Teaching and Learning Contextualised Design Methodologies for Technological Sustainability and Resilience Solutions

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Teaching & Learning Centre

iadt
DUN LAOGHAIRE

NTUTORR
National Technological University
Transformation for Recovery & Resilience

Sustainability Technology Elective Modules - background

- Modules not mainstream yet at IADT.

- Arises from a parent programme, the B.Sc (Hons) in Creative Media Technologies (CMT)

- Variety of mainly non-technology students – e.g. artists, designers, film makers, psychologists, with no engineering design background

- Modules involving technical design and development in a sustainability context

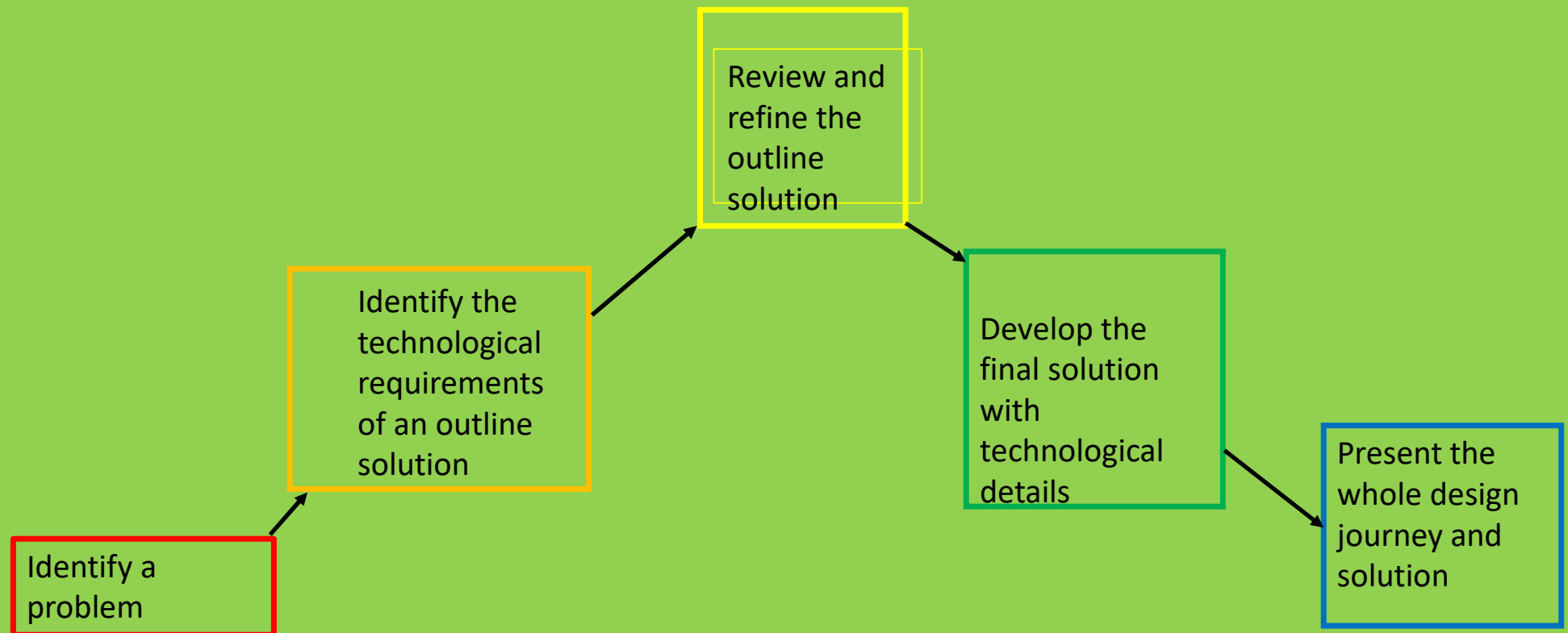- Modules involving detailed contextual studies into cities and communities

The three modules offered so far

- **Electronics for Sustainable Design – January 2020 –**

  technological build projects, design methodology with sustainability, recycled materials, circular economy, electronics workshops

- **Electronic Technology for Sustainable Cities – January 2021 –**

  technological design projects, urban and socio-economic, cultural aspects, design methodologies, electronics demonstrations

- **Electronics for Resilient Communities – January 2022 –**

  technological design/build projects, rural and cultural aspects, design methodologies, electronics workshops
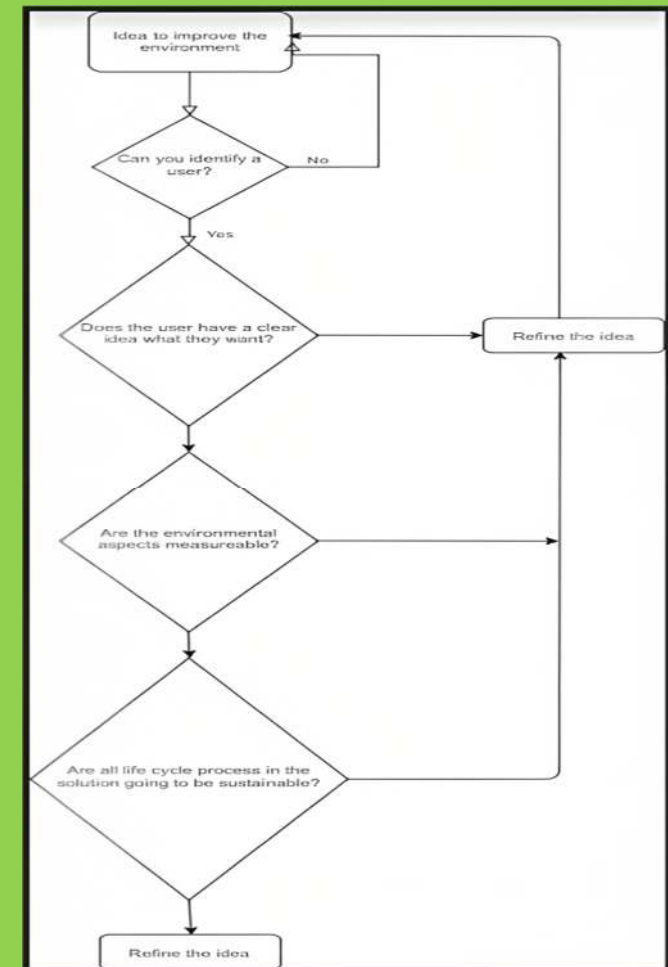
Approach to teaching

- Contextualisation in non-technical elements: e.g. geographical, social, geopolitical, cultural

- Sustainability context design workshops

- Practical electronics workshops

- Presentation and communications skills sessions

- Individual journal writing skills sessions

- Draft documentation and presentation

- Final 'event' presentation and demonstration

Design Flow Chart

Review and refine the outline solution

Identify the technological requirements of an outline solution

Develop the final solution with technological details

Identify a problem

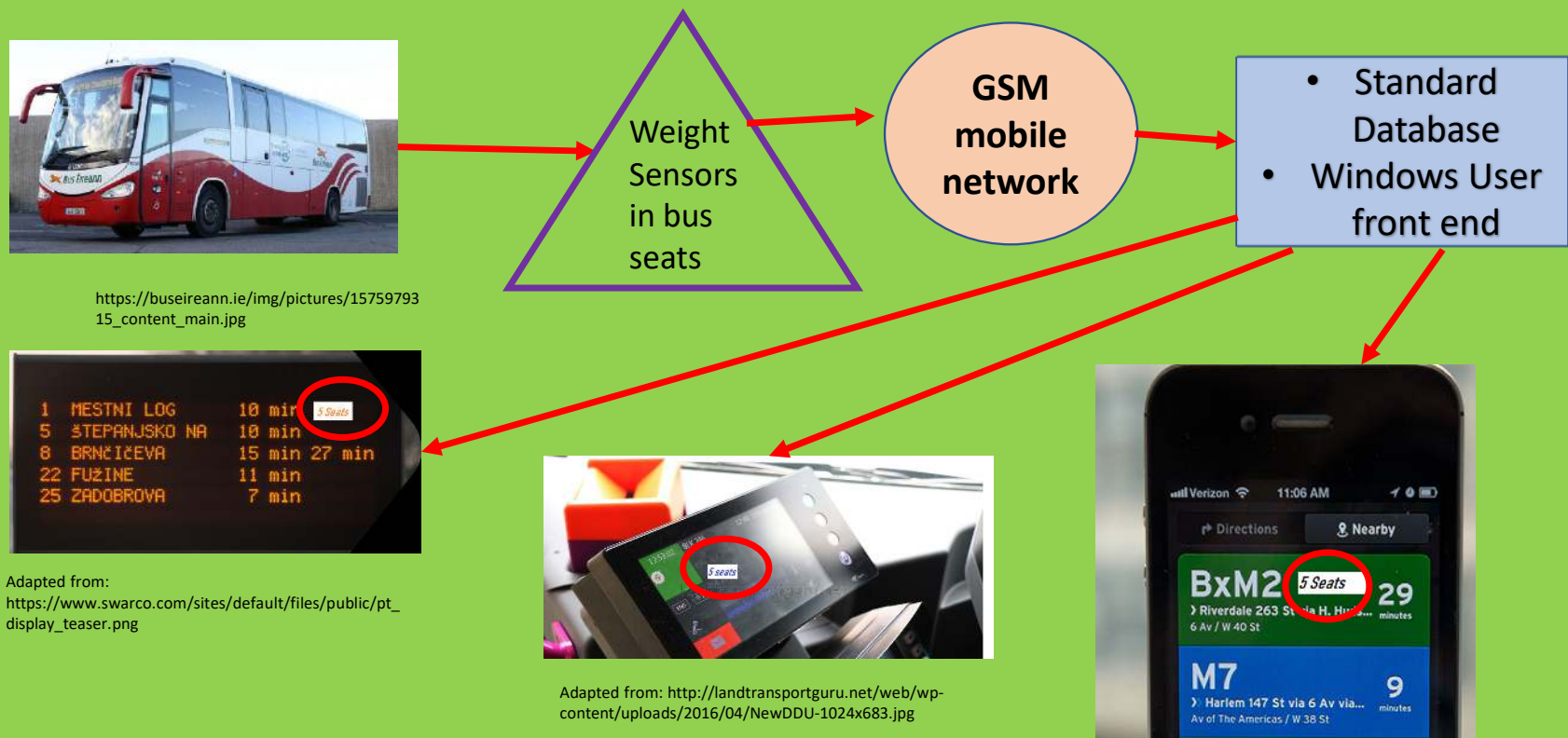Present the whole design journey and solution
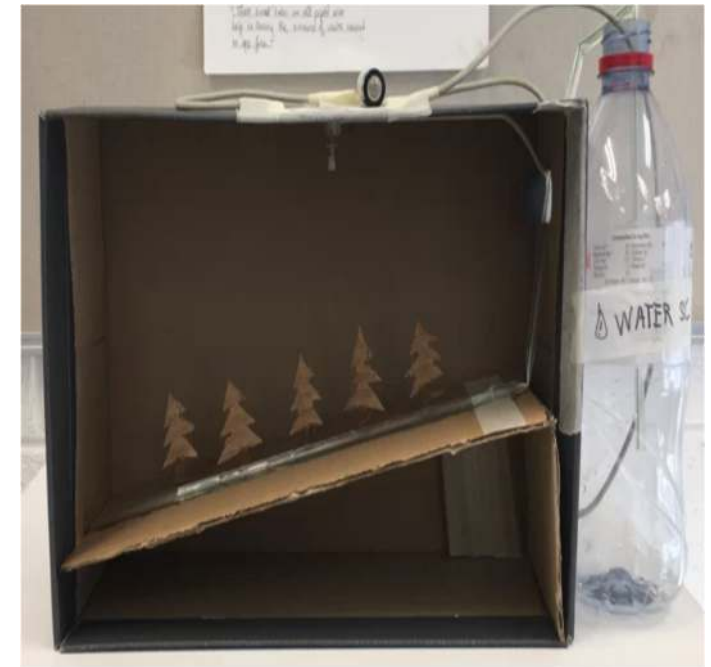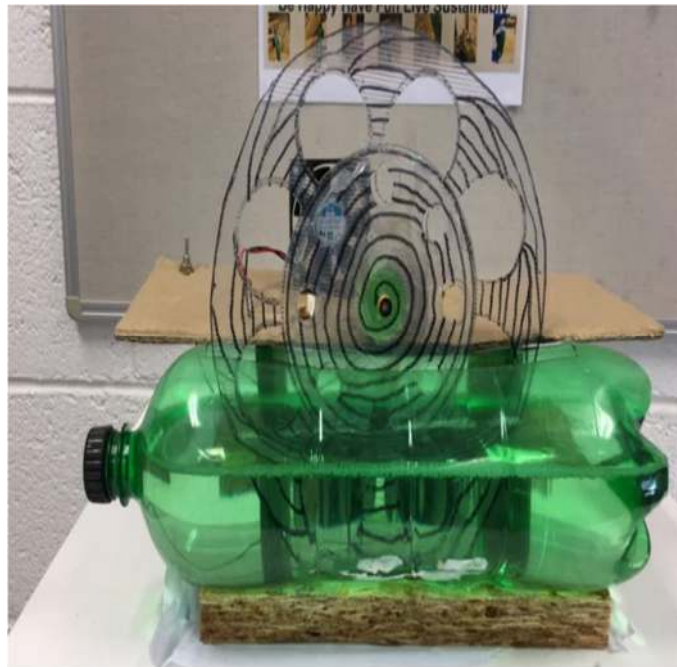
Design Flow Chart with Sustainability

- The flow chart was developed and introduced into workshops
- The chart combines the both user needs identification with a sustainability approach
- A circular product development life-cycle approach is embedded
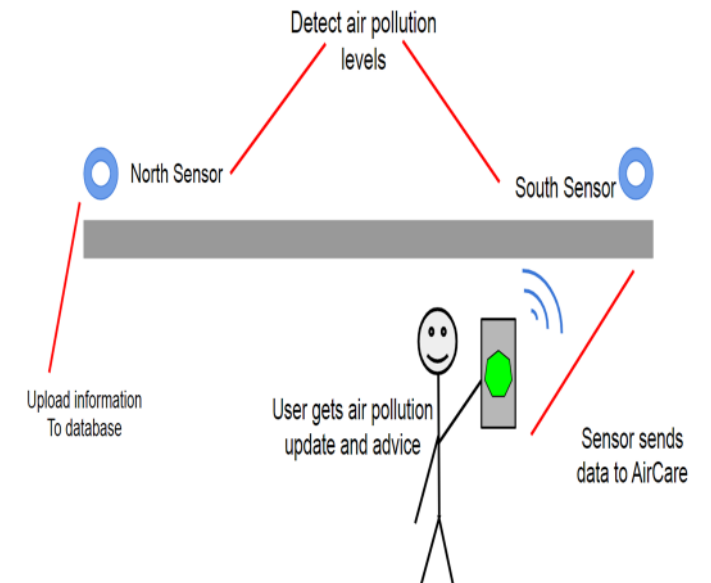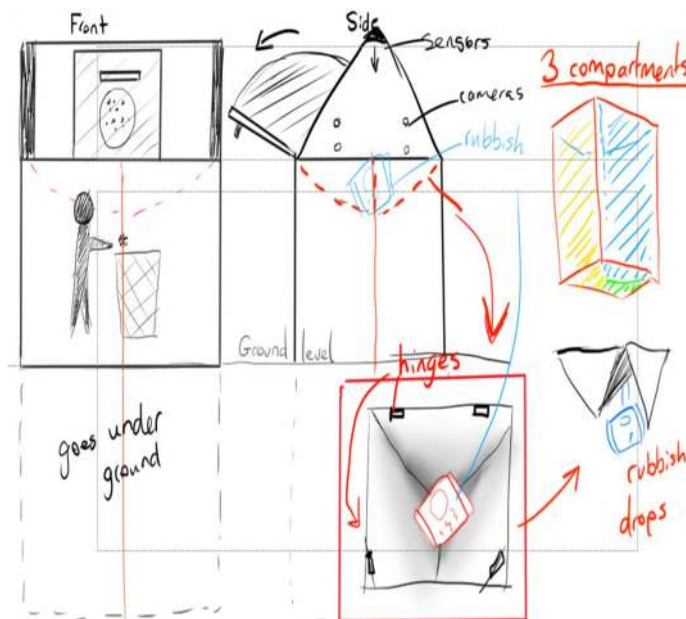- Students' attitudes in approaching sustainability in design are enhanced by this approach, as this helps to embed conscious patterns
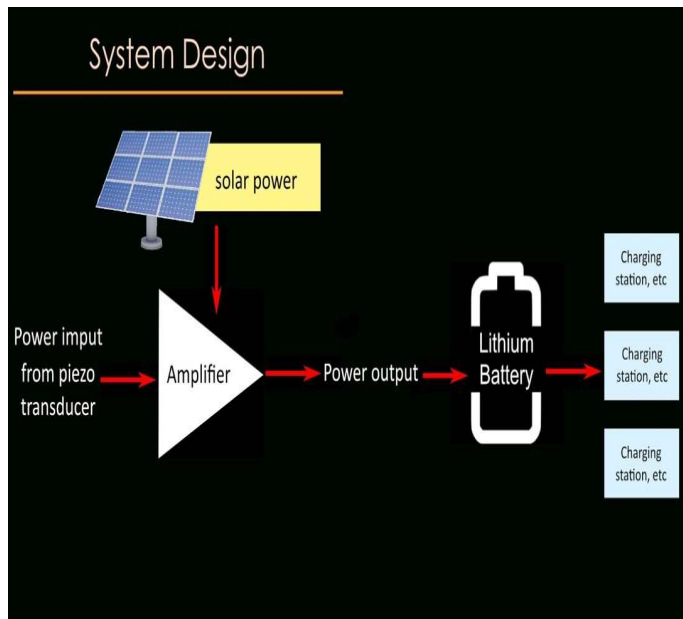
Design exemplar for Students

https://buseireann.ie/img/pictures/15759793
15_content_main.jpg

Weight Sensors in bus seats

GSM mobile network

- Standard Database
- Windows User front end

Adapted from:
https://www.swarco.com/sites/default/files/public/pt_display_teaser.png

Adapted from: http://landtransportguru.net/web/wp-content/uploads/2016/04/NewDDU-1024x683.jpg
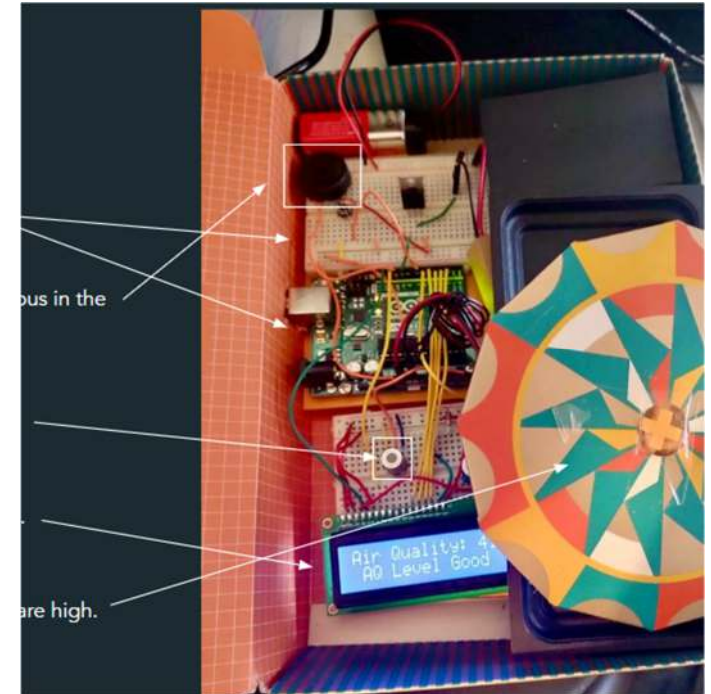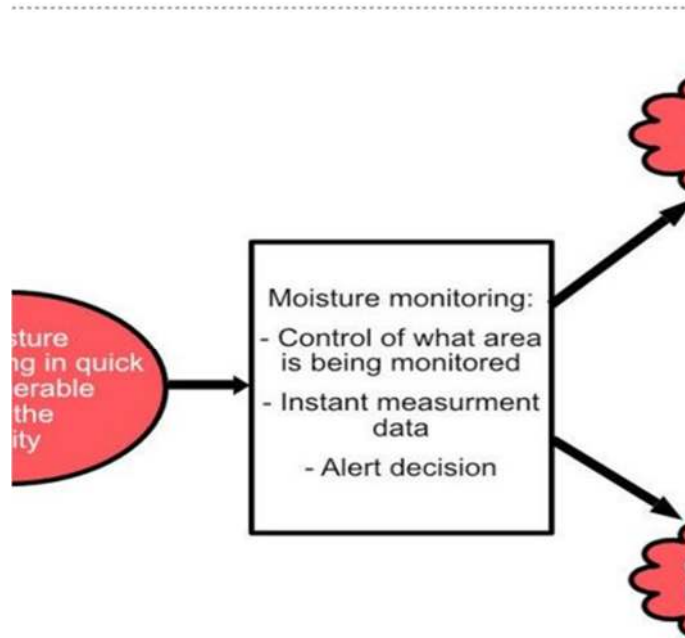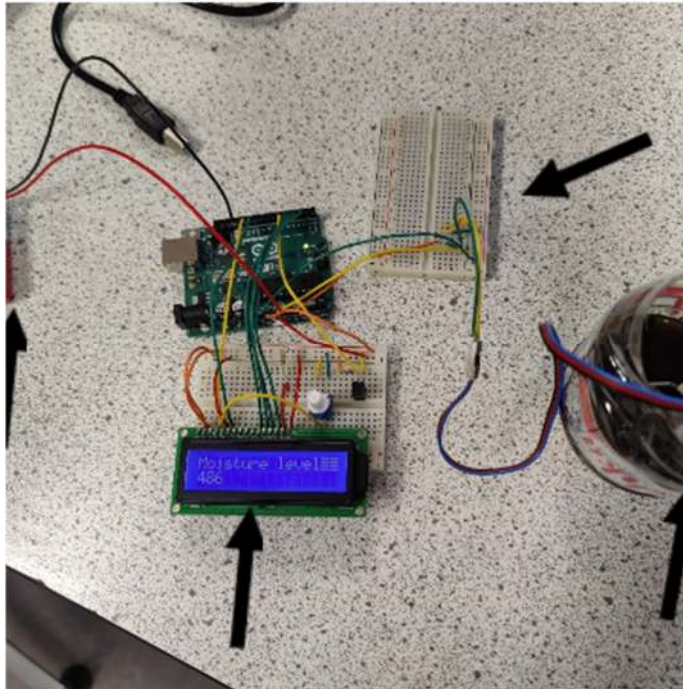
Example Projects from Electronics for Sustainable Design (ESD)

Example Projects from Electronics Technology for Sustainable Cities (ETSC)

Example Projects from Electronics for Resilient Communities (ERC)

Moisture monitoring:
- Control of what area is being monitored
- Instant measurment data
- Alert decision

National Forum – Local Enhancment Project (LEP) - Electronics for Sustainable Development

- Purpose: to develop teaching materials to enhance the delivery of modules

- Documentary deliverable in development : a guide for teaching the core areas in higher education

- Complementary videos: practical and instructional

Examples from the LEP Teaching Guide Draft

Theory behind sensor:

If the sensor detects smoke there is an increase in output voltage

If the sensor doesn't detect smoke the voltage stays low.

Note: some MQ-2 sensors have different pin layouts so check your module to make sure your using the correct setup.

MQ-2 Sensor

Smoke → → Higher Output Voltage

MQ-2 Sensor

No smoke → → Lower Output Voltage

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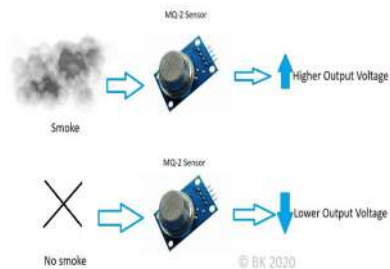
Pinout:

There are different kinds pin layouts on different smoke detecting modules. All you need for this tutorial is Vin , GND and an output pin or the Aout pin or in some cases its the A0 pin.

How Does the Arduino Soil Sensor Work?

The soil moisture sensor consists of two probes that are used to measure the volumetric content of water. The two probes allow the current to pass through the soil, which gives the resistance value to measure the moisture value.
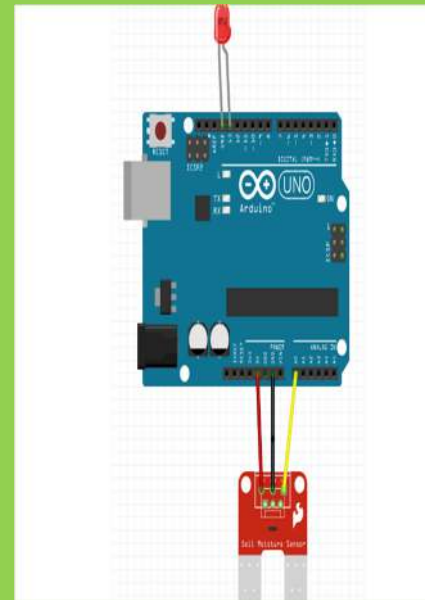
A comparator activates a digital output when a adjustable threshold is exceeded, in this case if the sensor Value is larger than the limit, then a LED will light up.

Otherwise:

```
int sensorPin = A0;
int sensorValue;
int limit = 300;

void setup() {
  Serial.begin(9600);
  pinMode(13, OUTPUT);
}

void loop() {

  sensorValue = analogRead(sensorPin);
  Serial.println("Analog Value : ");
  Serial.println(sensorValue);

  if (sensorValue<limit) {
  digitalWrite(13, HIGH);
  }
  else {
  digitalWrite(13, LOW);
  }

  delay(1000);
}
```
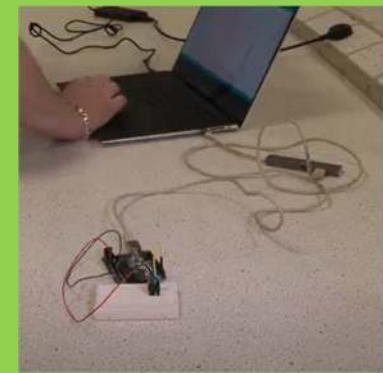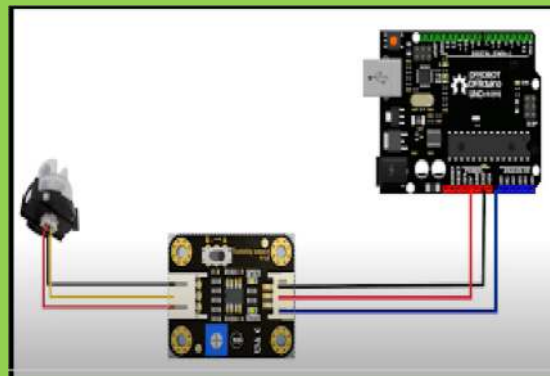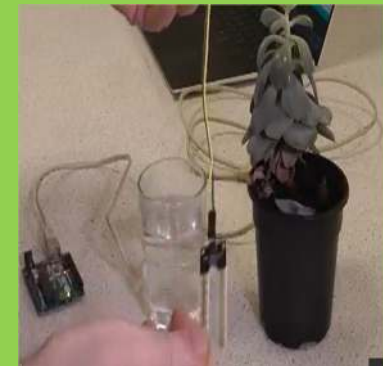
Example shots from the videos

Other ongoing sustainability initiatives at IADT

GET YOUR GREEN ON!
green week 2012
March 12th – 15th

WHAT'S YOUR CARBON FOOTPRINT?

June 7th – 10th
IADT
Dublin (Ireland)
filmeu
2022
SUMMIT
ENVIRONMENTAL SUSTAINABILITY IN FILM AND MEDIA ARTS INDUSTRY AND EDUCATION.
filmeu

Fernhill Park Experience

An interactive and educational, augmented reality gaming experience based on Fernhill Park and Gardens, that

The future of the Sustainability Technology Modules

- The CMT programme will no longer be running next academic year
- Electives are a home to sustainability technology modules
- To grow the modules, other 'vehicles' inside and outside IADT are sought
- The modules use pedagogies and approaches compatible with the **National Forum for the Enhancement of Teaching and Learning in Higher Education Open Course on Education for Sustainability**
- The modules can be grown into a more substantial standalone offering