Micro:bit LED Christmas Tree Lesson

Working towards outcomes of the Curriculum for Excellence:
I have used a range of electrical components to help to make a variety of circuits for differing purposes. I can represent my circuit using symbols and describe the transfer of energy around the circuit. (SCN 2-09a)
I understand the instructions of a visual programming language and can predict the outcome of a program written using the language. (TCH 1-14a and TCH 2-14a)
I can create, develop and evaluate computing solutions in response to a design challenge (TCH 2-15a)

Learning Intention	***Success Criteria***
We are learning to create a Christmas display using LEDs and the micro:bit.	- I can recognise some simple electronic components. - I can explain some simple electronics concepts. - I can connect LEDs to the micro:bit pins in a circuit. - I can code my circuit to light up in sequence.

Resources	Learners will need: • 1x micro:bit, 1x USB Cable, 1x Battery Pack and 1x device (iPad or Laptop). • 5-10 LEDs and 220ohm resistors (The ones I suggest already have resistors built in and can be found on Amazon 50pcs HERE 100pcs HERE) • 4x Crocodile Clips (30pcs on Amazon HERE) • Craft card and Bluetack. • A tiny amount of tin foil.
Timing	1hour 30mins
5-10mins	**Introduction** Watch introductory video from Mr Morrison. This looks at what the learners are going to create, what is electricity, what is an LED (video included), what is a resistor, and how to fold the card ready to draw the Christmas Tree.
15-20mins	**Part 1 – Creating the Cardboard Christmas Tree** Learners create their Christmas Tree (or other Christmas display). The card used does not have to be very strong. It is best to fold it in a way that it can stand up as demonstrated in the video. You don't want the tree to be too big so the lights are close enough together.
10mins	Once the tree has been created watch the second video which explains how to make holes in the card (Find a safe way to do this using the tools available to you in your classroom).
	Part 2 – Wiring the Christmas tree. The second video goes on to explain how to add the LEDs and wire them to the micro:bit. The circuit diagram demonstrates this. All the negative sides of the LEDs go to the GND pin via a crocodile clip. While the other end of the LED/resistor combination goes via crocodile clip to one of 3 different pins – split the number of LEDs you are using. Think about the split as to where they are on the tree as the LEDs grouped together will always be on or off at the same time.
20-30mins	Learners should wire their tree and make all the necessary connections to the micro:bit. *Troubleshooting – You may find that the crocodile clips don't make a good connection. If you first wrap the wires in tin foil, this should improve the conductivity.*

	Part 3 – Coding the Christmas Tree
5mins	The final video explains the last step of the project, to create code for the micro:bit so the lights light up in sequence. I would first suggest that you create the simple code that has the three pins always on, as shown in the video (Full Code HERE). This will allow learners to check that all the pins are working.
15-20mins	Then they should create the more complex version of the code which has the sequence (Full Code HERE). Once they have download this their project is complete. *Troubleshooting – You may find not all lights light up, try having the micro:bit plugged in by USB to the PC. I have found blue LEDs particularly need more Power than is possible from a battery that's not brand new.* **(Extension)** Learners could adjust the program to create a different sequence with the lights. • Learners could change the length of time they 'flash'. • Learners could change the order they light up. • Learners could create some Christmas music to accompany the sequence.
10mins	**Ending the lesson (Plenary)** After celebrating the classes creations there are optional plenary discussion questions. Have a great Christmas!