

arm

From play to projects: shaping learning with project-based learning

Arm School Program with support from CBSE
January 18th, 2023



Agenda

- + **Welcome and introduction to ASP**
- + **Professional development session**
- + **Feedback**
- + **Questions and answers**
- + **Thank you and session closure**

Nick Sample, Senior Manager, School Program, Arm

Robert Leeman, Program Manager, Arm

Suriya Gunasekaran, Operations analyst, Arm

Nick

Nick

arm

Welcome and introduction to the Arm School Program

Nick Sample, Senior Manager, Arm School
Program

Introduction to your speakers

The Arm School Program team

Rob Leeman – Program Manager, Arm



Rob started out as a network engineer before moving into teaching in secondary schools, leading departments in achieving outstanding results in Information Technology and Computer Science. Rob then worked for Cambridge Assessment, reforming the Computer Science A-Level and GCSE in the UK and developing assessment products for international clients, before joining Arm.

Nick Sample – Senior Manager, Arm School Program



Twitter: @n_sample

Nick is a member of the UK Digital Skills Partnership Computing in Schools delivery group and sits on the Strategic Board of the Cambridge Maths Hub. Prior to joining Arm, Nick worked in educational product development and assessment across the UK, US, Middle East and Caribbean regions, for companies including Pearson, Macmillan Education, Hodder, and Cambridge Assessment.

Arm School Program (ASP) vision



Vision To empower all learners with the opportunity to develop the interest, knowledge and skills that enable a lifetime of engagement in STE(A)M

How the Arm School Program works

Supporting teachers in effective classroom practice

Community and research

- + Supporting and developing teaching communities of practice, including Computing At School and Computer Science Teachers' Association
- + Research and development: working with our partners to help innovation and progress in schools' education

Content and training

- + Professional development support, including on EdX.org
- + Curriculum-linked, free-to-access teaching and learning resources for use in the classroom, including: lesson plans, worksheets, videos, presentational materials
- + Visit <https://school.arm.com> to find out more and sign up to our newsletter

<https://school.arm.com>

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Products

Solutions

Partners

Support & Training

Resources

Company

ARM SCHOOL PROGRAM RESOURCES

Resources for Schools (K-12)

Our teaching and learning resources help teachers deliver engaging and inspirational lessons in Computing using physical computing devices, such as the micro:bit. Applying the Arm School Program's project-based learning pedagogical approach, the resources encourage learners to develop soft STEM skills, such as creativity and resilience, while gaining the skills and knowledge needed for exam success.

To learn about the Arm School Program approach, download our brochure [here](#).

Download brochure

EdX: Teaching with Physical

Smart Schools on Arduino

Arduino Projects for

Computing on micro:bit

Arm School Program brochure



How the Arm School Program Can Help Teachers and Learners



Computing has transformed society in innumerable exciting ways. Part of our mission is to work with teachers and educational experts like you to spark learners' interest and engagement in the subject.

The Arm School Program is part of the Education team at Arm, the world's leading semiconductor IP company. Arm's technology is in billions of devices—from supercomputers, mobile phones, and cars to small computers from partners such as micro:bit, Raspberry Pi, and Arduino.

If you're interested in improving your learners' engagement in Computing, we can help. Project-based learning (PBL), combined with Physical Computing, offers a way for learners to experience the thrill of innovating while also gaining and practicing the skills and knowledge they need.

If you would like to learn how to deliver PBL effectively, we offer a range of free-to-access professional development courses as well as structured teaching and learning materials, which can support you from beginner to experienced PBL practitioner:

- + **Support and training for teachers** — a range of professional development courses and events for Computing teachers. Visit page 07 to find out more.
- + **Free-to-access teaching and learning resources** on arm.com/schools, linked to the Computer Science curriculum. Visit page 08 to find out more.

https://school.arm.com

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Products



Solutions



Partners



Support & Training



Resources



Company

Computing for International Schools

A complete curriculum covering grades 5 to 7 based on a project-based learning approach using micro:bits and MicroPython. Ages 9-12.

[Learn More >](#)

Raspberry Pi Pico Projects for Schools

Raspberry Pi Pico Projects for Schools: Explore cutting-edge topics in Computing, including ML and IoT. Ages 16-18.

[Learn More >](#)

Arm School Program on YouTube

Our wide range of videos supports teaching and learning computer science at home and in the classroom. Playlists are: *Introduction to Computing with Micro:bit* (download tasks [here](#)) and *Introduction to MicroPython* (download tasks [here](#)).

[Visit Our Channel >](#)



Contact



Search



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We will process your information in accordance with our [privacy policy](#).

Teaching with Physical Computing

A new series of PD courses from the Arm School Program

A course for teachers on Physical Computing and how to apply it through Project-Based Learning in the classroom.

Teaching with Physical Computing

Search for “Project-Based Learning” on edX.org

Course 1 Introduction to Project-Based Learning

Course 2 Practical application and classroom strategies for PBL

Course 3 Assessment of Project-Based Learning

Course 4 Soft skills, teamwork and the wider curriculum



Training with CBSE

Schedule and dates

Session title

Get started with Physical Computing – hardware and technologies to enhance learning

Introducing Physical Computing and Project-Based Learning

Contexts are key – how to create successful Project-Based Learning (PBL) projects from any context or subject

From play to projects – shaping learning with Project-Based Learning (PBL)

Assessing projects in Physical Computing

Developing employability skills with Project-Based Learning/Physical Computing

How to run an ASP Innovation Day

Date and time

September 21st 2022
3pm IST

19th October 2022
3pm IST

23rd November 2022
3pm IST

18th January 2023
3pm IST

22nd February 2023
3pm IST

15th March 2023
3pm IST

26th April 2023
3pm IST

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Main training session

Robert Leeman, Program Manager, Arm

Learning outcomes:

- + Understand the ASP schema
- + Understand the impact of play based learning
- + Understand how to apply a context to the ASP schema for younger learners
- + Understand how to develop a problem set and create effective success criteria based on play based learning
- + Understand how to scaffold and differentiate a Physical Computing project idea effectively for younger learners
- + Understand the hardware and delivery considerations for new Physical Computing projects
- + Develop a new Physical Computing project on a novel context/theme
- + Confidently iterate a new project after first delivery

“Our real problem is – what is the **goal of education**? Are we forming children that are only capable of learning what is already known? Or should we try developing **creative and innovative minds**, capable of **discovery** from the preschool age on, throughout life?”

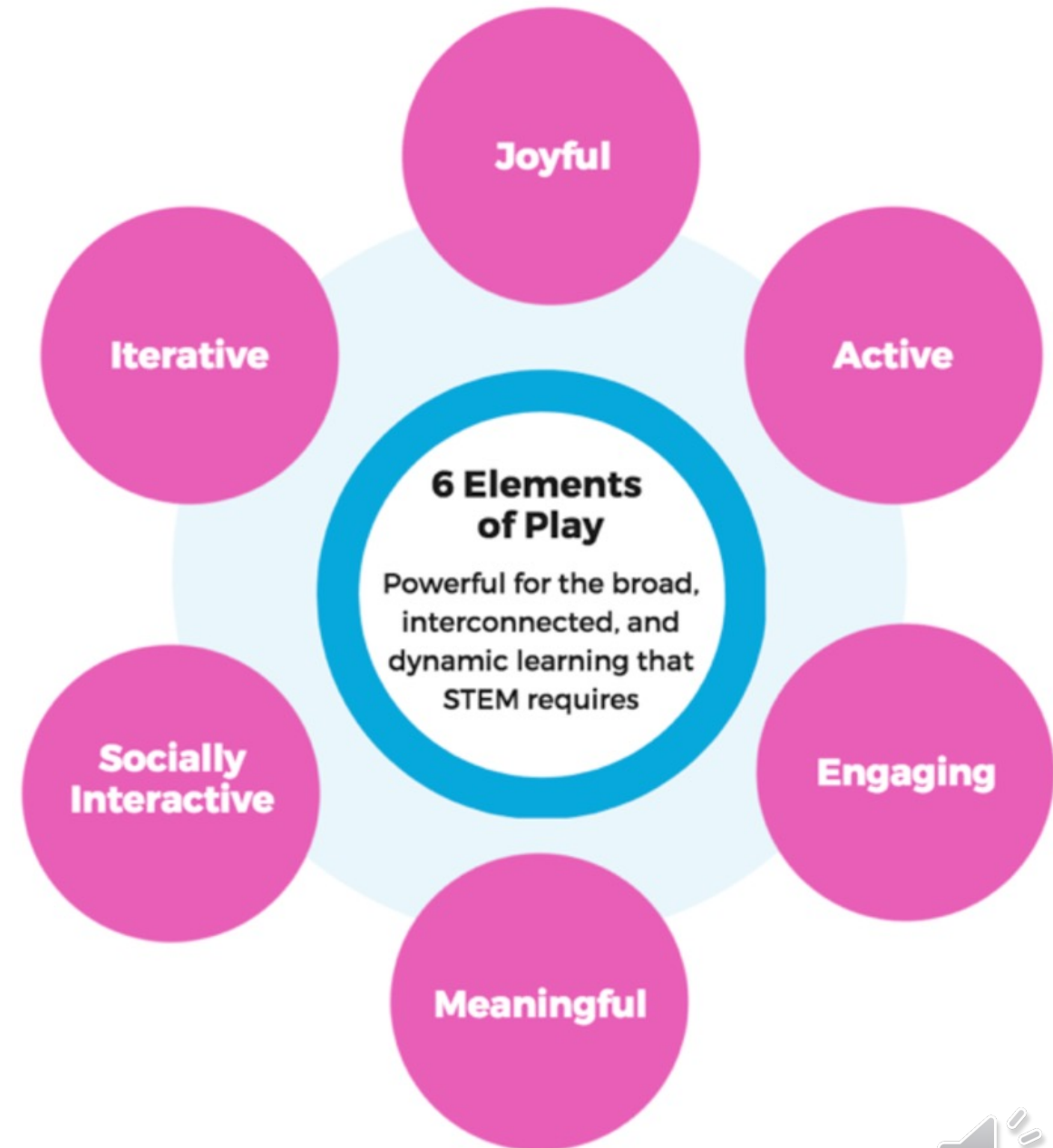
+ Piaget

Play Based Learning

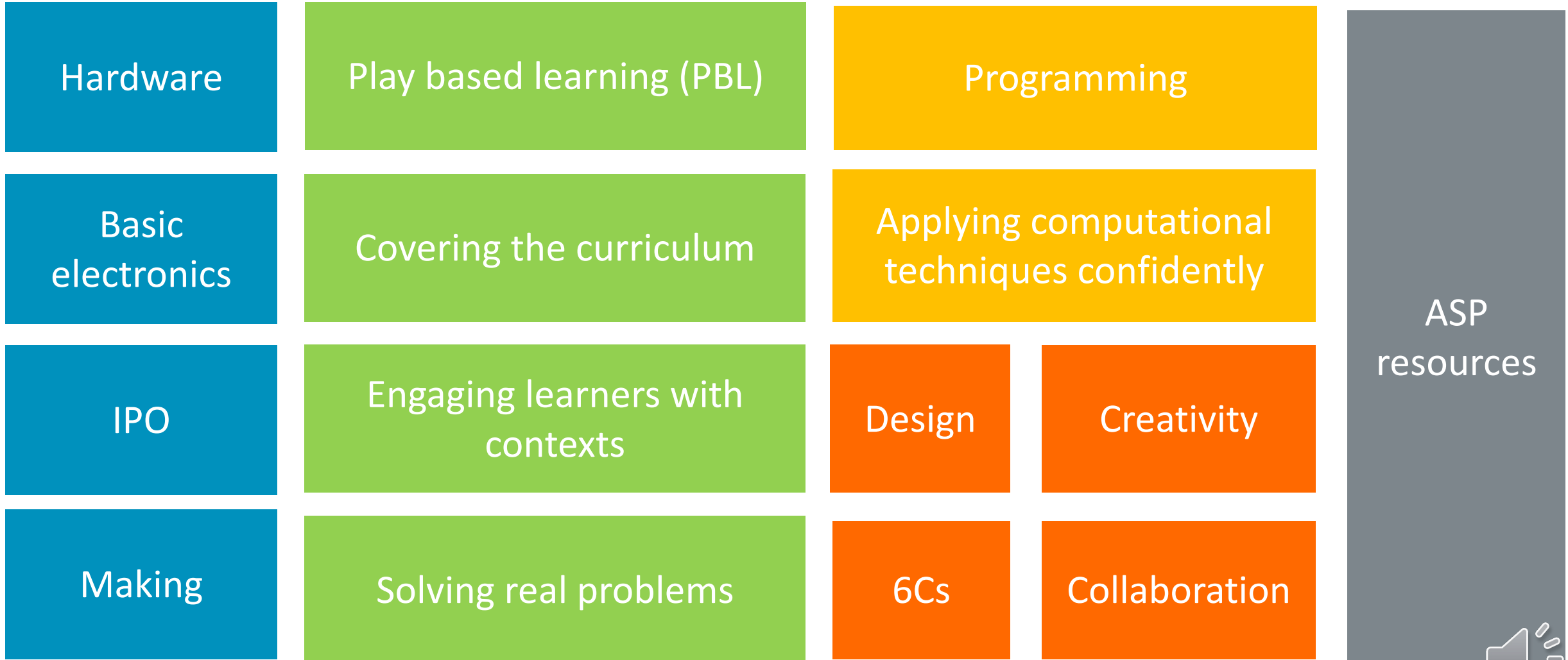
- + Play is a defining feature of human development
- + Play is engaging and can be harnessed to enhance learning
- + Child initiated and teacher supported through inquiry
- + Children learn best through first-hand experiences—play motivates, stimulates and supports children in their development of skills, concepts, language acquisition, communication skills, and concentration

Why play is important

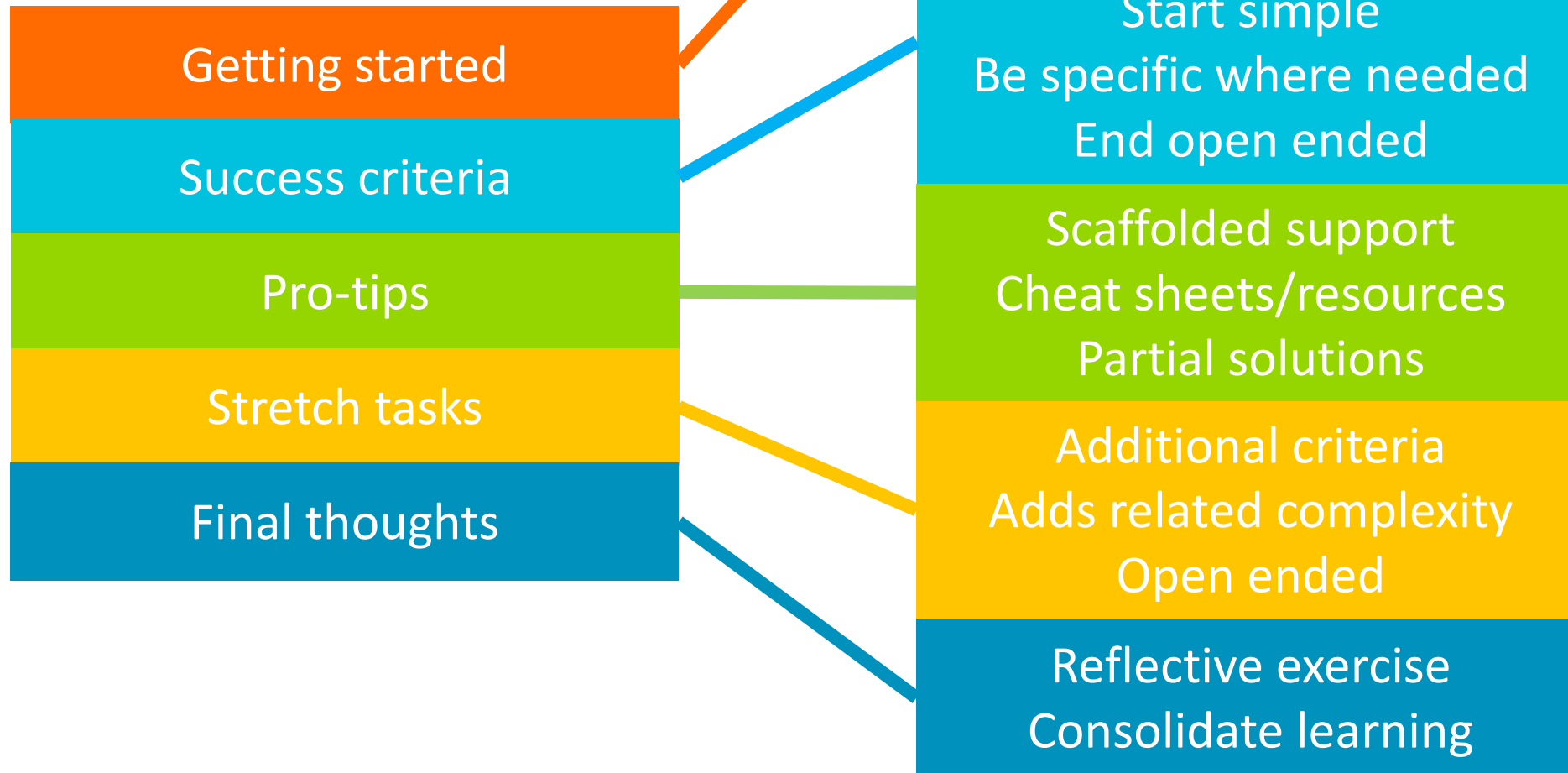
- Play is one of the most important ways in which young children gain essential knowledge and skills
- Play is ~20x more impactful than traditional didactic teaching and learning



Play Based Learning and Practical Computing



The ASP Schema



The Input Process Output (IPO) Model

- All computer systems take data into a system using 'Inputs', carry out processes on the inputs and then display the result of that processing using 'Outputs'
- Using the **Input, Process, Output** worksheet try to identify what the outputs will be



Design thinking

Design first

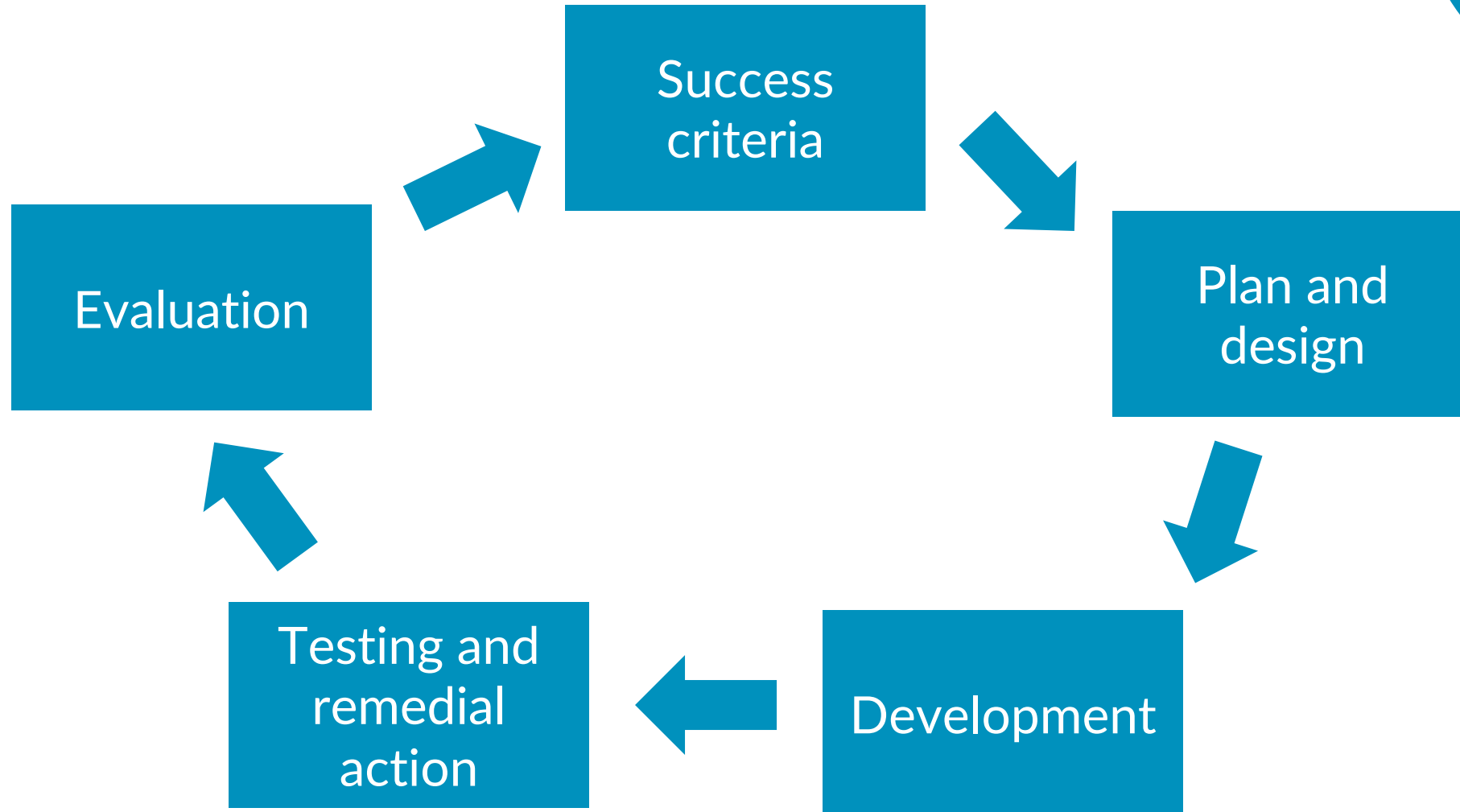
- + Concept designs and rapid prototyping
- + Iterating on designs
- + Objectives
- + Users
- + Sketching
- + Materials
- + Features and prioritisation
- + Analysis, why is this better?
- + Brand
- + What could be improved?

Objectives:	Users:	Materials:	Features Essentials:
Sketch:			Nice to have:
		How is this better?	Success criteria:
		Branding:	How to make it better?



Iterative development cycle

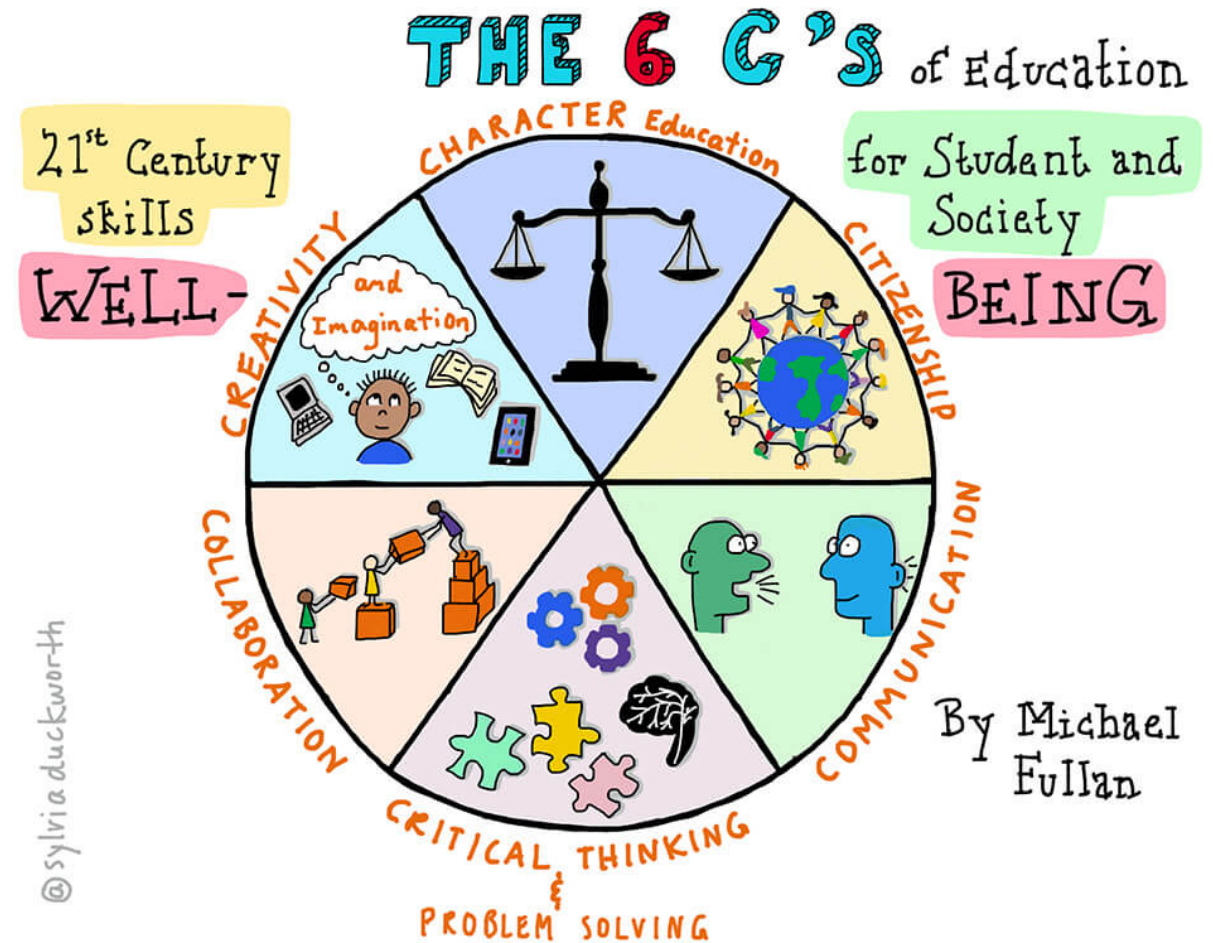
Iterative development cycle



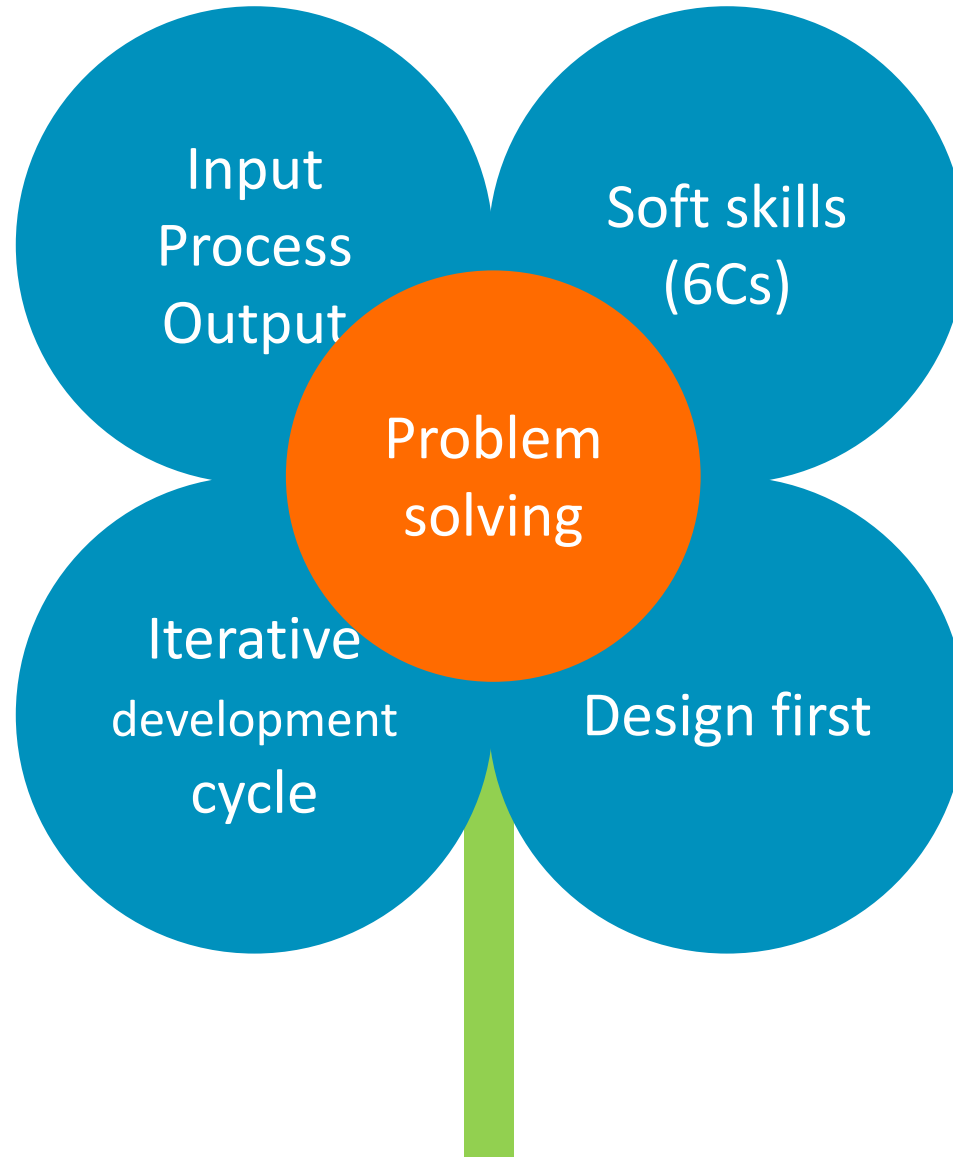
Soft skills

- Teamwork
- Collaboration
- Creative ideation
- Applied Computational thinking
- Communication
- Planning
- Iterative development
- Problem solving

Soft skills
(6Cs)

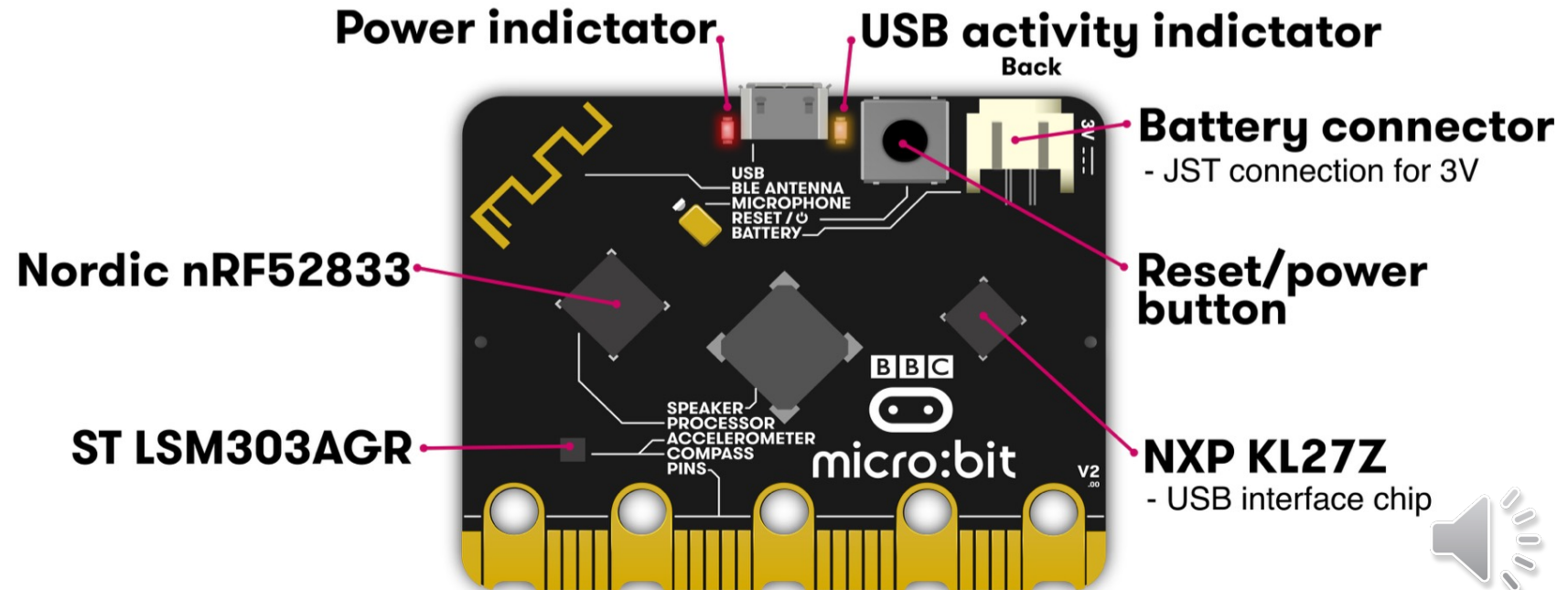
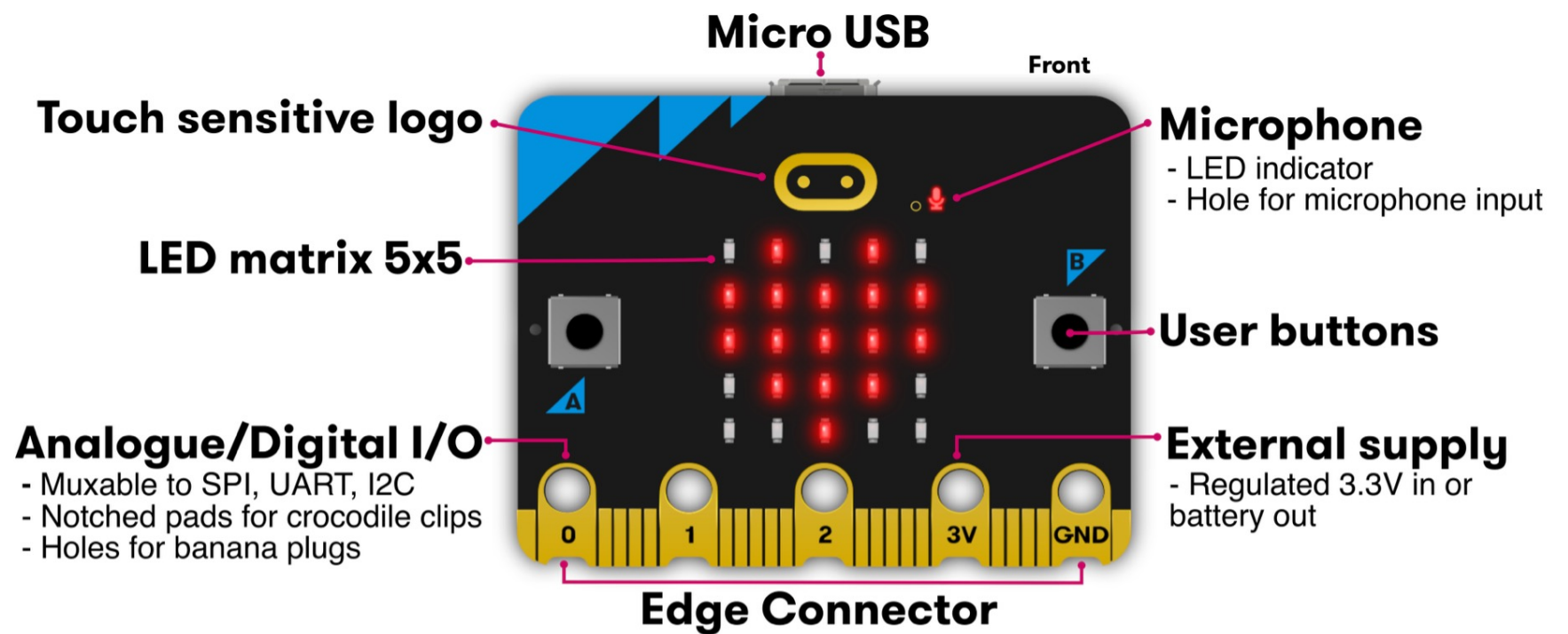


Core elements of the approach



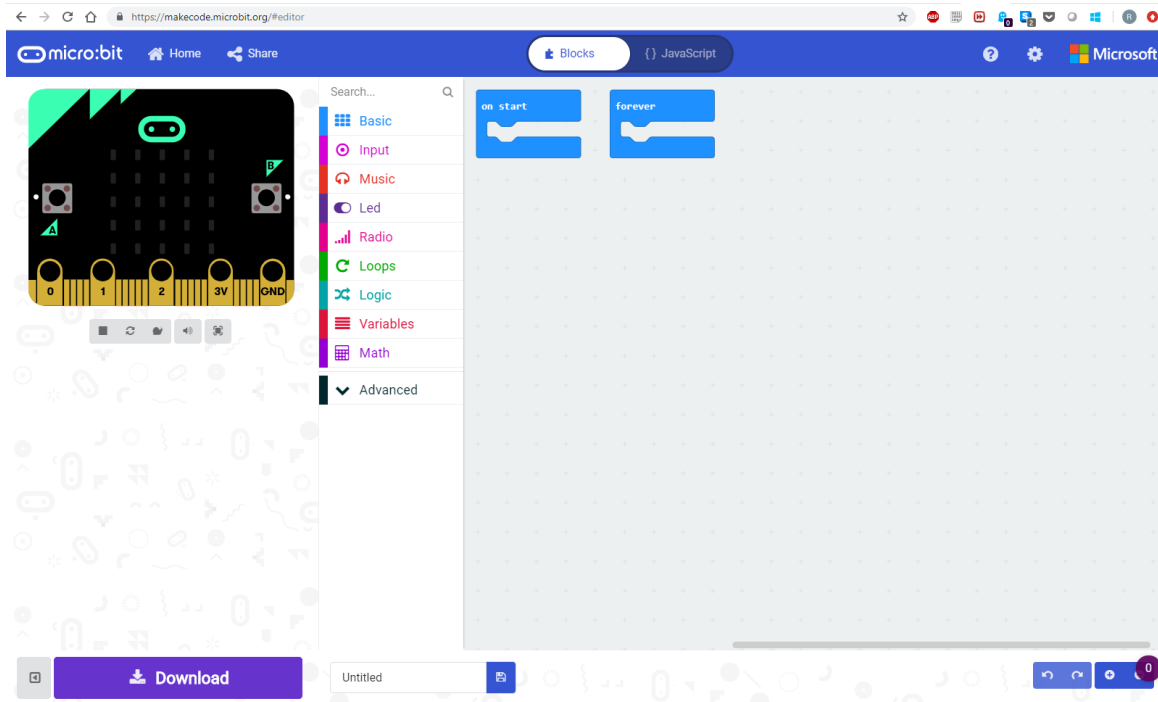
The micro:bit v2

- Speaker
- Microphone
- Faster
- More memory
- Extra button on logo



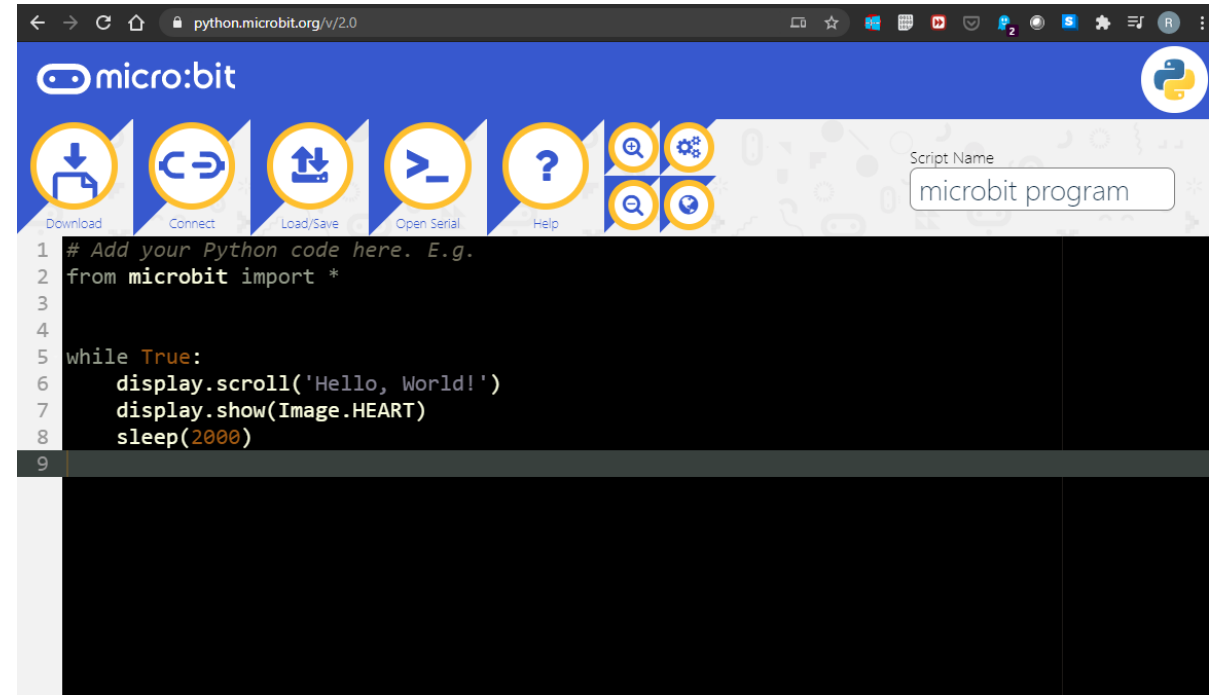
Makecode and MicroPython

Block based



<https://makecode.microbit.org/#editor>

Text based (MicroPython)



<https://python.microbit.org/>

Example project 1 – Name badge

Context setting:

You are a new student in a school, make a digital name badge so other learners can see your name.

Hardware:

- 1 x micro:bit + battery pack
- Velcro tape
- Small card square
- Safety pin

Success criteria:

- Create a digital badge using a micro:bit
- Program the micro:bit to display your name
- Add an icon (or make your own) after your name
- Add a theme song when a button is pressed
- Decorate your badge to show who you are!

Subject focus:

- Literacy
- Computing
- Technology/making
- Art and craft



IPO table

Input

- + N/A
- + Button press

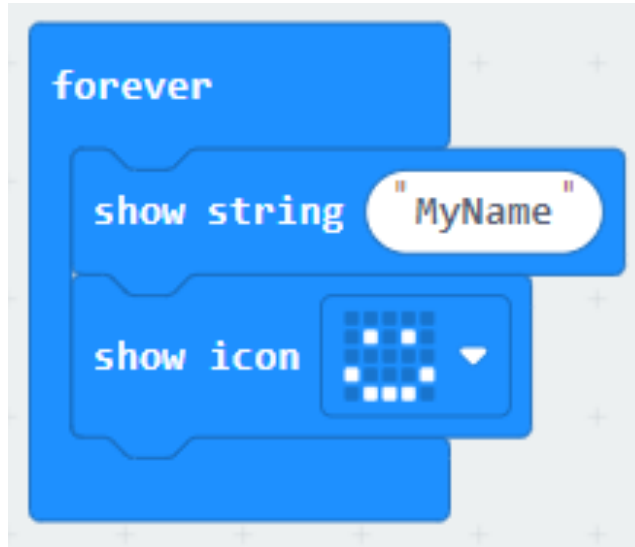
Process

- + Name 'show string' in a loop
- + Icon showing after name
- + Play melody/notes

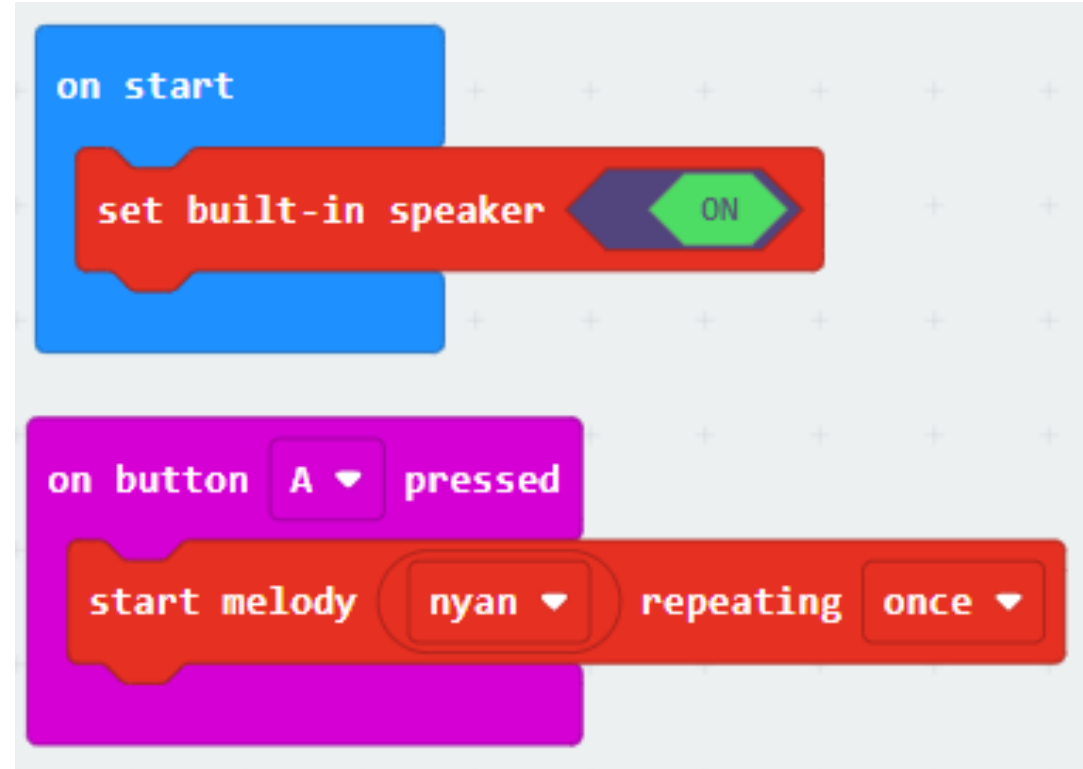
Output

- + Name on LEDs
- + Icon on LEDs
- + Sound through speaker

Example solution



```
forever
  show string "MyName"
  show icon
```



```
on start
  set built-in speaker ON

on button A pressed
  start melody nyan repeating once
```

Example project 2 – Animated animals

Context setting:

You are learning about animation and need to create an animation of an animal that can be controlled by the user.

Hardware:

- 1 x micro:bit + battery pack

Success criteria:

- Design and make an animation of an animal
- Add a 'happy' animation when a button is pressed
- Add a different animation when the animal is shaken
- Add appropriate sounds

Subject focus:

- Animation/art/computing
- Timing
- Interaction and IPO



IPO table

Input

- + N/A
- + Button press
- + Shake

Process

- + Show LED – PAUSE – Show LED
- + Play sound - Show LED – PAUSE – Show LED
- + On shake - Play sound - Show LED – PAUSE – Show LED

Output

- + Icon on LED
- + Play sound – Icon on LED
- + Play sound – Icon on LED

Example solution

The image displays a Scratch script on a grid background, organized into three main sections:

- on start:** A blue block containing a red "set built-in speaker" block with a green "ON" flag.
- on button A pressed:** A purple block containing:
 - A red "start melody" block with "nyan" selected and "repeating" set to "once".
 - A blue "show leds" block with a 5x5 grid of white LEDs.
 - A blue "pause (ms)" block with "100" entered.
 - A second blue "show leds" block with a different 5x5 grid pattern.
- on shake:** A purple block containing:
 - A red "start melody" block with "baddy" selected and "repeating" set to "once".
 - A blue "show icon" block with a 5x5 grid icon.
 - A blue "pause (ms)" block with "100" entered.
 - A second blue "show icon" block with a different 5x5 grid icon.
- Forever Loop:** A blue "forever" loop block containing:
 - A blue "show leds" block with a 5x5 grid of white LEDs.
 - A blue "pause (ms)" block with "200" entered.
 - A blue "show leds" block with a 5x5 grid of white LEDs.

Example project 3 – Classroom noise meter

Context setting:

Your teacher has asked you to create a digital noise meter to let them know when the class is being too loud.

Hardware:

- 1 x micro:bit + battery pack

Success criteria:

- Design and create a device that measures the noise level and shows it on a chart
- Have the device play an alarm sound when things get too loud

Subject focus:

- Physics – noise/decibels/measuring sound
- Computing – thresholds and event driven programming
- Selection and logic



IPO table

Input

- + Mic

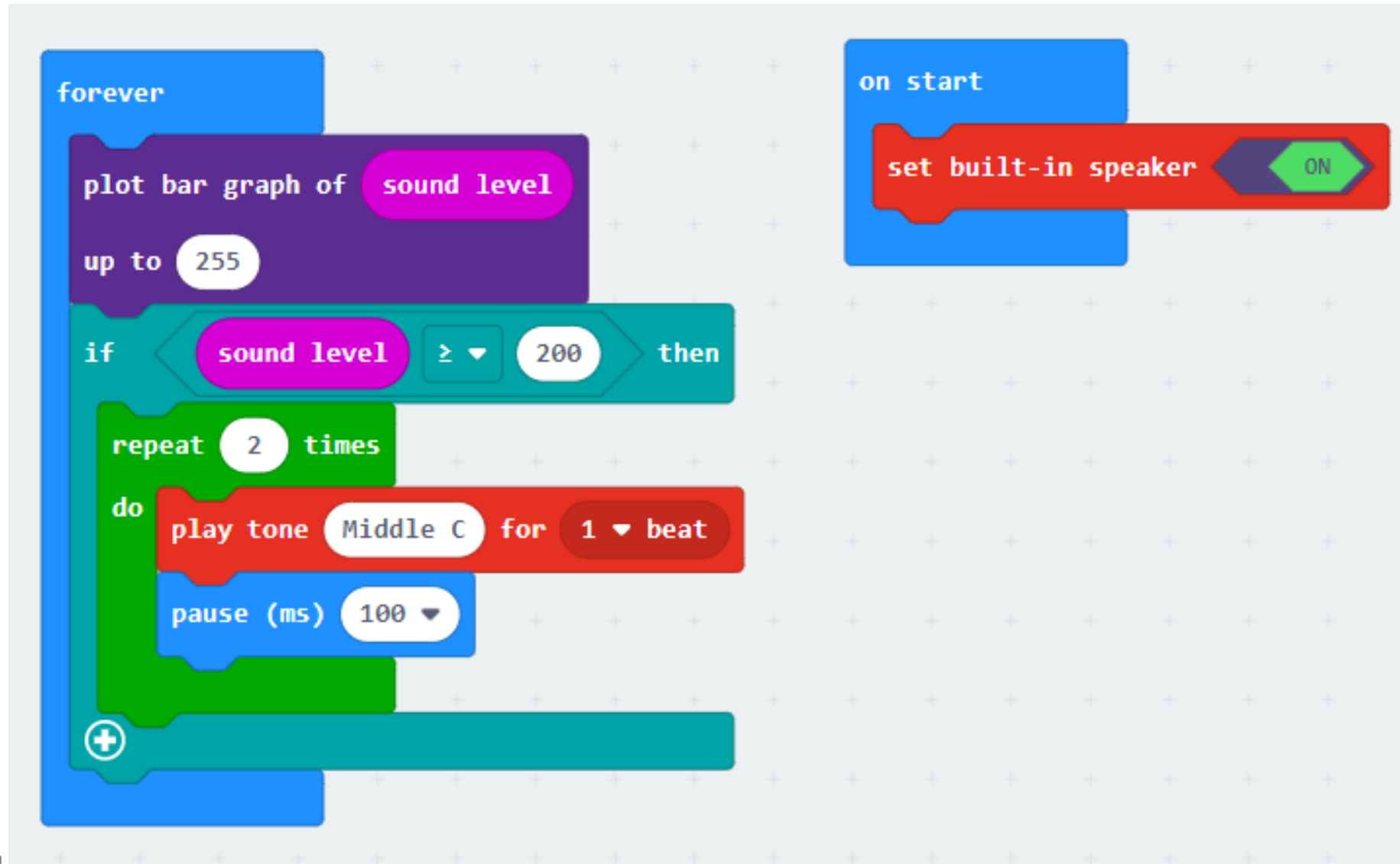
Process

- + Comparing input to threshold

Output

- + Plot on LED
- + Play alarm tone

Example solution



The global goals

Great set of real-world problems and contexts



[THE 17 GOALS >](#) [ACTION >](#) [NEWS >](#) [RESOURCES >](#) [BUSINESS >](#) [SCHOOLS ↗](#) [*A](#)

THE GLOBAL GOALS

In 2015, world leaders agreed to 17 Global Goals (officially known as the Sustainable Development Goals or SDGs). It's now five years on, and we have more work than ever to do. These goals have the power to create a better world by 2030, by ending poverty, fighting inequality and addressing the urgency of climate change. Guided by the goals, it is now up to all of us, governments, businesses, civil society and the general public to work together to build a better future for everyone.



- See 'do your bit' competition from the micro:bit foundation

Why aren't we using micro:bits more?

86%

of students said BBC micro:bit made Computer Science more interesting

85%

of teachers agree it has made ICT/Computer Science more enjoyable for their students

70%

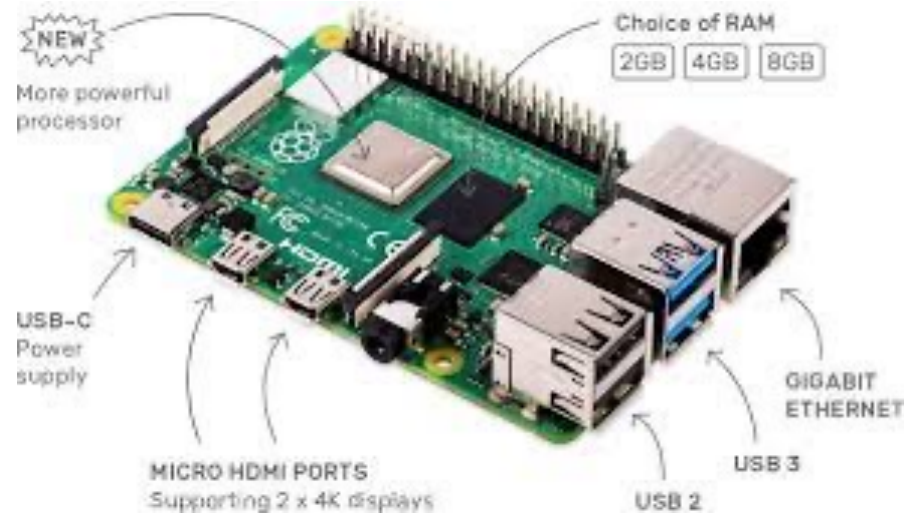
more girls said they would choose Computing as a school subject after using the micro:bit



Explore more projects and resources

- + <https://www.arm.com/resources/program-reg/arm-school-program-ty>
- + <https://microbit.org/projects/do-your-bit/>
- + <https://microbit.org/code/>
- + <https://microbit.org/projects/make-it-code-it/>

Other devices



Over to you!

- + Using the templates demonstrated above create your own PBL projects
- + Try them with a class
- + Iterate on it to improve delivery
- + Share them with colleagues and peers online
- + Share them with the Arm School Program

Teaching with Physical Computing

A new series of PD courses from the Arm School Program

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Feedback

Suriya Gunasekaran, Operations analyst, Arm

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Q & A

Nick Sample, Senior Manager, Arm School
Program


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Thank you and session
closure

Nick Sample, Senior Manager, Arm School
Program


Thank you and next steps

- + Visit EdX.org and search for 'Teaching with Physical Computing'
- + Sign up for free access to each course
- + Go at your own pace
- + Tell us about your experience in the feedback form after each course





Teaching with Physical Computing: Practical application and classroom strategies for PBL


This course guides you in using real-world problems to spark your learners' creativity and empower them to develop their own solutions using Physical Computing.



[▶ Play Video](#)

 **Estimated 12 weeks**
1-2 hours per week

 **Self-paced**
Progress at your own speed

 **Free**
Optional upgrade available

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Thank You

Danke

Gracias

Grazie

谢谢

ありがとう

Asante

Merci

감사합니다

धन्यवाद

Kiitos

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