Welcome to AustSTEM at STEM2022

Here you will discover some of the many ways that we are using our digital platform to enhance STEM learning across the curriculum

- CubeSat

- Weather

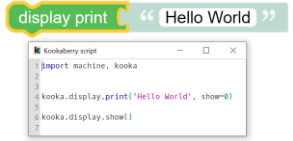
- Gravity

- Fire Risk

- Signals

- Sensors

- Coding



- Balance

We welcome the opportunity to collaborate with schools, universities and educational organisations in the creation of learning content with an emphasis on the Middle School years 5 to 8

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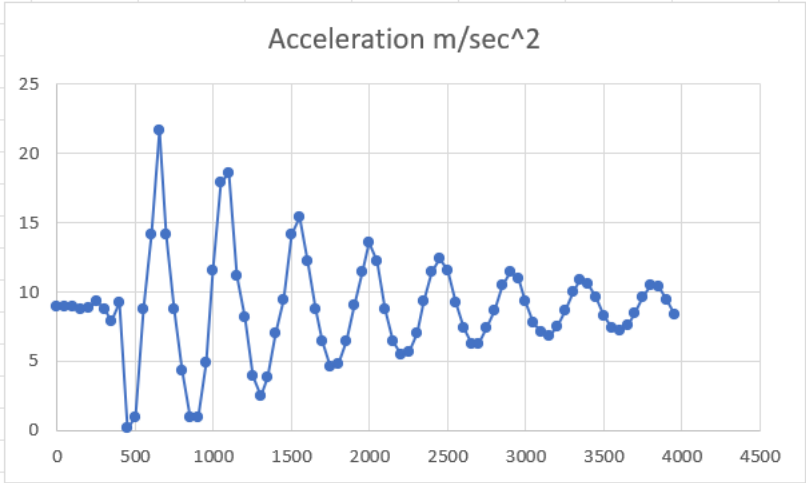
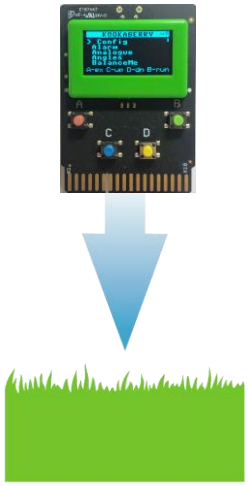
The Force of Gravity

- The force of gravity is what keeps our feet on the ground.

- We all experience the strength of this force as the product of our mass and an acceleration towards the earth of around 9.8 metres per second per second.
  (Newton's second law: **F = ma**)

msecs	Acceleration m/sec^2
0	8.90705
50	8.95667
100	8.9678
150	8.71241
200	8.80531
250	9.30099
300	8.77378
350	7.92444
400	9.18675
450	0.210831
500	0.920713
550	8.77943
600	14.1422
650	21.6721
700	14.1785
750	8.72614
800	4.28736
850	0.99433
900	0.96844
950	4.86038





Discover how dropping a single-board-computer on an elastic cord can measure accelerations and generate this graph using its internal accelerometer and data logging functionality.

Find out more about this experiential demonstration at this link on our AustSTEM Digital Learning Hub website

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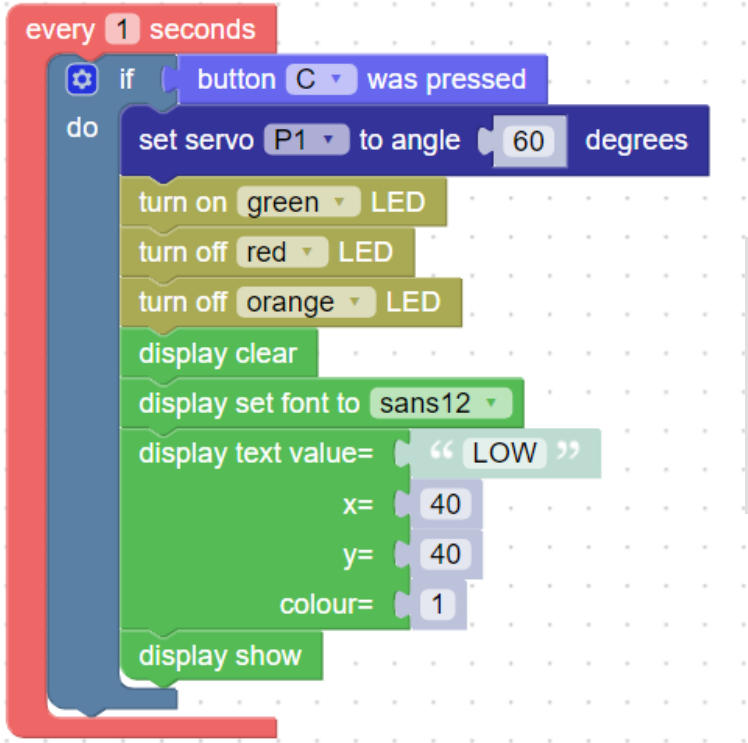
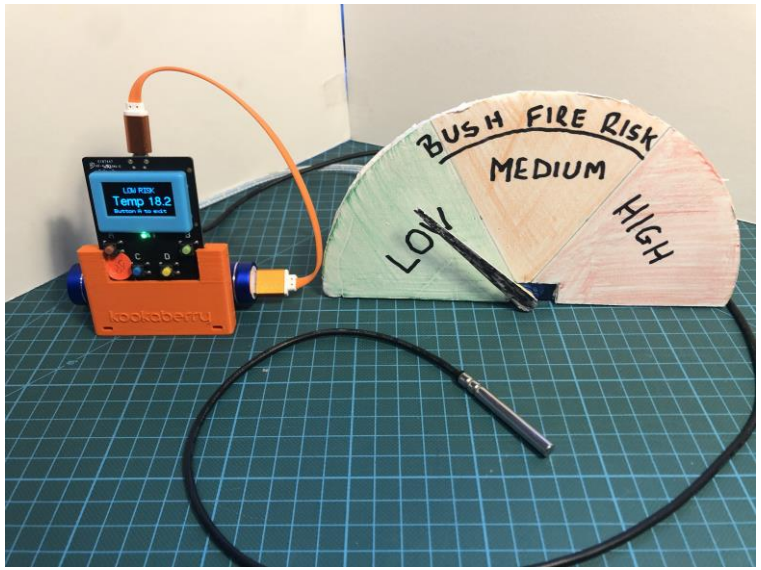
Bush Fire Risk Indicator

- This demonstration of a bush fire risk indicator is controlled by two simple programs written using KookaBlockly.
- One program controls the indicator by pressing buttons on the a single-board-computer.
- The other uses a temperature sensor to activate the pointer.





Full details of this resource, including a template for the indicator, can be found at this link on our AustSTEM Digital Learning Hub website

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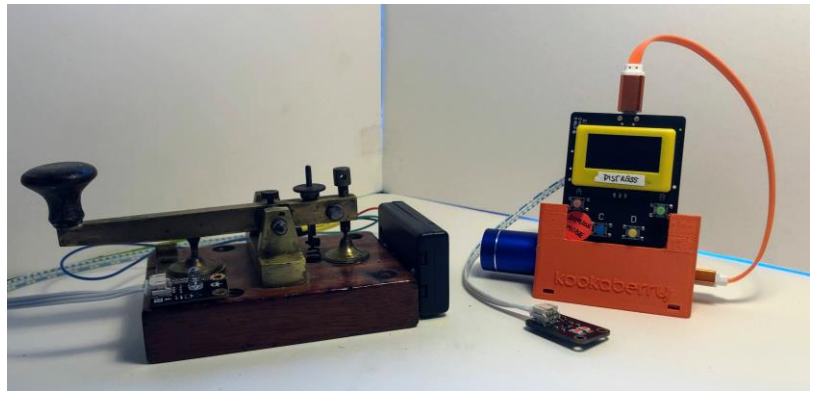
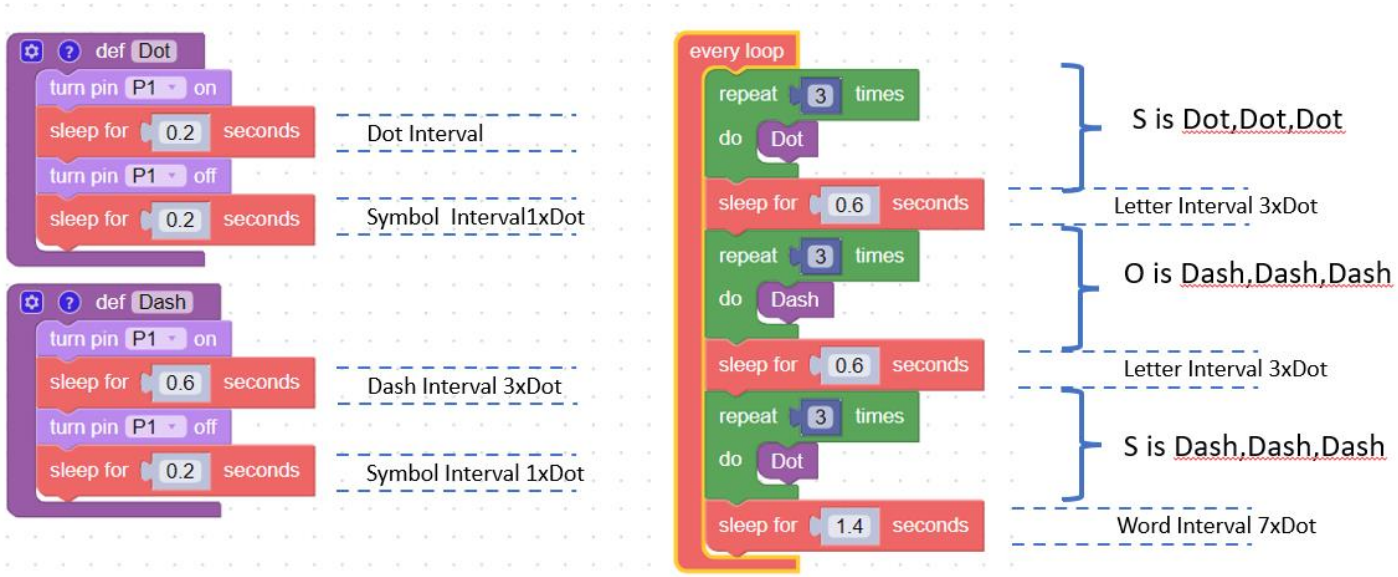
Telegraphing a Distress Signal

- This sequence of resources allows teachers to complete most of the Stage 3 DT learning outcomes, plus those in some other KLAs, using the single historical context of the electric telegraph sending a distress signal.
- A LED is used to indicate the SOS signal being sent in Morse code.
- The KookaBlockly visual programming editor is used to create the code.
- The initially long linear code is progressively shortened using loops, branches and functions.



The telegraph key is more than 100 years old!



Full details of this resource can be found at this link on our AustSTEM Digital Learning Hub website

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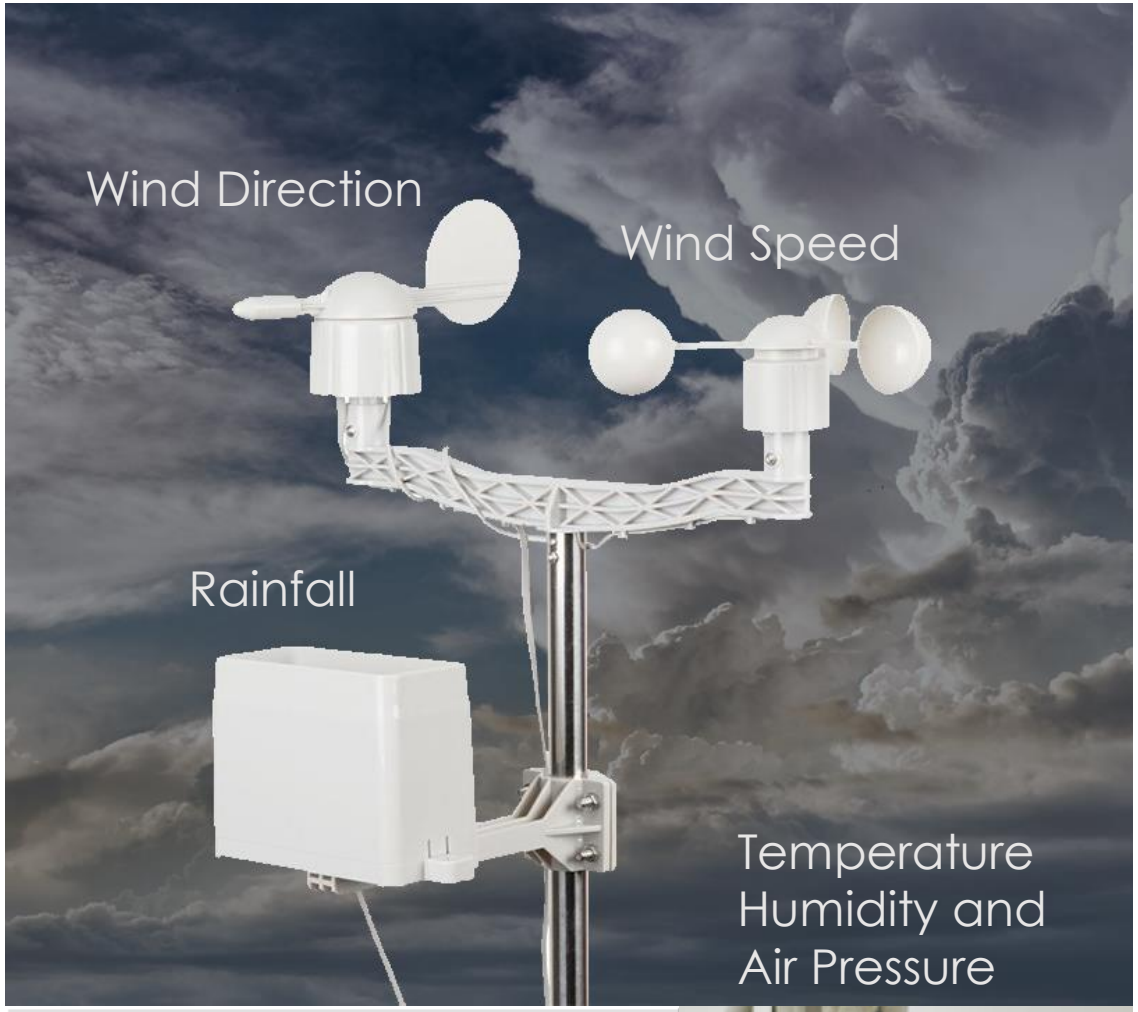
Weather Observation

- Observation of the weather is of fundamental interest in our daily lives and we rely on official weather forecasts to plan our activities.
- Using an off-the-shelf hobbyist weather observation kit, augmented by a temperature, humidity and air-pressure sensor, students are equipped to automatically record and chart their own weather observations.
- Students may use a pre-coded app and/or use programming tools to design and test their own programs for weather observation on a single-board-computer.
- Embedded software reduces the coding complexity of interacting with the weather sensors.



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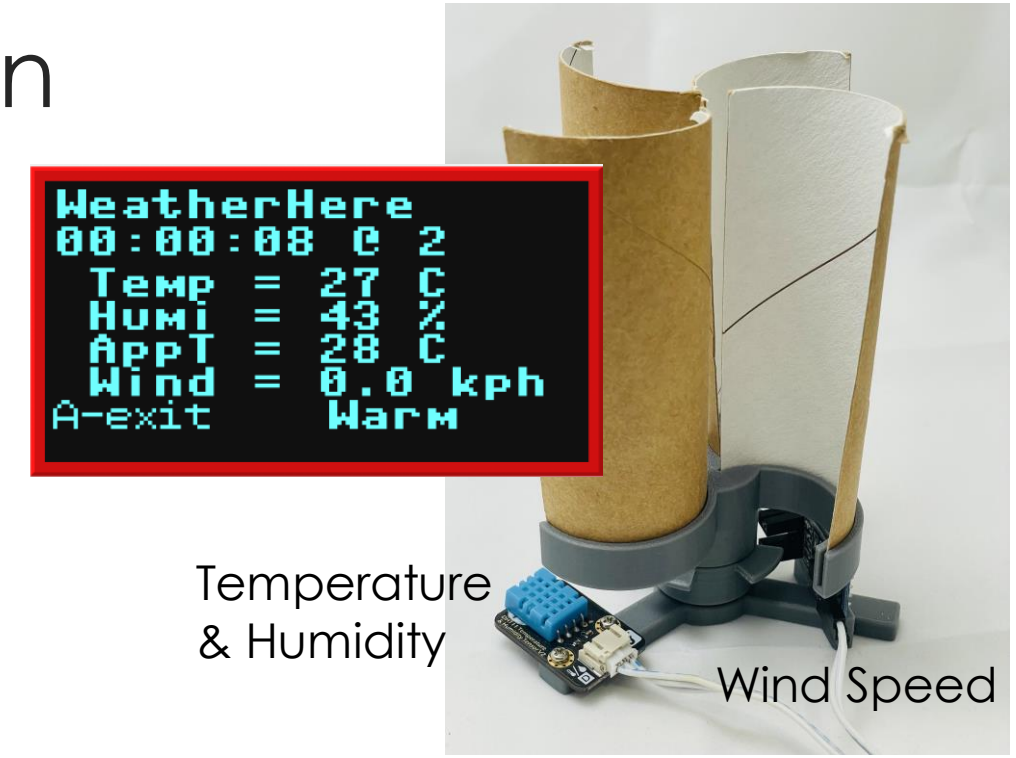
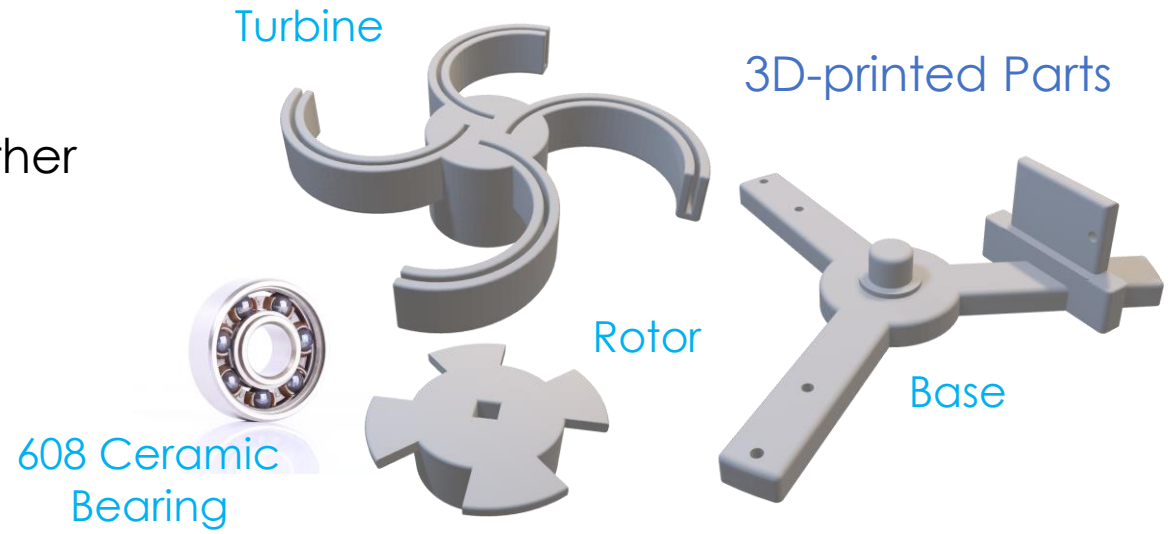
Low-Cost Weather Station

- A low-cost desktop weather observation station is constructed using some 3D-printed parts, a bearing, a paper roll, and two low-cost sensors.
- A DHT11 temperature and humidity sensor is attached to the base, but other atmospheric sensors may be used.
- The wind turbine's rotational speed is measured using an optical pulse sensor and to calculate wind speed.
- The pre-coded WeatherHere app records the observations for subsequent charting, for example, by using the GraphCSV app.
- Students may also use programming tools to design and test their own programs for weather observation on a single-board-computer.
- Embedded software reduces the coding complexity of interacting with the weather sensors.





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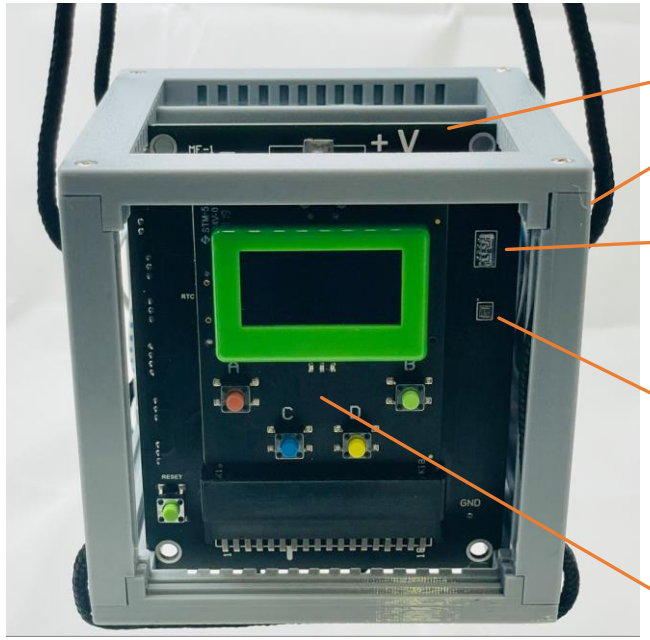
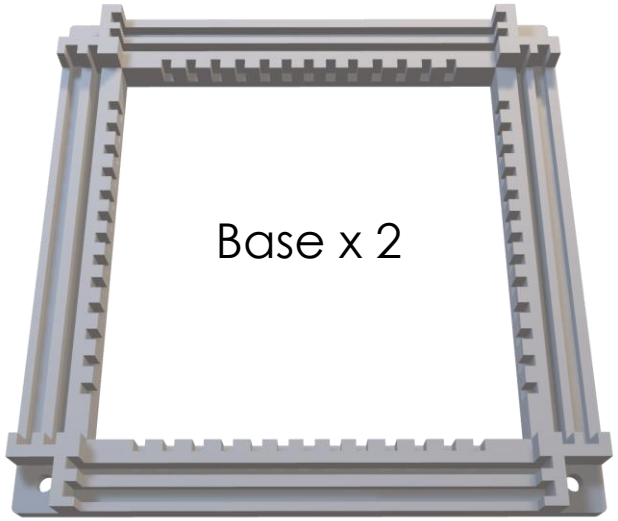
CubeSat Platform

- The CubeSat platform affords the opportunity for students to observe and automatically record environmental data at low altitudes.
- The 100 mm cube frame is easily 3D-printed and is assembled using only 8 screws at the corners.
- Standard sized circuit boards provide for a large variety of environmental sensors, a rechargeable battery power supply, solar panels, and a single-board-computer.
- The CubeSat is hoisted by available safe methods to make and record observations.
- On-board digital radio communications transmit environmental data to a complementary CubeSat ground-station for real-time observation and recording.
- Using CubeSat, students can plan, build, code, run, record and analyse observation missions.



3D-printed Frame



Pillar x 4

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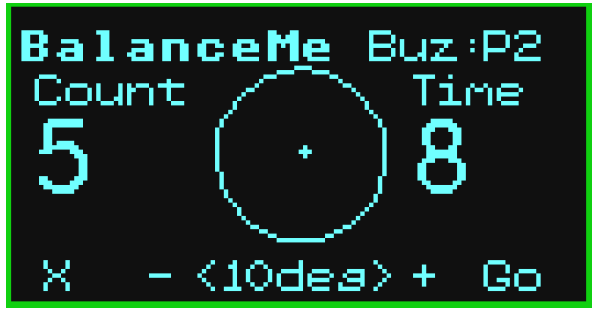
Balance: an Egg and Spoon Race

- BalanceMe is a popular app for use with the Practise Makes Perfect lesson plan.
- Students have to keep a dot (the egg) inside a circle as they compete against each other around a timed course. If the egg goes outside of the circle, the buzzer sounds and a "drop" is added to the count.
- The time taken, and the count of drops, are stored in the device's USB memory and also transmitted to a central device running the ListenLog app.
- The results can then be graphed and analysed.
- A good investigation is "Who won?" when two variables (Time and Drops) are analysed.



Full details on how to set this race up can be found at this link on our AustSTEM Digital Learning Hub website

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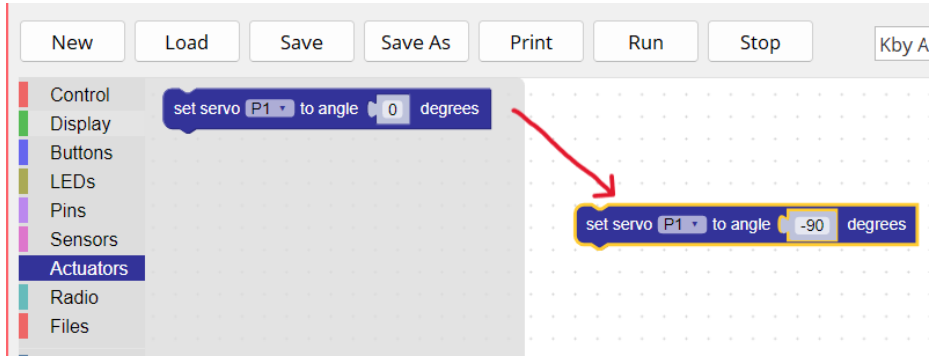
Sensors and Other Peripherals

- Peripherals are the sensing and activating devices at the boundaries of the digital world. Without them the digital world would be blind, deaf, mute and immobile.
- AustSTEM's primary teaching resources introduce students to peripherals as part of a plug-and-play digital ecosystem, including the programming tools to use them.
- Compatible peripherals are described on the Peripherals on our AustSTEM Digital Learning Hub website.
- Where appropriate, a simple KookaBlockly program is included in each description to demonstrate the peripheral's operation.

An example of a servo peripheral:



Full details of this peripheral can be found at this link on our AustSTEM Digital Learning Hub website

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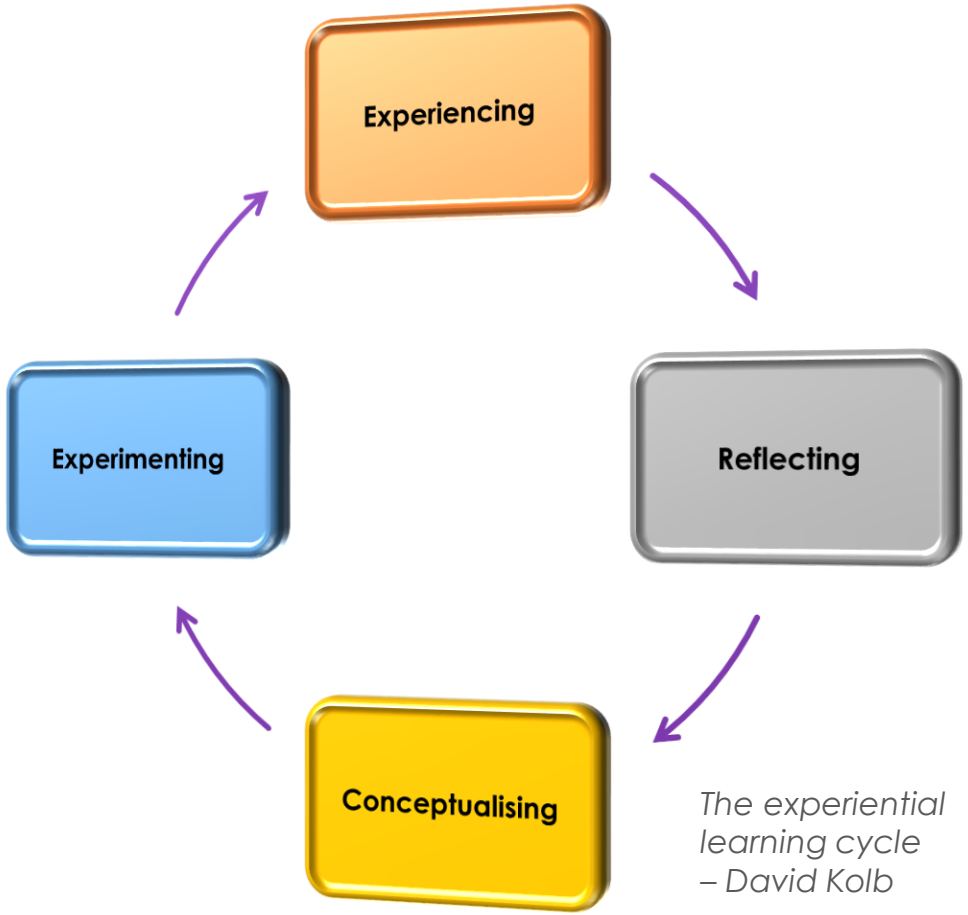
Enabling STEM Experience and Understanding

"I hear and I forget…
I see and I remember…
I do and I understand."

– Confucius



The experiential learning cycle – David Kolb

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