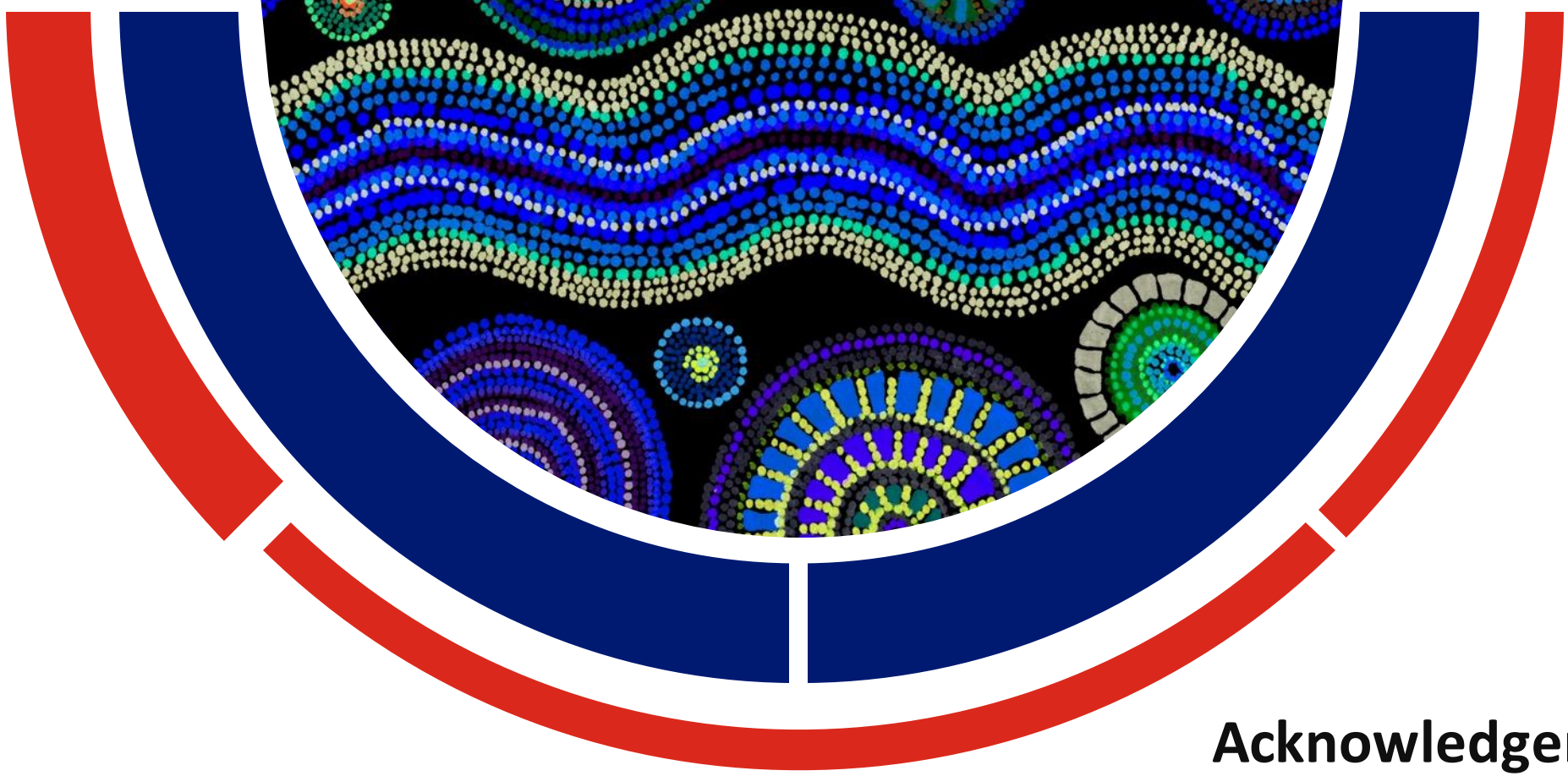
Using Robotics in STEM Classes

Presented by: Catherine Newington



Acknowledgement of Country

The ACS would like to acknowledge the traditional custodians of all the lands from which we join. We pay our respects to the Elders past, present and emerging and extend that respect to other Indigenous Australians present.

Session 1

https://padlet.com/catherinenewington/STEM

Agenda Session 1

01

Introductions and connect with ACS

Learn about ACS, sign up to our community and access loads of resources!

02

STEM

Dive into the theory of what makes u a good STEM program

03

TPACK

Look at a popular theory when using technology in your classes

04

Curriculum

Recap on the Digital Technologies Curriculum

05

Tech Play

Play with same tech available from ACS and consider the type of activities to complete in your STEM classes

ACS

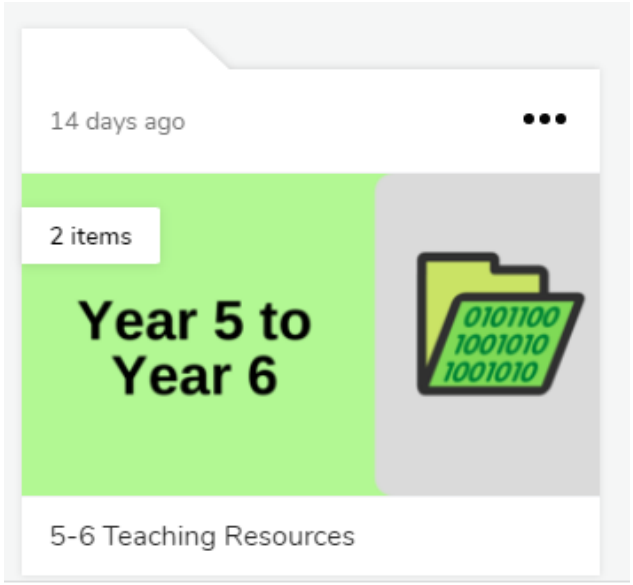
ACS is the peak body for IT professionals. They support all IT professionals – including educators.

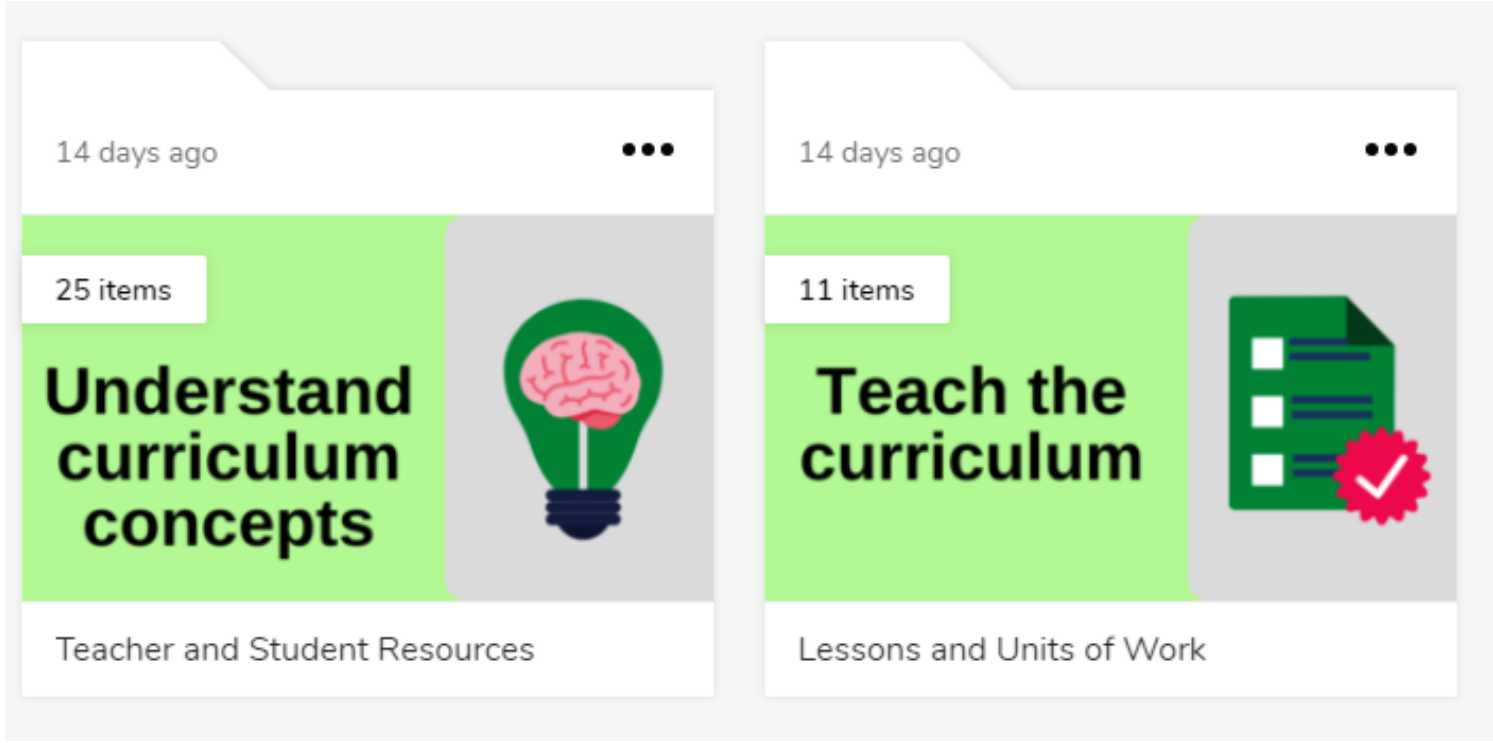
ACS ICT Educators is a program to support the implementation of the Digital Technologies Curriculum. We connect with teachers across Australia.

Create resources and help build scope and sequences and lesson plans. Moving to STEM units

We have a dedicated platform to help connect teachers.

Resource Structure





PERIPHERAL DEVICES

Levels 3-4

Information

For a digital system to function and performs certain tasks, it needs devices that will input and output data. Devices that will input the data into the computer (to store and manipulate the data) and devices that will output the data (to view the data). Peripheral devices are digital devices that are the extra 'add ons' to a computer. These can take the form of:

- Mouse
- Printer
- Scanner
- Webcam
- Monitor or interactive white board
- Speakers
- Microphone

These devices can be connected to a computer via a cord that will be directly plugged or wirelessly through WIFI or Bluetooth. Devices can also be added into a hard drive such as extra memory or a graphics card. Peripheral devices are categorised as:

Input devices	Output devices	Storage devices
Puts data into the computer such as a mouse to click, a keyboard to write information.	Takes data from the hard drive such as a monitor allows you to view information, speakers allow you to hear sound, printer printers out information.	Holds the data such as hard drives that allows you to save information from the hard drive.

Curriculum Expectation

Students will investigate and explore how peripheral devices are used to help perform a task (printer to print out a hard copy, a monitor to watch a video) for a purpose and the type of data that is transmitted between the devices.

Video Resource

Click the image to open the video

This video identifies and further explains the role of common peripheral devices.

Video Source: study.com

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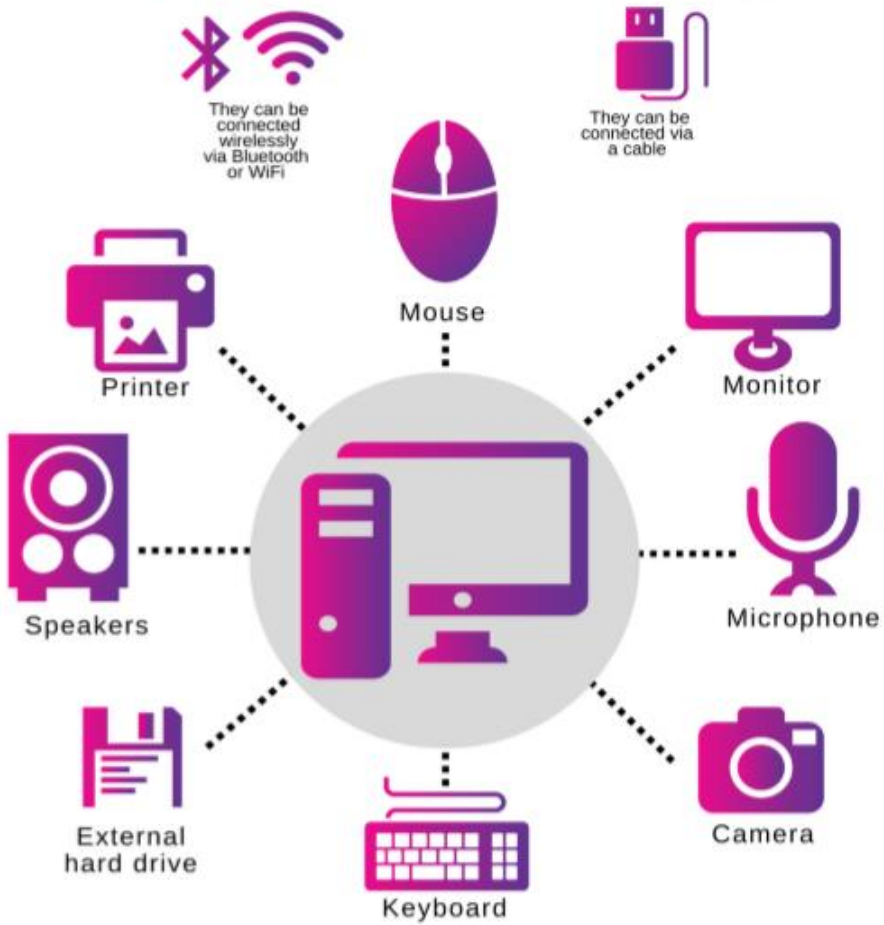

Devices can be categorised as:

Inputs

Data that goes into the hard drive, like a pressingarimo a key on a keyboard.

Outputs

Data that comes out of the hard drive, like information displayed on a monitor.

Storage

Data that is stored from the hard drive.

Teaching the Curriculum

Create units of work **WITH** teachers to help them:

1. Teach the Digital Technologies effectively. Provide a range of examples and show you how to align and assess the curriculum.
2. Save planning and resource building! Planning and lack of time is a known barrier. We help reduce that planning especially when implementing something new.
3. Provide you with enough information to get a general idea of the structure of the term while giving you enough room to move and make the unit your own.
4. Tech neutral - it doesn't matter what tech you use we can accommodate our units for you.
5. Seeing an increase in STEM specialist teachers. ACS focus is the Digital Technologies component of the unit.

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Access the Padlet with all the resources from today

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Getting to ‘that’ point

1

Understanding STEM

Understanding what is the theory behind STEM

2

Digital Technologies Curriculum

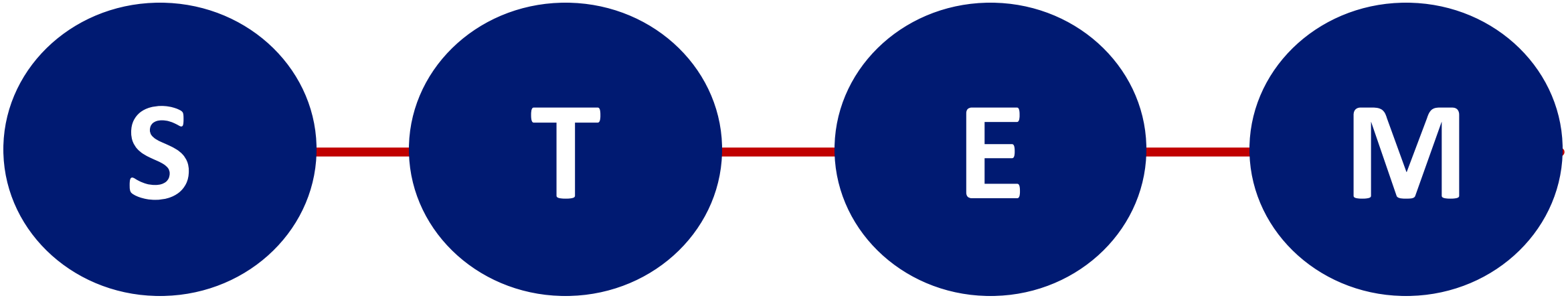
Understanding and having confidence to integrate the Digital Technologies curriculum into a STEM program.

3

Understanding the technology

Gain the skills to be able to pick the right technology to do the job!

STEM



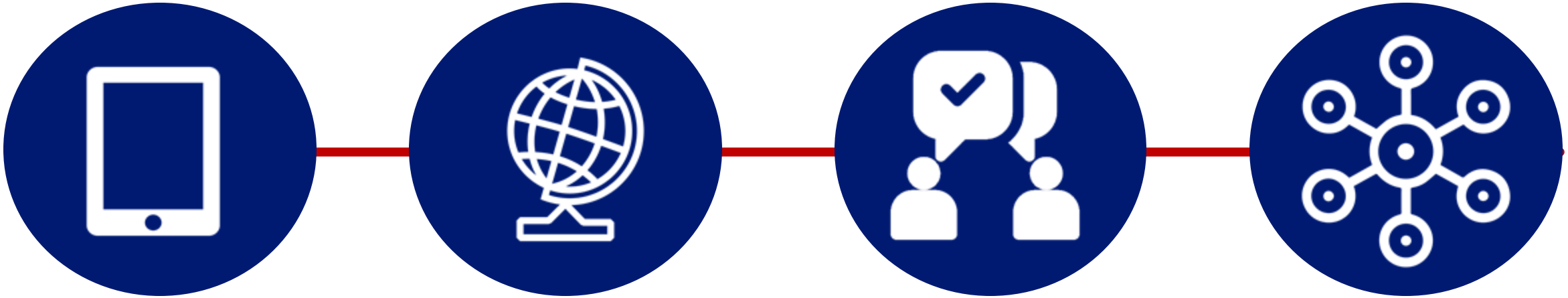
STEM – Science, Technology Engineering and Mathematics

Created to help build more awareness of careers in this area

Connection between multiple areas. To stop siloing the subjects

Real world problems. Made a connection to current issues

STEM



The impact of technology on society. How changes to technology have supported growth.

Bringing real life examples and adapting them to the classroom.

Allows students to explore real life scenarios to create authentic learning purposes.

See relevance when learning about topics.

TPACK

TPACK is a way of describing how technology pedagogy and content fit together to enable powerful learning.

The TPACK model highlights that an idea for using ICT in classrooms must have a sound curriculum and pedagogical fit.

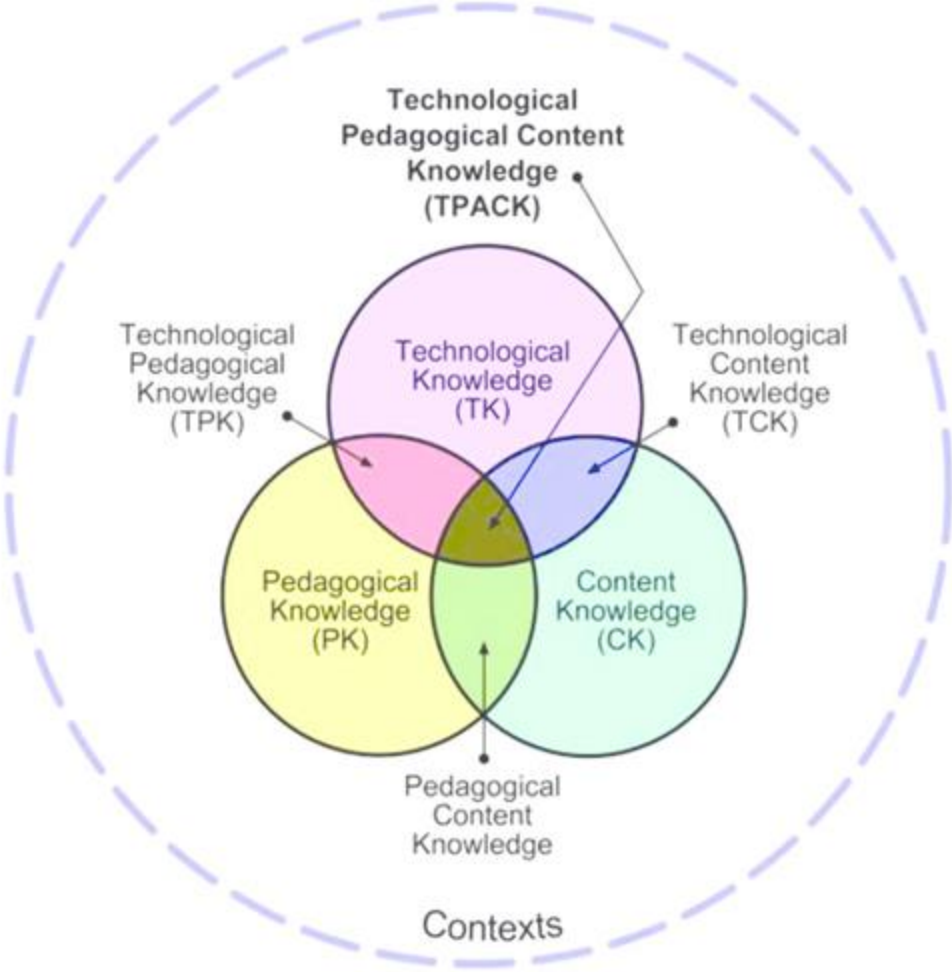


Image from http://tpack.org.

TPACK

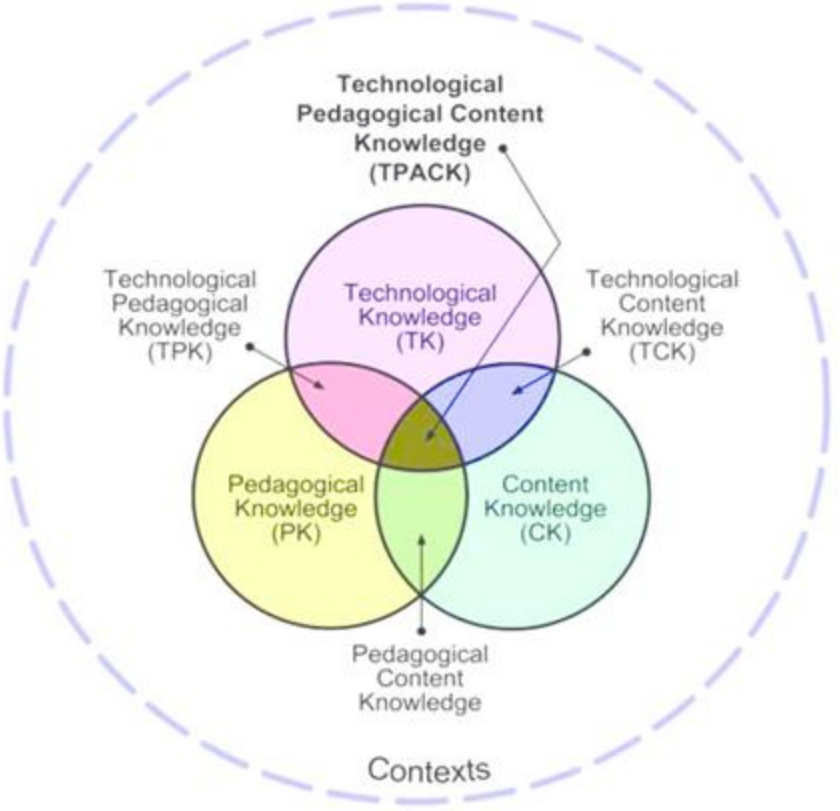
https://www.youtube.com/watch?app=desktop&v=yMQiHJsePOM

TPACK

Technology – Evaluating the technology as a tool and making sure you are using the right tool to complete the job.

Focus on how the students will use the technology when they are engaging in their learning. They need to be doing more than just engaging with the technology.

Look at how the technology fits into the curriculum rather than trying to fit the technology into the curriculum.
Example: Drones and 3D Printers



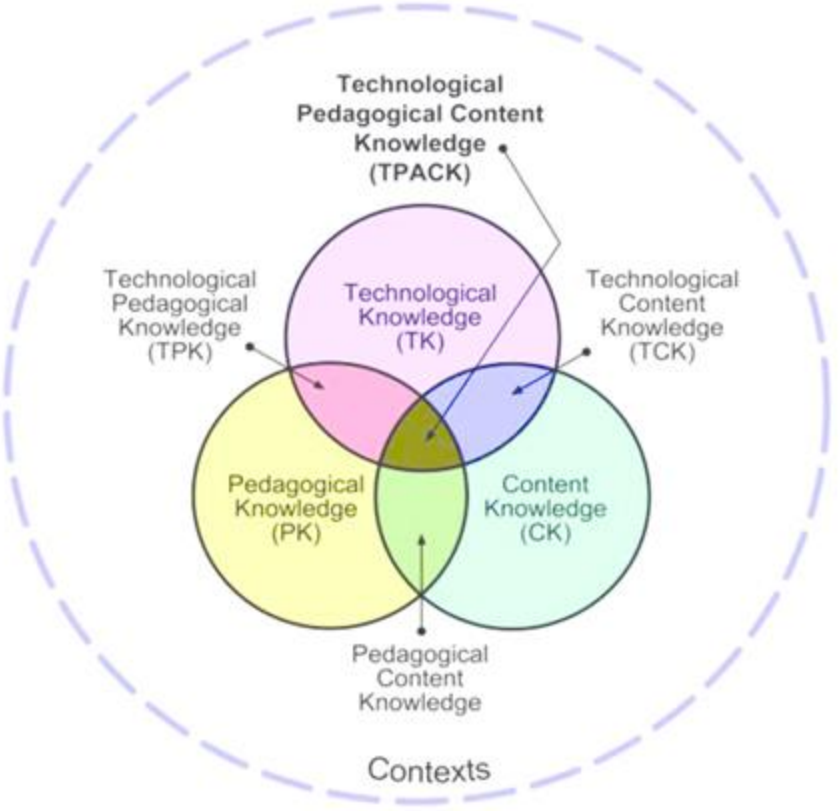
TPACK

Pedagogy – Knowing who you are as a teacher and knowing what works in your classroom.

Finding and evaluating the technology that fits into your pedagogy.

If you choose technology that doesn't marry your pedagogy, it can hinder.

I love project based learning, inquiry based learning where students are exploring and constructing their own knowledge. Drill and skill based technology doesn't work for me.



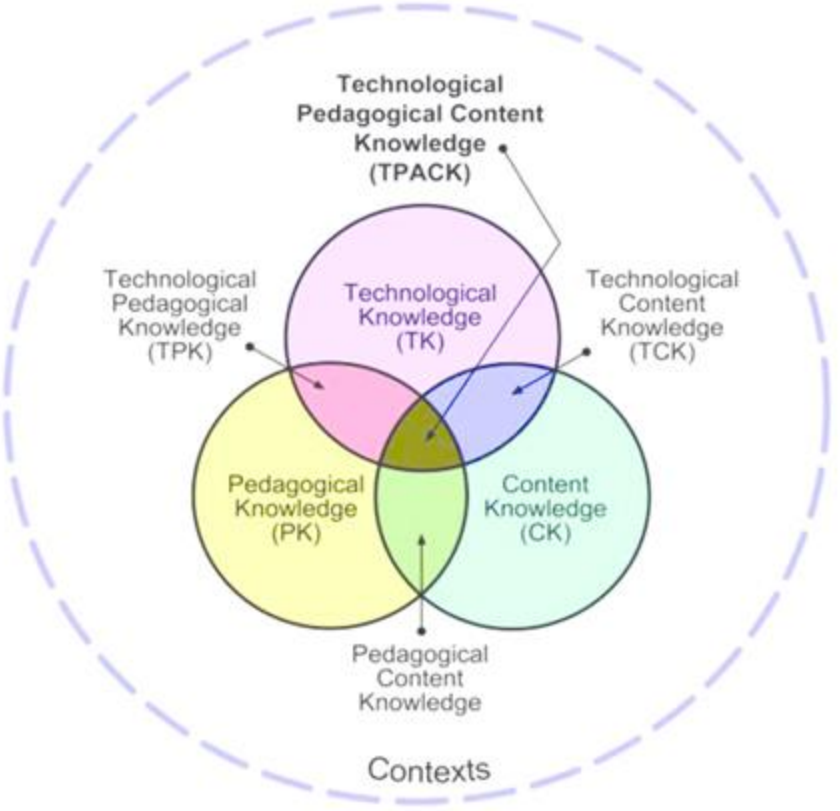
TPACK

Content – Knowing what you need to teach the students. Knowing the curriculum standards and knowing how you will assess.

Honour the curriculum

Knowing the standards that your students ned to meet too. This may be different for some.

Explore the curriculum.



TPACK Reflection activity

Where does your strength lie when using technology in your classroom, what programs are you confident with?

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Technology: What technologies are you using in your classes?

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Technology: What technologies are you using in your classes?

Pedagogy: How are you using technology to support your teaching practices?

TPACK Reflection activity

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Technology: What technologies are you using in your classes?

Pedagogy: How are you using technology to support your teaching practices?

Content: How are technologies supporting curriculum learning?

Curriculum

Digital Technologies Curriculum

- Investigating how a digital system works
- Looking at the parts that make up a digital system and knowing how they all work together
- The type of data it collects
- How you would creating with it
- Analysing it’s purpose

ICT Capabilities/Digital Literacy

- Investigating what you can do with a computer
- Learning about the functions of a program
- Knowing how to create a document
- Know your way around a program

Digital Technologies Curriculum

Systems

Data

Purpose

Collaborating

Designing

Algorithms

Digital Systems

The main components of common digital systems (hardware, software, networks), and how such digital systems may connect together to form networks to transmit data

Using technology (hardware and software)

Plugging in other parts peripheral devices

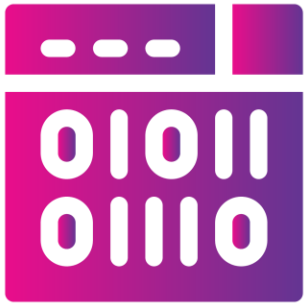
Connecting multiple devices together to make a network

How you connect (through wires or wireless connection)

How quick and safely you can connect and share information

Data Representation

Understand how data are represented and structured symbolically. Recognise different types of data.



Knowing what data is

Data can be represented in different way (money)

Data that is stored in a digital system is represented as 0 and 1s

Images, sound and text is stored as different data

The files to store data different on the quality

Data Interpretation

Collecting, collating and interpreting data. Commonly use spreadsheets. Cross over to data in Mathematics.

Collect and collate qualitative and quantitative data

Gather data from multiple sources. Visual it

Make sure that the data you have found is quality. Visual it

Data can be represented in different way (think money)

Using software to interpret data

Creating Digital Solutions

Create a **MEANINGFUL** digital solution. This is coding to create an app, creating a game. Create for a purpose and look at the potentials of technologies and bring that into the classroom

Using tech to solve problems

Solve problems based on how to use tech

Using tech to solve problems, add some coding commands

Solve problems to help your school

Using tech to solve problems, add a couple more

Solve problems to help your wider community.

Using programming languages (python to code)

Listen to your stakeholders

STEM

HARDWARE AND SOFTWARE 	Is there room to look at the hardware and software of technology?
DATA 	What data that can be collected?
COLLABORATION 	Can they use technology to work on project together?
DESIGN 	Is there room for students to design something new?

STEM

ROBOTICS 	Can robotics and programming be used at a method to solve a problem?
PROBLEM SOLVING 	Is there a problem based on specific themes students can solve?
COMMUNITY NEEDS 	How can solutions help the school community and wider community?

All Comes together

Educators

Knowing our students.
Knowing our pedagogy.

Curriculum

Honor the Curriculum.
Know what requirements we need to fulfill.

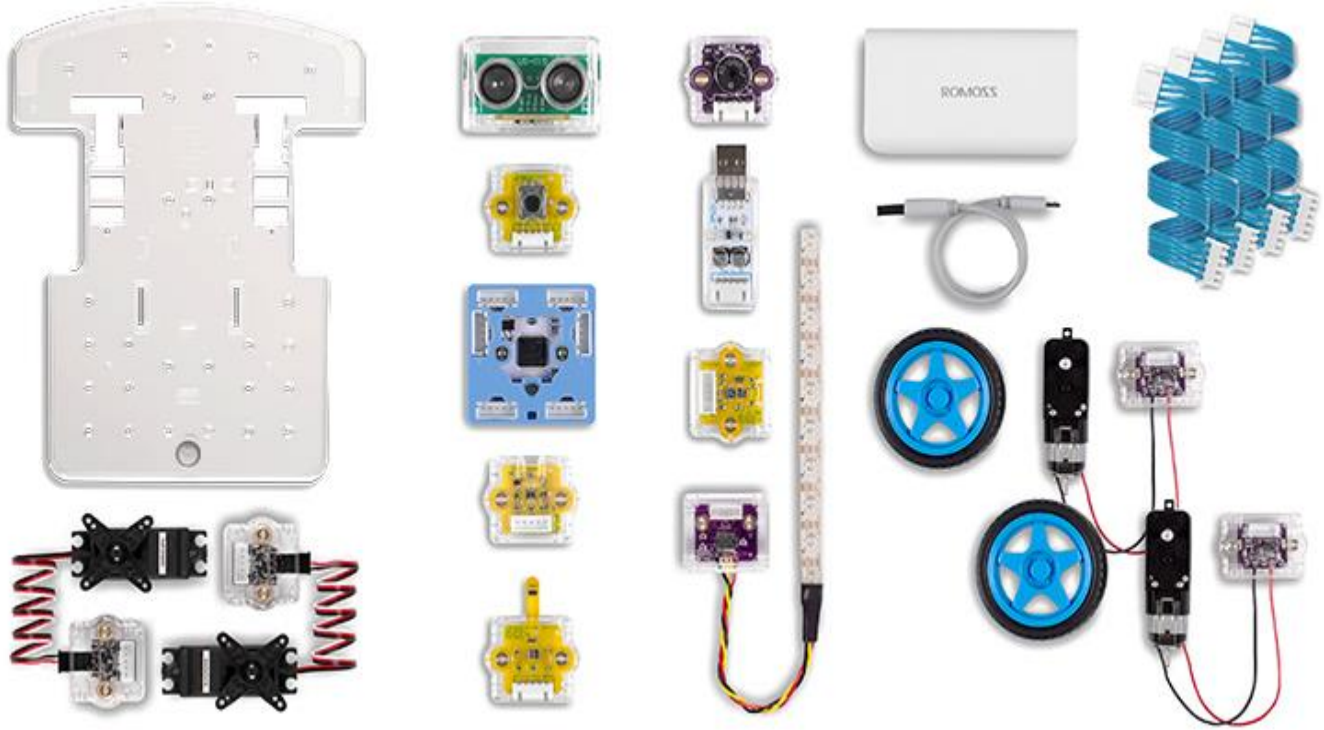
Technology

Allows you to evaluate the technology for your purpose. Choose the right tool for the task.

Implementation

ACS ICT Educators supports schools with robotics

Integrating digital technology across the curriculum through robotics and authentic learning experiences



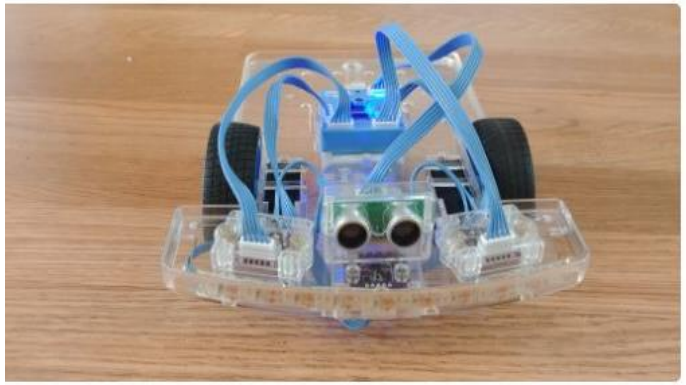
Implementation

Cubit's approach to STEAM Education emphasizes the integration of the various fields and an unconstrained problem-solving approach through design challenges in our curriculum themed around solving real-world problems.

https://cubit.cc/

Cubit Curriculum

Downloads Resources Support



Designing High-Tech Transportation Systems

Students will build and program the Cubit Racer, a robotic car they will program to run races, navigate mazes, drive autonomously, and more. Through these activities, they will practice and explore the science and mathematics of motion. Once students are familiar with basic Racer programming, they will use their Racer to explore math concepts such as calculating speed in a race and measuring angles of triangular driving tracks. They will use artistic and design thinking skills to create a car body shell to protect the robotic components.

3+ Hours Middle School

Science Technology Engineering Art Math

Add To Favorites

INTRODUCTORY FILES

Nothing here yet. Check back soon!

MASTERY FILES

PDF
Designing High-Tech Transportation Systems - Teachers Guide

PPT
Cubit-Racer-Vehicle-Technologies

UBIT WORKSHOP FILES (.PLAN)

PLAN
Racer Drive Forward

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Racer Forward Then Stop

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Self-Stopping Racer

PLAN
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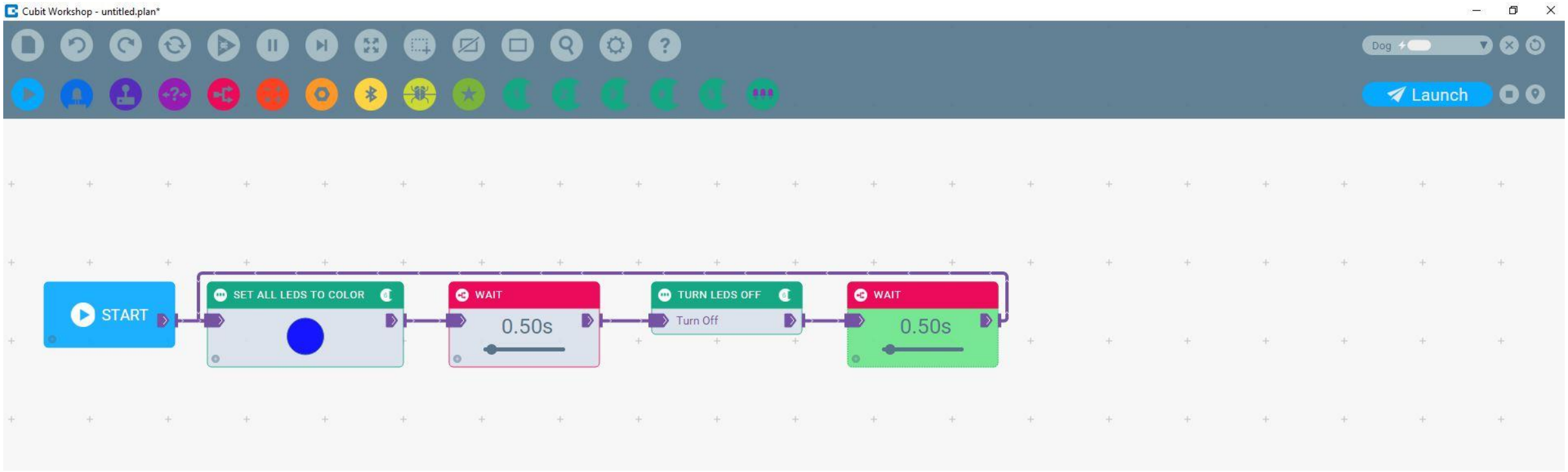
Cubit Workshop



Cubit Units

- Exploring Energy
- Metal Detector
- Robotics for Unstable Environments
- Sustainability in Structural Design
- Medical Technologies
- Manufacturing Technologies
- Utilizing Environmental Data to Improve Design
- Matter Tester
- Designing High-Tech Transportation Systems
- Sending Messages with Cubit
- Exploring Sound
- Weather Station
- Simulating Earthquakes
- Mystery Motion Box
- Monitoring Plant Growth
- Life Cycle Model
- Erosion Prevention
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- Butterfly Wing Defences
- Roller Coasters
- Water Quality Tester
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- Photo-therapy Device

Hands on Robotic Activities

1

Simulating Earthquakes

Build a prototype structure that will be tested on an earthquake simulating table.

2

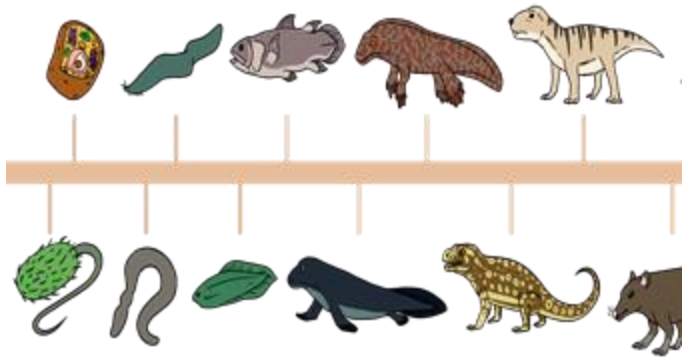
Exploring Sound

Explore how sound ca change (amplified and muffled using different materials)

3

Survival of the Fittest

Create new habitat for a species of caterpillar (represented by the LED strip). Find out the survival rate



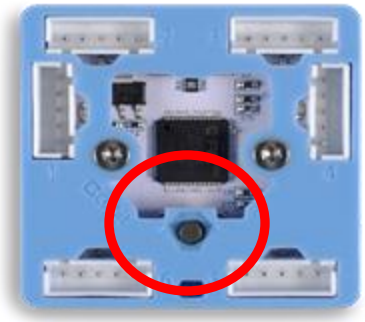
Using the Cubits

1

Plug the USB into the battery

2

Wait for blue lights to turn on. Press the grey circular button to launch the code



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Play and Reflect

How can you incorporate other areas of the Digital Technologies Curriculum through growing the activity?

Can this activity be integrated into one of your terms? Into a term of another year level?

How can the activity be aligned to another year level?

What challenges could you face with a task like this at school?

Could you use the same activity with robotics you already have available at your school?

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Want to borrow a class set Cubit Kits? Need help with the Curriculum?

catherine.newington@acs.org.au

Session 2

Practical Session

https://padlet.com/catherinenewington/STEM

Agenda Session 2

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Play with same tech available from ACS and consider the type of activities to complete in your STEM classes.

02

SAMR Model

Dive into the SAMR theory and evaluate how you are tracking when using technologies in your classroom.

03

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Learn about ACS, sign up to our community and access loads of resources!

04

Start Creating a Yearly Planner

Look at examples of yearly planners from ACS. Use these planners to adapt to your STEM classes

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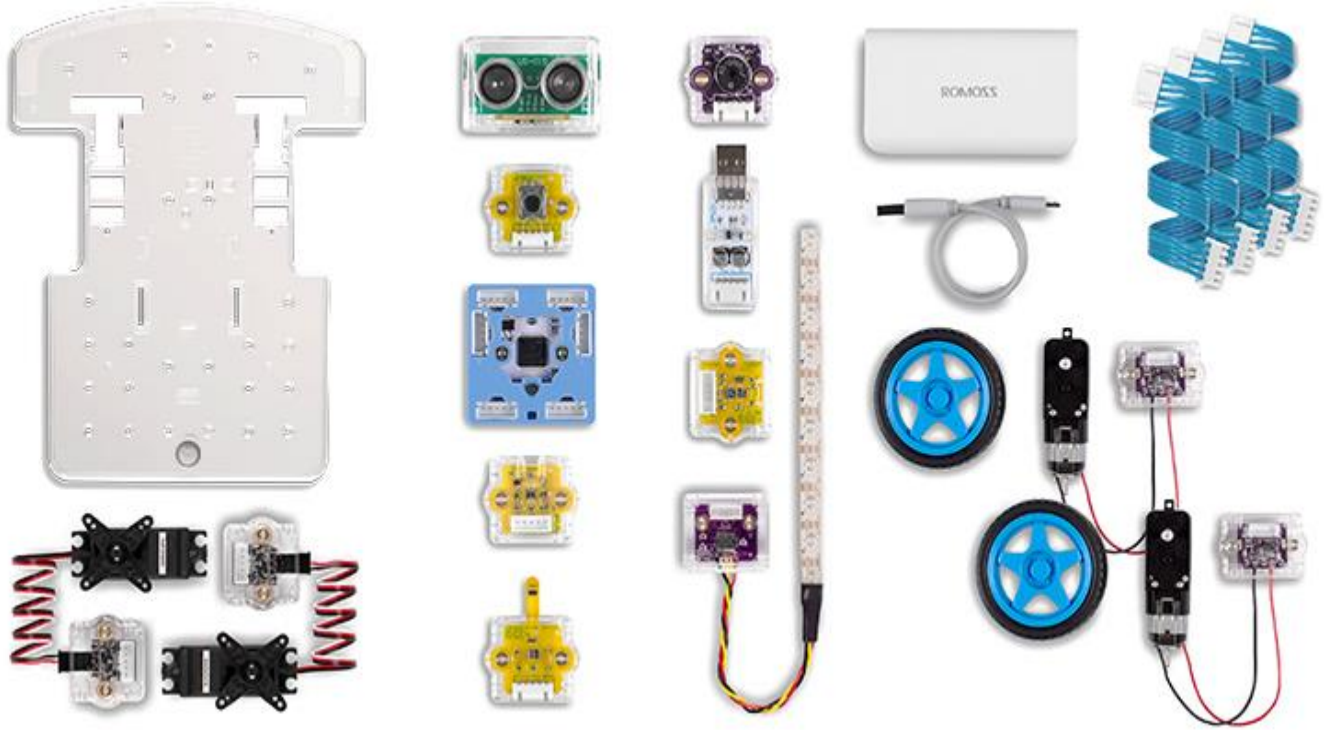

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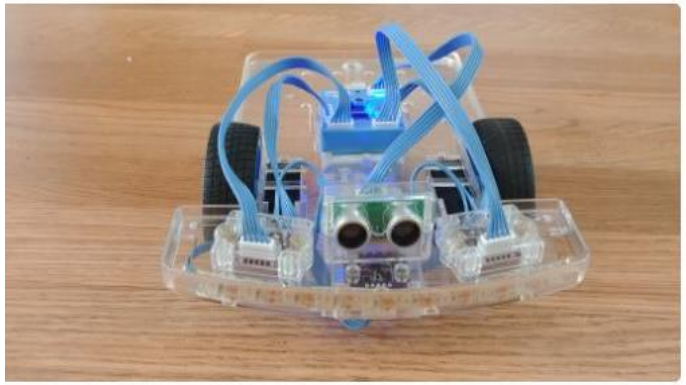

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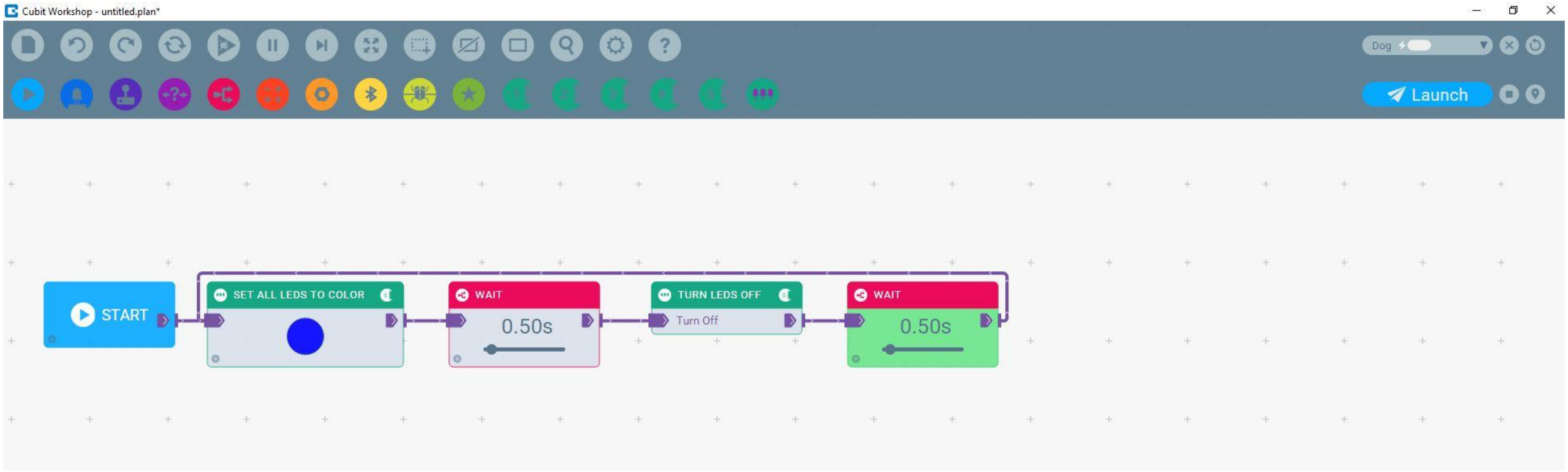

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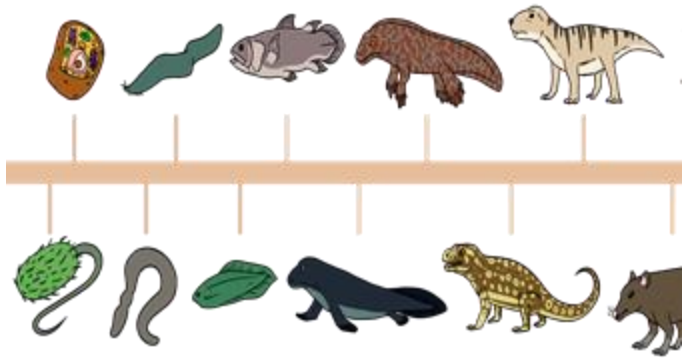


Hands on Robotic Activities

4

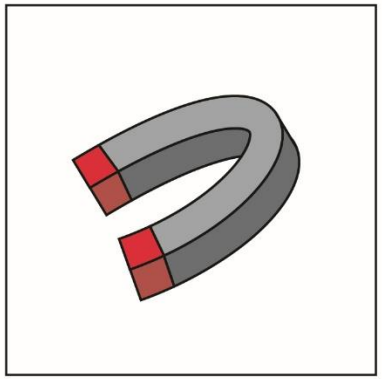
Sustainable House

Build a sustainable house out of materials and track the temperature.

5

Magnet Metal Detector

Test different items and find out if they have magnetic properties



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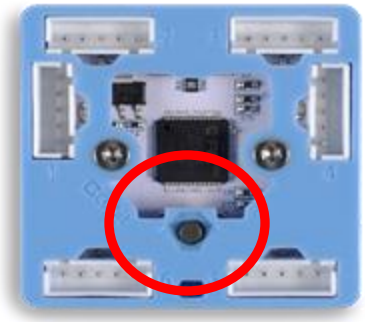

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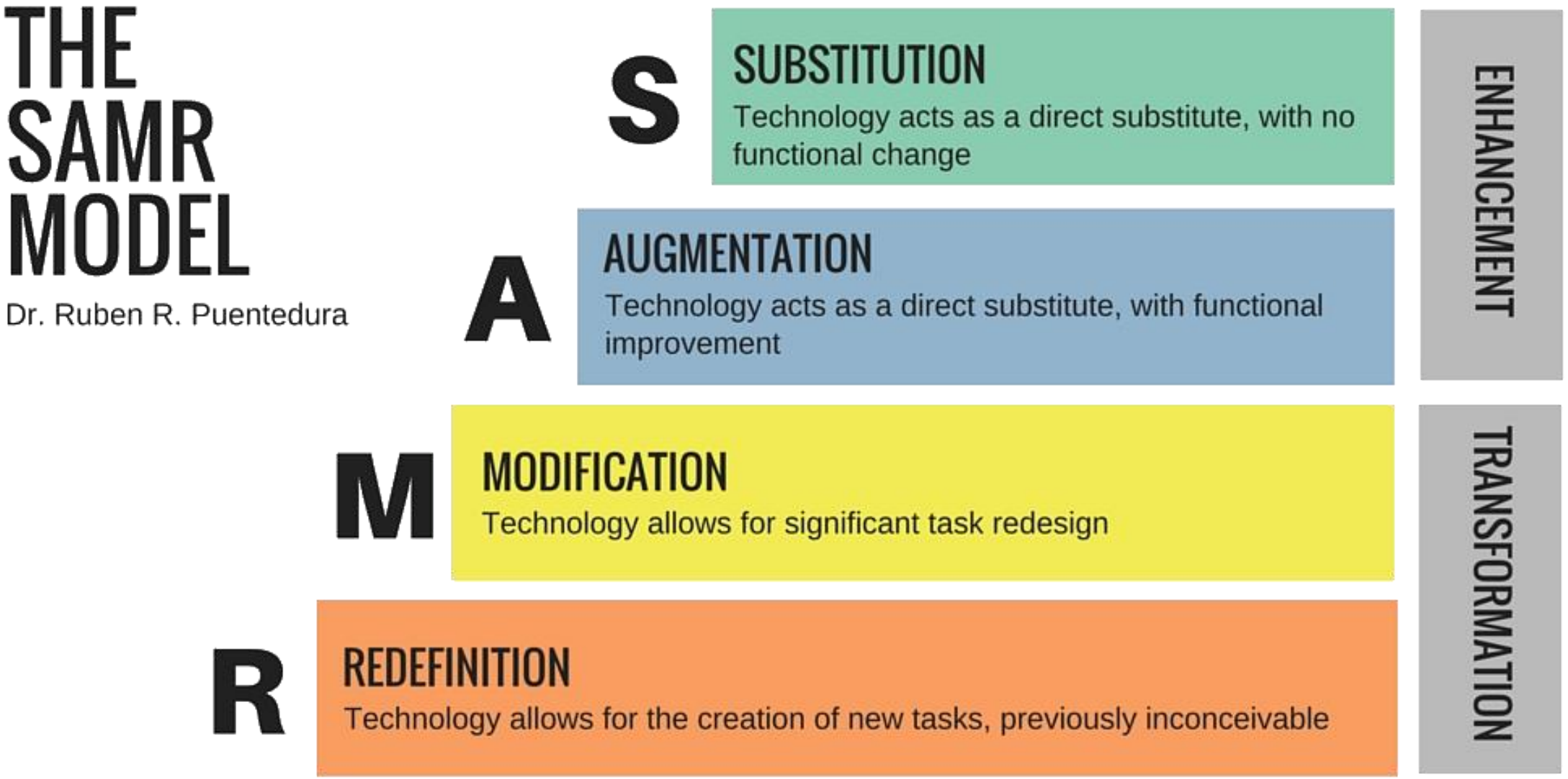
THE SAMR MODEL
Dr. Ruben R. Puentedura
S
SUBSTITUTION
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A
AUGMENTATION
Technology acts as a direct substitute, with functional improvement
M
MODIFICATION
Technology allows for significant task redesign
R
REDEFINITION
Technology allows for the creation of new tasks, previously inconceivable
ENHANCEMENT
TRANSFORMATION

SAMR Model

Substitution - Technology acts as a direct tool substitute for traditional practices, with no functional change could be time saving and resource friendly

- Digital textbook - online quizzes - digital whiteboard - word/docs

SAMR Model

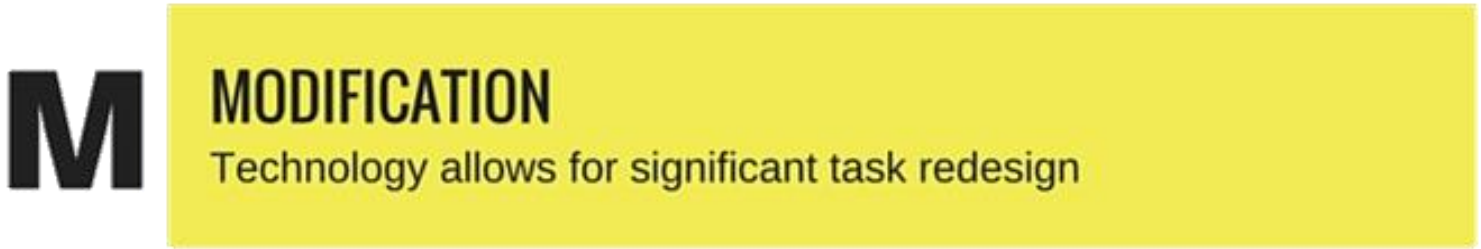
Augmentation - Some functional improvement

- Multimedia elements images, videos layout skills in presentations, online instruction, online independent research eg Gapminder

SAMR Model

Modification - Co -authorship and collaboration intended - less teacher direction

- Podcasts, blogs, website authorship ie google sites

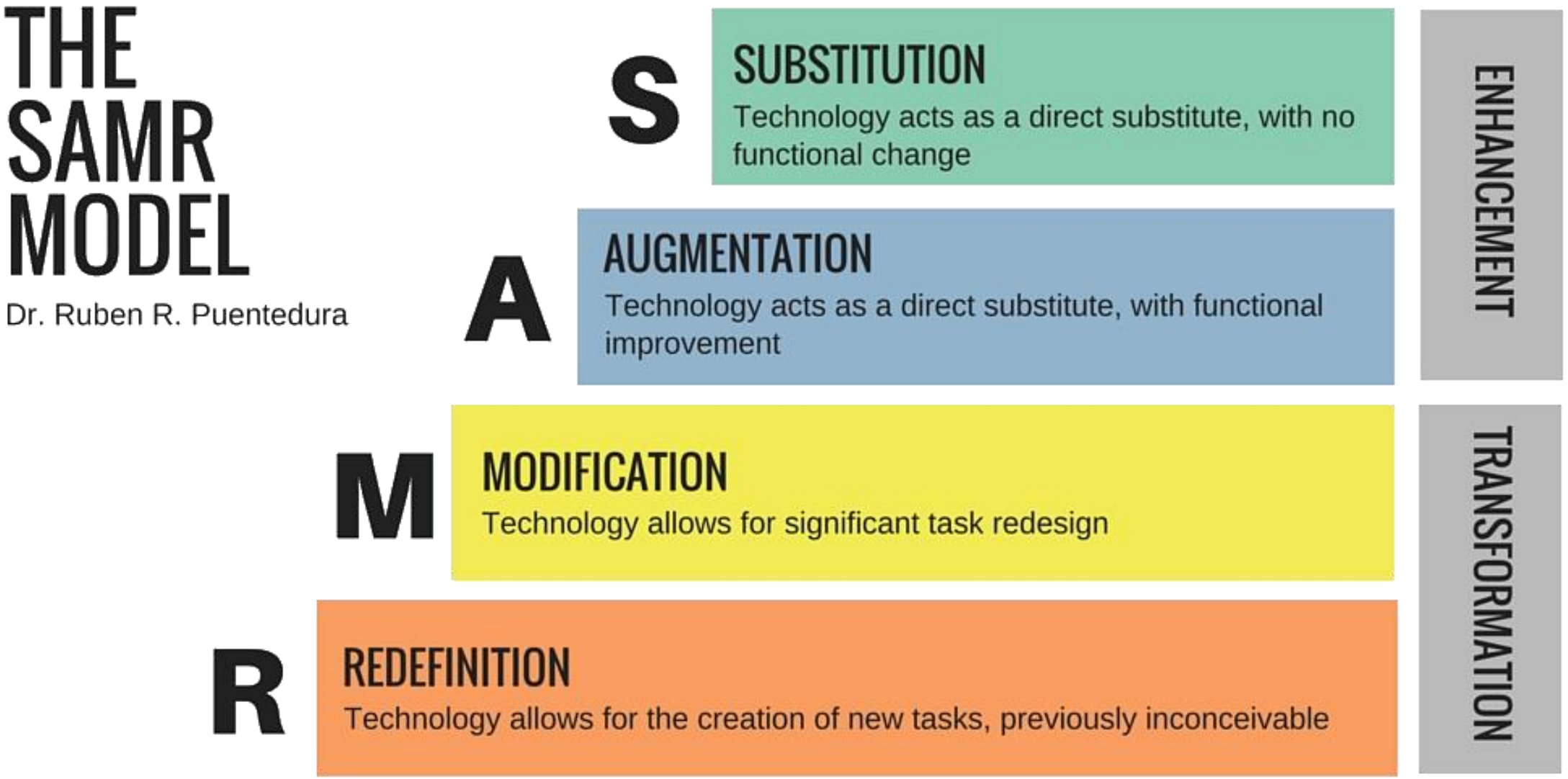


SAMR Model

Redefinition - student centered, self directed learning, real-world authentic problem solving. Students display high levels of technology skills

- Extensive multimodal elements in presentations
- Potential world wide audiences

SAMR Model


THE SAMR MODEL
Dr. Ruben R. Puentedura
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SAMR Reflection

Rate your use of technology in your lessons. Where does your strength lie when using technology in your classroom, what programs are you confident with.

0 = none 5 = always

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What technologies are you using and how you are using them in your classes?

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Where are they in the regards to the positions within the SAMR model?

SAMR Reflection

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What technologies are you using and how you are using them in your classes?

Where are they in the regards to the positions within the SAMR model?

What do you need to move onto the next level? How can ACS support that growth?

Evaluating Technology

PEDAGOGY 	Does the content accommodate for individual differences?
CURRICULUM 	Can the technology be used within another subject area of the curriculum?
ASSESSMENT & FEEDBACK 	When the learner is incorrect, does the technology give instant feedback?
INTERFACE & DESIGN 	Can content such as music and animations be controlled by the user (turned off and on)?
USABILITY 	Can students use the program independently after the first use?

ACS Community

ACS ICT Educators Program provides support to teachers to implement the Digital Technologies Curriculum with confidence.

https://www.acs.org.au/join-ict.html

Access the Padlet with all the resources from today

https://padlet.com/catherinenewington/STEM

YEAR LEVEL: F	TERM 1	TERM 2	TERM 3	TERM 4
KEY CONCEPTS • What is the focus/big question to drive the term?		**Classroom Concept: Healthy Eating** Digital Technologies Focus: Healthy Bots	**Classroom Concept: Animals** Digital Technologies Focus: Augmented Reality	**Classroom Concept: Seasons and Weather** Digital Technologies Focus: Data collection and weather stations.
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Session 3

Planning Session

Agenda Session 3

01

Tech Play

Play with same tech available from ACS and consider the type of activities to complete in your STEM classes.

02

Planning

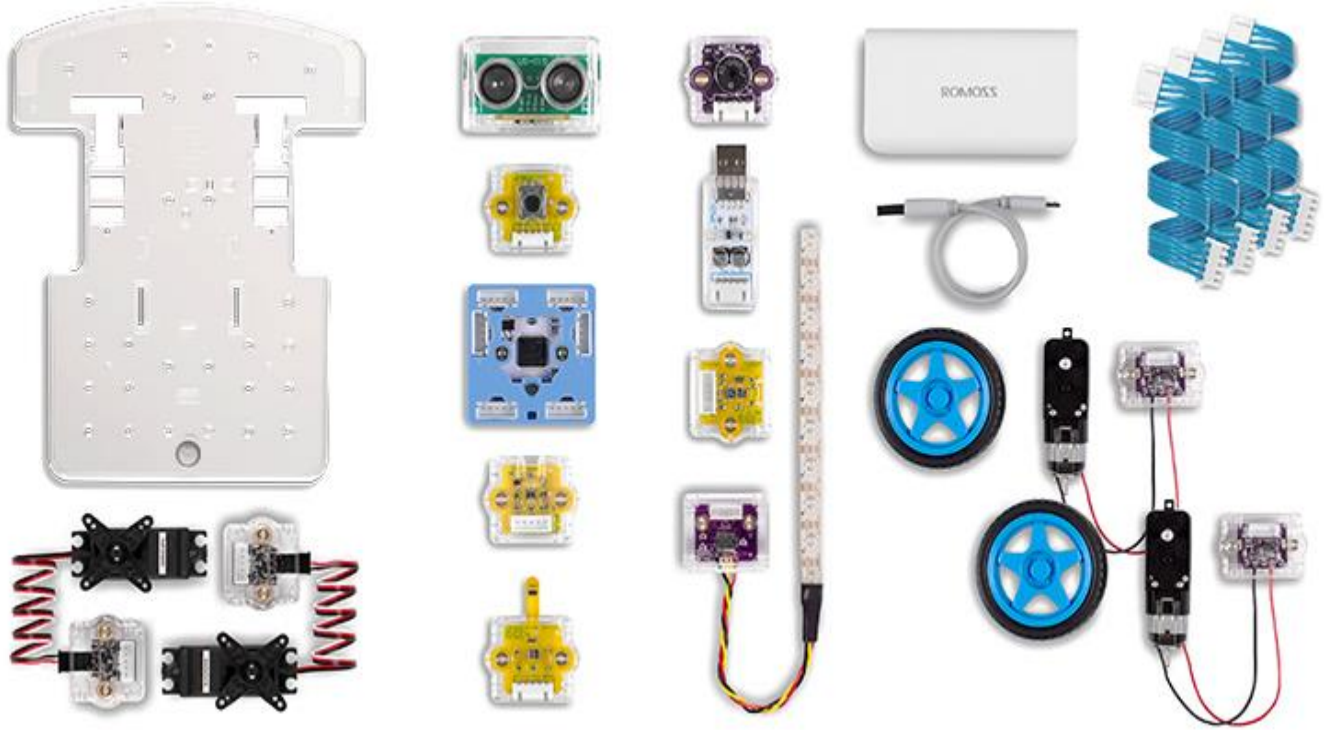
Showcase a scope and sequence and units of work. Then lets get planning and preparing for Term 3, Term 4 and beyond!

https://padlet.com/catherinenewington/STEM

Implementation

ACS ICT Educators supports schools with robotics

Integrating digital technology across the curriculum through robotics and authentic learning experiences



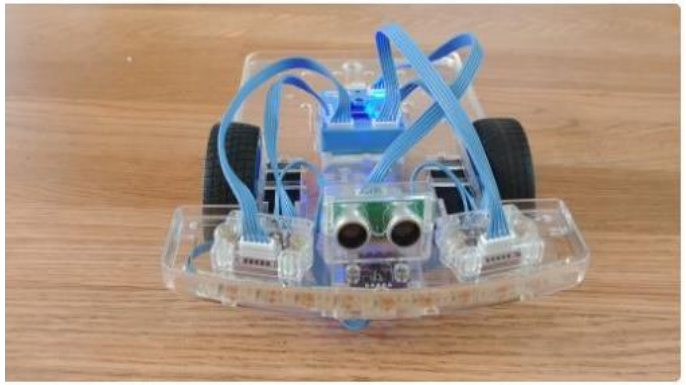
Implementation

Cubit's approach to STEAM Education emphasizes the integration of the various fields and an unconstrained problem-solving approach through design challenges in our curriculum themed around solving real-world problems.

https://cubit.cc/

Cubit Curriculum

Downloads Resources Support



Designing High-Tech Transportation Systems

Students will build and program the Cubit Racer, a robotic car they will program to run races, navigate mazes, drive autonomously, and more. Through these activities, they will practice and explore the science and mathematics of motion. Once students are familiar with basic Racer programming, they will use their Racer to explore math concepts such as calculating speed in a race and measuring angles of triangular driving tracks. They will use artistic and design thinking skills to create a car body shell to protect the robotic components.

3+ Hours Middle School

Science Technology Engineering Art Math

Add To Favorites

INTRODUCTORY FILES

Nothing here yet. Check back soon!

MASTERY FILES

PDF
Designing High-Tech Transportation Systems - Teachers Guide

PPT
Cubit-Racer-Vehicle-Technologies

UBIT WORKSHOP FILES (.PLAN)

PLAN
Racer Drive Forward

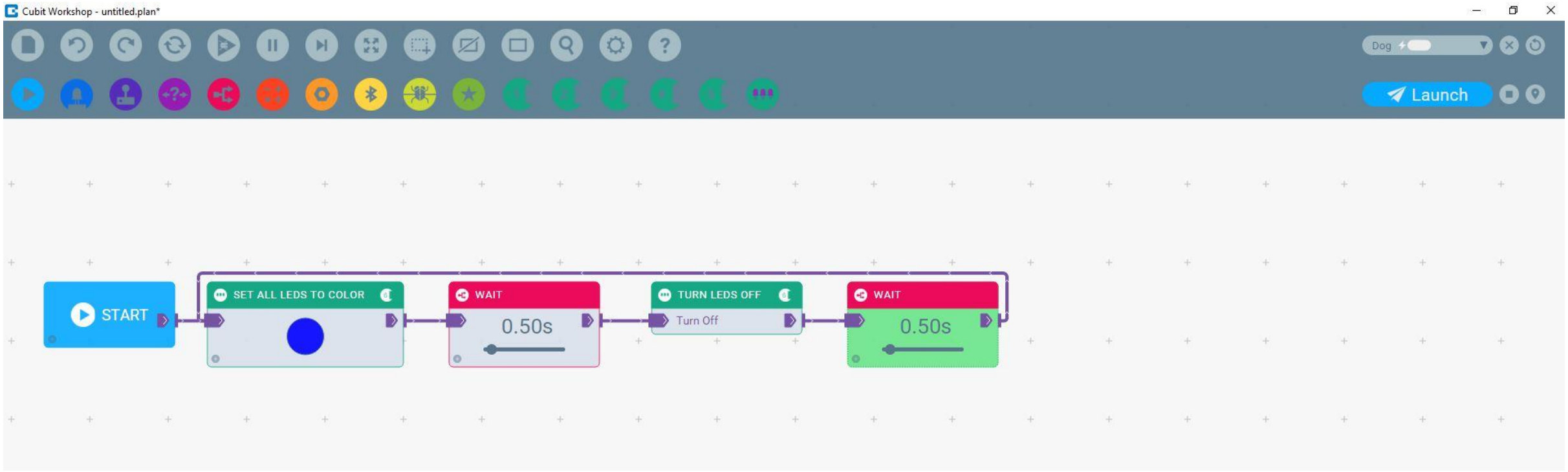
PLAN
Racer Drive Stop Blink Light

PLAN
Racer Forward Then Stop

PLAN
Self-Stopping Racer

PLAN
Self-Turning Racer

Cubit Workshop



Cubit Units

- Exploring Energy
- Metal Detector
- Robotics for Unstable Environments
- Sustainability in Structural Design
- Medical Technologies
- Manufacturing Technologies
- Utilizing Environmental Data to Improve Design
- Matter Tester
- Designing High-Tech Transportation Systems
- Sending Messages with Cubit
- Exploring Sound
- Weather Station
- Simulating Earthquakes
- Mystery Motion Box
- Monitoring Plant Growth
- Life Cycle Model
- Erosion Prevention
- Environmental Engineering
- Butterfly Wing Defences
- Roller Coasters
- Water Quality Tester
- Flying Pollinators
- Photo-therapy Device

Hands on Robotic Activities

1

Simulating Earthquakes

Build a prototype structure that will be tested on an earthquake simulating table.

2

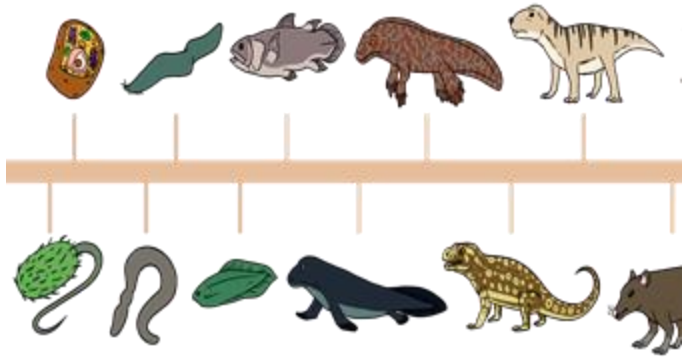
Exploring Sound

Explore how sound can change (amplified and muffled using different materials)

3

Survival of the Fittest

Create new habitat for a species of caterpillar (represented by the LED strip). Find out the survival rate



Hands on Robotic Activities

4

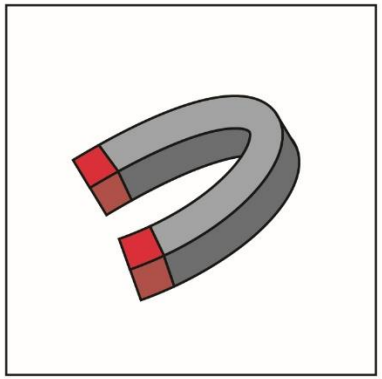
Sustainable House

Build a sustainable house out of materials and track the temperature.

5

Magnet Metal Detector

Test different items and find out if they have magnetic properties

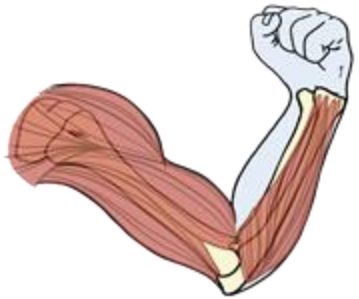


Hands on Robotic Activities

6

Bionic Joint

Design a bionic joint using the Cubit robotic DC motor and dial to create movement. Make it look good!



7

Perfect Plants

Measuring the light and temperature around the school. Based on the data you collected – where the best place to plant your basil.

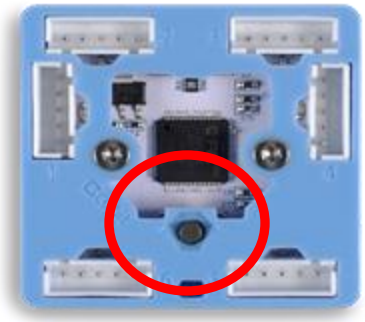
Using the Cubits

1

Plug the USB into the battery

2

Wait for blue lights to turn on. Press the grey circular button to launch the code



3

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Play and Reflect

How can you incorporate other areas of the Digital Technologies Curriculum through growing the activity?

Can this activity be integrated into one of your terms? Into a term of another year level?

How can the activity be aligned to another year level?

What challenges could you face with a task like this at school?

Could you use the same activity with robotics you already have available at your school?

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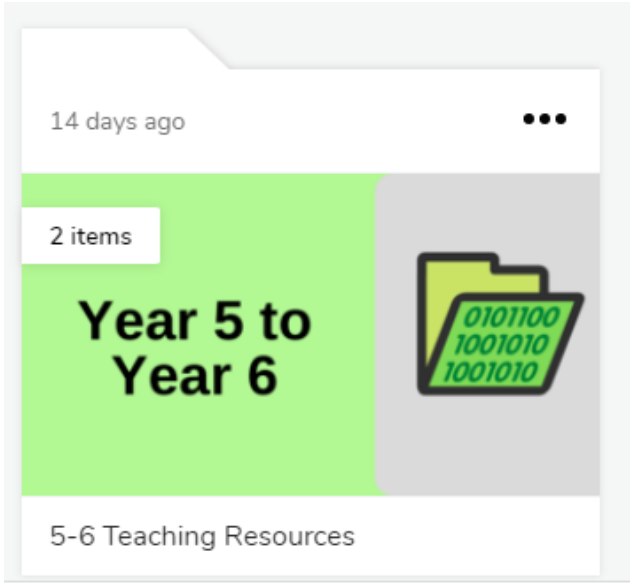
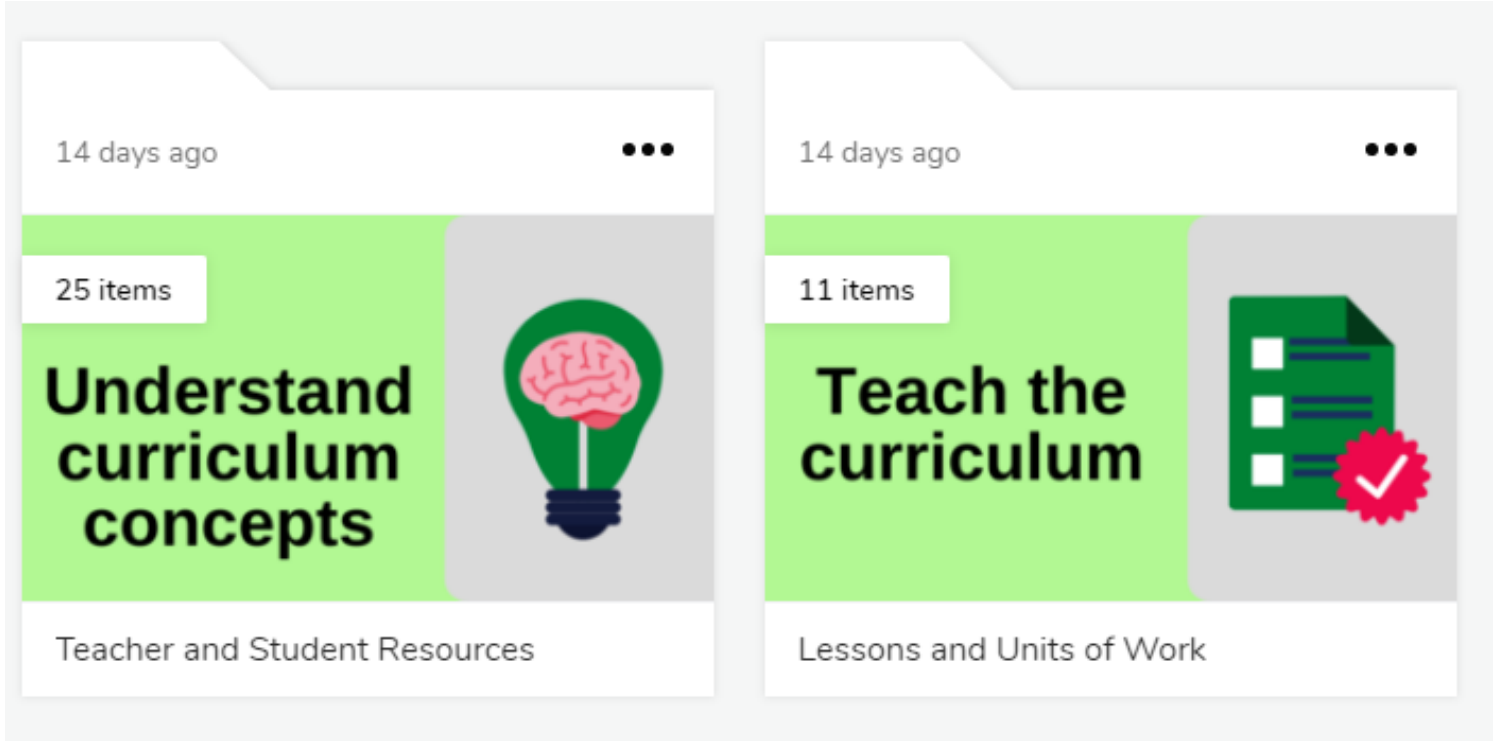
Resource Structure





PERIPHERAL DEVICES

Levels 3-4

Information

For a digital system to function and performs certain tasks, it needs devices that will input and output data. Devices that will input the data into the computer (to store and manipulate the data) and devices that will output the data (to view the data). Peripheral devices are digital devices that are the extra 'add ons' to a computer. These can take the form of:

- Mouse
- Printer
- Scanner
- Webcam
- Monitor or interactive white board
- Speakers
- Microphone

These devices can be connected to a computer via a cord that will be directly plugged or wirelessly through WIFI or Bluetooth. Devices can also be added into a hard drive such as extra memory or a graphics card. Peripheral devices are categorised as:

Input devices	Output devices	Storage devices
Puts data into the computer such as a mouse to click, a keyboard to write information.	Takes data from the hard drive such as a monitor allows you to view information, speakers allow you to hear sound, printer printers out information.	Holds the data such as hard drives that allows you to save information from the hard drive.

Curriculum Expectation

Students will investigate and explore how peripheral devices are used to help perform a task (printer to print out a hard copy, a monitor to watch a video) for a purpose and the type of data that is transmitted between the devices.

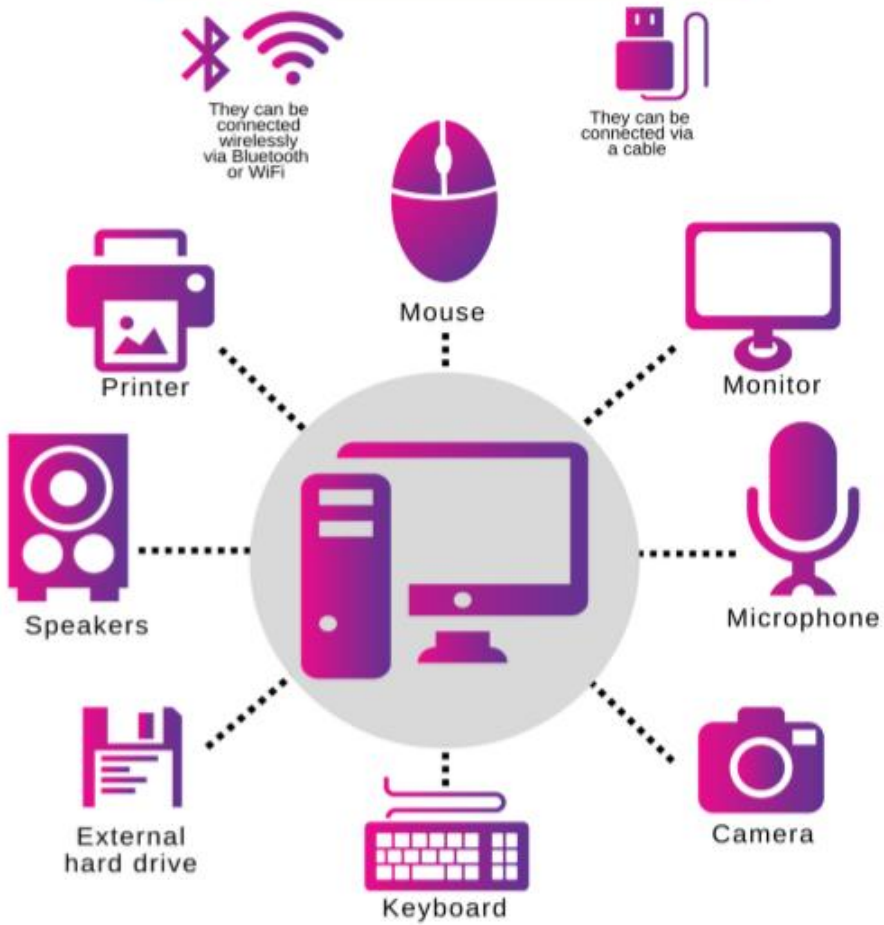
Video Resource

Click the image to open the video

This video identifies and further explains the role of common peripheral devices.

Video Source: study.com

PERIPHERAL DEVICES



Devices can be categorised as:

Inputs

Data that goes into the hard drive, like a pressingarimo a key on a keyboard.

Outputs

Data that comes out of the hard drive, like information displayed on a monitor.

Storage

Data that is stored from the hard drive.

Teaching the Curriculum

Create units of work **WITH** teachers to help them:

1. Teach the Digital Technologies effectively. Provide a range of examples and show you how to align and assess the curriculum.
2. Save planning and resource building! Planning and lack of time is a known barrier. We help reduce that planning especially when implementing something new.
3. Provide you with enough information to get a general idea of the structure of the term while giving you enough room to move and make the unit your own.
4. Tech neutral - it doesn't matter what tech you use we can accommodate our units for you.
5. Seeing an increase in STEM specialist teachers. ACS focus is the Digital Technologies component of the unit.

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