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	Nick Sample, Senior Manager, School Program, Arm
Professional development session	Robert Leeman, Program Manager, Arm
Feedback	Suriya Gunasekaran, Operations analyst, Arm
Questions and answers	Nick
Thank you and session closure	Nick

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

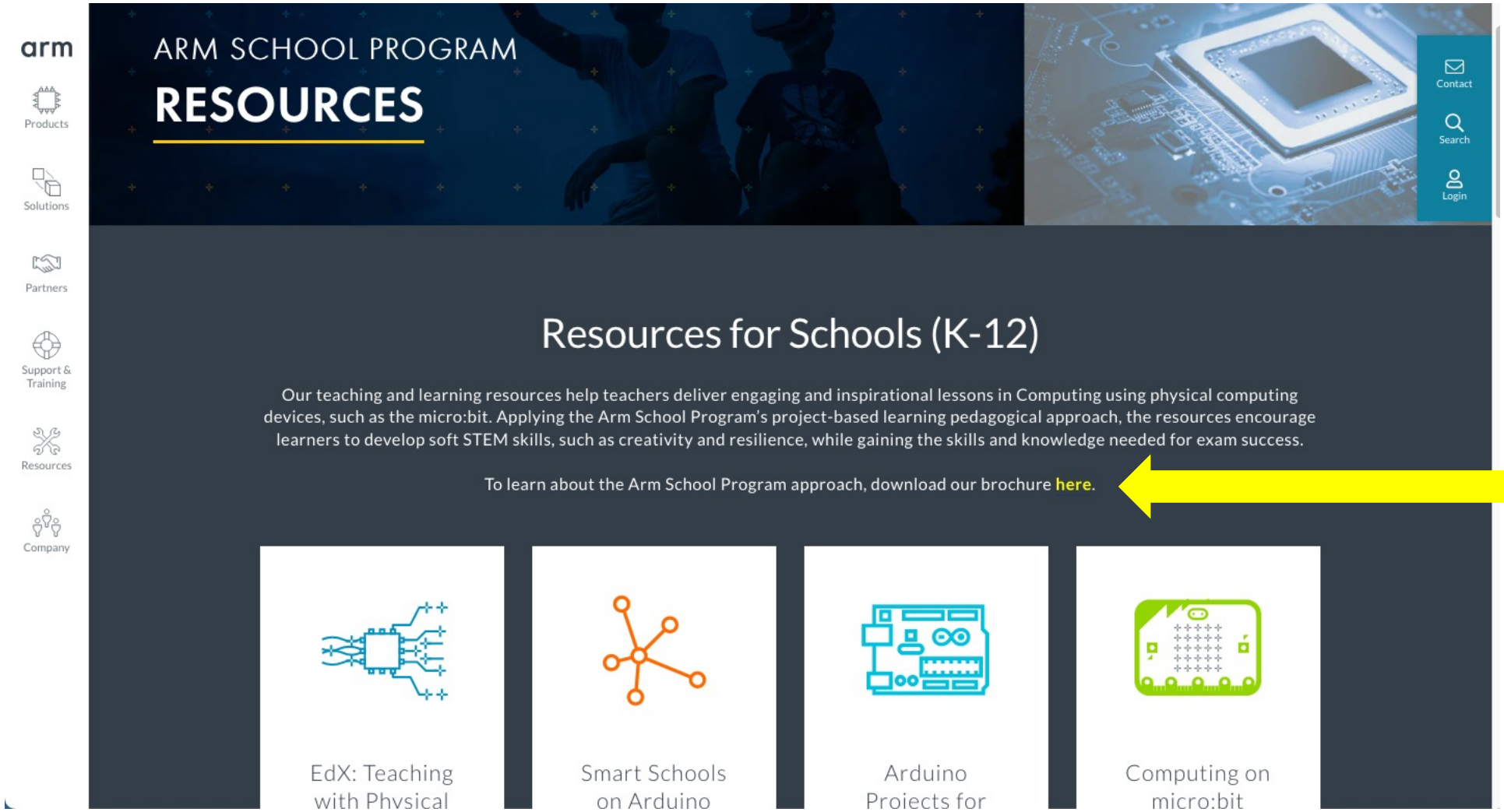
Community and research

- 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



Download brochure

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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.

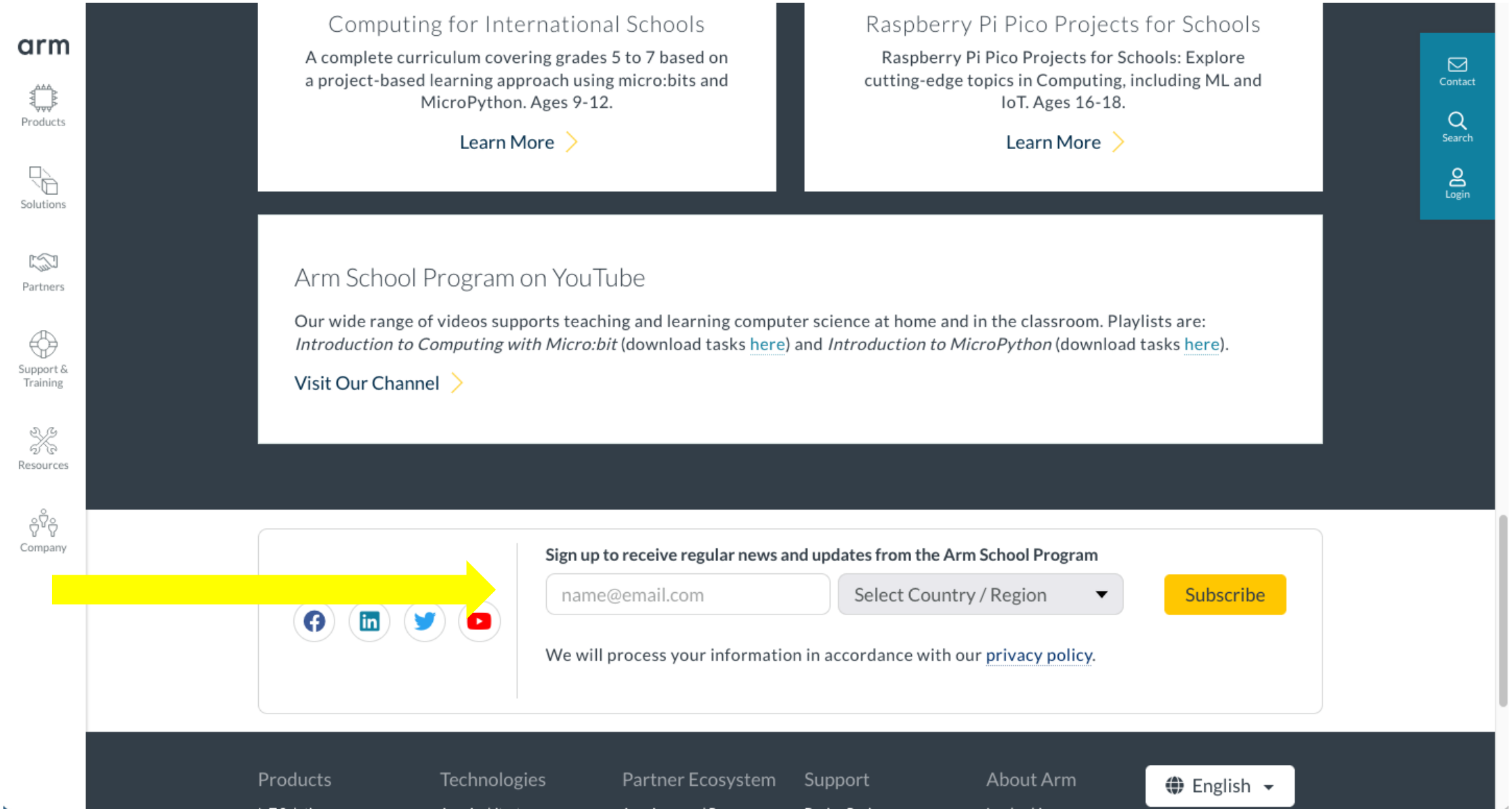
If you're interested in improving your learners' engagement in Computing, we can help. Project-based learning (PBL), combined with Physical Computing, offers a way for learners to experience the thrill of innovating while also gaining and practicing the skills and knowledge they need.

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

Sign up for School Program newsletter



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	Date and time
Get started with Physical Computing – hardware and technologies to enhance learning	September 21st 2022 3pm IST
Introducing Physical Computing and Project-Based Learning	19th October 2022 3pm IST
Contexts are key – how to create successful Project-Based Learning (PBL) projects from any context or subject	23rd November 2022 3pm IST
From play to projects – shaping learning with Project-Based Learning (PBL)	18th January 2023 3pm IST
Assessing projects in Physical Computing	22nd February 2023 3pm IST
Developing employability skills with Project-Based Learning/Physical Computing	15th March 2023 3pm IST
How to run an ASP Innovation Day	26th April 2023 3pm IST

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

Hardware

Basic electronics

IPO

Making

Play based learning (PBL)

Covering the curriculum

Engaging learners with contexts

Solving real problems

Programming

Applying computational techniques confidently

Design

Creativity

6Cs

Collaboration

ASP resources

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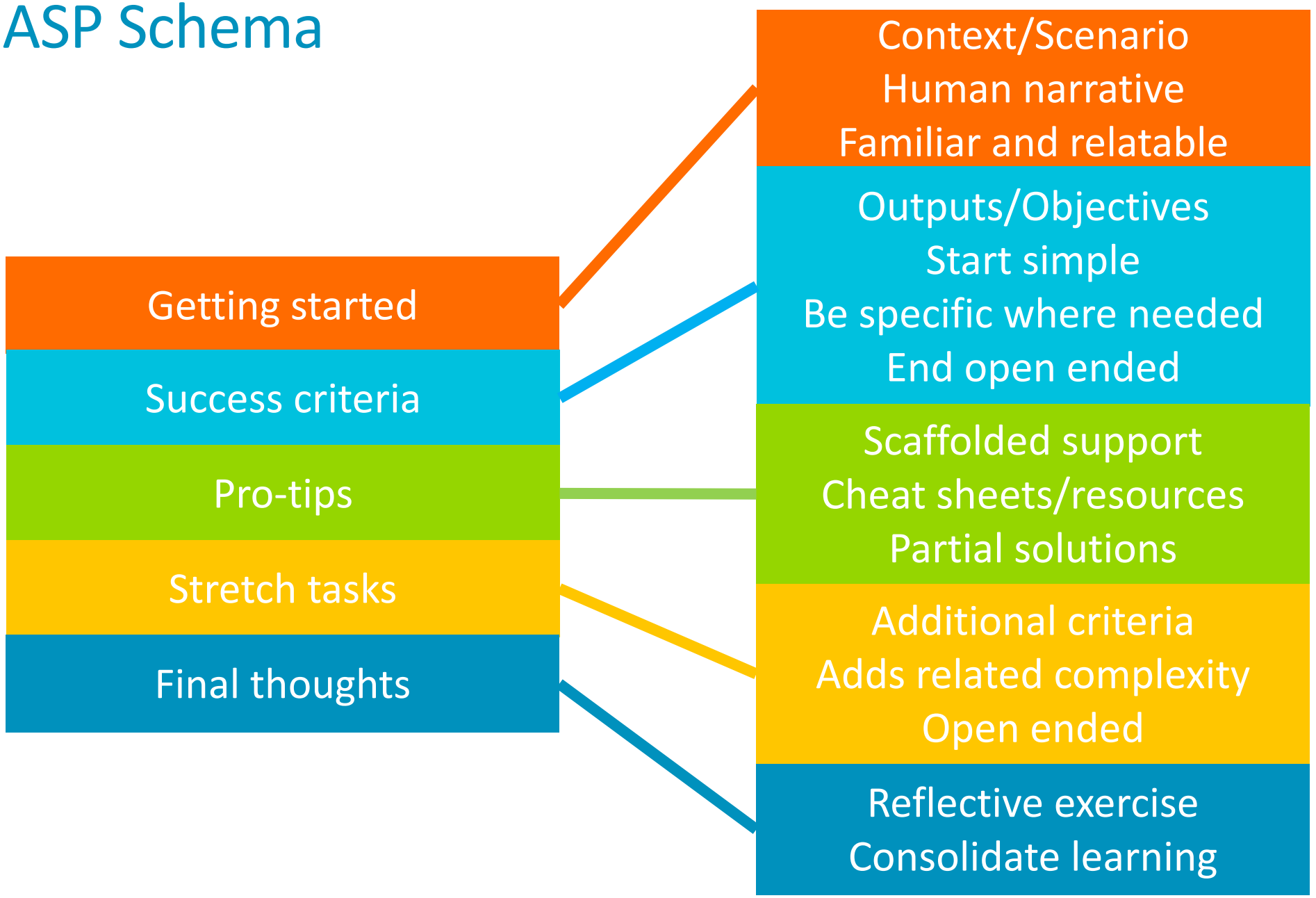
The ASP Schema



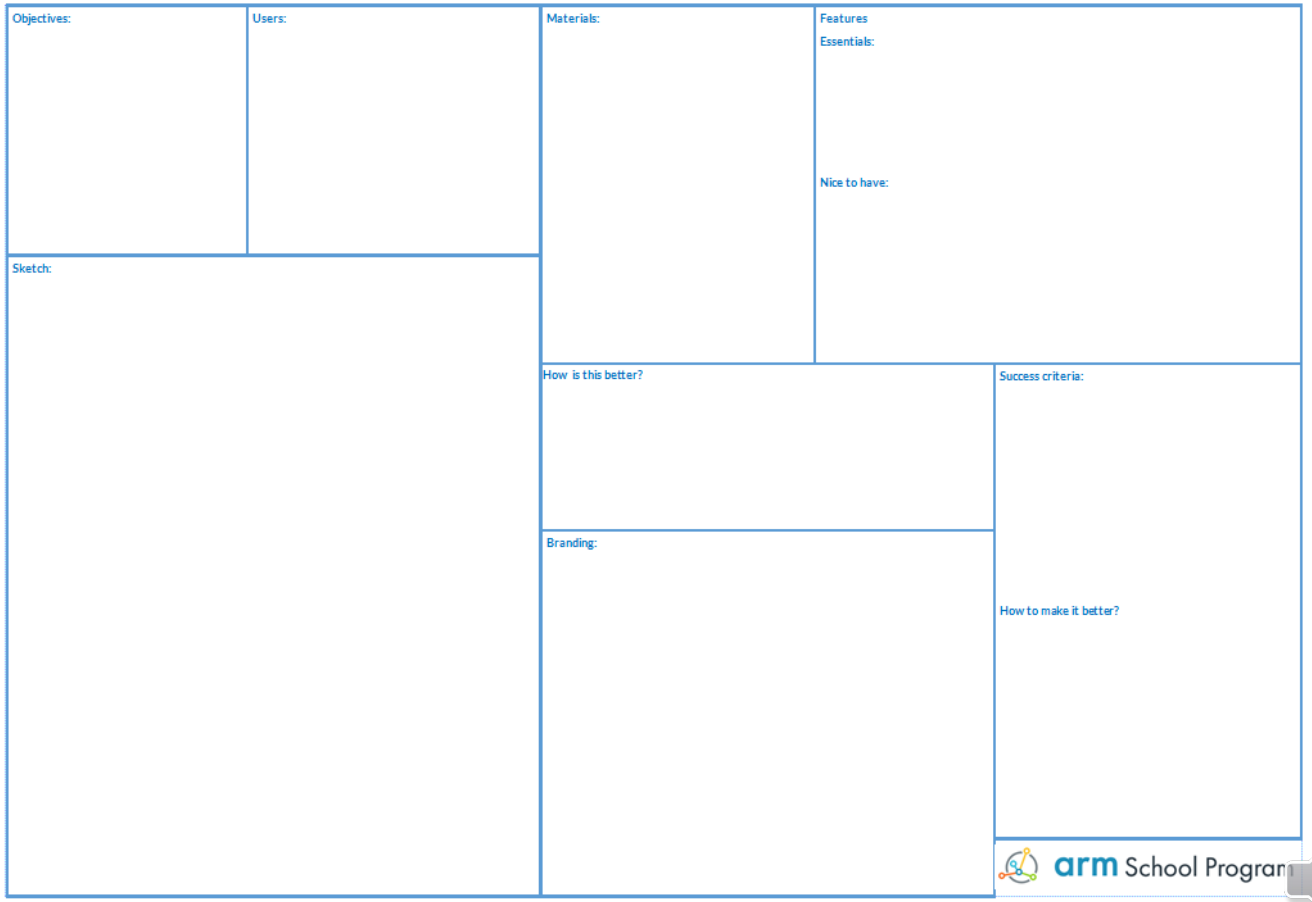
The Input Process Output (IPO) Model

- 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?



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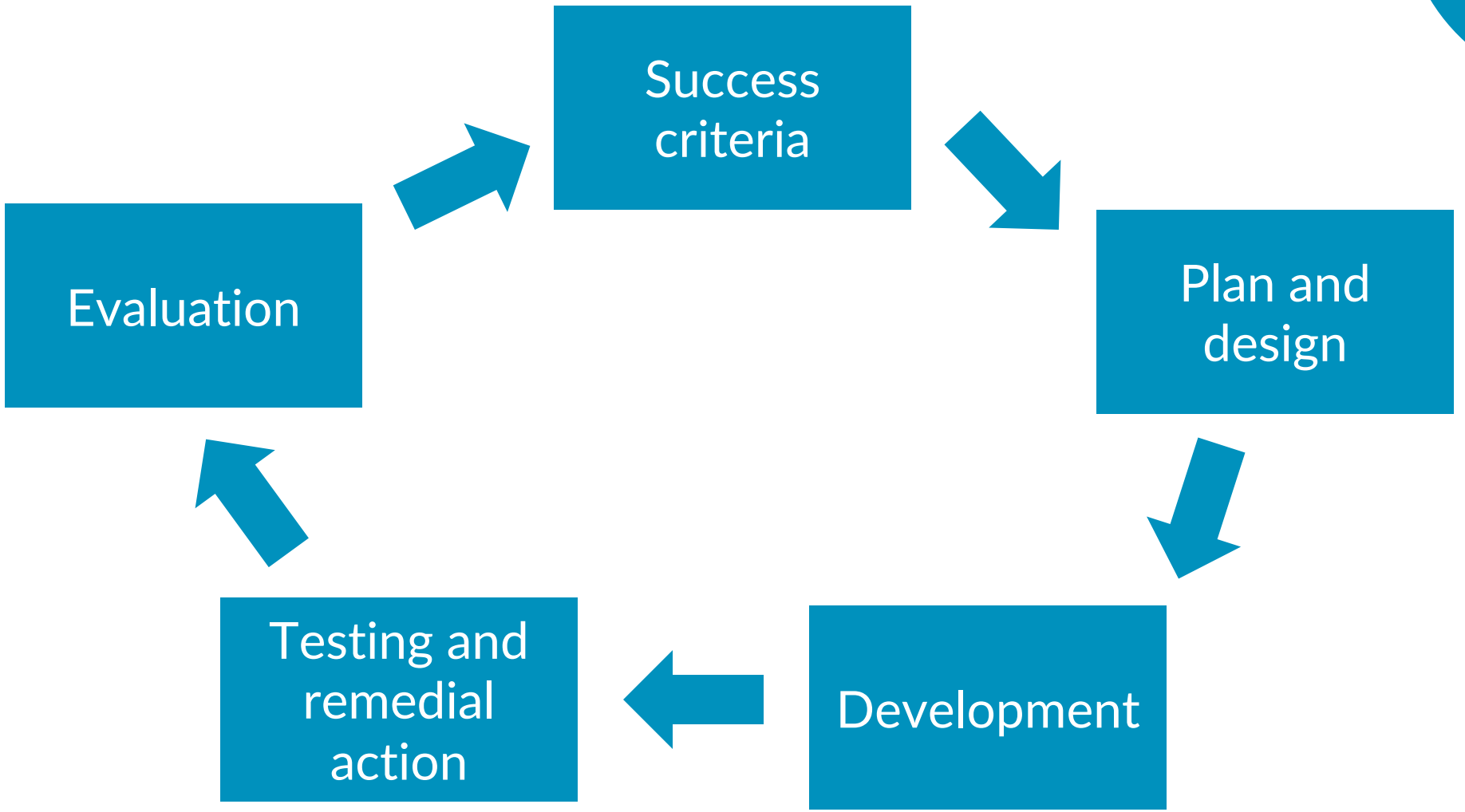
Iterative development cycle

Iterative development cycle



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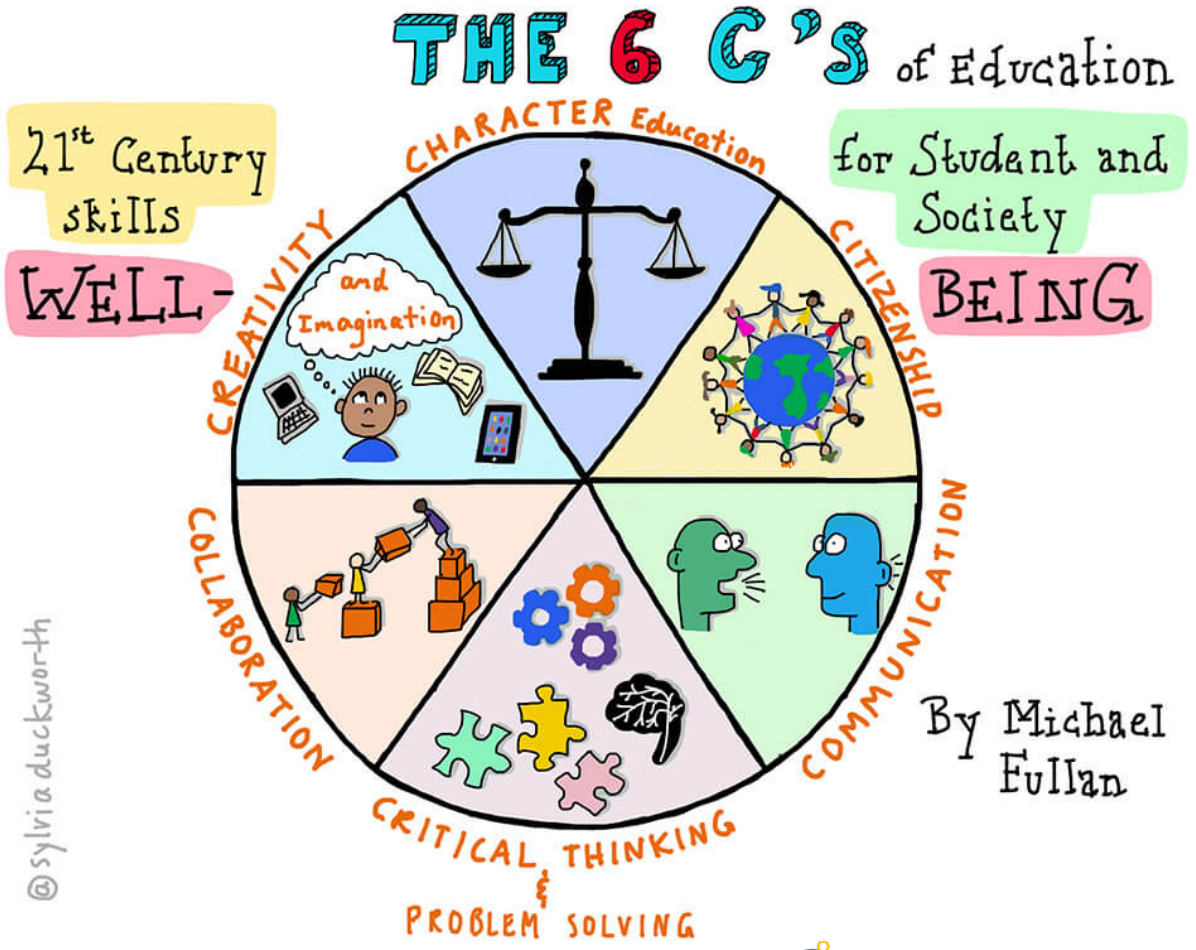
Soft skills

Soft skills (6Cs)

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



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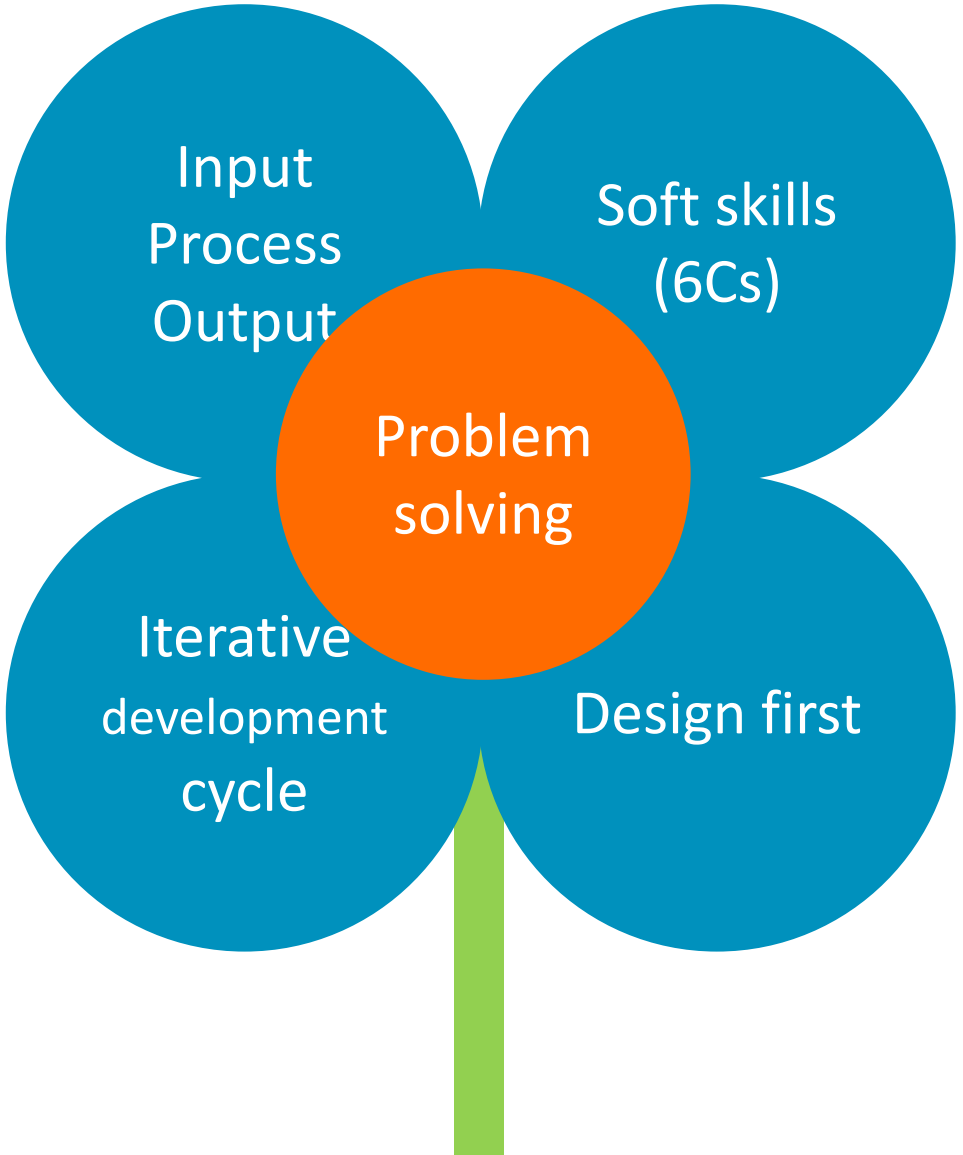
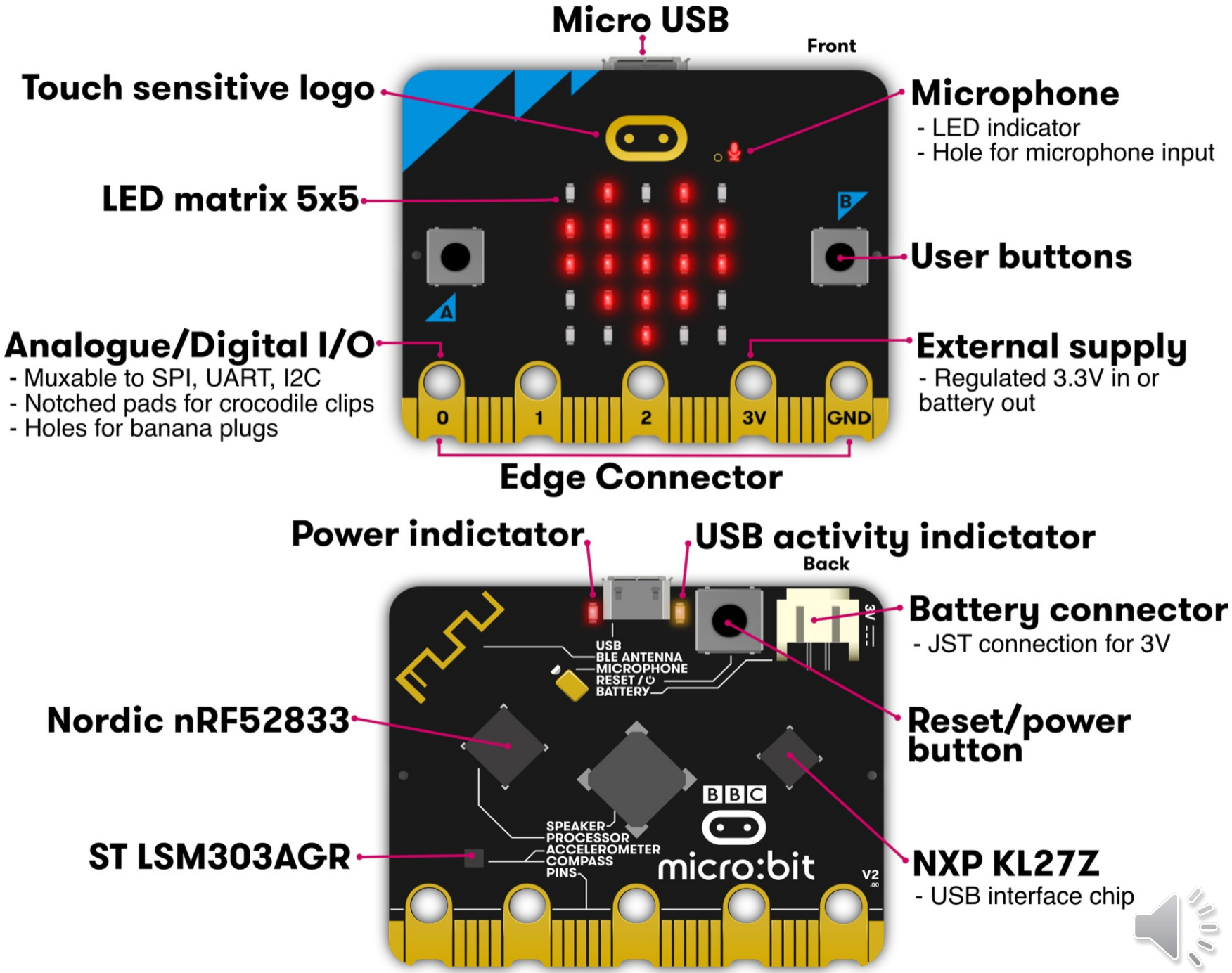
Core elements of the approach



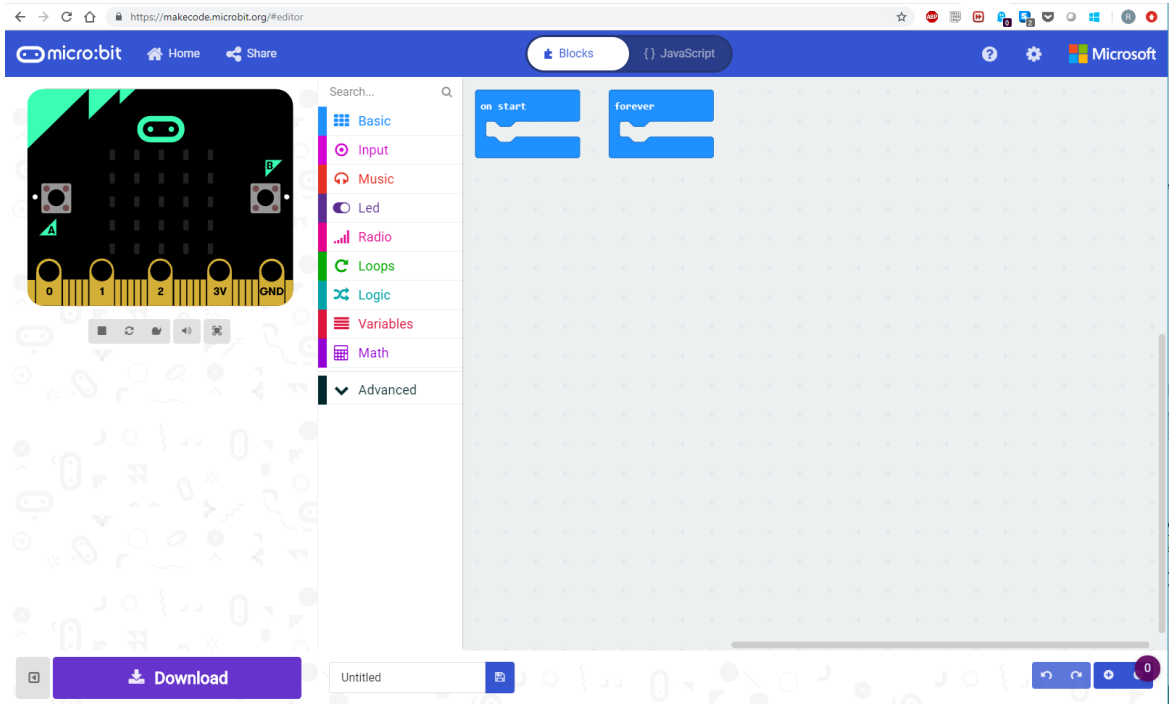
The micro:bit v2

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



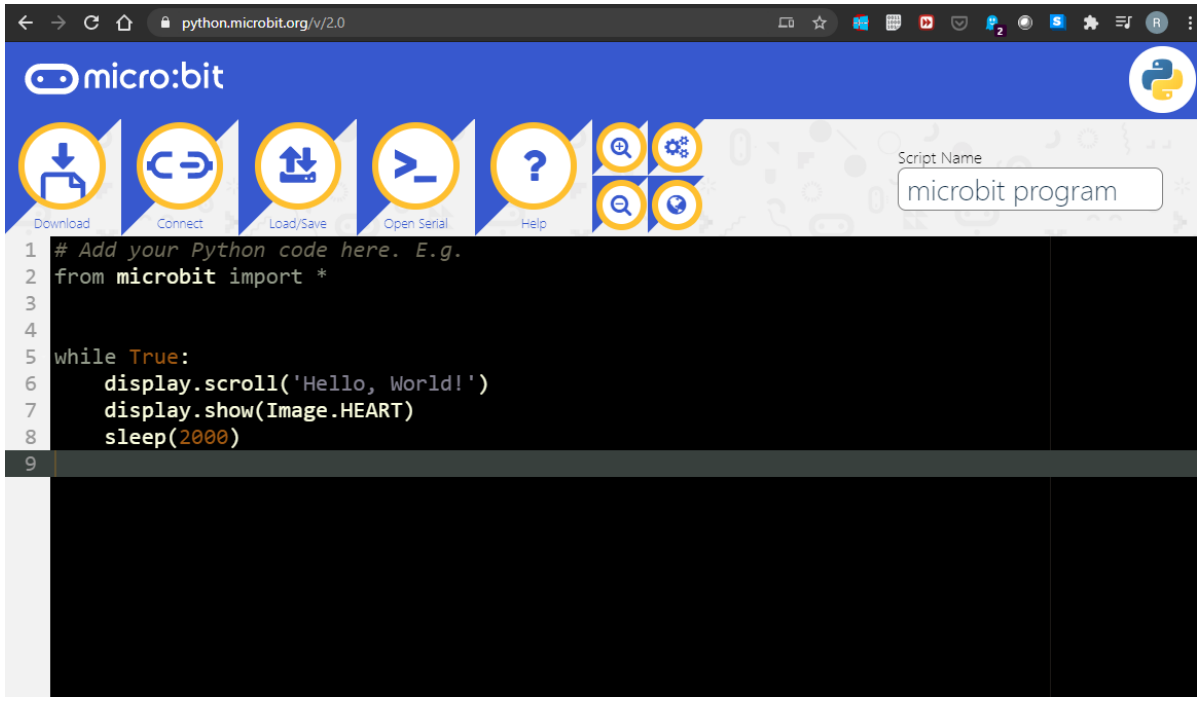
Makecode and MicroPython

Block based



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

Text based (MicroPython)



https://python.microbit.org/

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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.

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!

Hardware:

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

Subject focus:

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

IPO table

Input

- N/A
- Button press

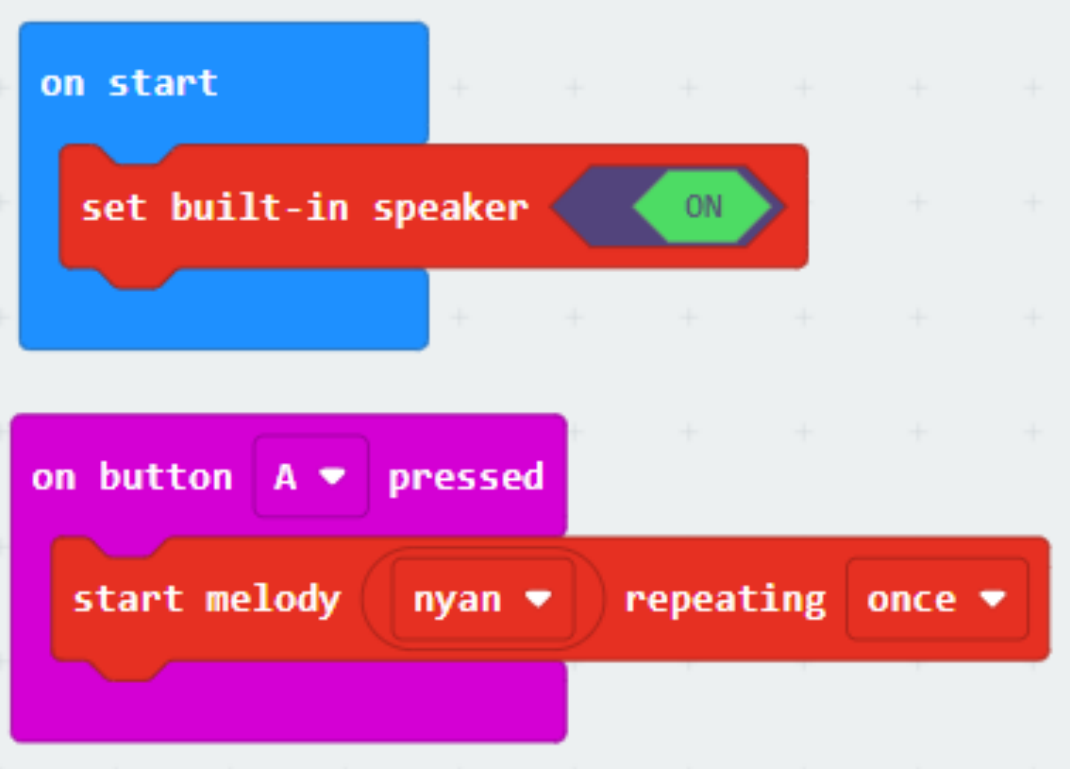
Process

- 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



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.

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

Hardware:

- 1 x micro:bit + battery pack

Subject focus:

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

IPO table

Input

- N/A
- Button press
- Shake

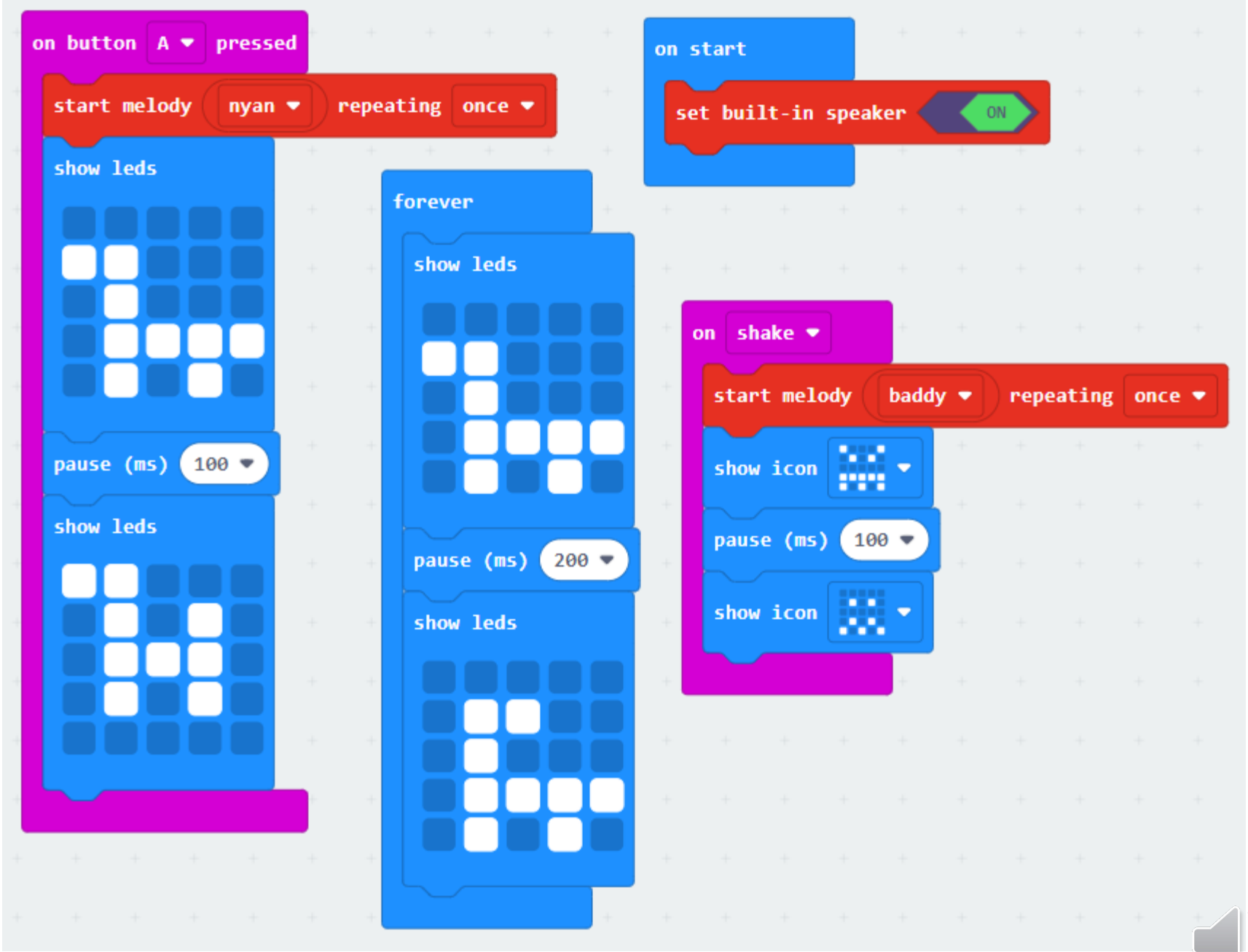
Process

- 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



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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.

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

Hardware:

- 1 x micro:bit + battery pack

Subject focus:

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

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IPO table

Input

- Mic

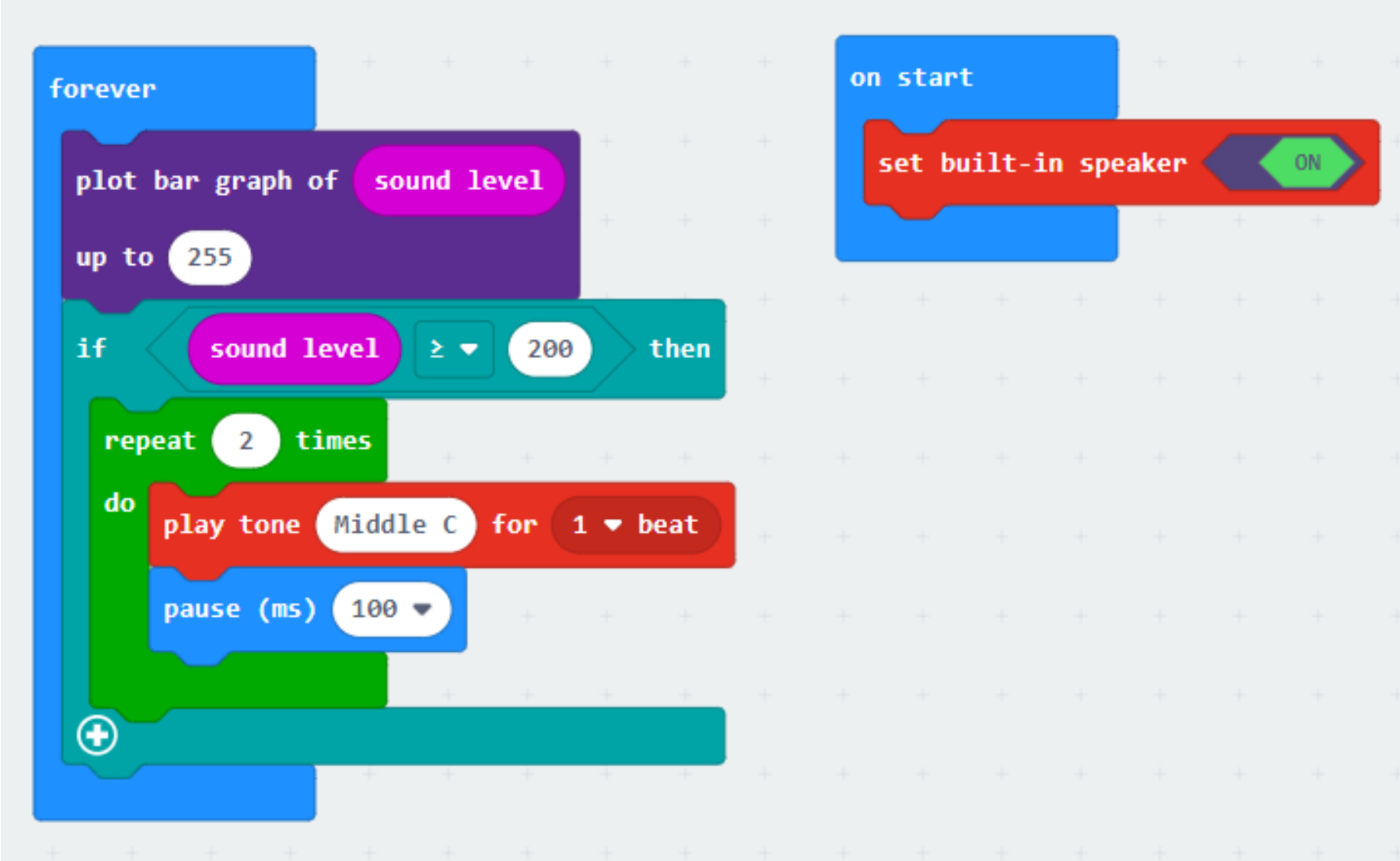
Process

- Comparing input to threshold

Output

- Plot on LED
- Play alarm tone

Example solution



The global goals

Great set of real-world problems and contexts

- 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

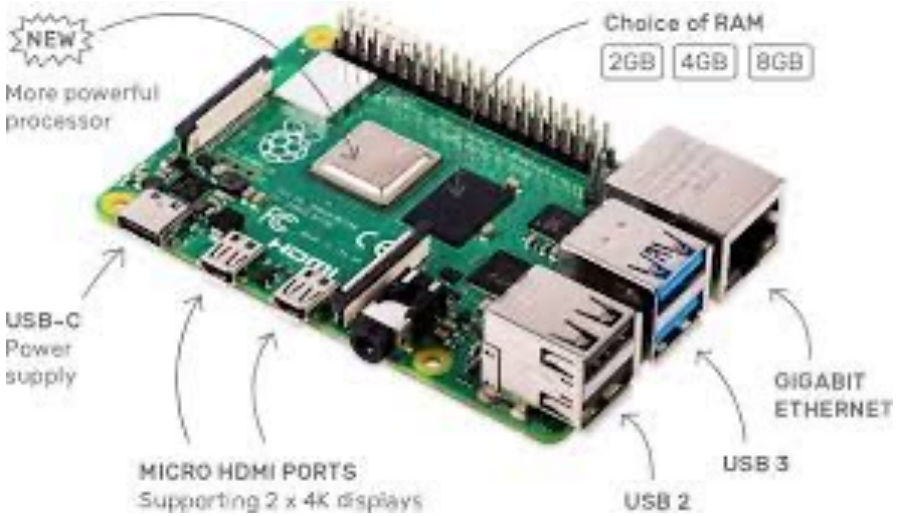
85% of teachers agree it has made ICT/Computer Science more enjoyable for their students

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

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Feedback

Suriya Gunasekaran, Operations analyst, Arm

Q & A

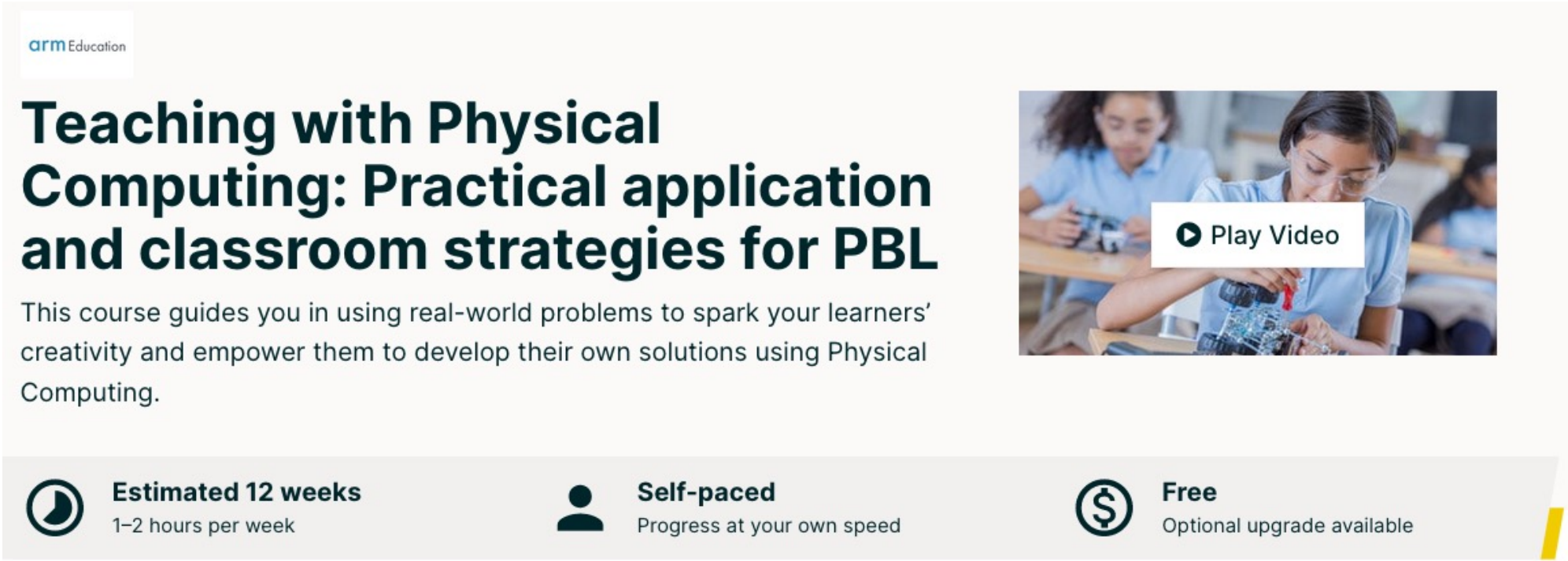
Nick Sample, Senior Manager, Arm School Program

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



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Thank You
Danke
Gracias
Grazie
谢谢
ありがとう
Asante
Merci
감사합니다
धन्यवाद
Kiitos
شكرًا
ধন্যবাদ
תודה