LEARN TO CODE USING MICRO:BIT

Levels 7-8

This unit of work was created in collaboration with the Digital Technologies teacher at Ilim College, Victoria.

Unit Overview

This unit was designed to support the development of Year 7 students programming skills in Python. The unit was created as an initial programming unit with little to no prior knowledge. The unit is divided into three sections: developing coding skills using visual programming (block coding), developing coding skills using general purpose programming (python) and investigating and improving design and user experience of digital solutions.

The unit has intentionally been created to develop skills within visual programming then moves into Python. Students will start with basic coding then develop their skills in visual programming. They will then switch to general purpose programming and develop more skills. The first three coding lessons are created with a focus to use visual programming (block coding). The intention was to create a foundation to build coding and programming knowledge. These lessons can easily be adapted to start coding in Python. If students commence coding in Python, the order of the sessions will need to change because activities vary in skill when coding in visual programming then again in general purpose programming. After the coding is complete, students will reflect on the activities they have completed and redesign the ideas to improve on design and user experience.

Other Curriculum Targeted Areas

Other curriculum areas can be targeted and assessed within this unit.
Other areas of interest may include:

- Design and Technologies

Further investigation into these areas is required to ensure they align with the following activities. Activities may need to be modified to ensure content descriptions and achievement standards are met.

Australian Curriculum Alignment

The following sessions have been created using the Australian Curriculum: Digital Technologies Curriculum. Tasks may need to be modified to ensure state Digital Technologies Curriculum content descriptions and achievement standards are met. ACS has support and documents to help align this unit to other Digital Technology Curricula.

Session

'Session' has been used to define the order of tasks to complete the unit. It does not define a set time required to complete the task. Time allocated to complete a session is the teacher's discretion. This allows for flexibility for the teacher to drive the duration of the task and make modifications if necessary. Sessions can be merged into one set period or sessions may run over multiple periods.

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Key Preparation

ACS ICT Educators

Resources have been created to help teachers and students unpack and understand topics found within the Digital Technologies Curriculum. These give brief explanations of the topic and the expectations to teach the topic at the curriculum year level. It is intended the information is presented in a way that will set the foundation for further research. ACS has resources to support the teaching of the Digital Technologies Curriculum from Foundation to Year 10. Access via: https://www.acs.org.au/ict-educators.html. Contact the ICT Educators via our email: icteducators.communities@acs.org.au.

Robotics

This unit has been focused onto use robotics throughout the whole session. The unit has been focused on using micro:bit ideas and activities can be adapted to meet the needs of the schools and robotics that are to be used. Investigation to the coding when using other robotics will need to occur.

Programming within the micro:bit Platform

For the purpose of this unit we have created sessions that focus on students coding in visual programming and then Python. The focus is to use the first half of the term to build computational thinking with visual programming to support students' ability with coding. Students will move onto coding in Python. Modifications for those sessions and assessment may be made based on the professional judgements of the teachers. Sessions (including material and activities) may need to be modified.

Key Understandings

Students will:

- Follow a series of steps and code to create different uses of the micro:bit.
- Follow steps to code from visual programming to general purpose programming.
- Redesign and improve a current micro:bit solution.
- Evaluate the student digital solution.

Key Questions

- What instructions do you need to follow to code the micro:bit?
- How is visual programming different to general purpose programming?
- What are the similarities and differences?
- How can you improve on a current design to make it more appeasing to the user?
- How is your digital solution an improvement compared to the current digital solution?

Key Vocabulary

Collaboration, protocols (ethical, social and technical protocols), digital solutions, functional requirements, constraints (social, technical, economic environmental), user experience, general purpose programming, algorithms, branching, loops, variables, iteration, user input, design thinking, user interface

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Session Number	Session Topic Focus	Learning Intention and Success Criteria	Introduction/Teacher Instruction	Whole Class Activity
1.	Collaboration	**Learning Intention** Students will generate and adhere to protocols when working in online spaces. **Success Criteria** I can create a guideline that I will abide by when using digital technology to work with technology and in small groups.	Introduce students to a digital collaborative space. Discuss the right and wrong way to use this space.	Each group creates a guideline to include social, ethical and technical protocols to abide by during their time working on their project and working with others in the class.
Session Resources	**Student Resources** • ACS Student Resource: Online Protocols		**Teacher Resources** • ACS Teacher Resource: Online Collaboration • Workable: 15 collaboration tools for productive teams	
2.	Creating a Digital Solution (Magic 8 ball)	**Learning Intention** Students will follow instructions and guidance to create a digital solution for the micro:bit. **Success Criteria** I can follow instructions and use the resources to code a digital step counter.	Introduce students to the basic functions of micro:bit. Demonstrating the how the software and hardware interact with each other. Students complete an introduction session to using micro:bits. They complete a an activity using the micro:bit and code their name or an image to flash on an off.	Brainstorm the different answers and results found in a magic 8 ball. Discuss the accuracy and probability when shaking and using a magic 8 ball. Students read through lesson materials and follow instructions to create a digital magic 8 ball. Students are encouraged to create and generate their own answers.
	Student Resources • Introduction video to micro:bit • micro:bit Lesson: Magic 8-Ball		**Teacher Resources** • micro:bit Education Foundation – Introduction to the BBC micro:bit	

Session Number	Session Topic Focus	Learning Intention and Success Criteria	Introduction/Teacher Instruction	Whole Class Activity
3.	Creating a Digital Solution (step counter)	**Learning Intention** Students will follow instructions and guidance to create a digital solution for the micro:bit. **Success Criteria** I can follow instructions and use the resources to code a digital step counter.	As a whole class, discuss how a step counter/pedometer operates. Introduce students to the flowchart and walk through the flowchart discuss the functions and purposes of a flowchart.	Students read through lesson materials and follow instructions to create and code a digital step counter.
Session Resources	**Student Resources** • micro:bit accelerometer video • micro:bit at home: step counter show		**Teacher Resources** • ACS Pedometer flowchart (located at the end of the document) • micro:bit Lesson – Step Counter	
4.	Creating a Digital Solution (proximity beacon)	**Learning Intention** Students will follow instructions and guidance to create a digital solution for the micro:bit. **Success Criteria** I can follow instructions and use the resources to code a proximity beacon.	As a class create a flowchart that is a distance alarm. When a person comes too close to an object an alarm will be automatically activated. Discuss an include different scenarios on how the alarm will be deactivated. Examples may include user input (physically turning it off with a code), if statements (if too close or far away), iteration	Students read through lesson materials and follow instructions to create a proximity beacon. Students are encouraged to change the distance setting and attempt to change the way the alarm in deactivated or even add in words or symbols that may flash.
Session Resources	**Student Resources** • micro:bit Lesson – Proximity Beacon • micro:bit video Proximity beacon coding guide		**Teacher Resources** •	

Session Number	Session Topic Focus	Learning Intention and Success Criteria	Introduction/Teacher Instruction	Whole Class Activity
5.	Creating a Digital Solution (rock paper Scissors)	**Learning Intention** Students will follow instructions and guidance to create a digital solution for the micro:bit. **Success Criteria** I can follow the instructions and code in python to create a rock, paper scissors game.	Introduce students to Python as the general-purpose programming language. Students create 'Hello World!' on their micro:bit in python.	Students create their own equivalent to the game rock paper scissors. They design and create three new icons. Students read through lesson materials and follow instructions to create and code a digital rock paper scissors game.
Session Resources	**Student Resources** • micro:bit Python Guide and 'Hello World!' activity • micro:bit Lesson - Rock, Paper Scissors • Programming with Mosh - What is Python? Why Python is to Popular? • Skill Crush Blog - What is python used for? • Wiki Python Simple Programs		**Teacher Resources** • micro:bit Python Guide and 'Hello World!' activity • Python.org • micro:bit micro python tutorials • micro:bit Let's Code • Trinket Python for Everybody • The Python Standard Library • micro:bit Python Guide	
6.	Creating a Digital Solution (micro:bit pet)	**Learning Intention** Students will follow instructions and guidance to create a digital solution for the micro:bit. **Success Criteria** I can follow the instructions and code in python to create a micro:bit digital pet.	Students continue to build on their 'Hello World' activity. They can code different icons to move across their micro:bit or code a different message.	Students follow the instructions to create a micro:bit virtual pet. Students read through the instructions and code in Python.
Session Resources	**Student Resources** • micro:bit Python Guide and 'Hello World!' activity • micro:bit Lesson – micro:bit pet		**Teacher Resources** • micro:bit Python Guide and 'Hello World!' activity • micro:bit images in python • micro:bit Lesson – micro:bit pet	

Session Number	Session Topic Focus	Learning Intention and Success Criteria	Introduction/Teacher Instruction	Whole Class Activity
7.	Creating a Digital Solution (tilt alarm)	**Learning Intention** Students will follow instructions and guidance to create a digital solution for the micro:bit. **Success Criteria** I can follow the instructions and code in python to create a micro:bit tilt alarm.	Students will complete another mini lesson found within the micro:bit micro python tutorials. They will continue to develop their skills within the micro:bit python environment.	Students follow the instructions to create a micro:bit virtual pet. Students read through the instructions and code in Python.
Session Resource	**Student Resources** • micro:bit accelerometer video • micro:bit Lesson – Tilt Alarm		**Teacher Resources** • micro:bit micro python tutorials • micro:bit Lesson – Tilt Alarm	
8.	Creating a Digital Solution (fireflies)	**Learning Intention** Students will follow instructions and guidance to create a digital solution for the micro:bit. **Success Criteria** I can follow the instructions and code in python to create a micro:bit fireflies.	Students will complete another mini lesson found within the micro:bit micro python tutorials. They will continue to develop their skills within the micro:bit python environment.	Students follow the instructions to create a micro:bit fireflies. Students read through the instructions and code in Python.
Session Resource	**Student Resources** • Fireflies Information • micro:bit Lesson – Fireflies •		**Teacher Resources** • micro:bit micro python tutorials • micro:bit Lesson – Fireflies • Make Code micro:bit project fireflies • York Dojo Fireflies • Make Code micro:bit Fireflies • BBC micro:bit MicroPython Fireflies	

Session Number	Session Topic Focus	Learning Intention and Success Criteria	Introduction/Teacher Instruction	Whole Class Activity
9.	Designing a digital solution	**Learning Intention** Students take a current technology and they will improve the design and the user experience. **Success Criteria** I can redesign and improve the current digital solutions.	Students look at a selection of technology that has changed and developed and improved over time. They brainstorm and make suggestions how they could improve and develop the technology they have coded of the term. They can include new technology to provide more features to the user.	Students take one of the projects they have completed in this unit and redesign the concept of the digital technologies. Example ideas: Rock paper scissors – Students create a digital game. They redesign the interface of the micro:pet – detail the how they would change the interface to make improvements on the overall use and feel of the product.
Session Resource	**Student Resources** • Key Questions: Student Design Brainstorm (located at the end of the document)		**Teacher Resources** • Tamagotchi Original VS Tamagotchi On: The evolution • Walking off Pounds: The history of Pedometers • Super Luigi Bros: Evolution of Mario • Evolution of game consoles	
10.	Student Evaluation	**Learning Intention** Students will evaluate their design based on a set criterion. **Success Criteria** I can evaluate my design by following a set of questions and prompts.	Students will present their ideas and design to their classmates. They will discuss how they have improved the overall experience. Students can identify one area/function they improved on.	Students will evaluate their new design by completing a set of prompts and answering questions. They will present their
Session Resource	**Student Resources** • Key Questions: Final Evaluation (located at the end of the document)		**Teacher Resources**	

Student Design Brainstorm		
Topic	**Questions**	**Ideas**
Improvements	Which micro:bit activity will you remix to improve? In 3 sentences or less explain the idea behind the digital solution. What is the primary function of the device?	
Existing solutions	What other technologies already exist? What will you modify from existing technologies? What do you like from existing technologies that you will use in your design? What will you take away and why?	
Digital solution explanation	Explain your idea. What is your idea? How would the user use your solution? On a scale of 1 – 10 (1 being lowest, 10 highest), how do you rate your idea?	
Functional requirements	What are the functional requirements (what are the must to make it work) of a digital device like to operate?	
User Experience	What can you add to your design? What could you improve on to give your user a better experience?	
Technical constraints	What issues could come up based on the digital platform you are using? (If you have lots of pictures and videos storage is a technical issue or loading time).	

Final Evaluation	
Questions/Prompts	**Evaluation**
Self-Evaluation • Explain your digital solution. • What is the purpose of your digital solution? • How could it meet the needs of others? • What makes this digital solution innovative? • What are the potential risks that could occur when users use your digital solution? • If you were to develop this solution again, what would you do differently? • Where there any features that you liked from the other designs?	

Assessment – Australian Digital Technologies Curriculum			
Content Description	**Session**	**Assessment Piece**	**Assessment Statement**
Investigate how data is transmitted and secured in wired, wireless and mobile networks, and how the specifications affect performance (ACTDIK023)	N/A		
Investigate how digital systems represent text, image and audio data in binary (ACTDIK024)	N/A		
Acquire data from a range of sources and evaluate authenticity, accuracy and timeliness (ACTDIP025)	N/A		
Analyse and visualise data using a range of software to create information, and use structured data to model objects or events (ACTDIP026)	N/A		
Define and decompose real-world problems taking into account functional requirements and economic, environmental, social, technical and usability constraints (ACTDIP027)	10	Digital solution design	Students took a micro:bit project and redesigned the digital solution to improve the functionality and user experience.
Design the user experience of a digital system, generating, evaluating and communicating alternative designs (ACTDIP028)	10	Digital solution design	Students took a micro:bit project and redesigned the digital solution to improve the functionality and user experience.
Design algorithms represented diagrammatically and in English, and trace algorithms to predict output for a given input and to identify errors (ACTDIP029)	N/A		
Implement and modify programs with user interfaces involving branching, iteration and functions in a general-purpose programming language (ACTDIP030)	5 - 9	Programming the micro:bit	Students programmed in python to create a digital solution using a micro:bit. Their code contained functions such as branching and iteration and other common functions.
Evaluate how student solutions and existing information systems meet needs, are innovative, and take account of future risks and sustainability (ACTDIP031)	11	Evaluations: Existing and student digital solutions	Students evaluated existing technologies and student designs to look how technology is meeting needs and innovative.
Plan and manage projects that create and communicate ideas and information collaboratively online, taking safety and social contexts into account (ACTDIP032)	1	Work completed using online collaboration tools	Students used online learning platforms to communicate ideas when coding, creating their digital solution design and evaluating their design.