Coding Fundamentals

Micro:bit Python Programming
Hello World and Scrolling Text

Overview

In this lesson, student learn to scroll text on the micro:bit LEDs using Python

Objectives

- Identify components on the micro:bit
- Utilize the online Python for micro:bit editor
- Create a first "Hello World" program

Materials

- micro:bit and micro-USB cord
- Computer with access to the internet

Approx. Time Required

1-2 hours

Cyber Connections

- **Programming** – Students will program in Python.
- **Hardware and Software** – Students will utilize small electronics and learn how a computer is programmed while using micro-controllers.

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Hello World and Scrolling Text

Begin the lesson by walking students through the different parts of the Micro:bit and explain the purpose of each.

Front
- *5x5 grid of LEDs* – used as a display; each light can be programmed to be on or off and have varying intensities of light
- *A & B Buttons* – buttons that can be programmed to respond to a press or a release
- *3 Input/Output (I/O) rings* – to attach sensors and send signals to/from the Micro:bit
- *3V and GND rings* – to provide power to the external devices that use I/O pins

Back
- *Antenna* – for Bluetooth connection with other devices
- *CPU* – to run programs; acts as the "brain" of the Micro:bit
- *Micro-USB* – to attach to computer; transfers data and power to Micro:bit
- *Battery Connector* – to attach battery pack for portable power
- *Accelerometer* – detects shaking, tilting, and other motion of Micro:bit
- *Compass* – detects magnetic fields and direction Micro:bit is moving/facing
- *Edge Pins* – allow users to slot Micro:bit into edge connector for greater I/O capabilities
- *Reset Button* – press to restart the Micro:bit and its current program

Introduce students to the "Hello World" program.
- The program is believed to have first been used in 1974 by Bell Labs technicians as they were trying to show their counterparts how the computer can be programmed to interact with humans. Since then, it has become widely accepted as the first program new programmers use to learn a new programming language or test a new device.

- "Hello World" is widely used for its simplicity, to familiarize users with the coding environment they will be using, and to introduce printing (a useful tool in every programming language).

- Help students navigate to the Python online editor at http://python.microbit.org/editor.html#, then walk through the first two lines of code.

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- The very first line of the program is a comment. If a line of code begins with the '#' sign, the program will skip over it when running. This can be extremely handy for making notes for yourself and others while writing a program, but can be deleted without affecting the program.

- The second line of coding will be in every program you or your students write for the Micro:bit. It instructs Python to import the library of code pre-existing for the Micro:bit. This allows the use of several commands and functions that are specific to the Micro:bit.

- After a few empty lines, the program contains **while True:**. This is a tool known as a **while** loop because the code loops "while" the test case is true. In our program's case, **True** is always true, so the code included in the **while** loop will repeat forever. To see this line in action, have students remove it and the indents to the left of the next three lines so the code will only execute once.

- The next line begins with **display**. This instructs the program that the next bit of code is for the LED display on the Micro:bit. **Scroll()** is a command for the display that allows a string of characters to scroll across the LED display from left to right. "Hello, World!" is the string of characters the program sends to be displayed.

```
display.scroll('Hello, World!')
```

- Following hello world is a use of the command **display.show()**, which instructs the Micro:bit to show a pre-programmed image on the display. In this case, the image is a heart. You can find a list of other pre-programmed images here: https://microbit-micropython.readthedocs.io/en/latest/tutorials/images.html

- Finally, there is a line of code that tells the program to sleep or pause its executing for a specified amount of time. This program uses 2000 miliseconds, or two full seconds. This will cause the program to pause on the picture of the heart before it starts again with the **while** loop.

- Take students through the naming of a program. The name is entered in the textbox in the top-right corner of the editor. It should read "microbit" to begin with, but students should name their program "HelloWorld."

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- Download the hex file that contains the program for the Micro:bit. This is done with the button in the top-left corner that contains the Micro:bit logo. Press this button to download the program , then locate the file on the computer. It should be in the downloads folder.

- Connect the Micro:bit to the computer and drag and drop the .hex file into the Micro:bit directory. The program should start running automatically!

Additional Challenges

1. Have students alter the code to scroll their own name in place of "world."

```
display.scroll('Hello, Cindy!')
```

2. Create a timer that counts down from 10. This can be done by adding two spaces between each number.

```
display.scroll('10  9  8  7  6  5  4  3  2  1')
```

3. How would the display be effected if spaces were added or removed between characters? Have students experiment with the delay between movements to control the speed of the characters scrolling across the screen. The default is set to 150 milliseconds if the user does not specify a delay. If the user does specify a delay, the program uses that value instead.

```
display.scroll('Hello, Cindy!', delay = 250)
```

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