Coding Challenges – Core CPD

This resource was developed as part of an Applied Technology CPD 2019/2020 workshop which took place during the 2019/2020 school year. All materials used during this workshop can be viewed in the Technologies section of www.jct.ie within the CPD Workshops tile.

Website Link:
https://www.jct.ie/technologies/cpd_supports_applied_technology_cpd_workshops_2019_2020

The learning experiences below were showcased as part of a unit of learning during this workshop and focused on how students could develop problem-solving and creative-thinking skills using Control Technology. The control software used during this activity was micro:bit, however these challenges can be accessed using any control software. This sample resource may assist you in planning and developing suitable challenges for your student's context. Reference to this resource can be found on slides 80-113 of the Applied Technology 2019/2020 CPD workshop presentation.

What is included in this PDF?

1. Sample unit of learning

Included is a sample unit of learning developed by the Applied Technology team using a generic school context. Contained in the unit of learning plan are the learning outcomes and key learning activated by engaging with the challenges below.

2. Sample coding challenges and support material.

Included in this resource are sample coding challenges for students' engagement. It is important to take note of the learning outcomes, key learning and the action verbs in the unit of learning plan which contextualise the worksheet activities.

Link to Resource

Note: It is recommended that you view the CPD workshop materials in conjunction with using this resource to contextualise the resource and develop a better understanding of how the unit of learning was developed.

[Green box] Consider the age, stage and prior learning of the students. What learning do you want to focus on? Explore both the intended elements which deliver the learning outcomes.

[Blue box] Identify the learning outcomes for your unit of learning. Identify the key learning for students using action verbs to support your thinking. Consider how we will assess and report evidence of learning.

[Orange box] Develop ideas for how students could experience this learning. How will I know they are learning?

[Purple box] Using your own classroom context, what methodologies and resources will support students in experiencing the learning outcomes. Ensure assessment aligns with the learning outcomes and their action verbs.

AGE AND STAGE:
First Year
i. April/May 1st year
ii. 4-6 week unit of learning

PRIOR LEARNING:
• 2 Design and Make Projects and portfolios
• Introduction to materials technology, electronics
• Applied control introduction

FOCUS OF LEARNING:
• Develop deeper understanding of applied control
• Promote student curiosity – social issues
• Focus on an issue in your community and build awareness of others
• Further develop visual and realisation communication skills

EXPLORE STRANDS AND ELEMENTS:
1.1, 1.2, 1.8, 1.10, 1.13, 2.2, 2.4, 2.8, 3.3,3.4, 3.6

CHOSEN LEARNING OUTCOMES
1.1 develop a design solution drawing on experience and using evidence, reasoning and decision making
1.2 analyse problems using a systematic approach
1.13 communicate evidence of the iterative process of design
2.4 design a logical sequence of instructions to control a device or system
2.8 create control solutions to indentified problems
3.3 explain how human, societal, and environmental considerations affect solutions and outcomes

LENS TO FOCUS THE LEARNING (OPTIONAL)
Sustainable Development Goals

KEY LEARNING
1.1, 1.2, 1.13: Further develop students understanding and experience of research, design and realisation

1.2,2.4,2.8: Apply control and systems thinking to create a solution to this brief

1.1, 1.2, 3.3: Building student awareness of road safety and propose solutions to address this in their local area

ACTION VERBS
Analyse: study or examine something in detail, break down in order to bring out the essential elements or structure; identify parts and relationships, and to interpret information to reach conclusions

Communicate: use visual gestural, verbal or other signs to share meaning or exchange information; interaction between sender and recipient; both work together to understand

Create: process and give form to the topic of what is to be created using selected methods and material and/or to give the material used a new form

Design: planning the features of a solution that solves a perceived user problem

Develop: advance a piece of work or an idea from an initial state to a more advanced state

Explain: give a detailed account including reasons or causes

HOW COULD STUDENTS EXPERIENCE THIS LEARNING?
• Thematic brief: success criteria (portfolio +responses) –stages
• Road Safety – RSA representative
 i. Site visit
 ii. Role play → discussion
 iii. Storyboard– scenarios – identify risks – user needs
 iv. Groups – mind-map –local context
• Applied control – software
 i. Traffic sequence – program
 ii. Microbit control – discovery learning (allows experimentation)
 iii. Introduce systems thinking – respond to the brief
• Primary research – evidence gathering
 i. Evidence gathering | Identifying risk /hazards

Presentation | Questioning skills focus

ONGOING ASSESSMENT
• Student portfolio to record decisions
• Group critique
• AFL Techniques
• Feedback

RESOURCES
• Focus on microbit response – hardware + software- IT access
• 'My Design Guide' – primary research, questioning
• Co-create success criteria
• Material Focus – build on skills – acrylic manufacture

METHODOLOGIES
• AFL – Feedback loop
• Group critique – final
• Learning Log – decisions
• Experts – control programming

ASSESSMENT AND REPORTING
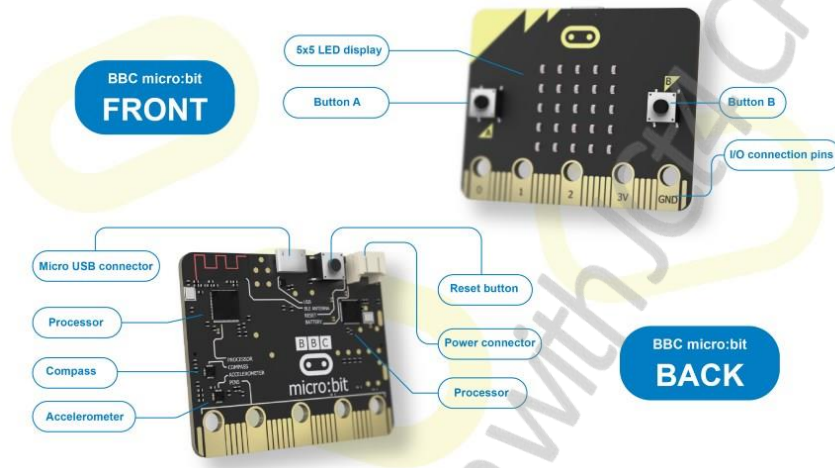• Portfolio Evaluation
• Recorded feedback
• Success criteria

REFLECTION
This resource is only for use during JCT facilitated Applied Technology workshops

Developing creative thinking and problem-solving skills through coding.

Go to https://makecode.microbit.org/

micro:bit activity:

Introduction to basic commands

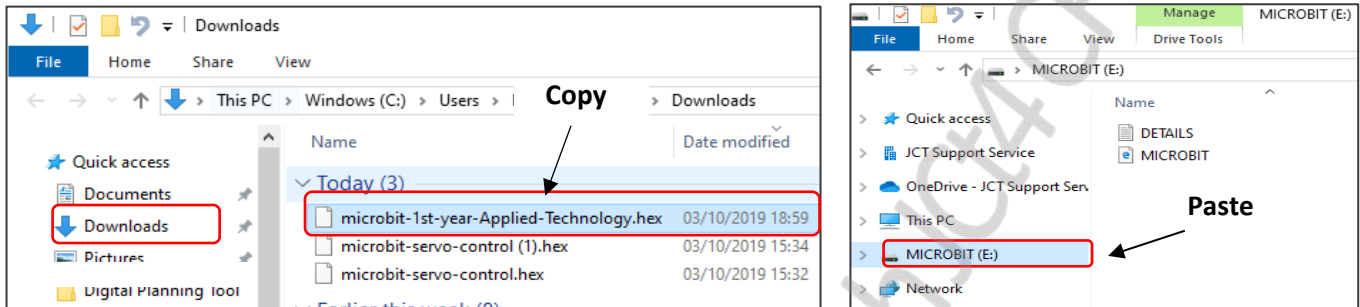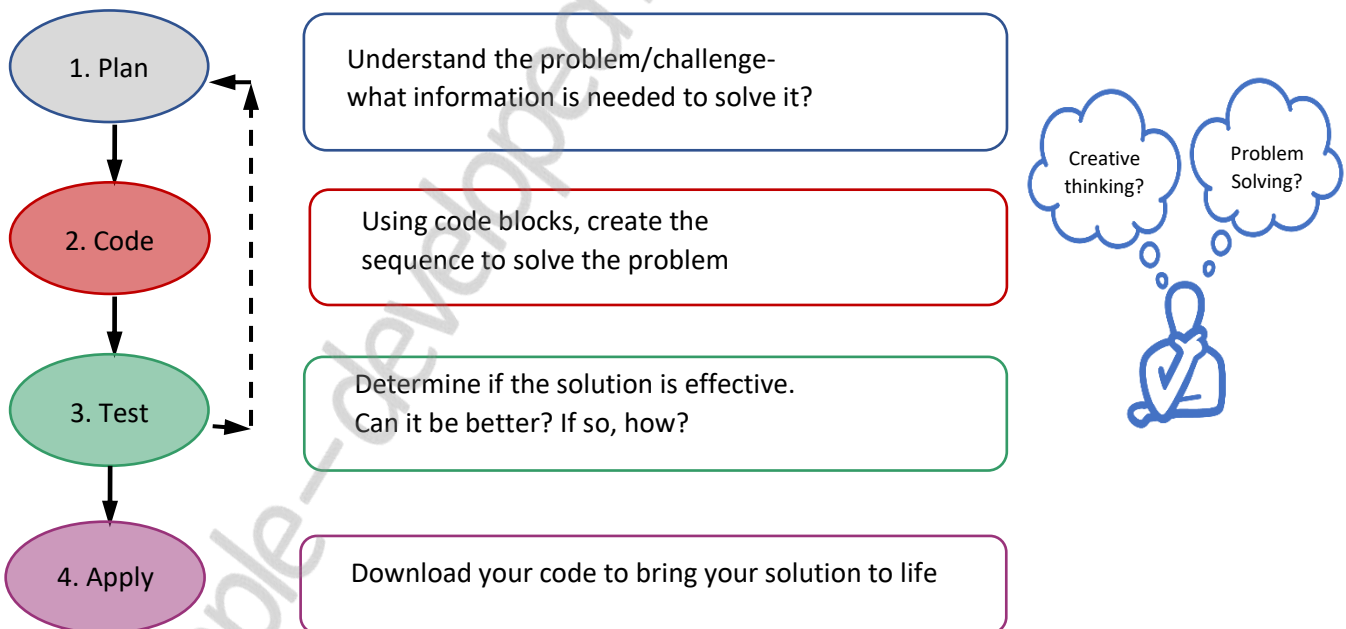## Steps

1. Place a on button pressed block to run code when button **A** is pressed.

2. Place a show string block inside on button A pressed to display text. Change text as required.

3. Place a pause block after the show string block. Change the pause time as required.

4. Place a show icon block after the pause block. Change the icon as required.

5. Copy and paste the completed on button A pressed block.

6. Rename on 'button A' to 'shake'. Change the icon as required.

7. Look at the simulator and make sure it shows your text and icons on the screen.

8. If you have a micro:bit connected, click Download to transfer your code!

To transfer the HEX file to the micro:bit.

Once the file is downloaded, 'copy' the file from the Downloads folder and 'paste' it into the micro:bit drive.

Planning for coding skills development

1. Plan

Understand the problem/challenge- what information is needed to solve it?

2. Code

Using code blocks, create the sequence to solve the problem

3. Test

Determine if the solution is effective. Can it be better? If so, how?

4. Apply

Download your code to bring your solution to life

Creative thinking?

Problem Solving?

Coding Challenge 1:

Caoimhe wants to include a digital display for a model pedestrian crossing in her project.

After a countdown of five seconds, the display will indicate to the pedestrian to walk. After another two seconds, the display will indicate to other pedestrians approaching the crossing to stop.

Planning Process
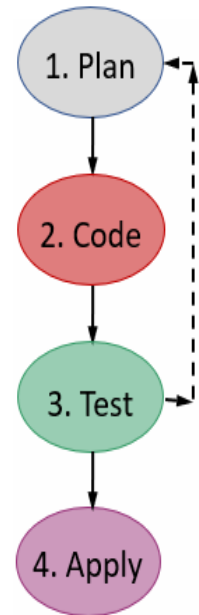
Pause and reflect

How effective was this planning process in facilitating creative thinking and problem solving?

How might this process support students?

Planning Process

Notes:

How to connect your servo motor to the micro:bit

3V **0V**

Signal
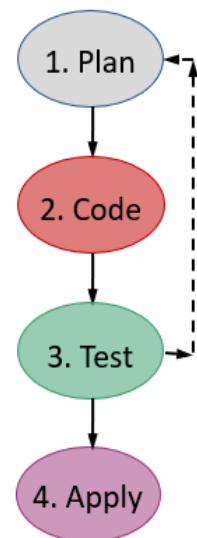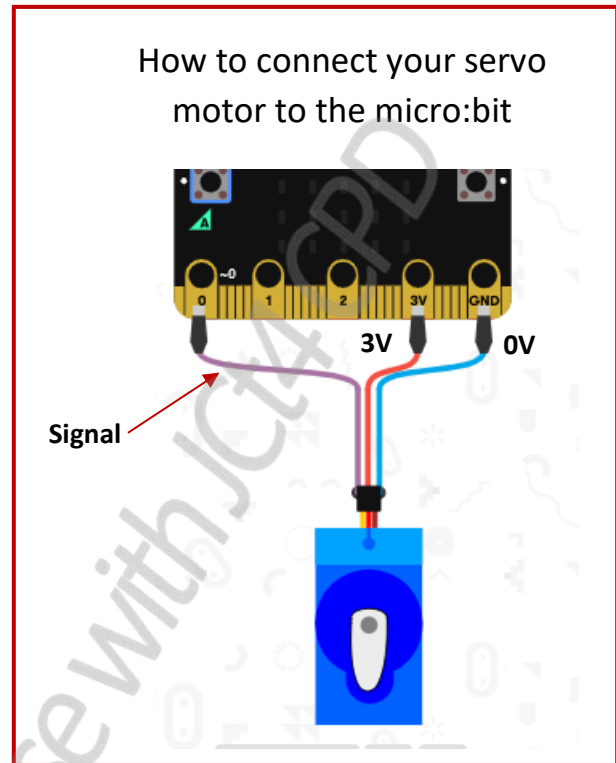
Coding Challenge 2:

Open and close a barrier using a servo motor

Planning Process
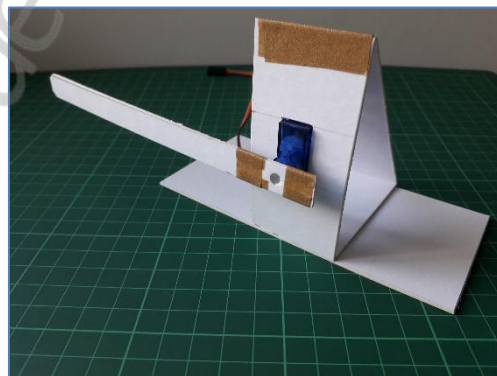
1. Plan
2. Code
3. Test
4. Apply
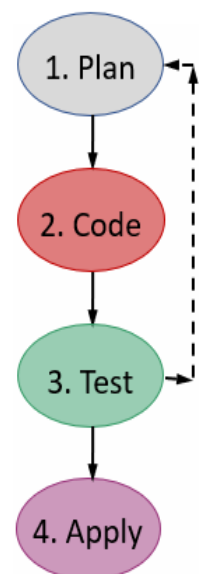
Micro:bit activity:

Use the **radio** to send and receive messages with another micro:bit
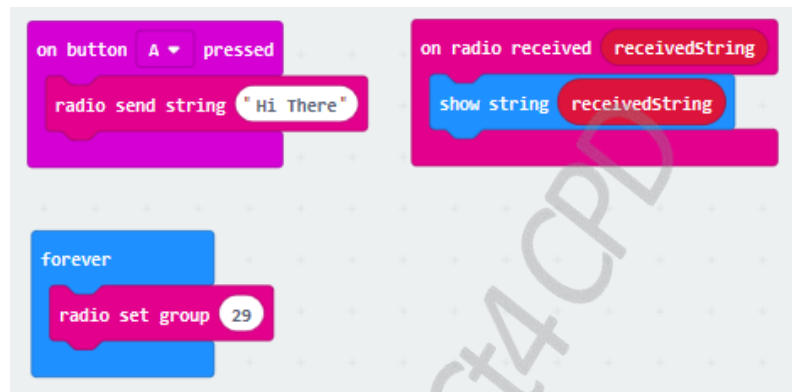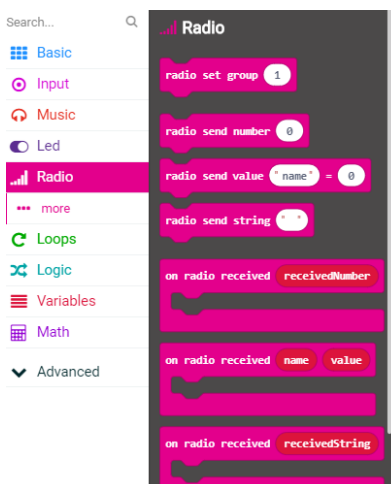
Steps

1. Place a on button pressed block to run code when button **A** is pressed.

2. Place a radio send string block inside on button pressed block. Change text as required.

3. Place a show string block inside on radio received 'received string' block.

4. Copy and paste received string into the show string block.

9. Ensure that both micro:bits communicate directly by setting the radio set group to the same channel number.

10. Look at the simulator and make sure it shows your text and icons on the screen.

11. If you have a micro:bit connected, click Download to transfer your code!

Coding Challenge 3:

Use one micro:bit to send a radio signal to another micro:bit to open its barrier for two seconds. Then close the barrier.

Planning Process

1. Plan
2. Code
3. Test
4. Apply

This resource was created to support a Professional Development workshop facilitated by JCt4 during the 2019-2020 school year and sits within the context of the discussions that took place during this workshop.
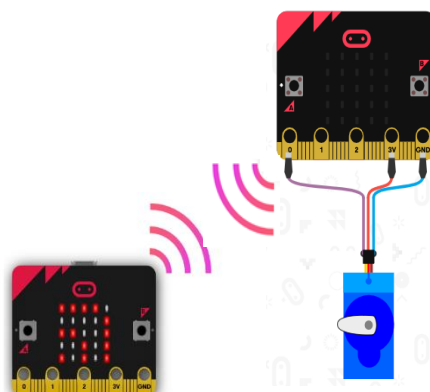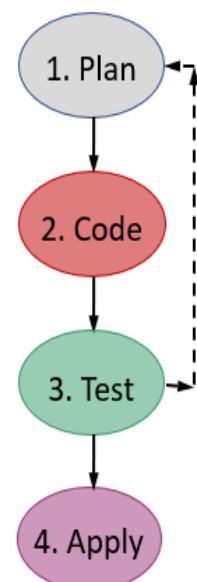
Coding Challenge 4:

Planning Process

Coding challenge 3 modification:

*If button A or Button B on one micro:bit is pressed,
the barrier connected to another micro:bit is opened or closed.*
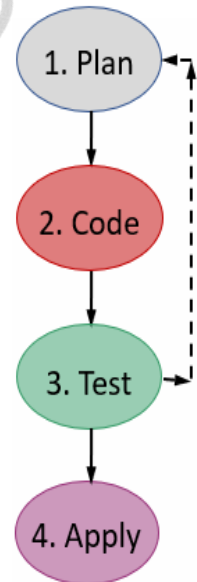
Extension Challenge

Planning Process

Some road safety signs display the speed of the oncoming traffic. Use the radio feature to wirelessly communicate between two micro:bits and complete the following task.

Task:

If a random number picked on one micro:bit is ≤ 50, display a happy face on the second micro:bit, otherwise display a sad face.

For further tutorials:

https://makecode.microbit.org/#

Future Learning for Students

What must I consider if I want to advance my prototype to a final solution?