優質教育基金
Quality Education Fund

優質教育基金主題網絡計劃
2022-2023
QTN 透過活的科學：促進中小學創意STEM教育

Sharing by Participated School:

Mr. Chan Ping Yiu, William

St. Paul's College

Head of Information Services and Technology Department
& STEM Education Coordinator

FOUNDED 1851

Special thanks to:

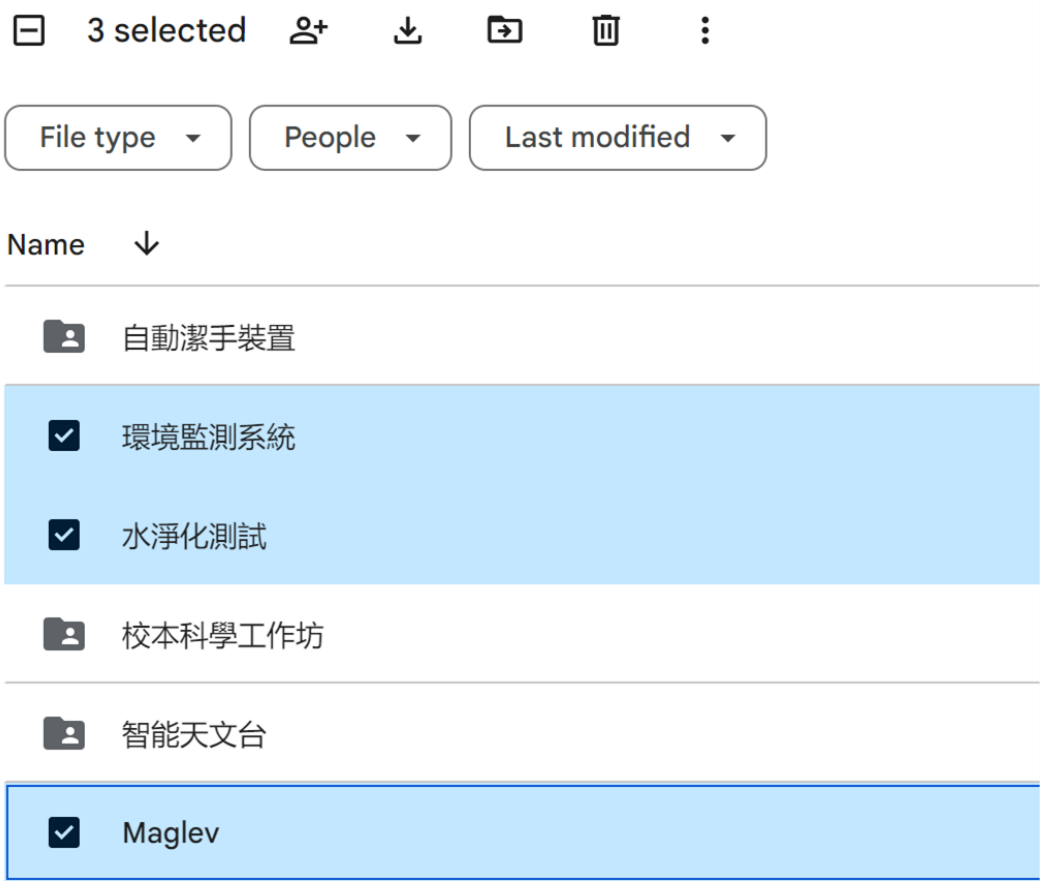
Network Coordinating School:

萬鈞伯裘書院

Man Kwan Pau Kau College

Great Supports by Pak Kau College

1. Teacher trainings
2. Teaching resources
3. Lesson Co-planning
4. Technical Supports
5. Many activities prepared



1. 自動環境監測系統 (Learning IOT using Microbit + sensors)

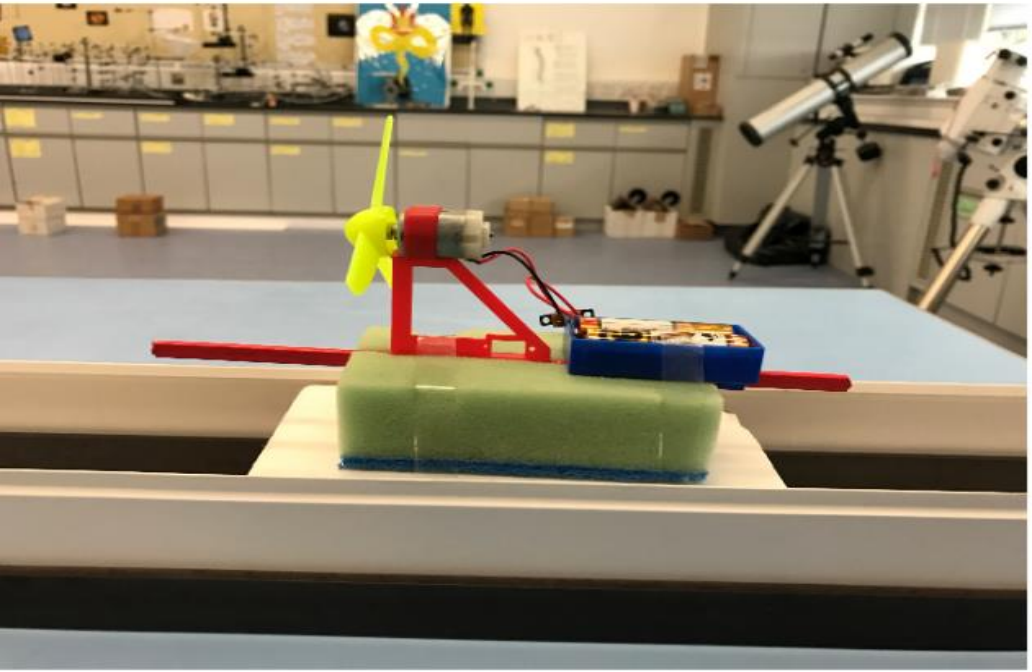
- 學生可運用 Micro:bit 微電路版，透過不同的感應器及裝置，設立環境監測系統。
- 運用物聯網，將數據上傳在雲端系統，並達至科學數據化顯示。

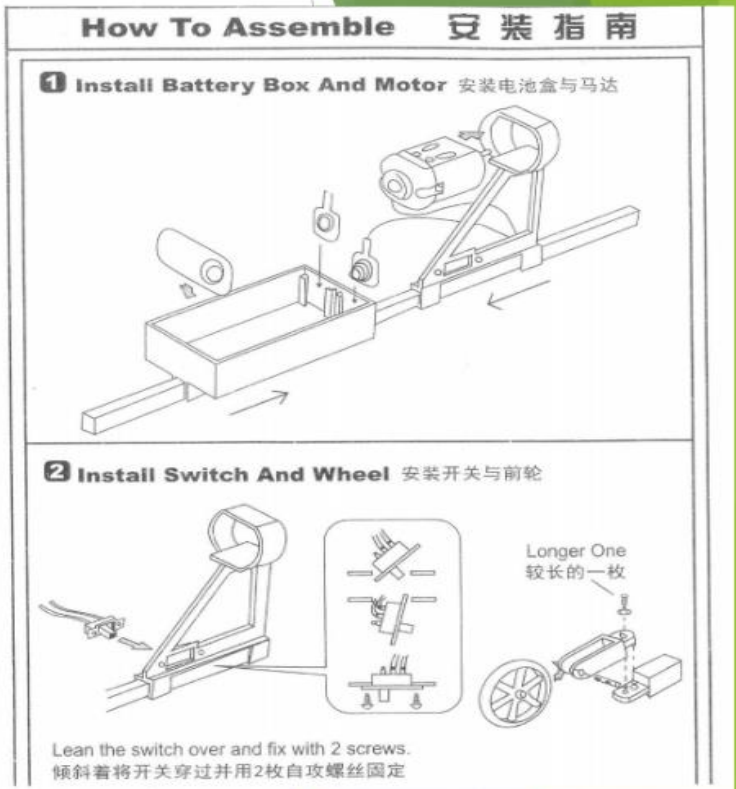
科學	科技	數學
觀察生物 電的使用	程式設計 感應器應用	雲端數據系統 統計

- 運用科學過程技能
- 發展共同解決問題能力和創造力
- 發展綜合和應用科學、科技和數學的知識與技能的能力

2. 磁浮列車

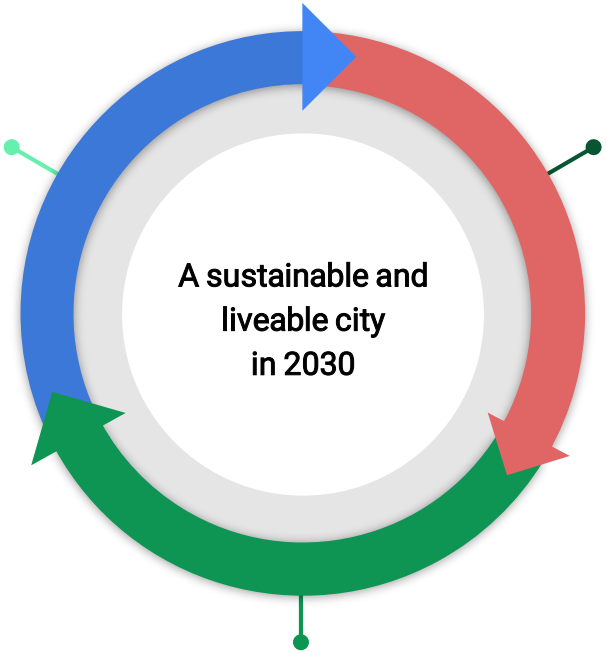
製作電舫動部分





Matched with our School Theme: Building a SMART Sustainable City

To what extent your proposal is an effective way to achieve your goals?



What are your major concerns towards your community?

How will you bring change(s) to the community facilities to make it more sustainable and liveable?

Smart Sustainable City

IoT Technologies

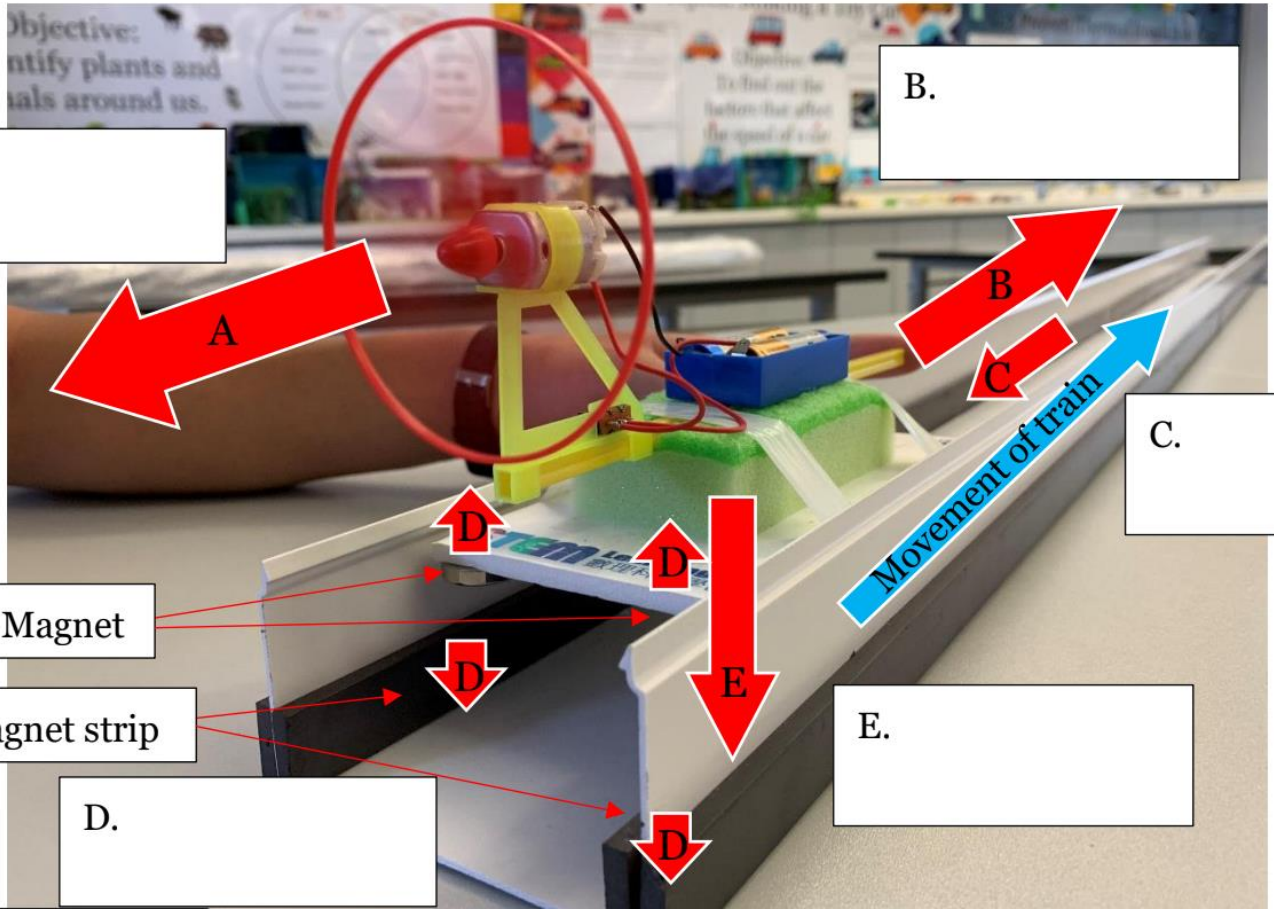
- Legality and Security
- Air Quality
- Digital Transformation
- Green Urban Areas
- Water Quality

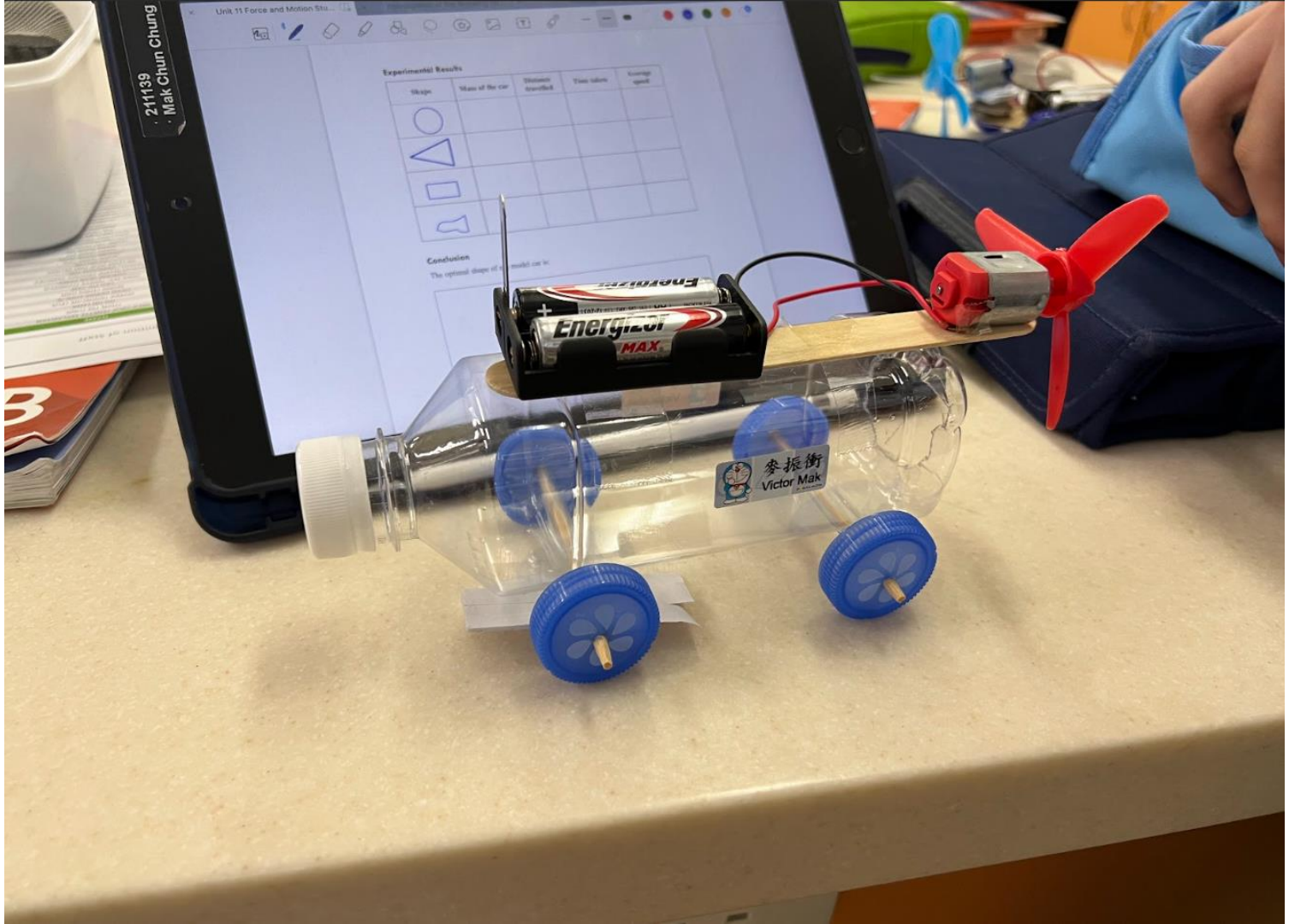
- Energy
- Occupation
- Waste Management
- Sustainable Mobility
- Tourism and Culture

Sustainability Indicators

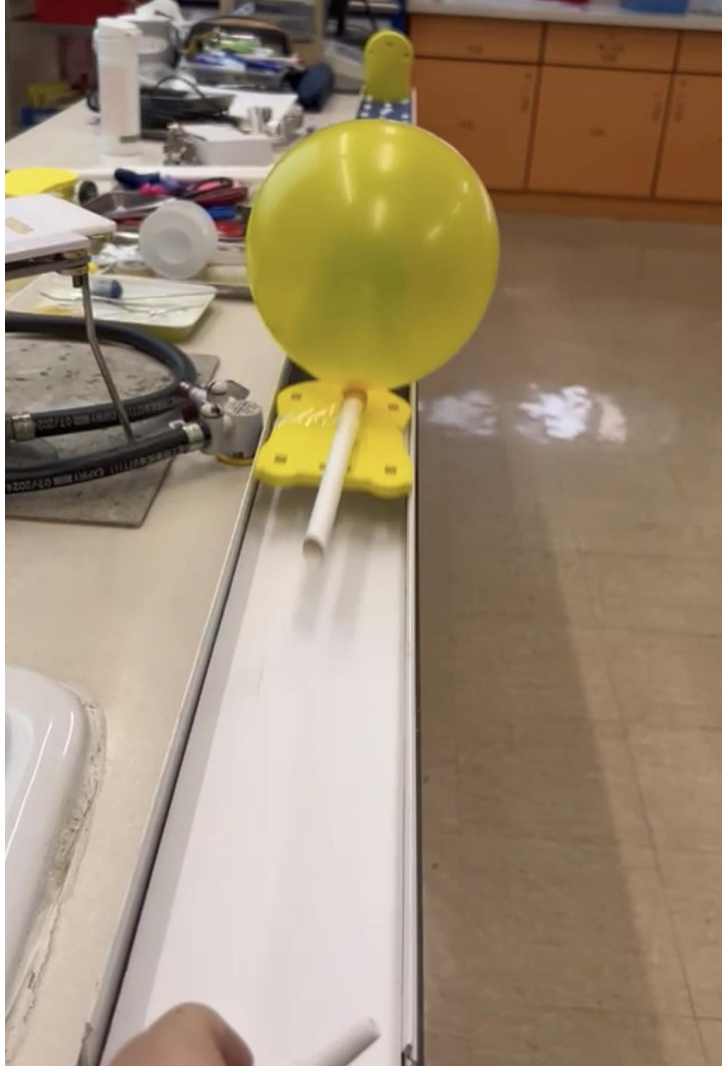
Form 2 Curriculum: Modified Maglev Activity (Force and Friction)

Applied force (Backward)	Force of gravity (Downward)	Air friction (Backward)
Reaction force (Forward)	Magnetic force (repulsion)	




211139
Mak Chun Chung
Unit 11 Force and Motion Stu...
Experimental Results
Conclusion
Energizer
MAX
麥振衡
Victor Mak

Supreme
B9D
B10D
B9C
B10C
C9D
C10D



264

Form 4 Curriculum
Importance of IOT and IOT Application Examples

- Devices + Sensors
- Apps writing
- IOT
- API
- **GIS (Data manipulation)**

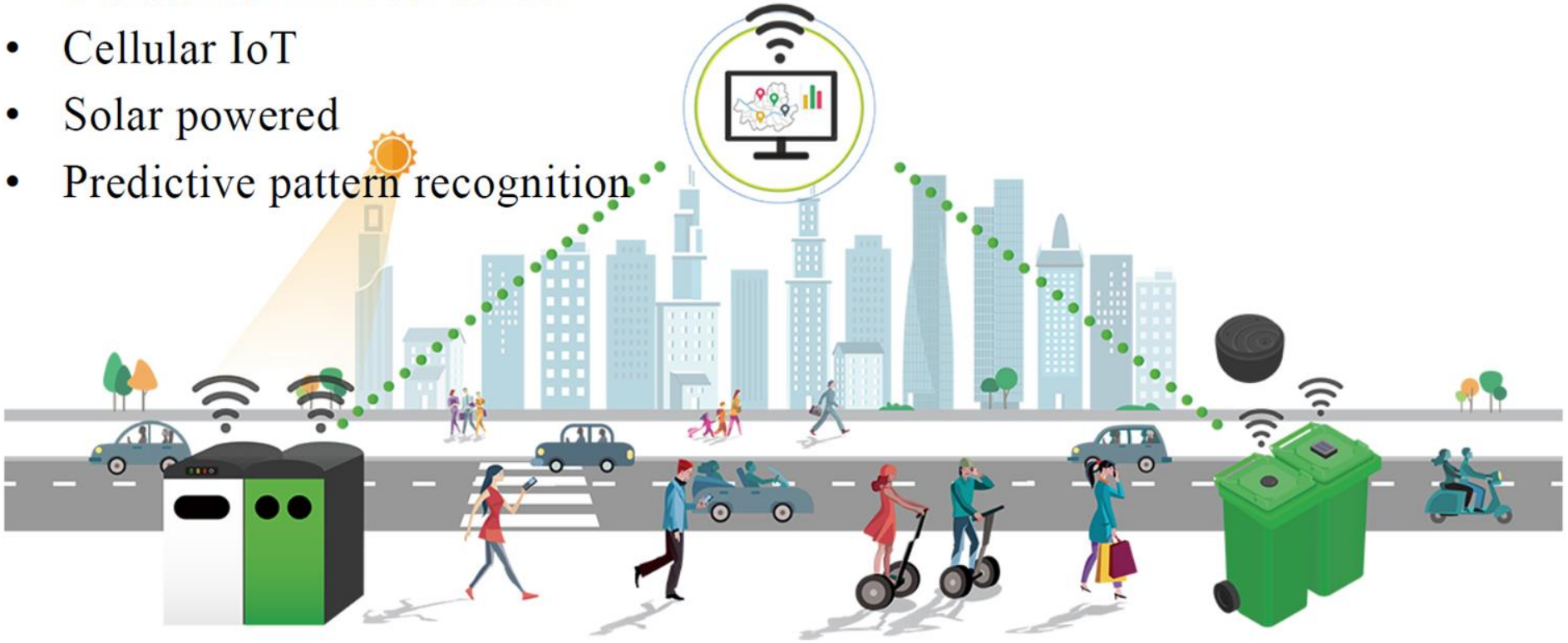
Cool Applications

- Sustain (Smart cities)
- Move (Self driving cars)
- Heal (Healthcare)
- Feed (Agriculture)
- Make (Manufacturing and packaging)

- The purpose of this section is two fold:
  - Get you excited about IoT potential
  - And more importantly, have you thinking of better ideas than the ones already out there

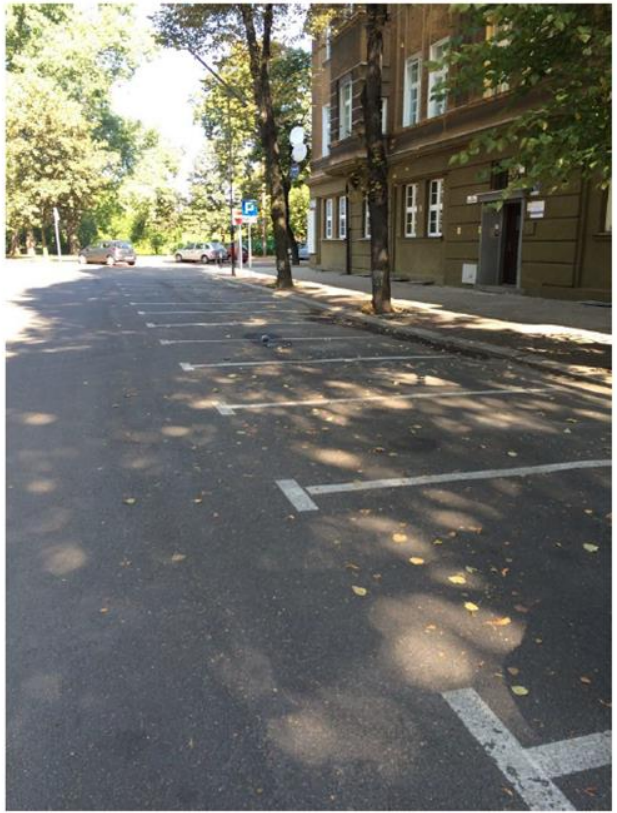
Smart Waste Management

- Ultrasonic fill-level sensor
- Cellular IoT
- Solar powered
- Predictive pattern recognition



http://ecubelabs.com/integrated-waste-management/

Smart Street Parking in Poland



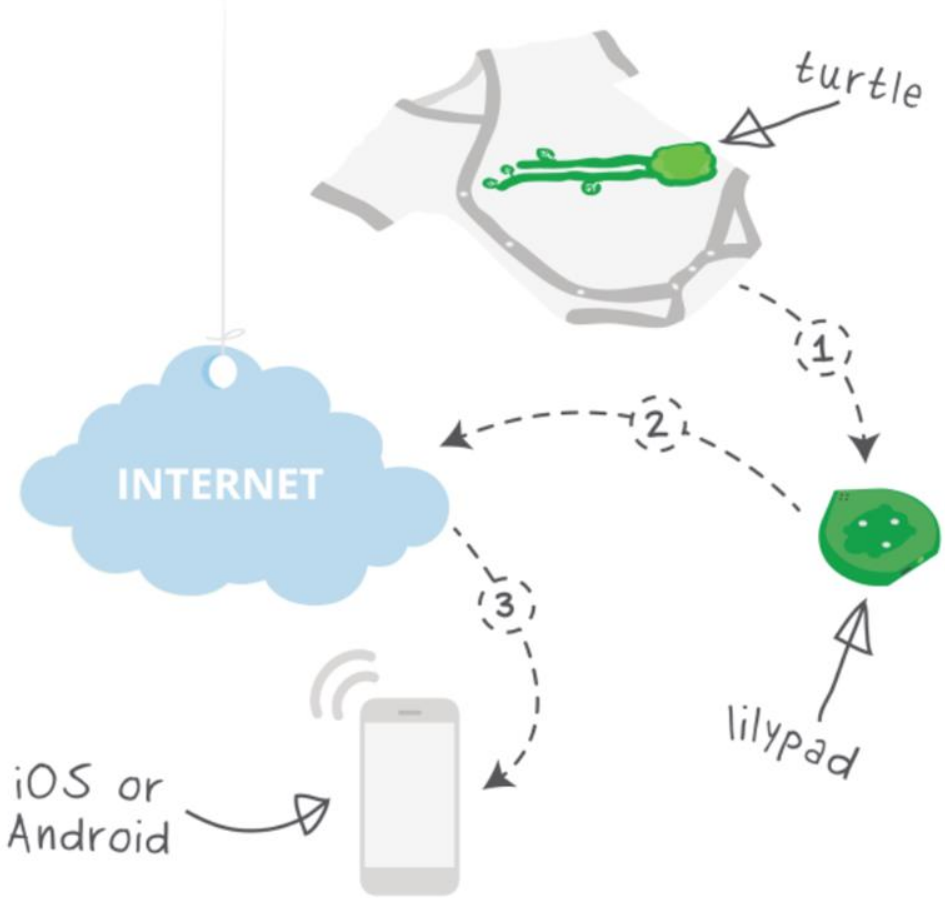
http://www.worldsensing.com/success-story/gliwice-smart-parking-solution/#

Baby Monitoring – Activity Tracking

http://mimobaby.com/

http://www.owletcare.com/smart-sock-2/

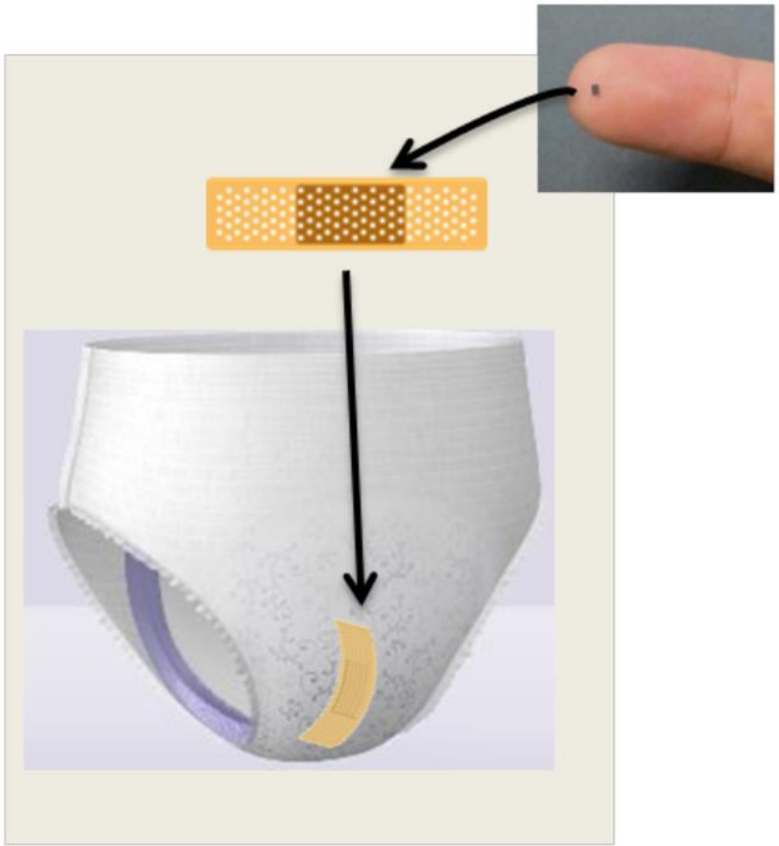
Baby Monitoring – Activity Tracking



1. The turtle sends information about the baby's breathing, body position, sleep activity, and skin temp to the Lilypad via Bluetooth LE.
2. The Lilypad streams data and live audio to the cloud via WiFi.
3. Parents receive real-time insight about their baby on their smartphone.

http://mimobaby.com/

Elderly Monitoring – Incontinence Management

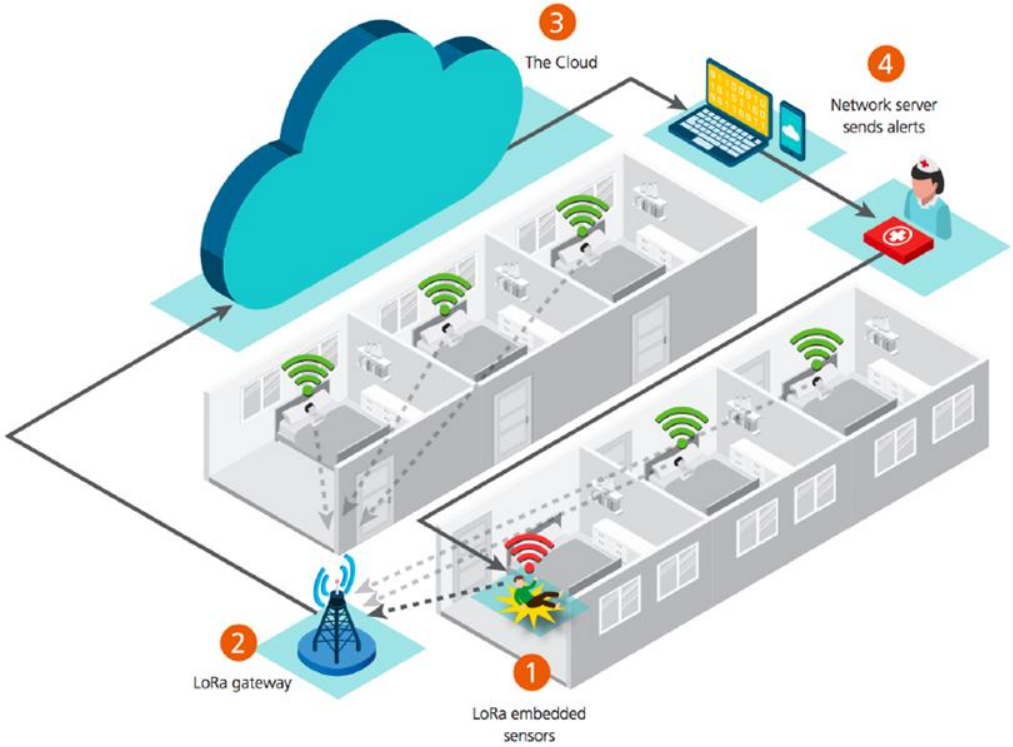


- In most nursing homes, between 40% and 60% of residents suffer from urinary incontinence.
- Smart diaper allows caregivers to remotely detect if an incontinence event has occurred.
- Improved quality and dignity of care by not having to disturb the elderly.

http://rfmicron.com/health-care/

http://www.medisens.com/news/press-release-1

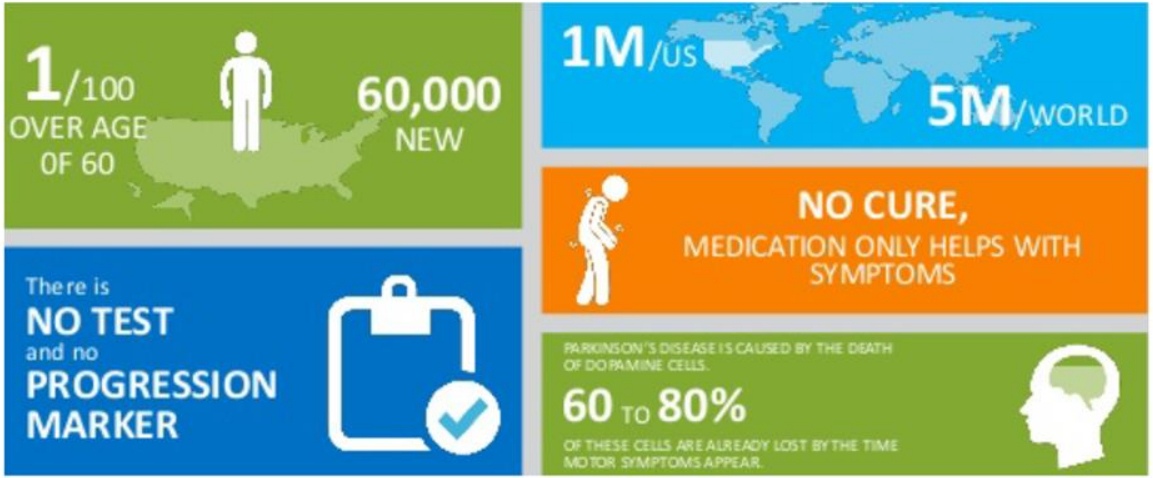
Elderly Monitoring – Fall Detection



1. Fall/movement data collected by sensors embedded with LoRa Technology
2. Data from all sensors is sent to a LoRa gateway as person moves
3. Gateway sends information to the Cloud where the data is analyzed by an application to determine what is normal and what is a fall
4. Application server sends reports and alerts on the fall and location of the person to a computer or mobile device

http://www.semtech.com/wireless-rf/internet-of-things/downloads/Semtech_Health_FallDetection_AppBrief-FINAL.pdf

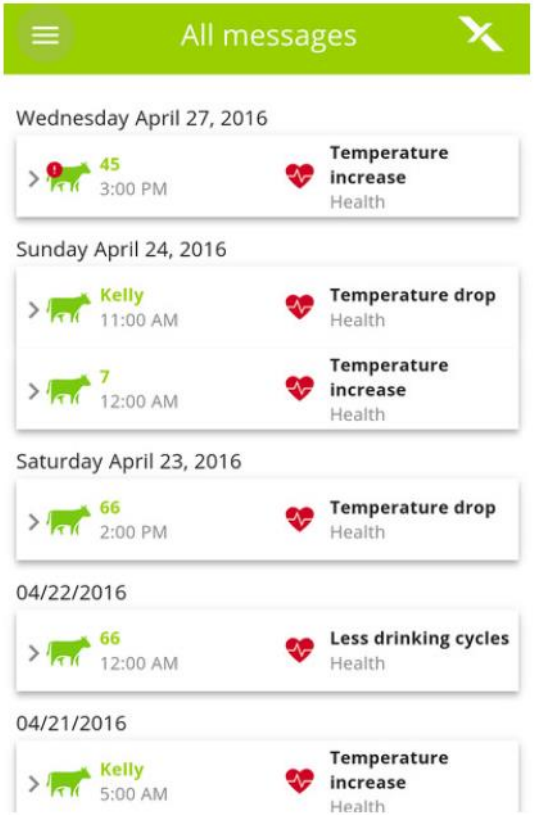
Disease Treatment and Progression Monitoring – Parkinson's



Patients with Parkinson's disease must be continually assessed in order to keep up with their symptoms. This becomes potentially problematic as symptoms fluctuate on a constant basis, and a monthly check in with their doctor may not be representative of their experience.

https://www.slideshare.net/rcnossen/healthcare-iot-and-analytics-to-treat-parkinsons

Connected Livestock

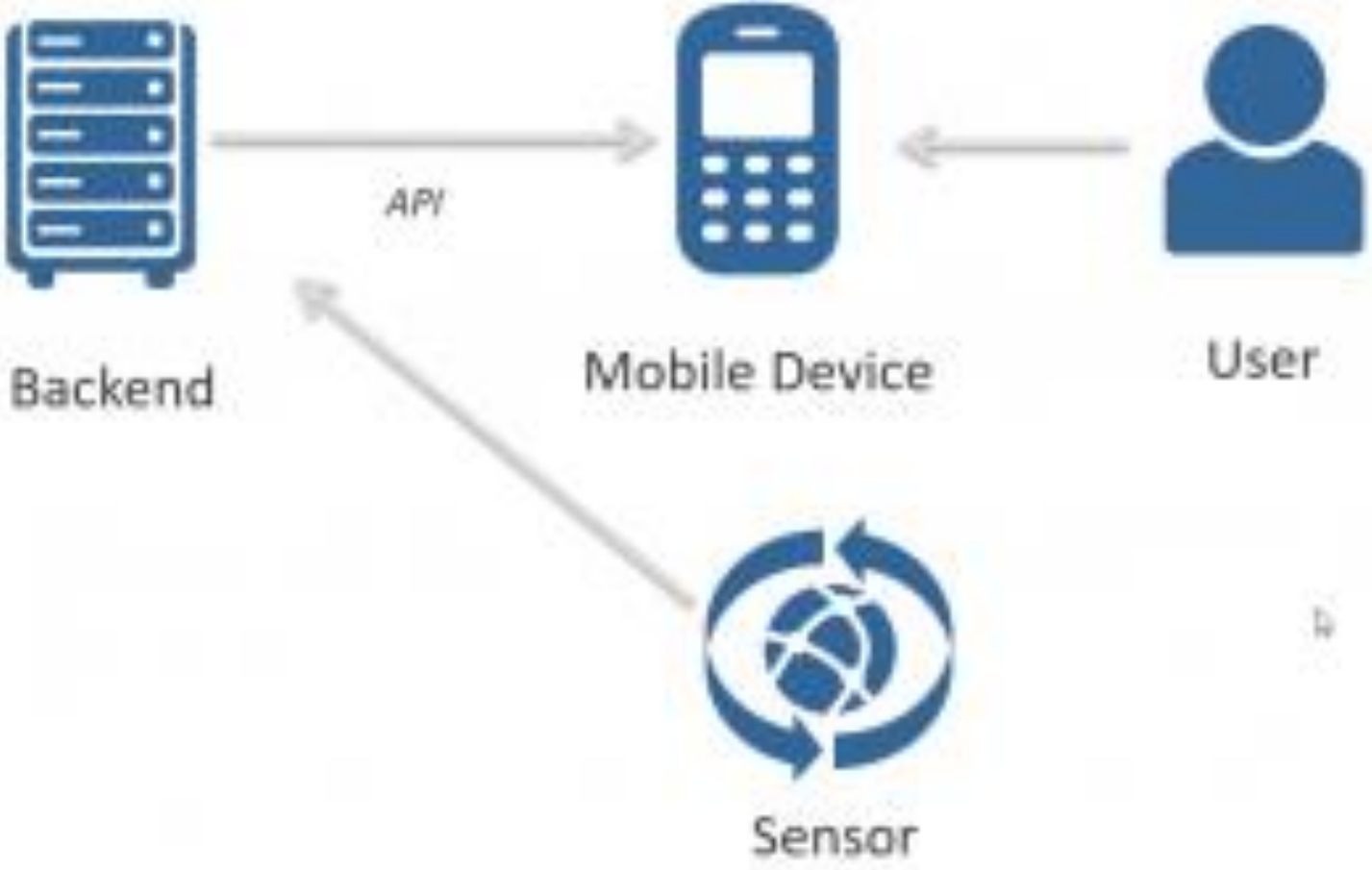


http://uk.smaxtec.com/smaxtec-system/

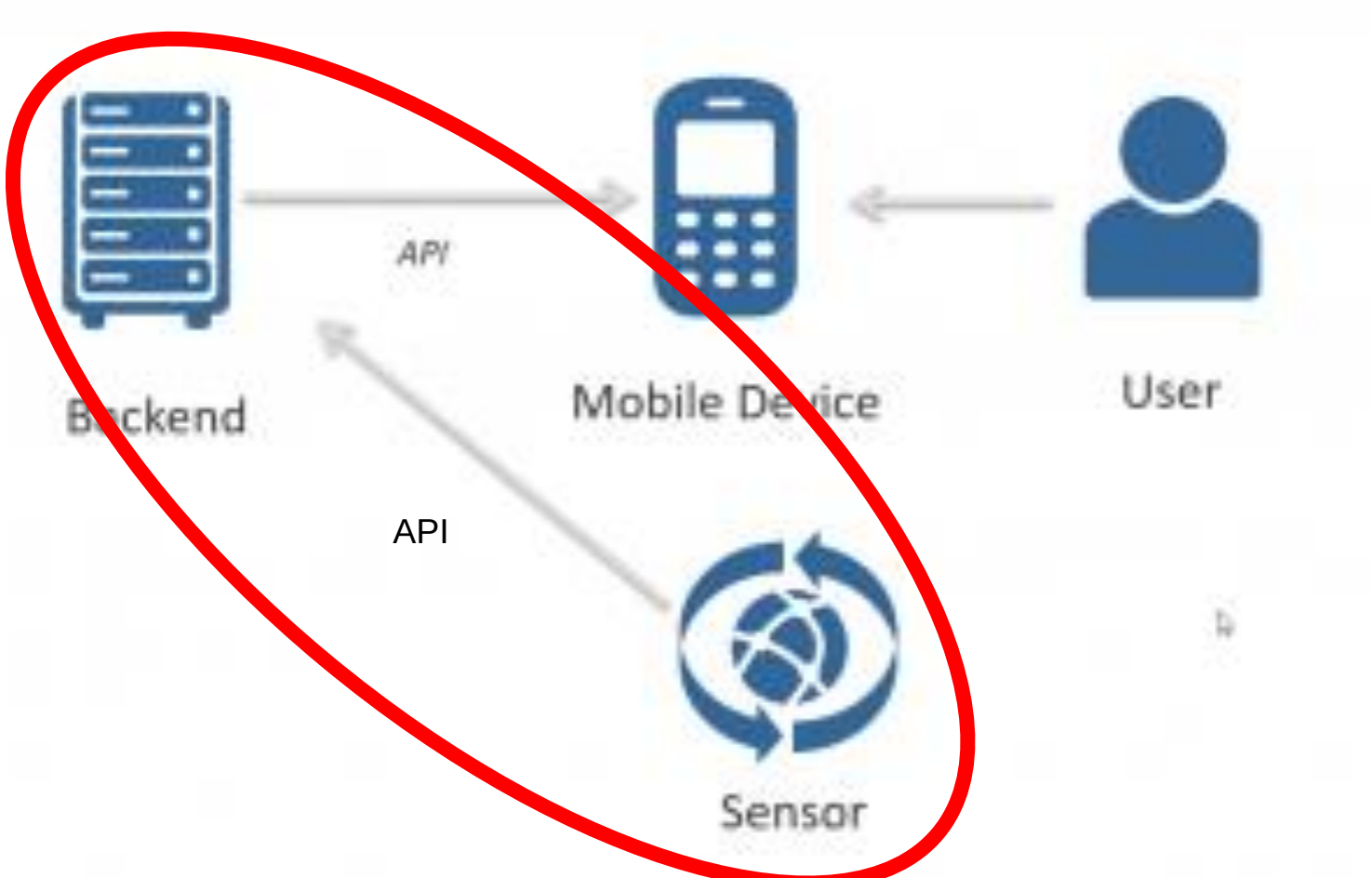
Conclusion

http://www.eetimes.com/author.asp?doc_id=1328602

Session 2: Hands-on IOT knowledge

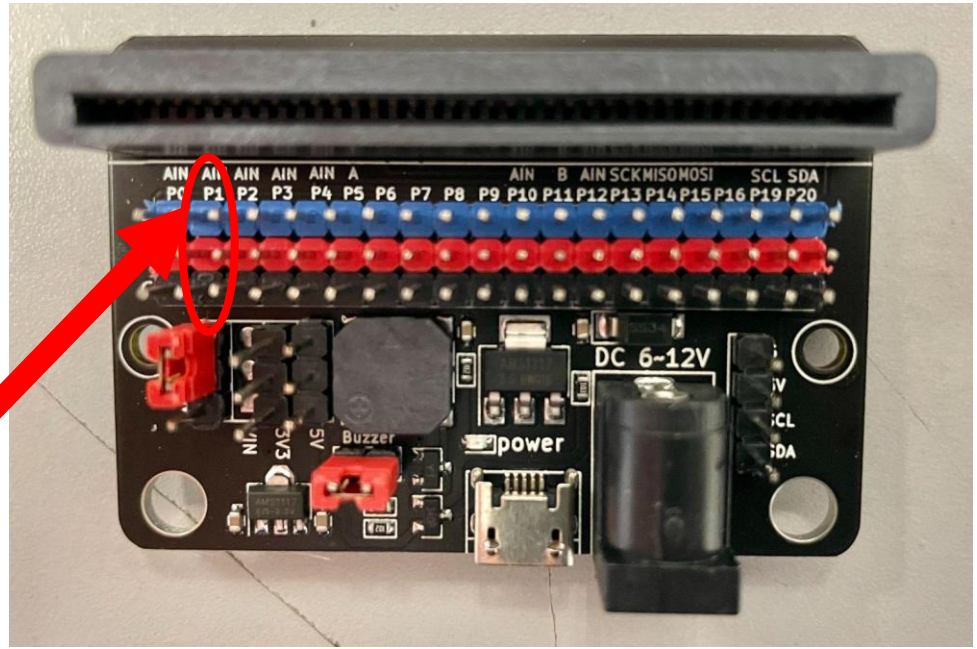

API
Backend
Mobile Device
User
Sensor

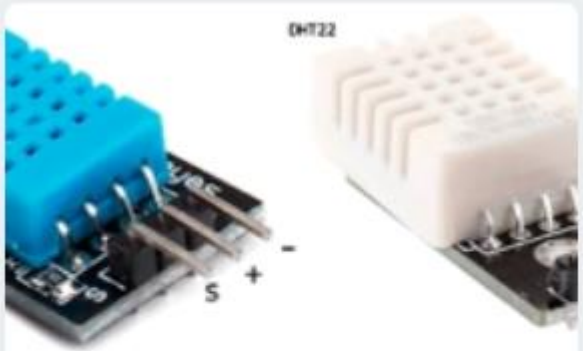
Lesson 1: Sensors → Thingspeak (Database)



Connect the Temperature and humidity sensor

1. Connect To PIN P1
2. Search and add Extension: DHT11

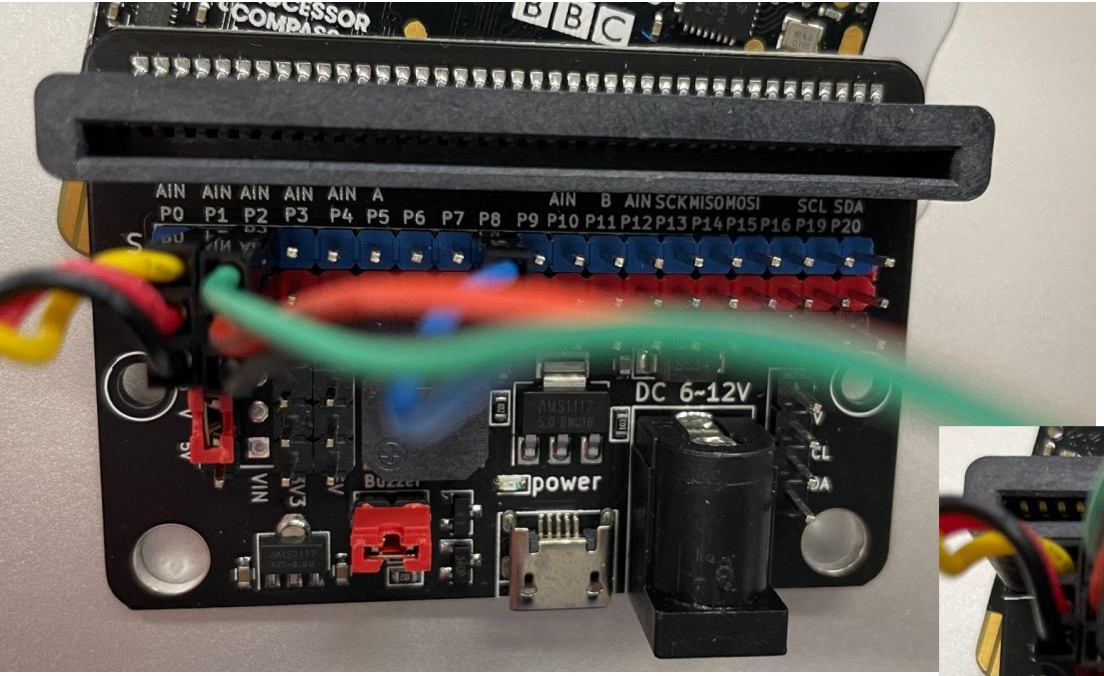


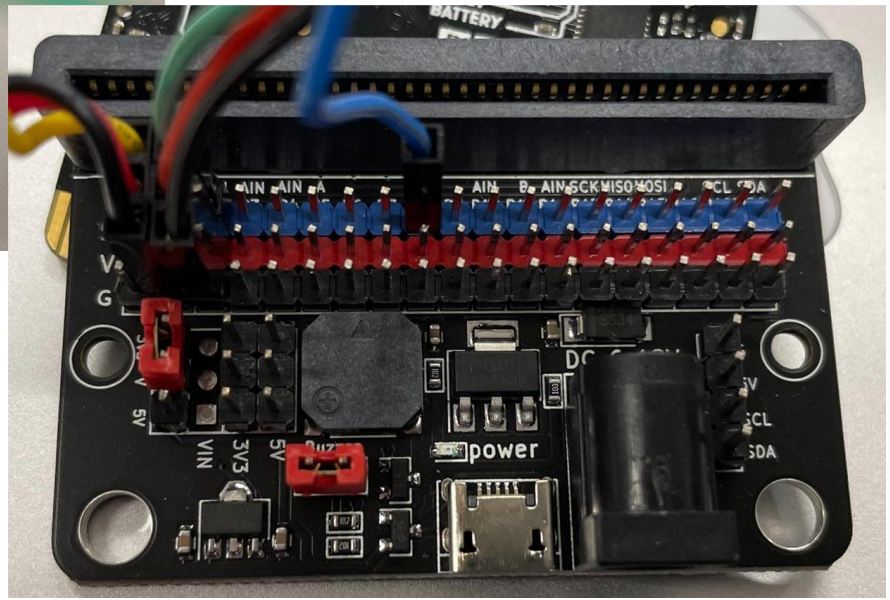


DHT11_DHT22

MakeCode extension for DHT11/DHT22 humidity and

Learn more


AIN P0
AIN P1
AIN P2
AIN P3
AIN P4
A P5
P6
P7
P8
AIN P9
B P10
AIN P11
SCK P12
MISO P13
MOSI P14
P15
P16
SCL P19
SDA P20
DC 6-12V
power
VIN
3V3
Buzzer


power
VIN
3V3
5V

TEMP and HUMID

Channel ID: **1570251**
Author: mwa0000024719121
Access: Private

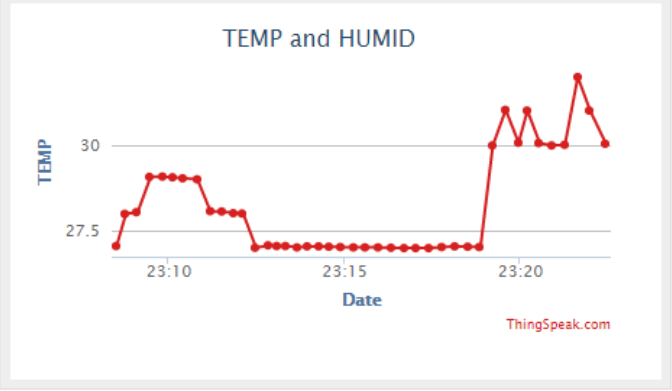
Private View | Public View | Channel Settings | Sharing | API Keys | Data Import / Export

Add Visualizations | Add Widgets | Export recent data | MATLAB Analysis | MATLAB Visualization

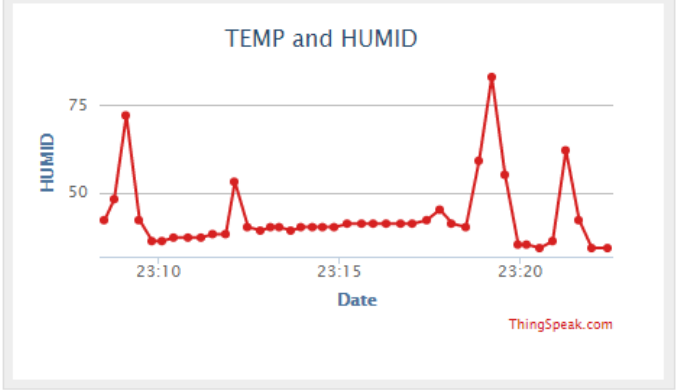
Channel Stats

Created: about 10 hours ago
Last entry: about 9 hours ago
Entries: 42

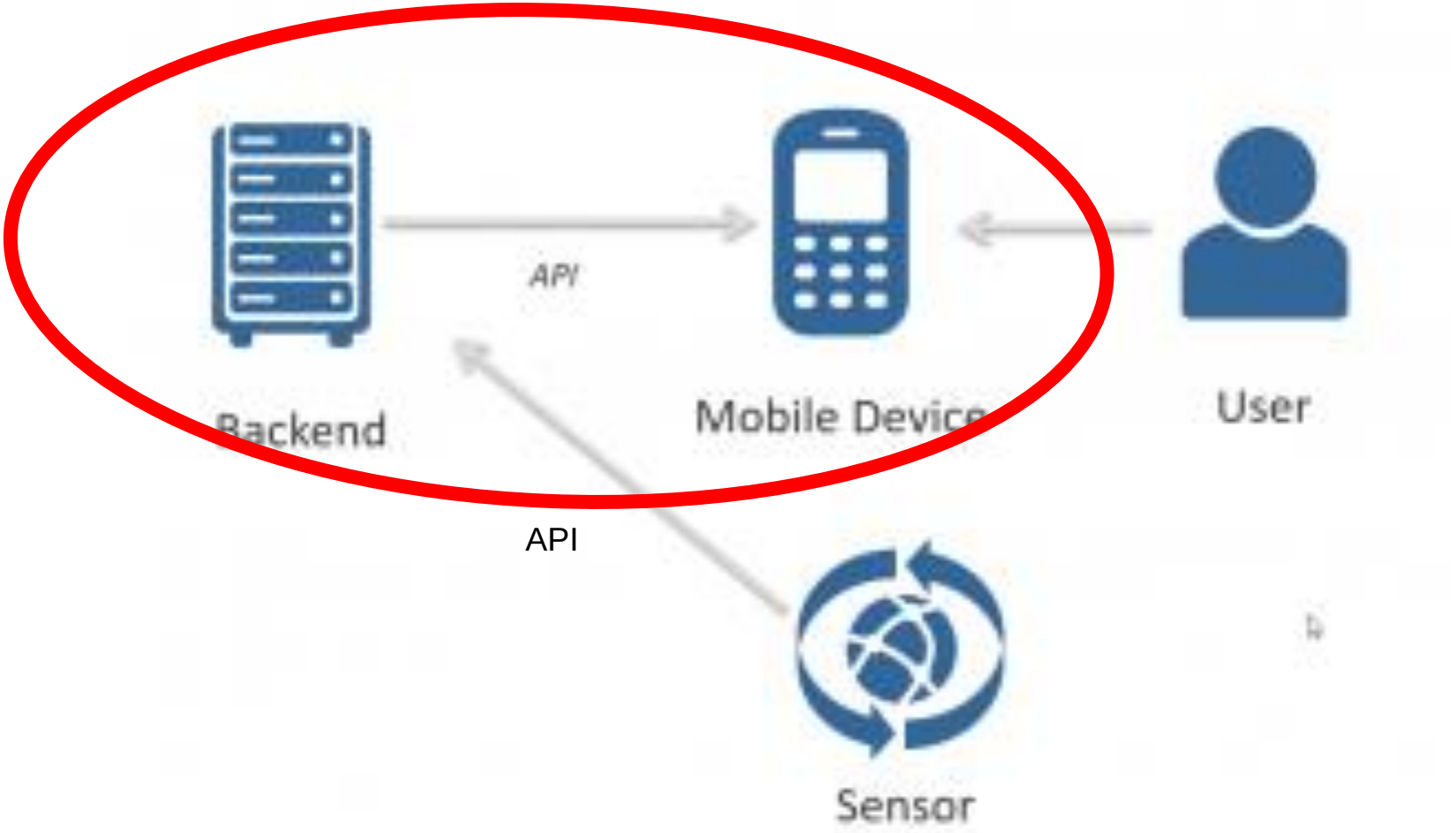
Field 1 Chart



Field 2 Chart



Lesson 2: Database → Mobile Apps



Advanced Apps Development with IoT and API

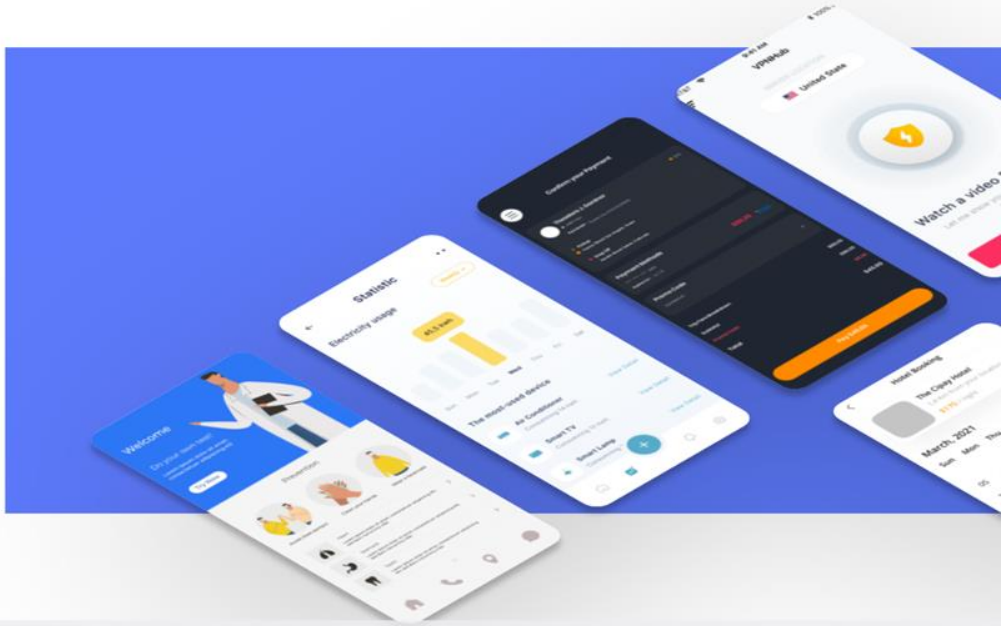
thunkable

Solutions Community Docs Blog Pricing Log In Sign Up

Create Your Own Native Apps With No-Code

Join the millions of creators turning their ideas into apps with Thunkable

START TODAY



4B IOT

Channel ID: **1582477**
Author: mwa0000024719121
Access: Public

Import

Upload a CSV file to import data into this channel.

File Choose File No file chosen

Time Zone (GMT+00:00) UTC

Upload

Export

Download all of this Channel's feeds in CSV format.

Time Zone (GMT+00:00) UTC

Help

Import

The correct format for data import is provided in this CSV Import Template File. Use the field names *field1*, *field2*, and so on, instead of custom field names.

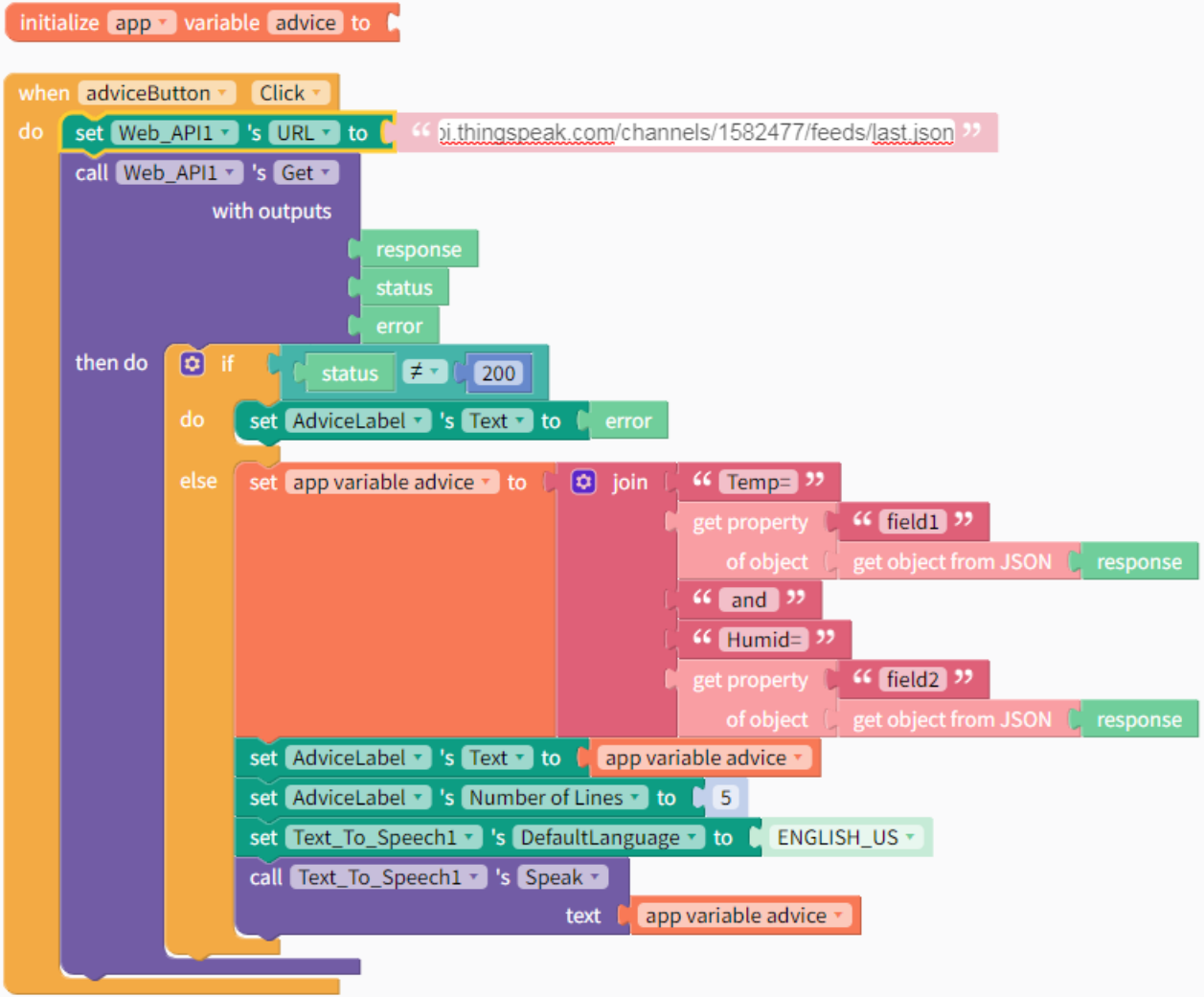
CSV Import Format

```
created_at,field1,field3,field4,field8,elevation
2019-01-01T10:11:12-05:00,11,33,44,88,10
```

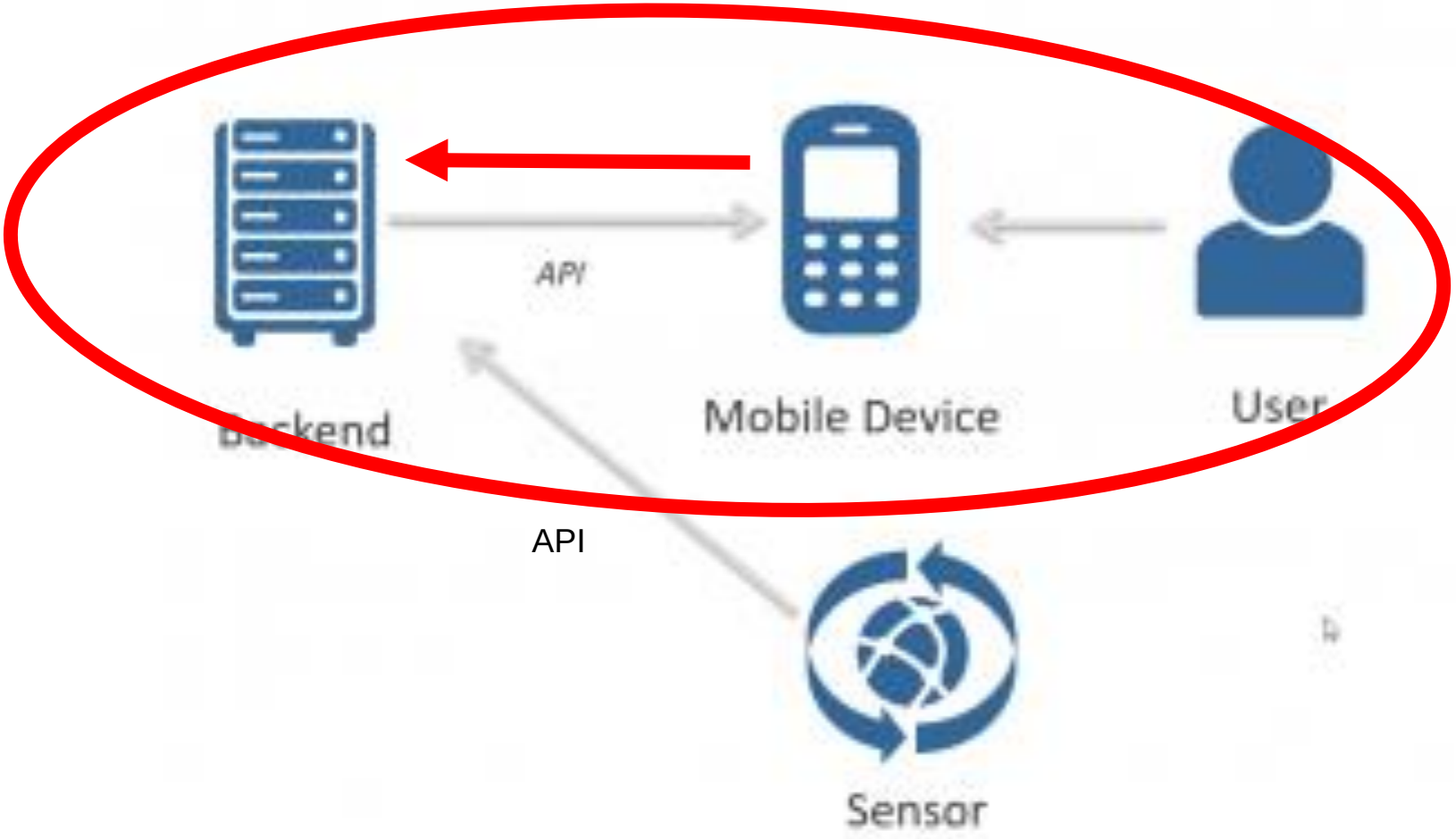
Other Import and Export Options

You can also use MATLAB, the REST API, or the MQTT API to import and export channel data.

Read Data
Write Data


initialize app variable advice to
when adviceButton Click
do set Web_API1 's URL to "api.thingspeak.com/channels/1582477/feeds/last.json"
call Web_API1 's Get
with outputs
response
status
error
then do if status ≠ 200
do set AdviceLabel 's Text to error
else set app variable advice to join "Temp="
get property "field1"
of object get object from JSON response
"and"
"Humid="
get property "field2"
of object get object from JSON response
set AdviceLabel 's Text to app variable advice
set AdviceLabel 's Number of Lines to 5
set Text_To_Speech1 's DefaultLanguage to ENGLISH_US
call Text_To_Speech1 's Speak
text app variable advice

Lesson 3: Mobile Apps → Database (Firebase/Airtable)



Session 3:
Data Manipulation (GIS)

Learning GIS

CSDI

Common Spatial Data Infrastructure Portal

Search Dataset e.g. School...

FRAMEWORK SPATIAL DATA

- Address
- Administrative Area
- Building
- Coordinates Reference System

Overlay Layers

1. **Choose input layer**

3D_Pedestrian_Network_...

2. **Choose overlay layer**

Buffer_of_Lamp_Post_Ge...

3. **Choose overlay method**

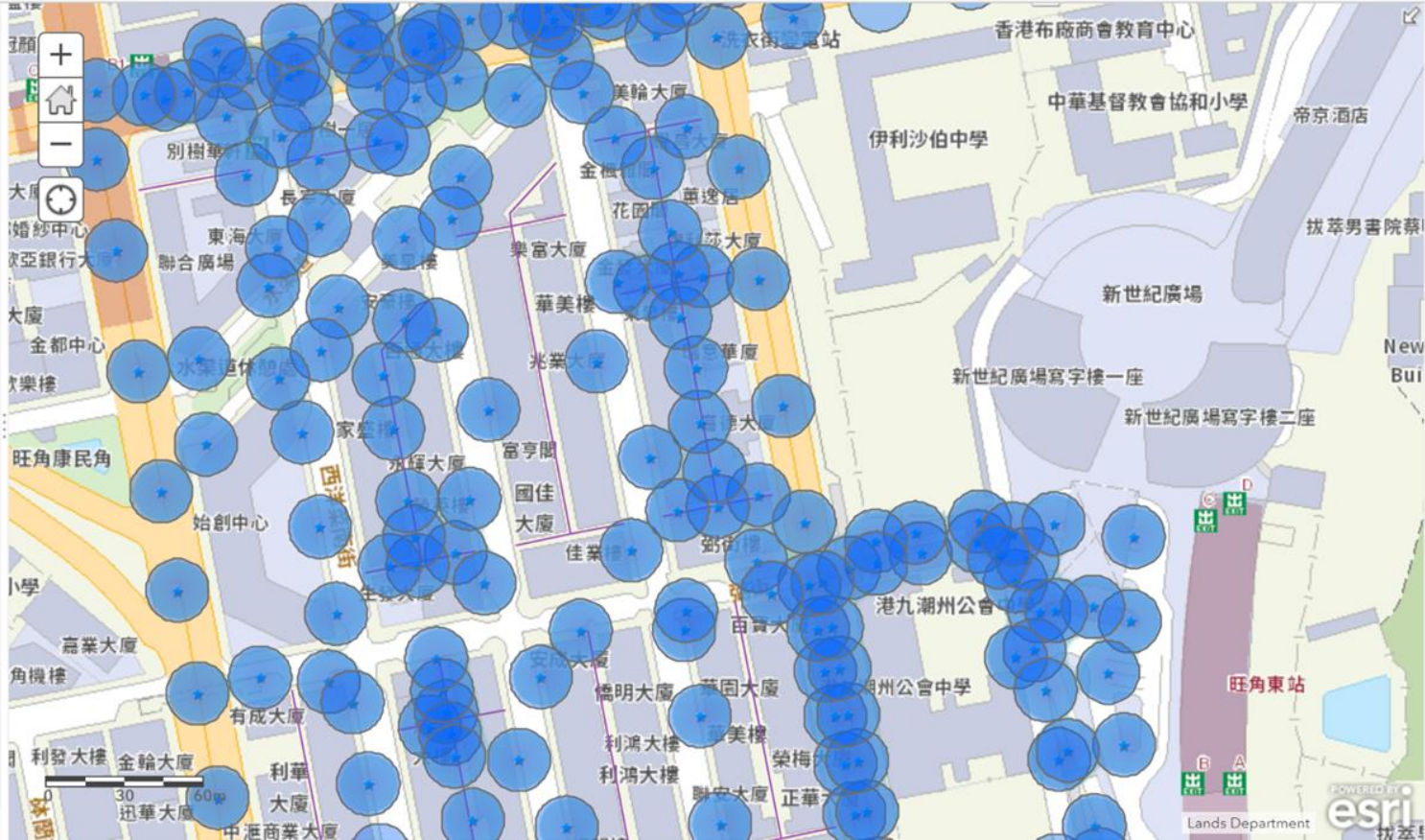
Intersect Union Erase

Output: Points

4. **Result layer name**

Intersect of 3D_Pedestrian_Netw

Save result in geolab_s1621



storymaps.arcgis.com/stories/83c999b4568a45faa6b146acf64807a7/edit

Update

Adjust map appearance

Search by location

Map layers

Erase_3D_Pedestrian_Network_GeoLab_with_Buffer_of_Lamp_Post_GeoLab_copy_s1621

Buffer_of_Lamp_Post_GeoLab___copy_s1621

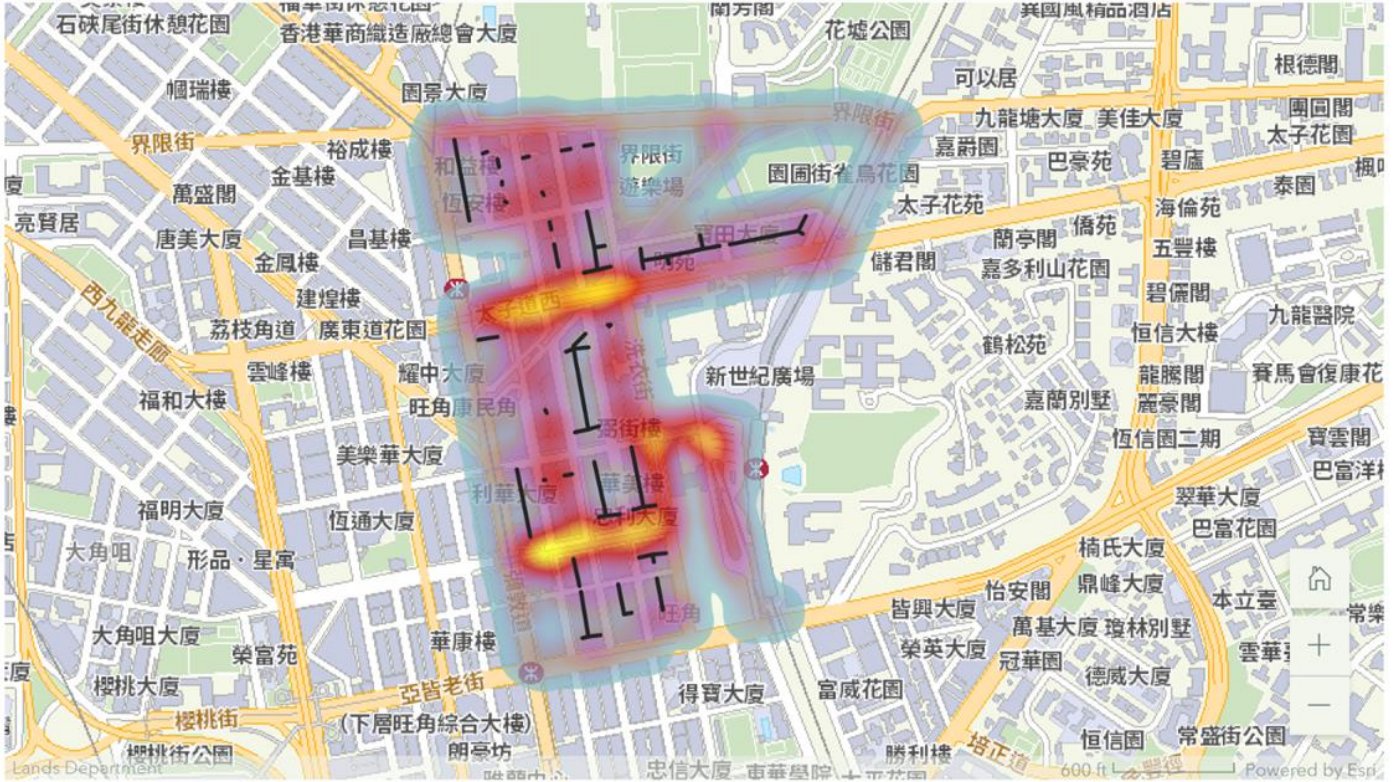
Lamp_Post_GeoLab - copy

3D_Pedestrian_Network_GeoLab

Lamp_Post_GeoLab

Modifications made here will only affect the appearance of this map in this story. To edit the underlying map, click the button below.

Edit in ArcGIS

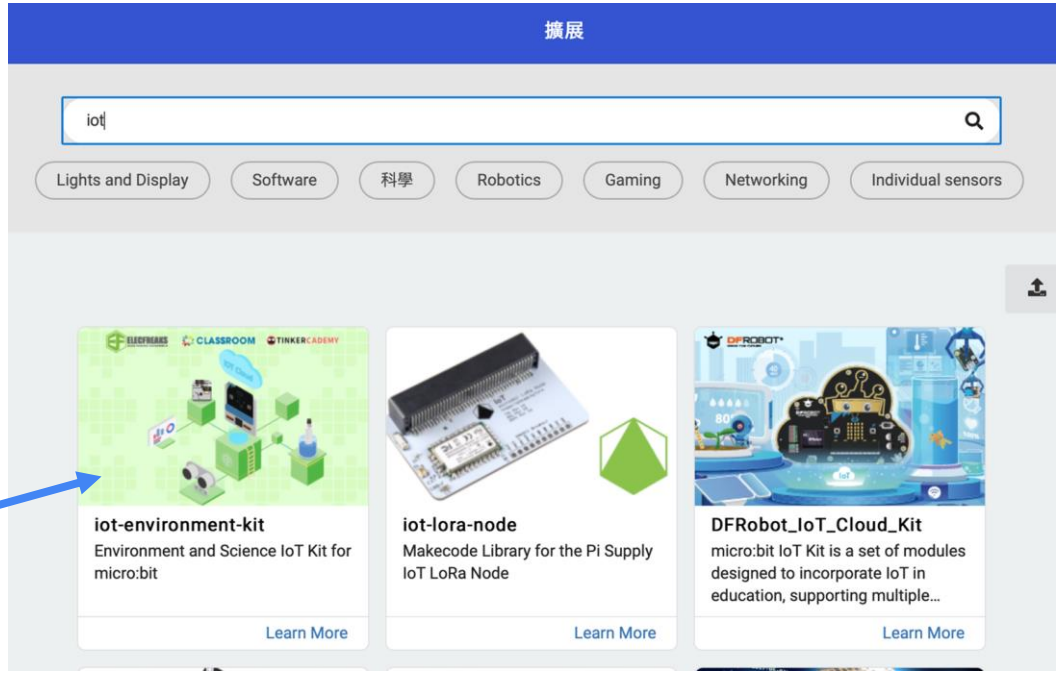


Cancel

Place map

Enrichment

- 這時會彈出一個對話框。搜索“IOT”，然後點擊下載這個代碼庫。

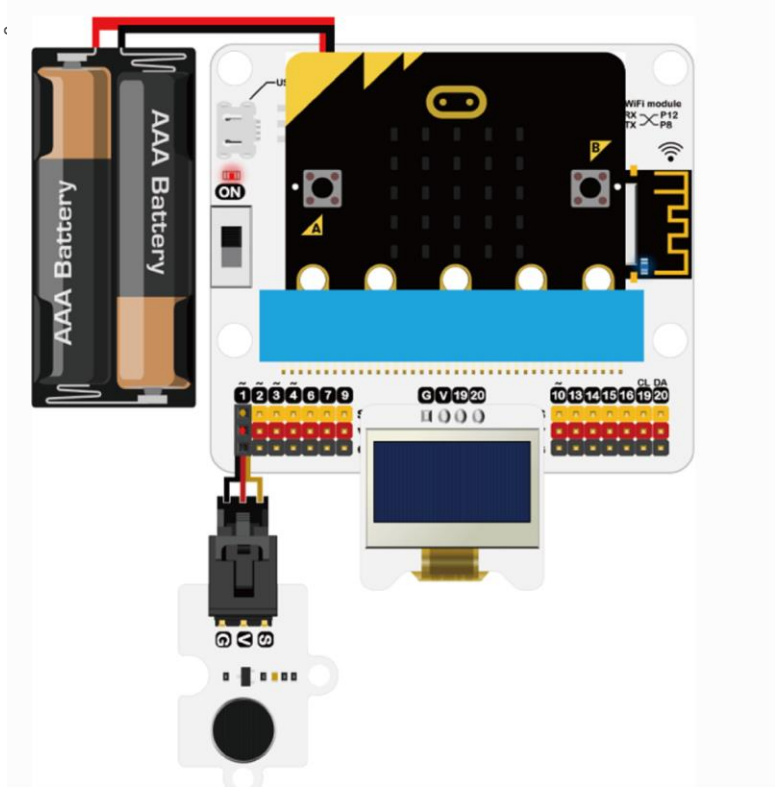


Enrichment: 協助圖書館利用Microbit 量度音量

- 在OLED中插入OLED 初始化 寬128 高64 積木塊。

Enrichment: 協助圖書館利用Microbit 量度音量

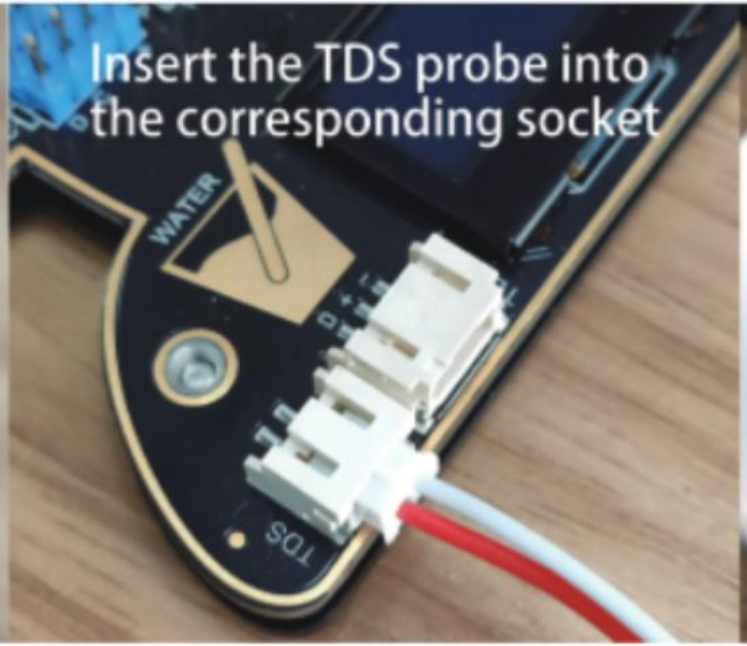
- 如圖所示，將噪聲傳感器模塊連接到P1口。
- OLED屏幕連接I2C接口。

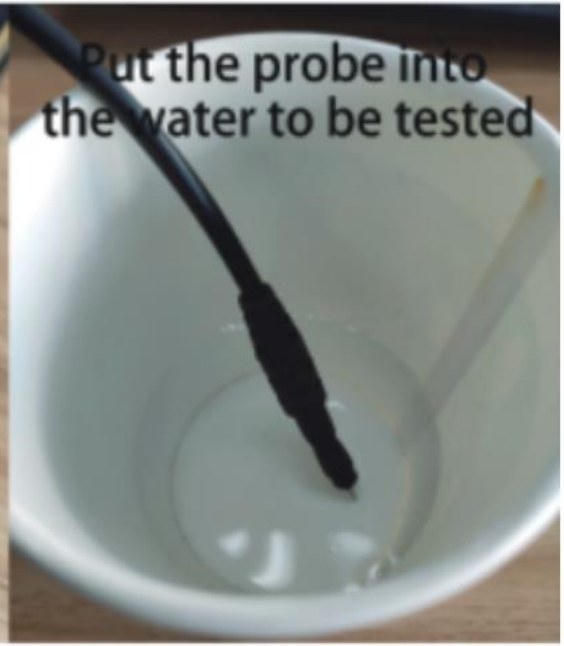


3. 水淨化測試

Remote Laboratory: Coral reef

將 TDS 探頭插入 TDS 插座。將探頭放在不同的水資源上，輕輕搖晃，將它連接io:bit 或iot booster





懸浮在水中的顆粒會降低水的透明度。清澈的水對於保持池塘健康非常重要。清澈的水使光線可以到達池塘植物。污染可能對魚類和其他池塘動物有害。直接排放污水帶來的有害影響。人類及禽畜排泄物、清潔劑及肥料能助長水中藻類的繁殖。於短時間內大量繁殖的藻類會消耗水中的氧氣，導致魚類及水中生物因窒息而死亡。

Smart Sustainable City

IoT Technologies

- Legality and Security
- Air Quality
- Digital Transformation
- Green Urban Areas
- Water Quality

- Energy
- Occupation
- Waste Management
- Sustainable Mobility
- Tourism and Culture

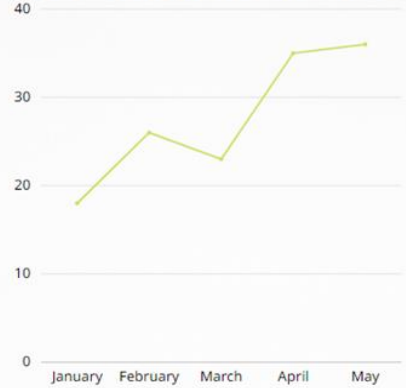
Sustainability Indicators

Students’ Innovative Projects and achievements

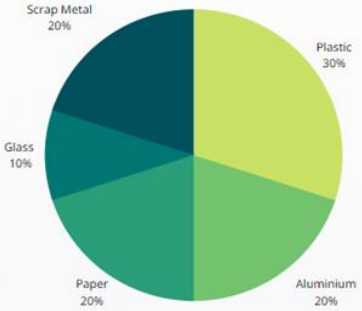
Brain Station:

▲ 比賽中獲得第三名的聖保羅書院團隊在設計自閉症兒童學習教材上作了深入的探討。

Your Recycle Trend



Your Recycle This Month



Congratulations! You have broken the record

How can I do better?

It seems that you have used too many plastic this month

Here are some advices:

1: Bring your own bottles

2: Record your lifestyle in the graph below

100 bottles recycled

You saved

21.2 Kwh energy

130 kg CO2

Green envoy

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Thank you