

SCIENCEOXFORD



Science Oxford Challenge

Code a rainbow message of hope

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Code your own rainbow message of hope

We have put together instructions for three possible ways to code your own rainbow message of hope for your window to show support for the NHS and the fight against Covid-19.

The first option is to make a simple rainbow shape. The second and third, more complex, options are to code an LED or NeoPixel rainbow display. All three displays will look great in your window! If you don't have a micro:bit, you can still follow the instructions to code an online image and then you can display your laptop screen in your window to share your message of hope.

Age group: 7 to adult

What you will need: listed under each option

Skills: coding using the block editor, physical programming, resilience, problem solving, iterative design, creativity



Option 1: code a rainbow shape

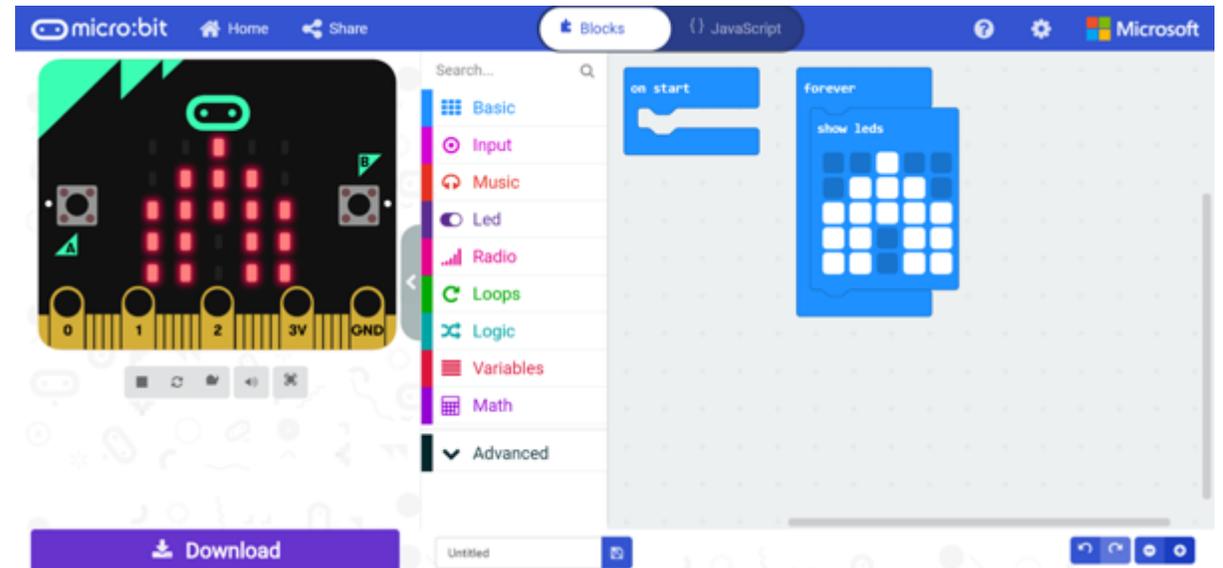


You will need: laptop; micro:bit; USB cable; battery pack for display.

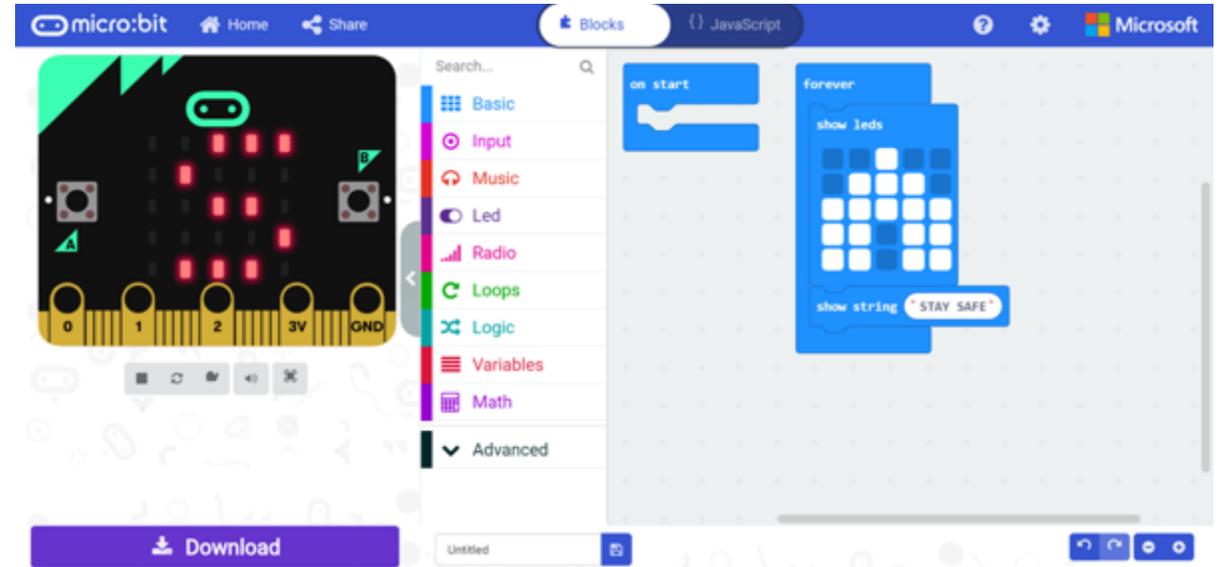
optional: scraps of felt or fabric, scissors, glue or needle and thread

If you're new to using a micro:bit or it's been a while, visit these [lesson plans](#) to learn the basics, then open the online block editor by going to <https://makecode.microbit.org/> and clicking on 'New Project'.

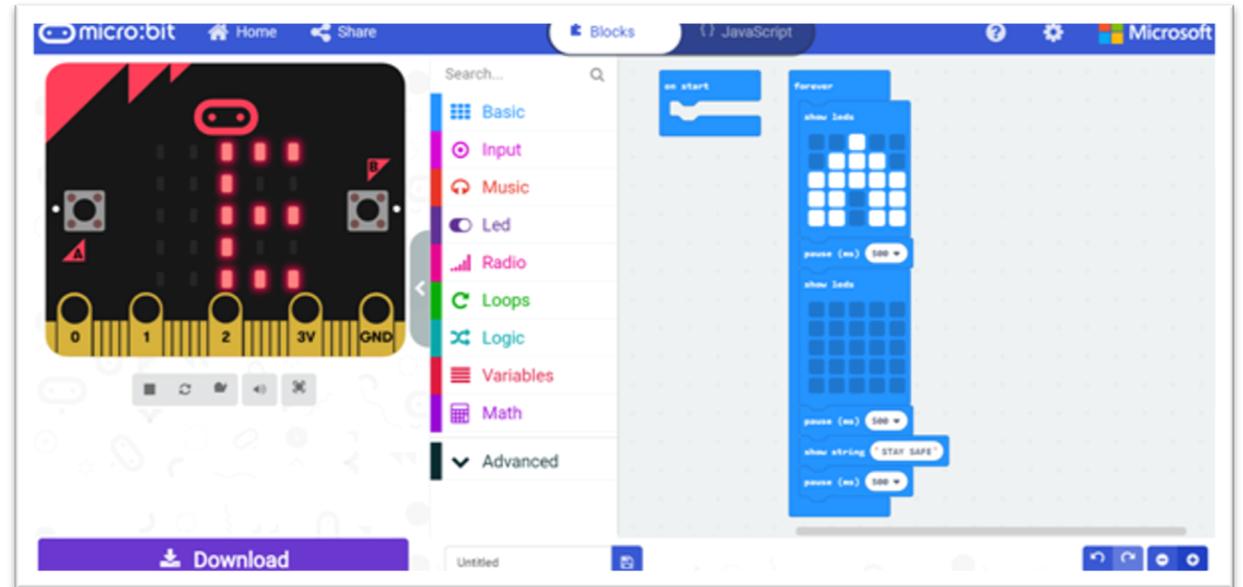
1. Click on the blue 'Basic' tab and drag a 'show LEDs' block inside the 'forever' block. Click the paler squares inside the 'show LEDs' block to draw your rainbow (or anything else you would like). The picture on the left hand side of the screen shows you what your micro:bit will look like when you upload your code.



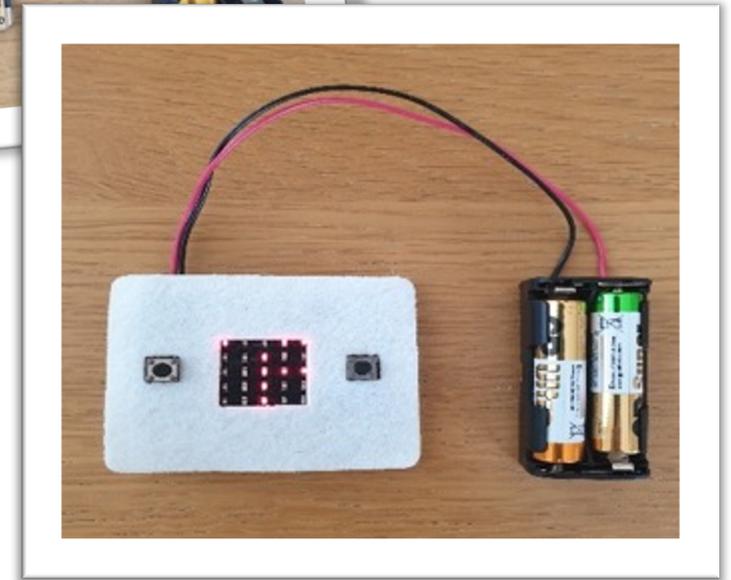
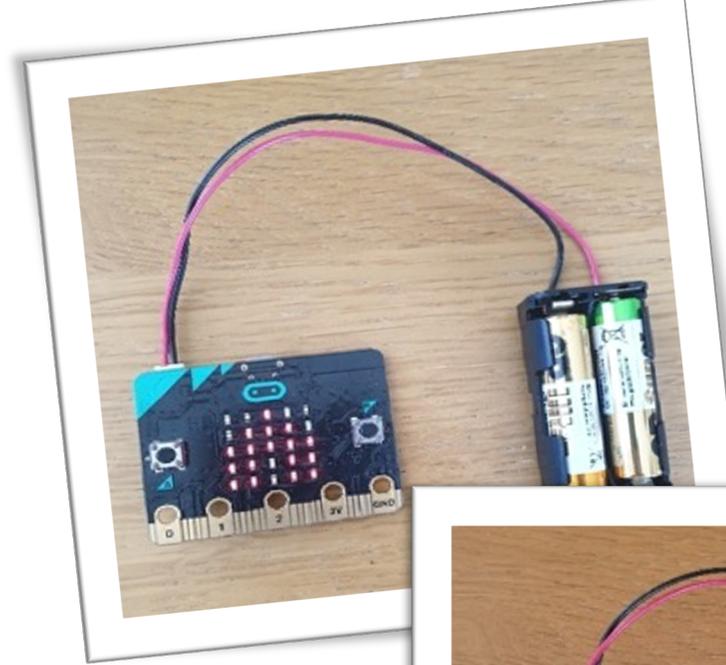
2. To add a message to your rainbow picture, click on the 'Basic' tab again and find the 'show string' block. Drag it underneath your 'show LEDs' block. At the moment, the message is 'Hello!' but you can change it to whatever you would like it to say by typing in the white box.



3. The code you have written flashes onto the micro:bit screen quite quickly, so you may want to add pauses to make it easier to see more clearly. The 'pause' block can be found in the 'Basic' tab and you can change the length of the pause by typing in the white box. Explore different options until you are happy that your code does what you want it to do. The code we've done is shown here, but yours might look very different!



4. To upload your code to the micro:bit, connect it to your laptop using the USB cable and wait for the pop-up window to appear. Click 'Download' then drag and drop your code into the micro:bit window. Depending on the browser and laptop you're using, you may need to find the micro:bit as it appears as a drive under 'My Computer', and select 'Save As' to save the hex code onto the micro:bit. Your micro:bit will flash orange as the code uploads and then you will see your picture and message. To display in your window, disconnect from the USB cable and plug in the battery pack. You could use scraps of felt or fabric to sew or glue a cover for your micro:bit. Or, simply display using your laptop.



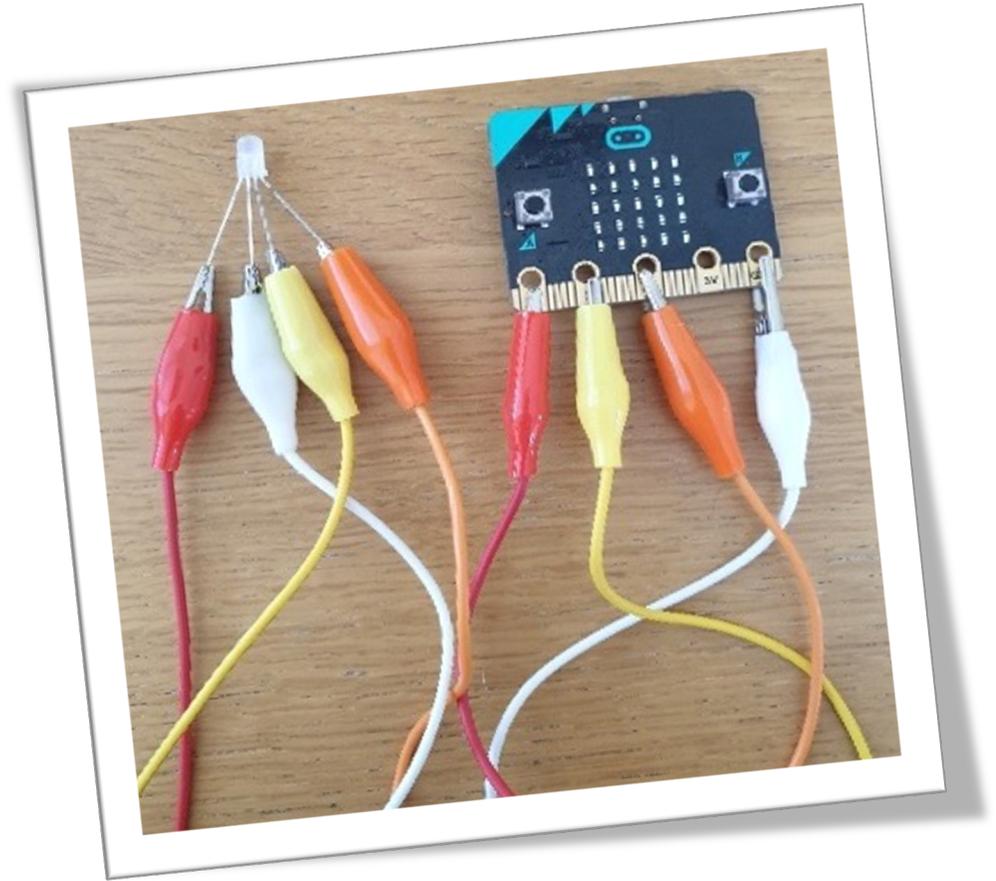
Option 2: code an LED rainbow shape



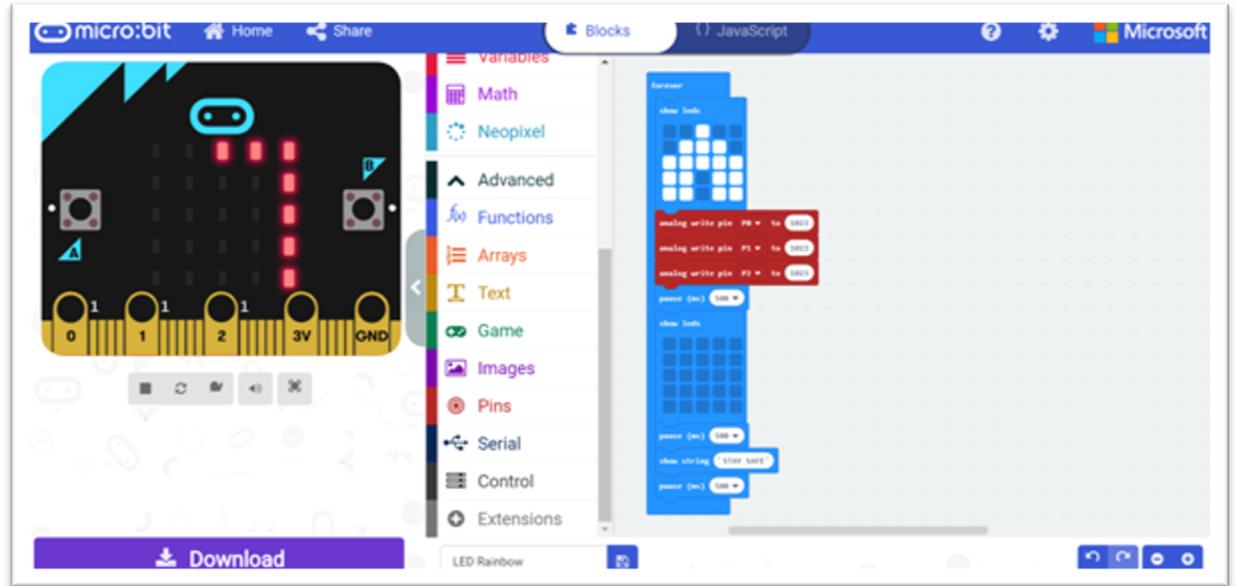
You will need: laptop; micro:bit; USB cable; battery pack for display; 4 crocodile clips; common cathode RGB LED. optional: scraps of felt or fabric, scissors, glue or needle and thread

Start by following the instructions for challenge 1 to code your picture and your message. Test your code by checking the picture on the left-hand side of your screen. If it's showing what you expect, carry on to add your rainbow LED.

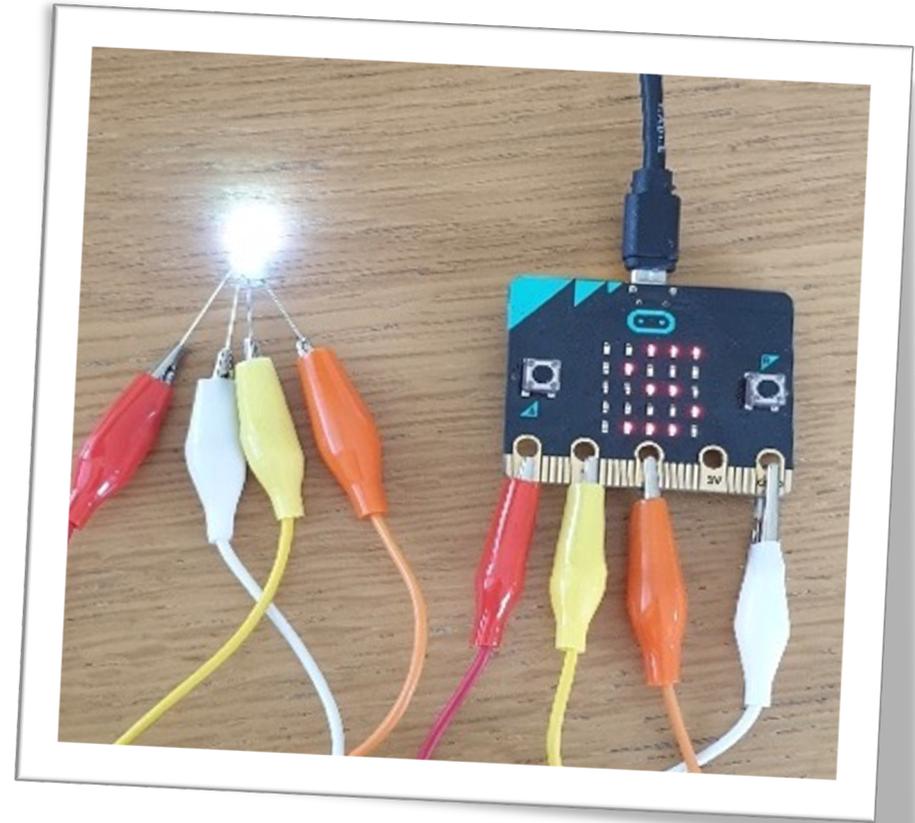
1. Your RGB LED is three LEDs in one; red, green and blue. By mixing these three LEDs, it's possible to make lots of different colours. To control the LED, first you need to connect it to your micro:bit, using the crocodile clips. Find the longest leg of your LED and connect it to the GND pin of your micro:bit. Connect the other legs to 0, 1 and 2 .



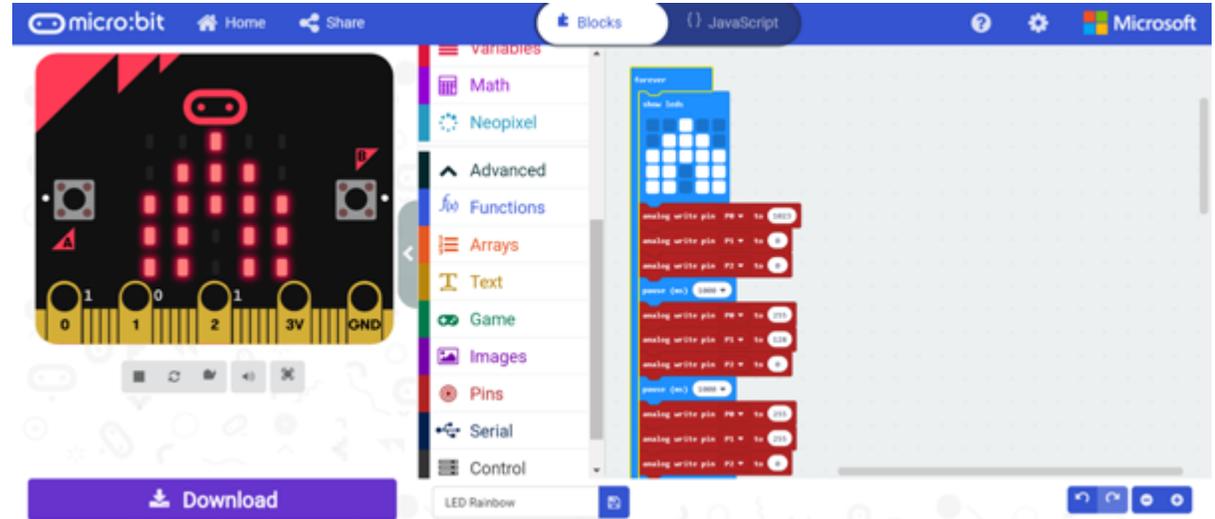
2. To test your connections, you need to code each colour to turn on. In the online block editor, click on the 'Advanced' tab and choose 'Pins'. Drag and drop the 'analogue write pin () to ()' block to under your 'show LEDs' block. In the white spaces, tell your code which pin you would like to turn on (pin 0) and how strongly (1023, which is the maximum). Repeat this for pins 1 and 2.



3. Download your code and transfer it to your micro:bit. Your LED show produces a white light, from blending all three colours together. You can experiment by changing the values for each pin to see what colours you can make. If you want red, green or blue, make sure that the values for the other LEDs are 0.



4. To make your LED change to all the colours of the rainbow, you need to code each colour, adding a pause between each one. Download to your micro:bit after each change to check your code. These are the values that we used but you can experiment until your LED shows exactly what you'd like. Once you're happy with your code, download it to your micro:bit and add the battery pack to display it in your window or use the display on your laptop. If you would like to, use your fabric scraps to create holders for your micro:bit, wires and LED.



	Pin 0	Pin 1	Pin 2
Red	1023	0	0
Orange	255	128	0
Yellow	255	255	0
Green	0	1023	0
Blue	0	0	1023
Indigo	102	0	204
Violet	255	0	255

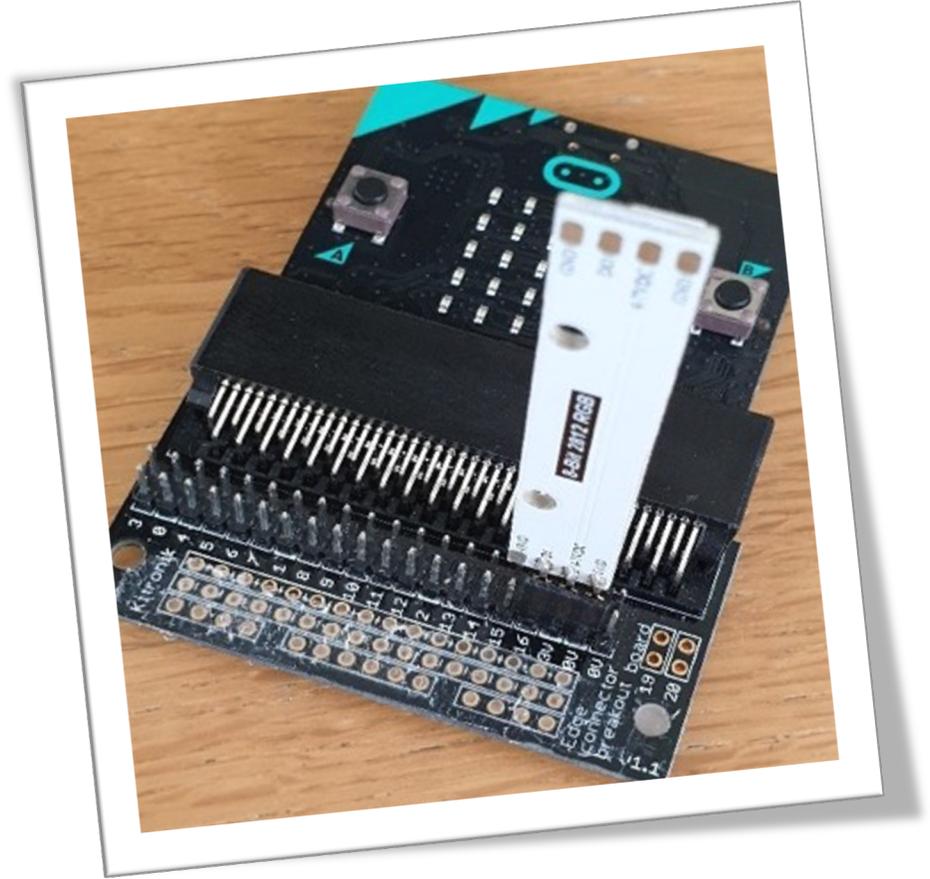
Option 3: code a NeoPixel rainbow

You will need: laptop; micro:bit; USB cable; battery pack for display; strip of 8 NeoPixels; edge connector, connecting wires. optional: scraps of felt or fabric, scissors, glue or needle and thread

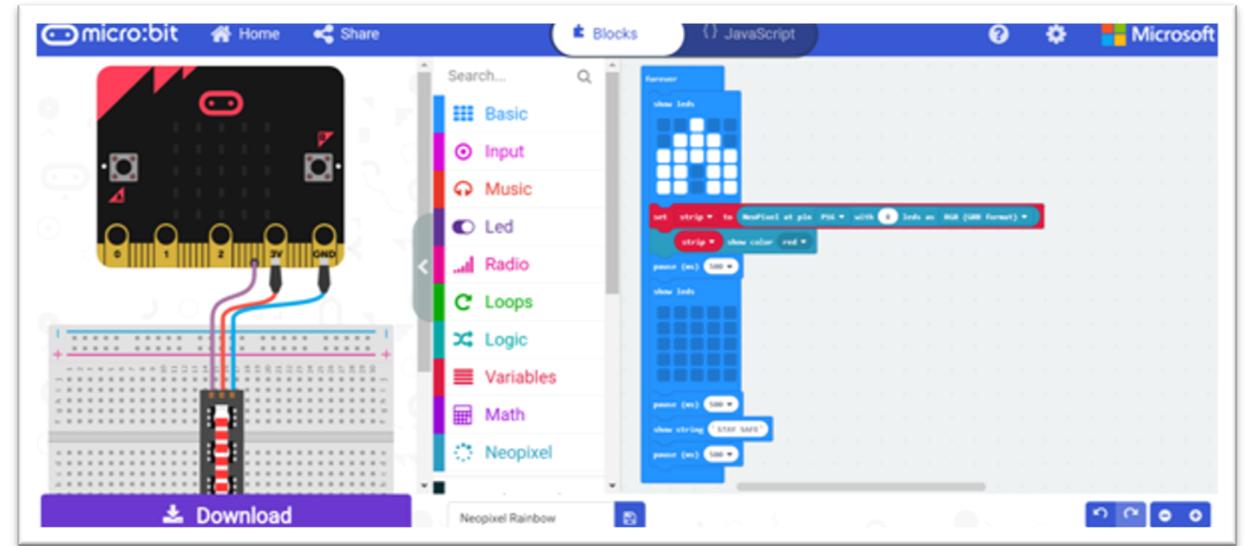
Start by following the instructions for challenge 1 to code your picture and your message. To add your NeoPixel rainbow, you need the NeoPixel blocks. Find these by going to the 'Advanced' tab and clicking on '+ Extensions' then choosing 'NeoPixel'. A light blue 'NeoPixel' tab will appear with the others on the left of your workspace.



1. You need to attach the NeoPixel strip to your micro:bit. Look closely at the edge connector and find the pins marked 0V, 3V and 16. Now look at your NeoPixel strip and find GND, 4-7VDC and D1. Attach the NeoPixel strip to the edge connector by connecting 0V to GND, 3V to 4-7VDC and 16 to D1 then connect your micro:bit to the edge connector by pushing it into the slot at the top.

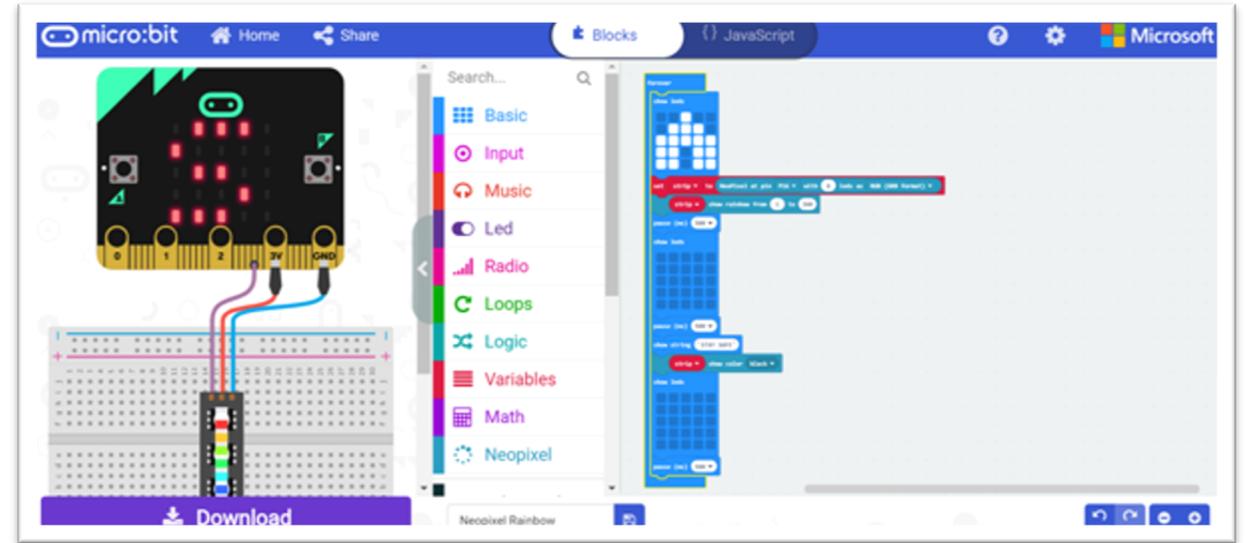


2. Now we can start coding the NeoPixels. Click on the 'Neopixel' tab and drag and drop the red 'set strip to ()' block. You need to tell the block that your NeoPixel strip is at pin 16, has 8 NeoPixels and is RGB format so make those changes. Test your code by adding the 'strip show colour red' block and looking at the picture on the left of your screen to check that all the NeoPixels are red.

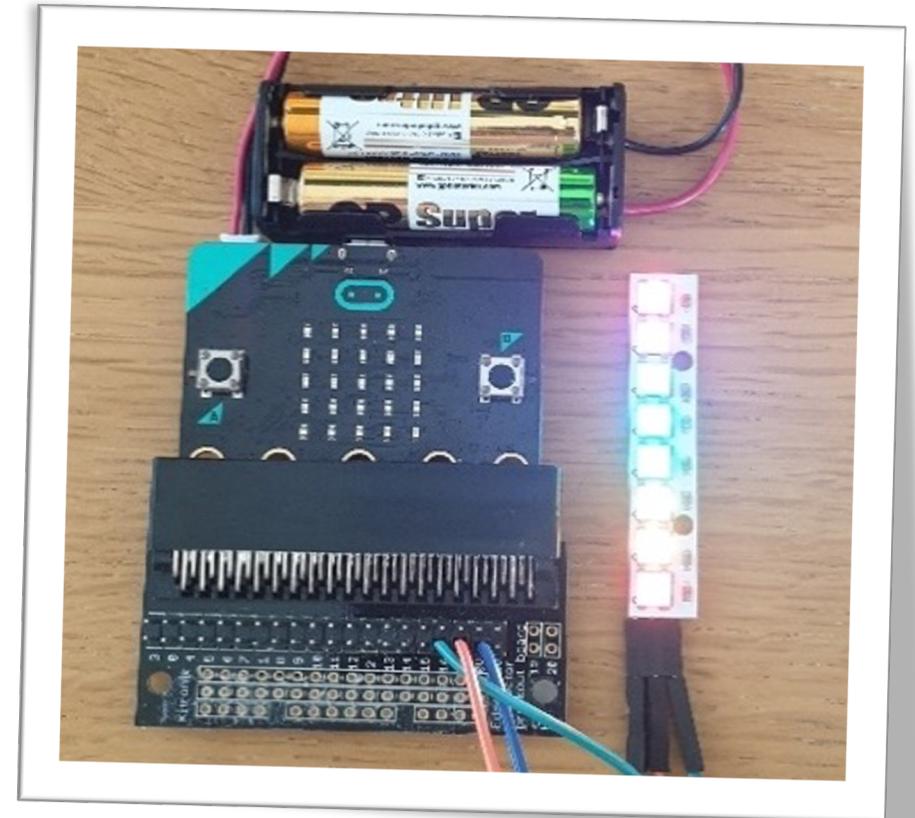


3. To change your NeoPixels to a rainbow, delete the 'strip show colour red' block and go back to the 'NeoPixel' tab to choose 'strip show rainbow from 1 to 360' instead.

We added a block to tell the NeoPixels to turn off as well, so that the rainbow flashes, but you can experiment to decide what you would like your NeoPixels to show.



4. Once you're happy with your code, download it to your micro:bit and add the battery pack to display it in your window. You can use connecting wires instead of plugging the NeoPixel strip directly into the edge connector, so that you can display your micro:bit and NeoPixels together. If you would like to, use your fabric scraps to create holders for your micro:bit, battery pack and NeoPixels.



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