

# Micro:Bit: Electronic Lock

## For Poi Ching School

## Project: Electronic Lock

Programme: Microbit

Theme / Challenge Statement: How can we create an electronic lock using the Microbit?

Level: Primary 6 and up

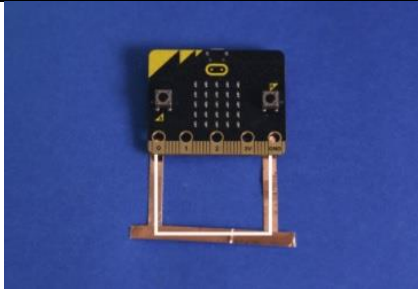

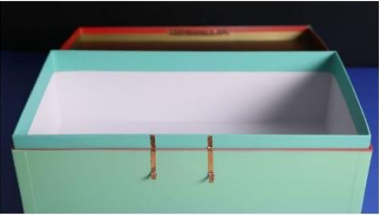
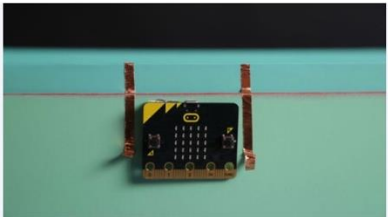
## Summary

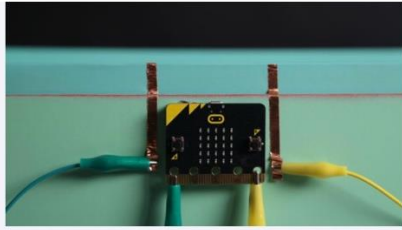
This project challenges students to create their own password system by turning the Microbit into an electronic combination lock to alarm a box or any other chose object.

<b>Prior Knowledge:</b>	Students should already know: <ol style="list-style-type: none"> <li>1. the key concepts of circuits (open and closed)</li> <li>2. how to use the BBC Launch Code Editor (intermediate)</li> <li>3. the basic components of Micro:Bit (Micro:Bit, buzzer, crocodile clips)</li> </ol>
<b>Learning Objectives:</b>	By the end of the lesson, students should be able to: <ol style="list-style-type: none"> <li>1. create a code that will turn the Micro:Bit into an electronic combination lock</li> <li>2. set-up Micro:Bit as a combination lock by applying their knowledge on circuits</li> <li>3. collaborate with a pair or group to successfully complete the project</li> </ol>

## Lesson Plan and Activities

Time	Teacher Activities	Purpose	Resources Needed
<b>Introduction/Pre-activity</b>			
30 minutes	Review the concept of circuits (open and closed), and the basics of Micro:Bits	To allow the students to recall key concepts of circuits and the basic components of Micro:Bit	Micro:Bit parts: <ul style="list-style-type: none"> <li>- Micro:Bit</li> <li>- Buzzer</li> <li>- 4 crocodile clips</li> </ul>
<b>Lesson development/Main activities</b>			
30 minutes	<b>Introduction of Project</b> Microbit has the ability to test if a circuit is complete or not by using copper tape (or kitchen foil). Knowing this, students can know think creatively how can they turn the Microbit into an electronic. Hint: We are going to separate the circuit into two pieces, two strips that connect to the Microbit and one strip which connects them together when it touches.	To let students understand the objective of the project  To provide initial guides or hints to students	Copper Tape Sticky Back Velcro (or double sided tape)

				
<p>30 minutes</p>	<p><b>Design Thinking Process</b> Go through the design thinking process with the kids. For this project, we will use a box to turn our Microbit into an electronic lock. Allow students to be creative with their alarm system (box design).</p>		<p>To let students understand and apply the process of design thinking</p>	
<p>30 - 45 minutes</p>	<p><b>Make the circuit breaker</b> Open the box and attach a strip of copper tape on the inside, front lip of the lid.</p>  <p><b>Make the alarm connectors</b> Close the box slightly and mark 2 points where the strip touched the front. Attach two vertical strips of copper tape here with a fold at the end.</p>  <p>Attach the Micro:Bit using Velcro or blue tack</p>  <p>Connect the Micro:Bit By using the crocodile clips, connect one side to P0 and the other to GND</p>		<p>To engage students in thinking logically and critically as they create their box for the electronic alarm system</p>	<p>Box</p>



Attach the buzzer  
Stick it to the box and connect the red wire to P1 and the black to GND



30 minutes

### Launch the Code Editor

Give students ample time to independently figure out the accurate code for the alarm code. The objective for students is to code an alarm response when the box is open, otherwise, no sound.  
Teachers may choose to give hints to students such as using the forever loop or the if-else block.  
Below is the test code:

```

    forever loop
      if pin P0 is pressed
        then
          show leds
          digital write pin P1 to 0
        else
          show leds
          pause (ms) 500
          digital write pin P1 to 1
          show leds
          pause (ms) 500
          digital write pin P1 to 0
  
```

To explore the available code blocks to use in solving the challenge

To engage in logic thinking by identifying the steps needed in creating a successful electronic alarm system

To let students learn and edit their codes from their errors

Laptop  
Microbit Code Editor  
<https://makecode.microbit.org>

	<p>Check if it works – when the box is closed there should be no sound, when its open the alarm should go off.</p> <p><b>Troubleshooting</b></p> <p>If the alarm is going off when the box is closed, the connection is not being made properly. Ask students to troubleshoot their code, or to check if their box and the wires are properly set-up.</p>		
<p>45 minutes</p>	<p><b>Passcode System</b></p> <p>At this stage, the system works but the alarm will always go off if the box is opened. Ask students how can we disable the lock if the owner (or we) wants to open the box? <i>Answer:</i> Setting a passcode</p> <p>Ask the students how can they program their Micro:Bit to include a passcode. Give students hint on using the A button and the B button. This works by setting a Cipher (or password) with 2 numbers. Press the A button to increase the 1<sup>st</sup> number and B button to increase the second. Then press buttons at the same time to check if its correct.</p>	<p>To further challenge students in developing a passcode system for their electronic lock</p>	

	<b>Troubleshooting</b> if necessary		
<b>Closure and consolidation/Post-activity</b>			
30 mins	<p><b>Reflection</b></p> <p>As this may be the students' first time to create an electronic lock system, ask about what they liked about this project, what can they improve and what are the things that they find tricky. Extend the activity by linking this project to real-life prompts such as:</p> <ul style="list-style-type: none"> <li>- What are the advantages and disadvantages of creating your passcode system?</li> <li>- How can this project address real-life problems? How can it not?</li> <li>- What are the possible issues arising from people developing their own lock system?</li> </ul>	To engage students in self-assessment of work and identify ways for improvement	