

BBC micro:bit introduction

Step by step instructions

Resources required:

- BBC micro:bit
- USB A type (standard) to Micro USB cables (supplied with the micro:bit)
- Computer workstation running Windows or Mac OS X
- The workstations must be able to mount a USB drive (which is how the micro:bit appears) on the users desktop so they can copy a file on to it. You should test this before hand for the classroom you are in, some network configurations will prevent this from working.
- You do not need the batteries or the battery packs for this session.

Pre-requisites:

- Basic keyboard / mouse skills
- Basic Windows Explorer / Mac OS Finder file copy (drag & drop) skills
- Basic web browsing skills

Objectives:

- Concept: Introduction to the BBC micro:bit's key features
- Skills: Access & operate the simple programming editor
- Discovery: Explore the micro:bit's built in sensor types & the values they report

Sequence:

There is a video of the hardware overview and the programming activity at www.microbit-learning.co.uk which is where this document and other supporting materials comes from.

The Hardware

1. Distribute the micro:bits & cables
2. Introduce the hardware - Front:
 - Pushbutton A & B, left & right
 - Matrix of 5 x 5 LEDs
 - The Pins where external connections can be made:
 - 0, 1 & 2 are inputs or outputs under programmable control
 - They can detect switches (digital) or a range of voltages from various sensors (analog)
 - The 3V and GND provide a low level power source for accessories connected to these pins.
 - They are quite safe to handle but still need to be treated with a degree of care
3. Introduce the hardware - Back - from top going clockwise
 - The Micro USB port
 - The Reset button
 - The battery connector

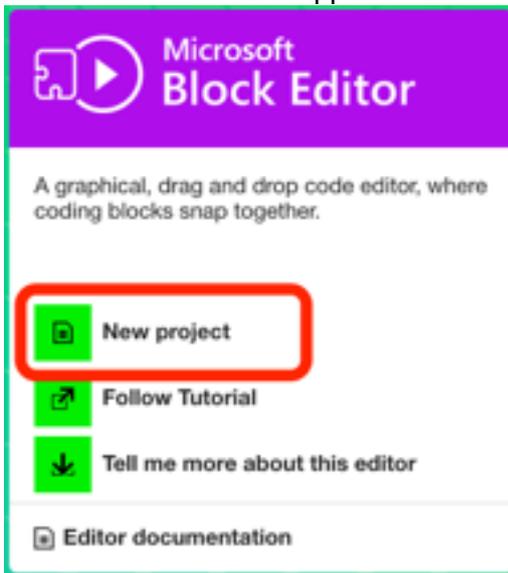
- Below the battery connector is the microprocessor that enables the micro:bit to act as a USB drive and then programs the main processor with whatever code you put on it.
- The pins are duplicated on the back
- An accelerometer chip - it can detect the micro:bit's orientation in three axis (X, Y & Z).
- A compass chip - it can detect which way the micro:bit is pointing. The USB port is the direction, so if the USB port is pointed at magnetic North, the reading is 0.
- The main processor is the larger chip top left.
- The blank area top left edge has a square track on it, this is the BlueTooth antenna.

Startup:

1. Login to workstation, launch web browser, goto **www.microbit.co.uk**
2. Plug in the micro:bit to the computer - this will allow time for the workstations to load the drivers
3. Whilst drivers are loading, click Create Code (top black menu bar or purple button in middle of page)



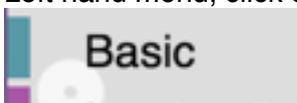
4. Click the New Project for the Microsoft Block Editor (centre panel, headed in purple) - this will allow time for the web app to download and initialise.



The quick start / student confidence taster:

Before explaining too much, this gives the student a little taste of their control over technology.

1. Left hand menu, click on the teal Basic button, the top item



2. Click on 'show string'

3. Click on the default text ('Hello!') and change to their name / favourite phrase etc



4. Click on the Run button on the web page top line - the simulator will show the words the student has entered.



Depending on the browser & screen size, the work 'run' may not show.

5. The app will save changes automatically. You can see a small icon switching between a pencil (edit) and disk (saved) just under the script name.
6. Depending on the browser & screen size, the simulator may take up the whole page. If this occurs, click the Blocks icon bottom right to return to the programming layout.
7. Click on the Compile button the web page top line - this will download the program code that can be put on the actual micro:bit.



The code is downloaded to the web browsers download folder. This is usually in the users home folder but will be dependant on the network configuration. Where ever it is, most browsers allow you to open the location of the download folder or you can use Explorer / Finder to open up that folder.

There will be a new file in the download folder. On Windows, this has the name of the script (top right on the code editor web page, auto generated superlative word then script (eg, "awesome script"). On Mac OS using Safari it is called Unknown, otherwise it is the script name as per Windows.

8. **I strongly recommend you practise this in advance.**

This file needs to be dragged over the to the micro:bit drive that is mounted on the computer by any means the student is comfortable or familiar with. It is exactly like putting a file on to a USB Flash drive. The yellow LED on the back of the micro:bit will flash whilst the file is being copied.

When the copy is done, the micro:bit auto-ejects itself. Windows will close any Explorer window that was open on that drive. Mac OS will complain that a drive wasn't properly ejected. C'est la vie. After a few seconds, once the device has programmed itself with the copied file, it will reset itself and then reappear on the desktop

9. The string they entered above will then be displayed.

10. Press the reset button on the back of the micro:bit to have it redisplay it.
11. No doubt some students will enjoy the hilarity of getting the micro:bit to display something rude. If you are of the author's vintage (BBC micro computer, ZX81) it will be no different than we were then. However the BBC will take objection to anything a student tries to share that violates its guidelines.

Repeat with different phrases in 'show string' until the prime skill of drag & drop on to the device has been understood.

If a student drags over any other file, nothing bad will happen. In fact, the file will be stored just as a USB drive. It's just a very very small one (8Mb).

Name the script:

1. Click on the name of the script (top right) to change it to something - "My first script" or similar.
2. Click on the "My Scripts" button top left to return to the list of student scripts.



Scripts are stored in the web browser. For network logins that are typically used, this information will be stored in the students web data. If students do not login to a workstation, the script will likely remain on that computer only.

New script, use a sensor:

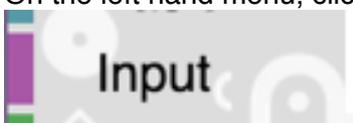
1. On the web page listing the students scripts, on the left hand side click the green Create Code button.



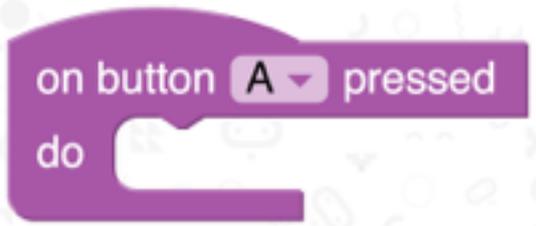
2. Click the purple Microsoft Block Editor.



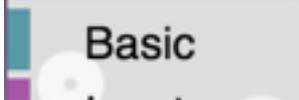
3. On the left hand menu, click the purple Input button



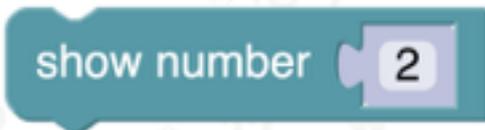
- Click on the first item, 'on button A pressed' - this block will be run when button A is pressed



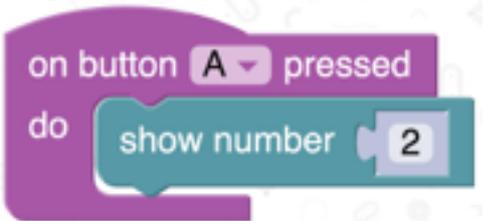
- On the lefthand menu, click the teal Basic button



- Click on the 'show number' block



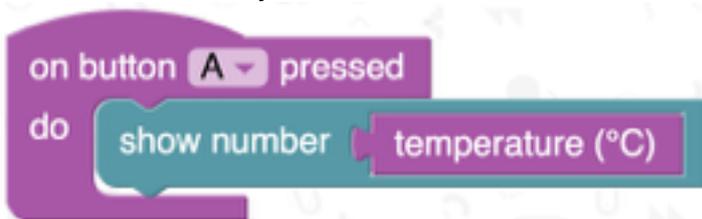
- Drag it so that it is inside the 'on button A pressed block'



- Click on the 'temperature' block in the Input section (top left).



- Drag it so that the jigsaw piece on its left end fits in to the 'show number' block where the number 2 is currently shown.



- Click on the Run button on the web page top line - the simulator will be displayed.
- Click on the A button on the simulator (the left hand one) and a number will be shown on the display (usually 21).
- Click on the Compile button the web page top line.
- Copy this new program over to the micro:bit
- Wait a few seconds for the copy to finish
- Press the A button and the temperature of the CPU will be displayed - typically somewhere in the 30's - higher than ambient temperature as the processor generates heat as it runs.

Discovery:

Repeat the previous exercise with the light level, rotation, running time, acceleration (how the micro:bit is orientated) or compass.

The compass needs calibrating on first use, the student will be prompted by the micro:bit to rotate it until the LEDs have formed a square.

The light level can be influenced by holding a hand over the LEDs on the front of the micro:bit or by holding it at a light source.

The running time is in ms - how many ms in a second?

It is useful for future sessions if the students note the typical sensor values.

Going further:

Try the button B to trigger the display - click the A on the block to change it to B.

Display something when button A is pressed and something different when button B is pressed

Try the on shake block and it's other options for screen or logo up/down.