STEM MINDS

Science Technology Engineering Math

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DAY 2: USING THE LEDS AND BUTTONS

Required Materials

- Laptops/tablets (1 per student)

Learning Goals

We are learning to code with micro:bit

- I know how to turn the LEDs on the micro:bit on and off
- I can create programs that respond to user input using the buttons on the micro:bit
- I can explain the concept of user input and data in my own words

Minds On (10 Minutes)

Where possible, have all students join the teacher in community circle. When all students are seated, ask students to quickly summarize what they remember about coding from yesterday. Ensure that students are making connections with the idea that “coding is the language that computers speak”, that we need to learn to code if we want to “speak” with computers, and that coding requires us to make sure that our instructions are very clear.

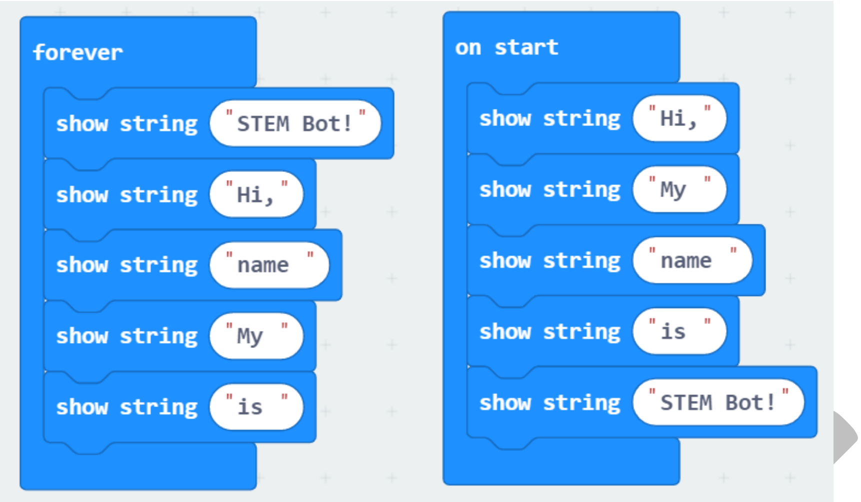
Next, tell students that there are five key concepts we need to have a strong grasp of before we can start working today. ***You can use the slides for this lesson to support you if needed.***

Concept 1: Sequence

As we learned yesterday, sequence very simply means to put something in order. You may wish to show a picture or write on the board/a piece of chart paper something that is out of sequence (for example, a group of numbers written as “3, 1, 5, 2, 4”). To put them in sequence would mean to put them in the correct order (e.g. “1, 2, 3, 4, 5”).

Sequence is one of the most important concepts when it comes to coding. No matter what coding language you are working with, the idea of sequence stays the same. Very simply, sequence in coding means that the computer will read your code in the exact order that it is written from top to bottom.

In order to have our code work the way we want it to, we need to make sure that our instructions are appearing in the right order! This will become more challenging as our code becomes longer and more complex.



```
forever
    show string "STEM Bot!"
    show string "Hi,"
    show string "name "
    show string "My "
    show string "is "

on start
    show string "Hi,"
    show string "My "
    show string "name "
    show string "is "
    show string "STEM Bot!"
```

The above example shows an example of improper sequence (left) and proper sequence (right). micro:bit will run both without displaying any errors, but you will not end up with the outcome you likely intended.

[CONCEPTS 2-5 REDACTED FROM SAMPLE]

Working On It (35 Minutes)

In today's lesson, students will be learning how to create programs for the micro:bit that respond to user inputs (button presses) and change its outputs (LED screen) by creating a stopwatch.

Concepts covered include:

- Using variables
- Displaying information
- Using the buttons as inputs

Key takeaways from this lesson include:

- Variables are places to keep data for later use. For example, storing a high score or time so that it can be displayed later. Variables have their own toolset, which is the red category.
- Round variable blocks fit into other blocks. The set block allows you assign a value, while the change block modifies the value the variable currently has.
- Functions are parts of the program that run under certain conditions, like a button being pressed. Some built in functions can be found in the input toolset, which is pink. ***You can tell if a block is a function if it does not need to snap into another block!*** Code blocks inside of a function will run when the function occurs.

You may wish to have students follow along with the video independently on their own devices or to follow along as a class, periodically pausing where necessary.

WATCH THE VIDEO LESSON

When students are done watching the video, they can get started on their extension challenges.

Extension Challenges include:

- Animate a heartbeat using the LED matrix
    - Advanced: Have the heart beat only when you press the buttons
    - Advanced: Make the heartbeat speed up/slow down with the A/B buttons (requires variables)
- Create an animation of a stick person waving or dancing on a button press
- Animate a dog or cat that will sit when a button is pressed
- Use other inputs like the on_shake gesture to further customize any of the above challenges (they're very similar)

Modifications:

- If needed, students can focus just on a sequence of commands to create an on-screen animation using the forever function, rather than an interactive project using the buttons

See Appendix E for sample code.

You can challenge students to complete as many extensions as possible, create challenges for each other, or give an award for the most creative solution. Pick a strategy that works for your unique group of students.

Be sure to circulate throughout the class while students are working in order to provide guidance. You may wish to give students access to the video link so they can go back and re-watch a section if they are stuck.

Important Notes:

- Be sure to have students download their project file or produce and save a share link in order to save their work. See Appendix H for a sample project tracker for students to use.

- Be sure to give students a 5 minute and 1 minute warning before their time to work on their project is wrapping up so students can manage their time effectively.

Consolidation (10 minutes)

Depending on your group of students, you may want to provide 3-5 minutes for students to get cleaned up, devices put away, and to rejoin you in community circle or to return to their seats.

When students have gathered, have students use Think, Pair, Share or another strategy to analyze the following image. Tell students that the coder wants to use the micro:bit to count students as they come into the room one at a time and display the total when the B button is pressed.

You can find a copy of this image in the slides for this lesson.

Ask students to determine:

- What, exactly, will this code do in its current form? Is it what the coder wants?
- If changes need to be made to this code in order for it to work, what changes should we make?

[IMAGE REDACTED FROM SAMPLE]

Students may identify the following issues:

- The counter does not start from 0
- When the A button is pressed, the counter goes up by 2, not 1.
- The total is displayed when both buttons are pressed, not just B.
- The show number block with the “students” variable will just show a 0, since “students” has not been declared. This should be changed to a show string block like “There are “.

The corrected code could look like:

[IMAGE REDACTED FROM SAMPLE]