

The Education University of Hong Kong 2021-2022 Quality Education Fund Thematic Network – Tertiary Institutes STEM Project Team

SCHOOL: SOUTH YUEN LONG GOVERNMENT PRIMARY
SCHOOL (P5)

TOPIC: SMART LIGHTING AND LUX MEASUREMENT

目標

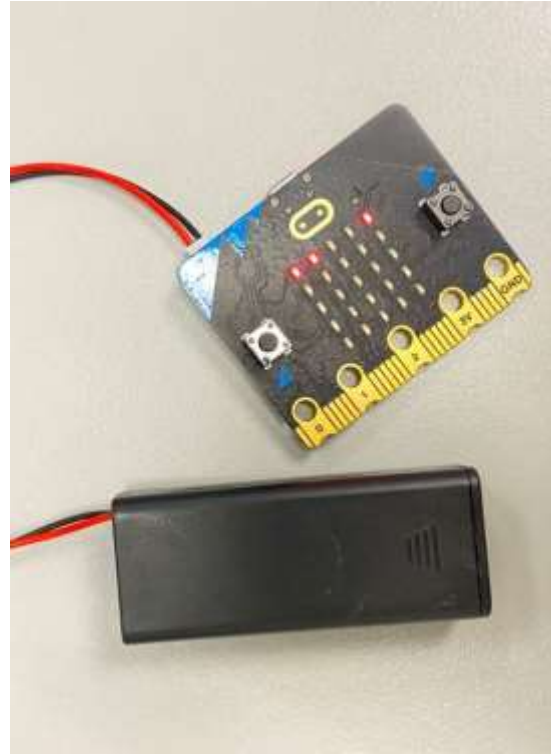
1. 以Micro:bit 量度光度 (Light Level)
2. 透過Micro:bit收集的光度 (light level)作出比較，借標定 (Calibration) 將收集的數據轉換成lux(標準化的單位)
3. 代入轉換成lux的公式到Micro:bit的編程，製作智能燈具

Measuring tools

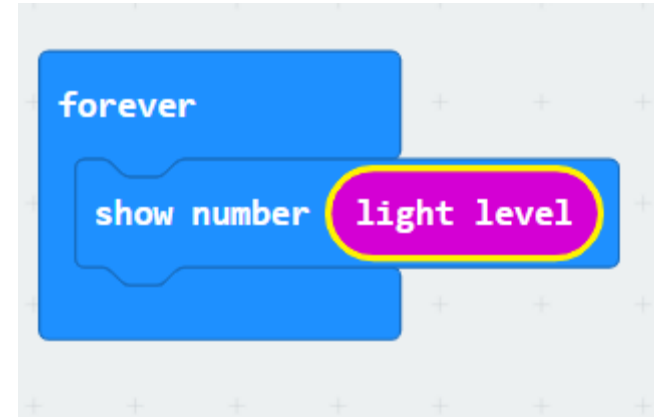
Lux Meter (~HKD\$80)



Micro:bit



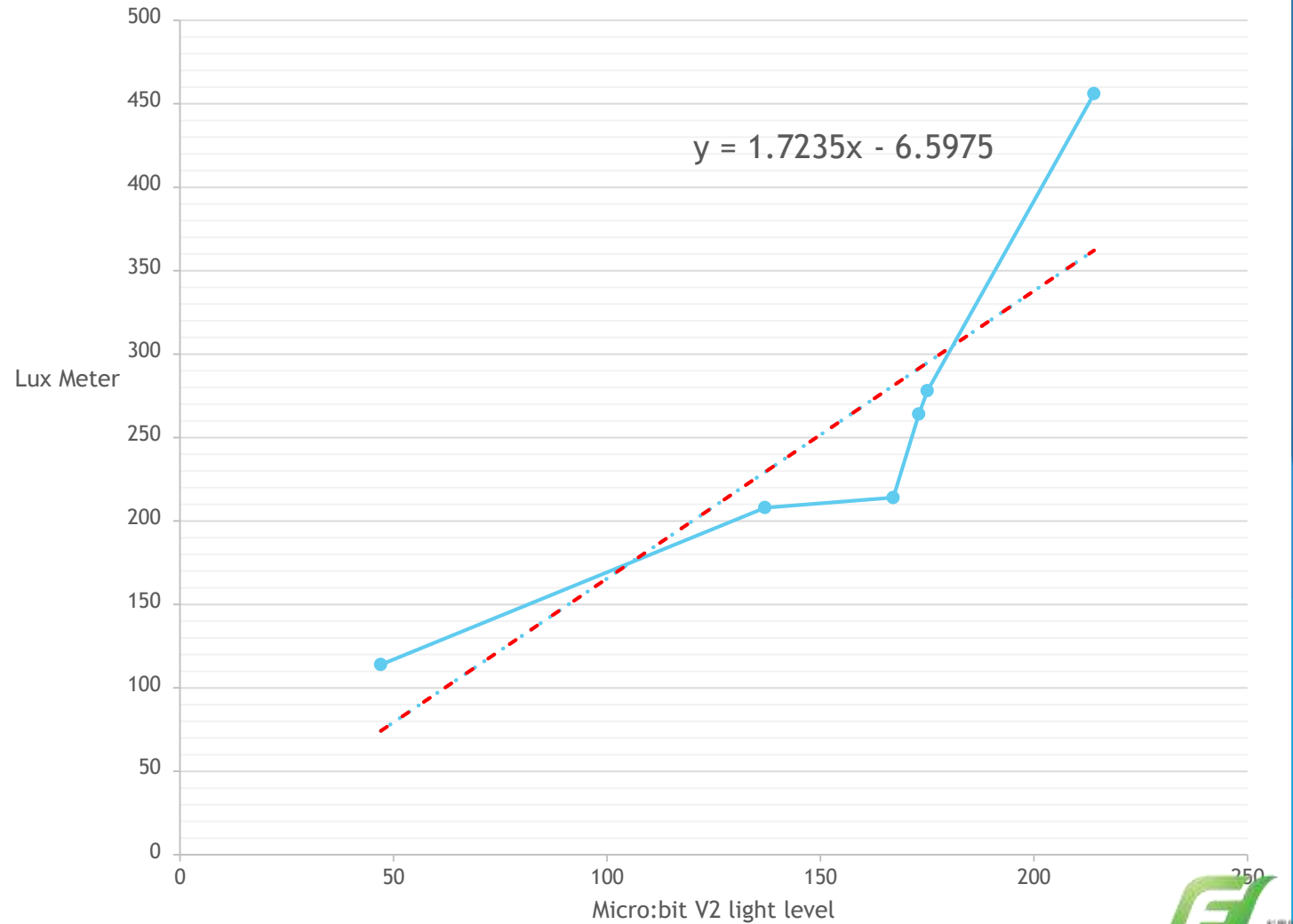
Micro:bit code



Light level reading:
0 (dark) to **255** (the most intense
light the micro:bit can measure)

Calibration (Micro:bit V2)

Light Level Reading	
Microbit V2	Lux Meter
47	114
137	208
167	214
173	264
175	278
214	456



Calibration (Micro:bit V2)

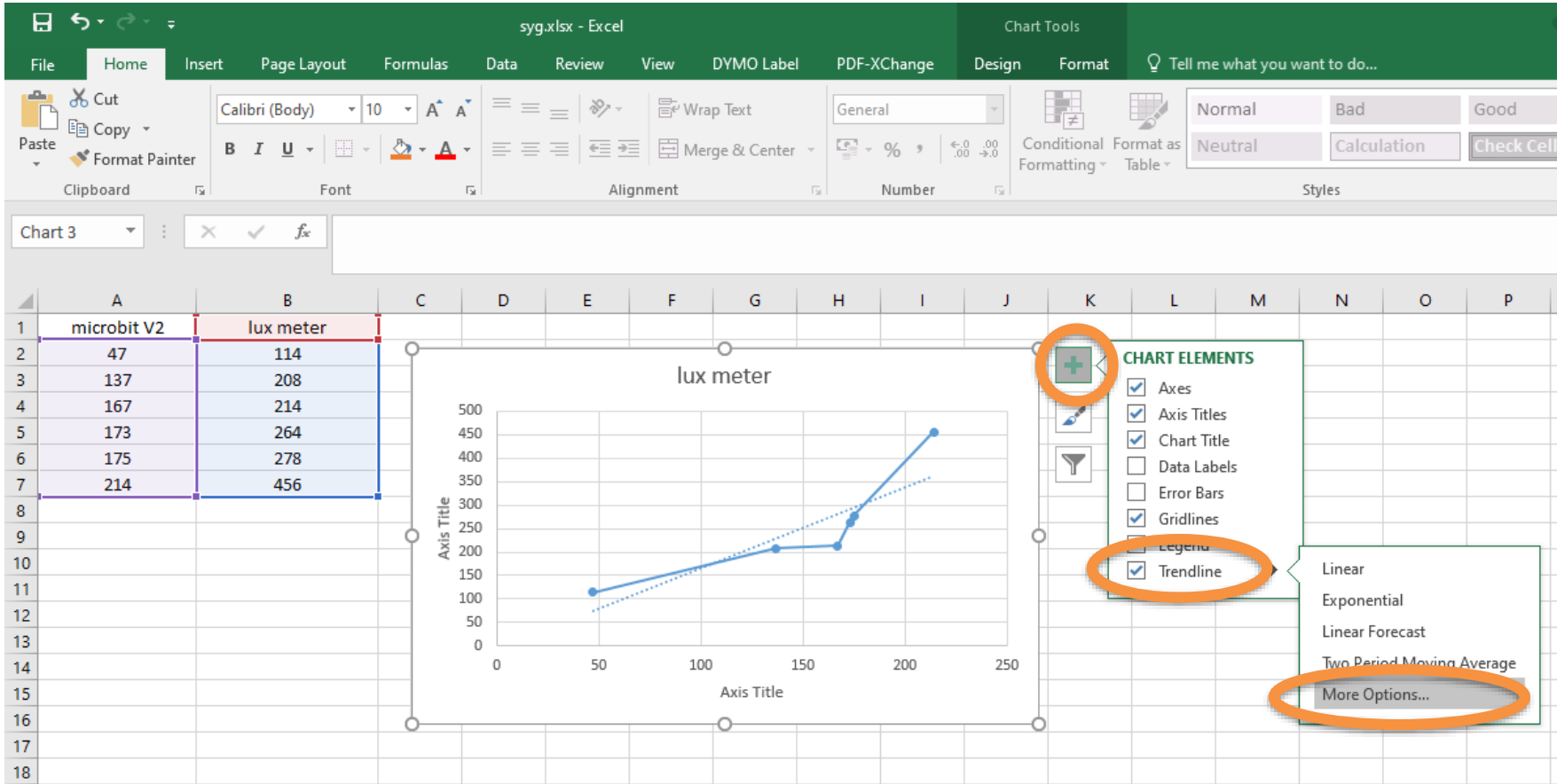
1. Select the data

microbit V2	lux meter
47	114
137	208
167	214
173	264
175	278
214	456

Scatter with Straight Lines and Markers
Use this chart type to:
• Compare at least two sets of values or pairs of data.
Use it when:
• There are few data points.
• The data represents separate measurements.

lux meter

Calibration (Micro:bit V2)



Format Trendline

Trendline Options



Trendline Options

- Exponential
- Linear
- Logarithmic
- Polynomial
- Power
- Moving Average

Trendline Name

- Automatic
- Custom

Forecast

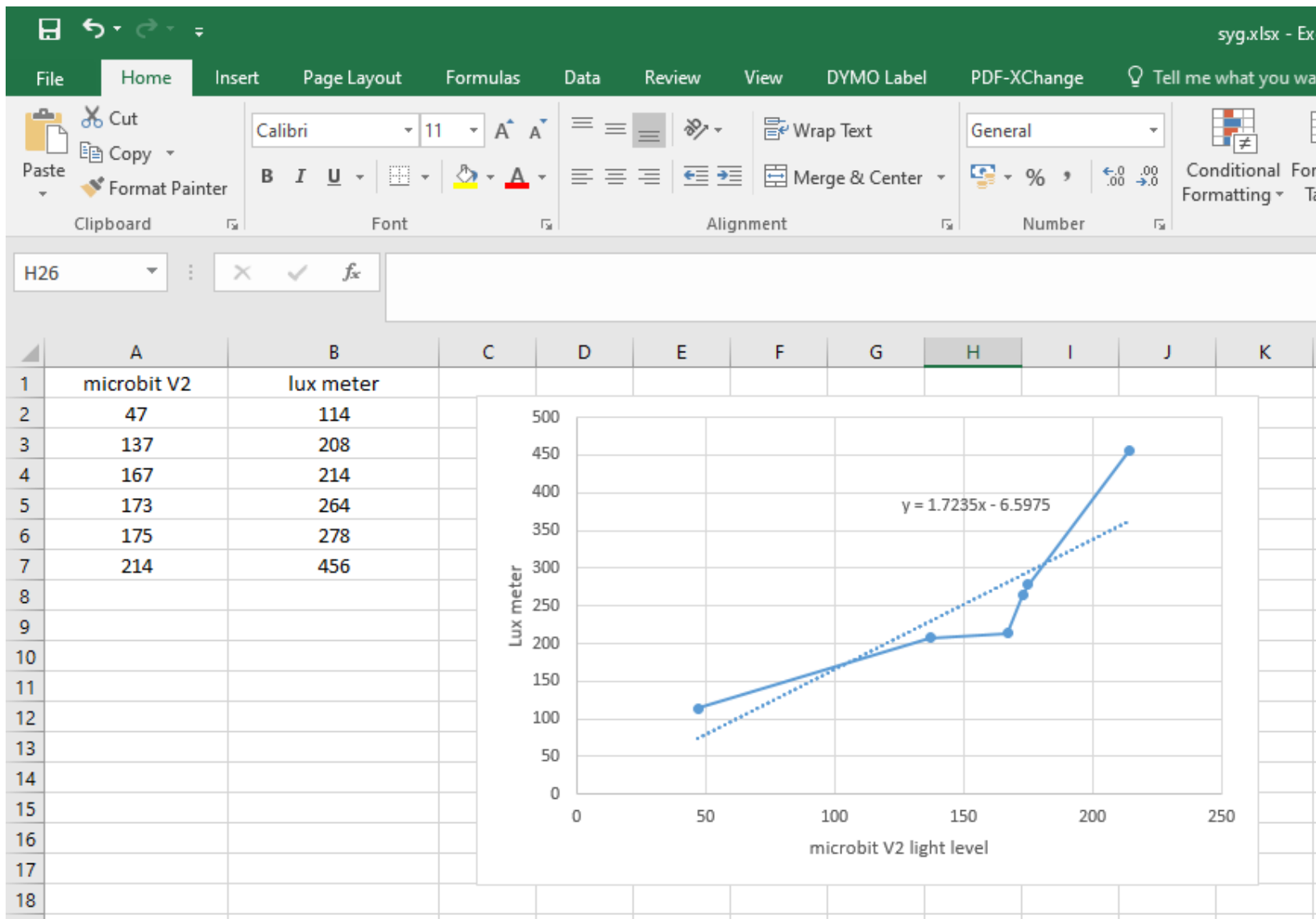
- Forward
- Backward

Set Intercept

Display Equation on chart

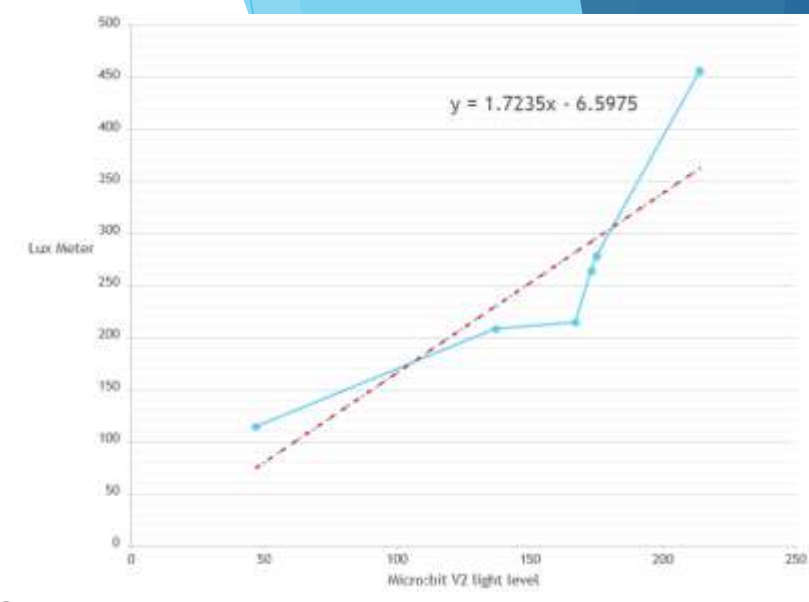
Display R-squared value on chart

Calibration (Micro:bit V2)



Micro:bit Coding

```
forever loop containing:  
  set lux to light level * 1.7235 - 6.5975  
  show number round lux  
  pause (ms) 2000
```



Equation
 $y = mx + c$
 $y = 1.7235x - 6.5975$

Micro:bit Coding

Scratch-style Micro:bit code blocks. A blue 'forever' loop block contains a red 'set lux to light level x 1.7235 - 6.5975' block, a purple 'show number round lux' block, a green 'if lux < 300 then' block, and a blue 'pause (ms) 2000' block. The 'if' block has a red 'digital write pin P0 to 1' block in the 'then' section and a red 'digital write pin P0 to 0' block in the 'else' section. The number '300' in the 'if' block is circled in yellow.

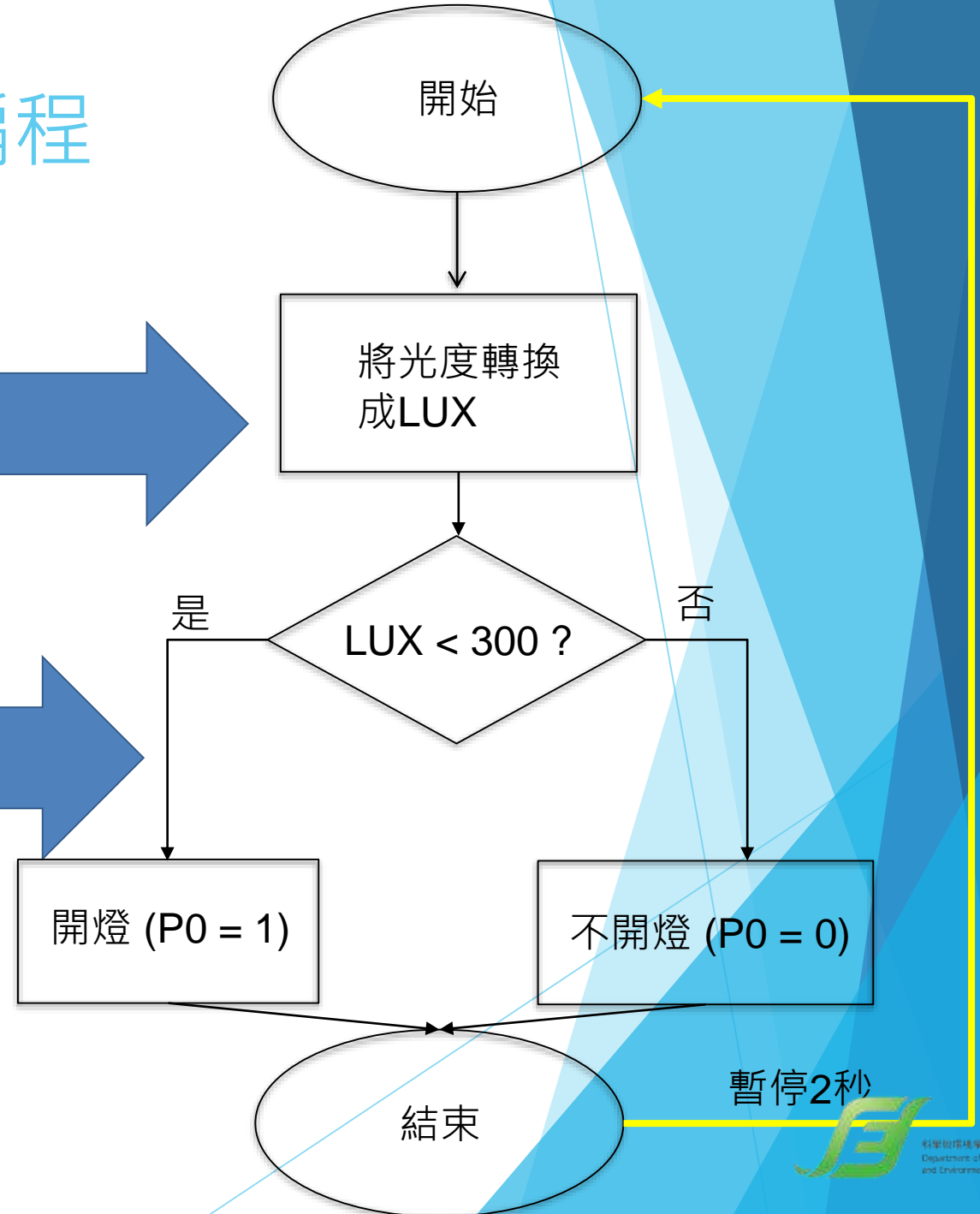
Adjust by student based on different situation

LED/light bulb turn on

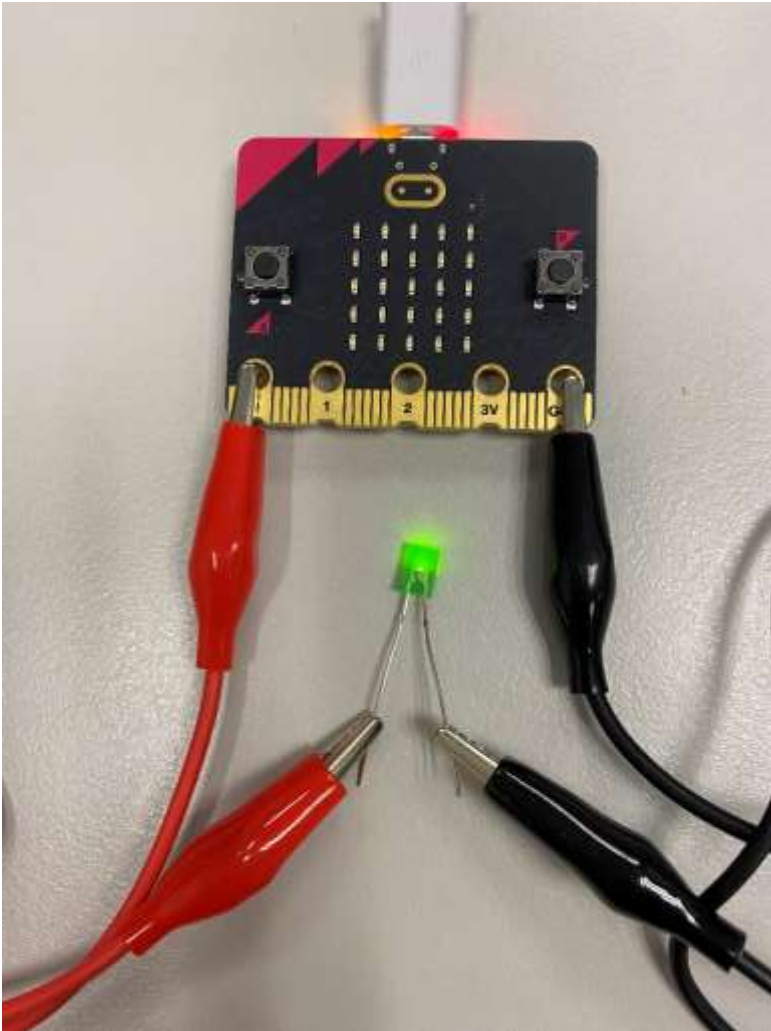
LED/light bulb turn off

Chinese Scratch-style Micro:bit code blocks. A blue '重複無限次' (Repeat Forever) loop block contains a red '變數 lux 設為 光線感測值 x 1.7235 - 6.5975' block, a purple '顯示 數字 四捨五入 lux' block, a green '如果 lux < 300 那麼' (If lux < 300 then) block, and a blue '暫停 2000 毫秒' (Pause 2000 ms) block. The '如果' block has a red '數位信號寫入 引腳 P0 數字 1' block in the '那麼' section and a red '數位信號寫入 引腳 P0 數字 0' block in the '否則' (Else) section.

條件式編程



Prototype



- If Lux $<$ 300, LED light turns on.
- If Lux $>$ 300, LED light turns off.