plan filled out with multiple inputs and outputs.

INPUT	OUTPUT
Button A	"I'm Hungry" + Neutral face
Shake	"Noooo!" + Animated sad face
Button B	"Yum" + Animated smile

INPUT	OUTPUT
Button A	"let's dance!" ☺
Button B	"That's all you got?" 😐
Shake	☺ 😗 ☺

STEP 4 5 MINUTES

Share and reflect.

Ask for volunteers who would like to present their character to the rest of the group, and have the rest of the characters shared as an interactive gallery walk.

Ask makers to reflect on:

- What challenges did you encounter?

- How did you work through these challenges?

STEP 5 ⏱ 5 MINUTES

Clean up.

Makers will:

- Disconnect the battery pack.

- Put supplies and technology in their assigned bins.

- Return laptops to cart and plug in for charging.

- Return tools and materials that can be used again to the right place.

- Clear tables of garbage and recycling.

TROUBLESHOOTING TIPS

Display on board is not showing what we expected.

Version check

- Check to see if the latest saved copy of the code has been uploaded.
- Re-save the latest version and drag it onto the Micro:bit.

Bugs in code

- Check your code to look for mistakes.
- Check to see if there are extra blocks hiding in the coding space.

The LED on the Micro:bit isn't flashing when we press upload.

Bad cable or USB port

- If the Micro:bit doesn't show up in the computer's menu, try a different cable.
- Try a different USB port.

Code isn't uploading correctly to the board, and the board might feel hot.

Burnt board

- Press the reset button on the board, and then try uploading again.
- If the Micro:bit board feels hot, it could be overheated and stop working. Try uploading to a new Micro:bit board.

When we connect the battery pack, the Micro:bit doesn't power up.

Battery problems

- Check the batteries to see if they're in the right position (+/−).
- The batteries could be low or dead. Try replacing them.
- Battery pack could overheat or have stopped working. Try a new battery pack.

TROUBLESHOOTING TIPS

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