Virtual Pet with Micro:bit Inventors Kit

Year level band: Year 7-8

Description: In this learning sequence students will have an introduction to electronics. Through this exploration they learn about digital systems and how designs are represented and communicated to others using a Microbit and electronics breadboard.

Resources: BBC Microbit Kit including Microbit, Battery and holder, USB micro cord.
Kiktronic Inventors Kit
Kiktronic Inventor's Kit Tutorial Book
https://www.kitronik.co.uk/blog/inventors-kit-experiment-1-help
Make Code for Microbit site - https://makecode.microbit.org/

Prior Student Learning:

Students may benefit from having some experience with

- visual programming
- creating simple projects with the Microbit

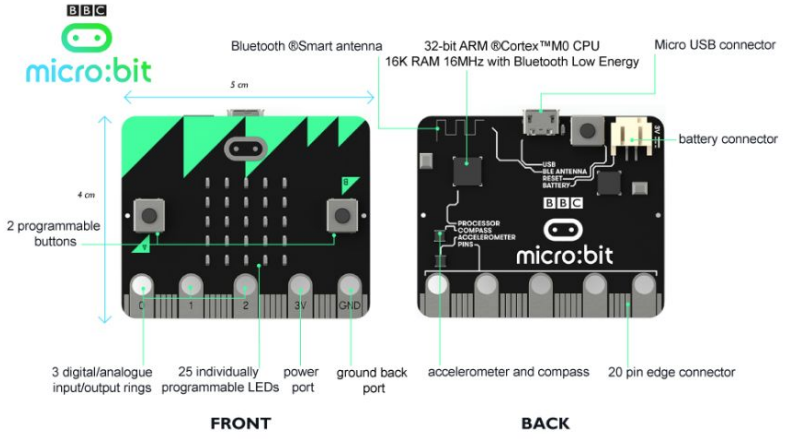
Australian Curriculum alignment summary: Technologies Learning Area

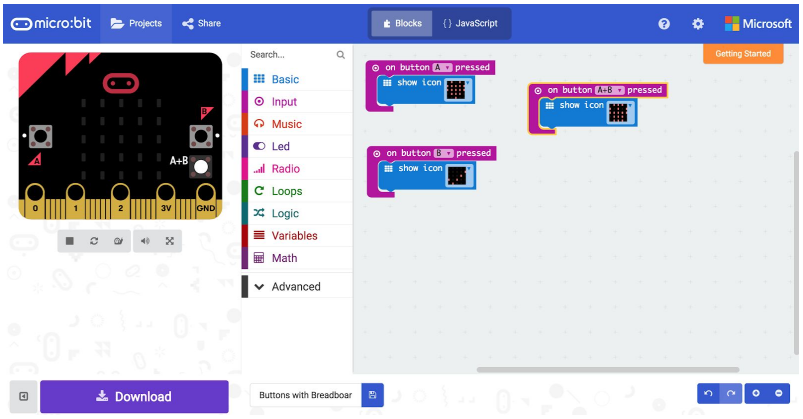
Digital Technologies: Students learn about digital systems and visual programming.
Design and Technologies: Students identify a problem and consider designed solutions.
Mathematics: Students explore statistics and probability through creating tables and graphs and making inferences.

Year	**Content Descriptors**
7-8	**Digital Technologies** Knowledge and Understanding ● Investigate how data is transmitted and secured in wired, wireless and mobile networks, and how the specifications affect performance. Process and Production Skills ● Design algorithms represented diagrammatically and in English, and trace algorithms to predict output for a given input and to identify errors. ● Implement and modify programs with user interfaces involving branching, iteration and functions ina general purpose programming language ● Evaluate how student solutions and existing information systems meet needs, are innovative and take account of future risks and sustainability **Design and Technologies** Knowledge and understanding

	• Analyse ways to produce designed solutions through selecting and combining characteristics and properties of materials, systems, components, tools and equipment Process and production skills • Select and justify choices of materials components, tools, equipment and techniques to effectively and safely make designed solutions.
	Capabilities **ICT -** **Generate solutions to challenges and learning area tasks** Independently or collaboratively create and modify digital solutions, creative outputs or data representation/transformation for particular audiences and purposes **Select and use hardware and software** Select from, and safely operate, a range of devices to undertake specific tasks and use basic troubleshooting procedures to solve routine malfunctions

Element	**Summary of tasks**
Learning hook	Why use electronics? Ask students if they have ever wondered how buttons on a remote control work?. If you have an old remote control or old computer/phone, you could take the cover off or give students an opportunity to remove covers from old technology. Investigate the use of buttons on different types of technology. *Safety: Ensure power cords and batteries are removed and equipment is not plugged into power.* Suggest that they are going to find out how make their own game with a microbit using buttons. More information on electronics An introductory channel for information about electronics https://www.youtube.com/watch?v=r-X9coYTOV4&index=1&list=PLah6faXAgguOeMUlxS22ZU4w5nDvCl5gs
Achievement Standards	**Digital technologies** **By the end of year 8** Students generate and document in digital and non-digital form, design ideas for different audiences using appropriate technical terms, and graphical representation techniques including algorithms.

Learning Map (Sequence)	They independently and safely plan, design, test, modify and create a range of digital solutions that meet intended purposes including user interfaces and the use of a programming language. **Design and Technologies** **By the end of year 8** They independently and safely plan, design, test, modify and create a range of digital solutions that meet intended purposes including user interfaces and the use of a programming language. They plan, *document* and effectively manage processes and resources to produce designed solutions for each of the prescribed technologies contexts. Students use *appropriate protocols* when collaborating, and *creating and communicating ideas*, information and solutions face-to-face and online.
	• Create a simple project with a microbit • students participate in creating a breadboard with buttons using BBC Microbit • Students investigate how the Microbit can control electronics using simple circuits with buttons or LEDs • Students represent their circuit with drawings and start electronics symbols
Learning input	Look at a labelled diagram of the Microbit and get to know the parts.  Depending on the experience of the students the teacher may have a completed prototype for students to view and use during this process.

	Students should be free to create their own designs and plans for the circuit to suit their own purpose. An example is create a circuit with buttons. Explore the terms and symbols for creating diagrams of simple circuits https://learn.sparkfun.com/tutorials/how-to-read-a-schematic/all Where do you see buttons used in electronic?
With Blocks	Create a simple program using buttons on the microbit 

With JavaScript	input.onButtonPressed(Button.A, () => {
	basic.showIcon(IconNames.Heart)
	})
	input.onButtonPressed(Button.AB, () => {
	basic.showIcon(IconNames.Skull)
	})
	input.onButtonPressed(Button.B, () => {
	basic.showIcon(IconNames.Yes)
	})

With Python	Button A and B should be programmed first as it will override the Button B and Button A commands on the elif statement. **from microbit import *** **while True:** **if** button_a.is_pressed() **and** button_b.is_pressed(): display.show(Image.GHOST) **elif** button_b.is_pressed(): display.show(Image.SAD) **elif** button_a.is_pressed(): display.show(Image.HEART) **else**:

	display.clear() https://www.youtube.com/watch?v=uh7jpsnpzyo
Debugging	• Check your spelling. • Check you have the correct commands. • Check your brackets are paired. • Check grammar is correct including capitals and punctuation.
Electronics	Students should use the Kiktronic Inventors Kit manual to reproduce the first experiment to learn how the board works. See page 14.
Learning construction	If required the teacher may demonstrate how to build the code and download it to a Microbit. (for detailed instructions go here) They trouble shoot any difficulties they have getting the Microbit to respond and do what they want it to do. They experiment with changing the code and observing any changes or differences to the performance of the Microbit. Students test the Microbit by testing the buttons. Students create experiment 1 in the kiktronic inventors book, page 14 or https://www.kitronik.co.uk/blog/inventors-kit-experiment-1-help Reproduce the board with 2 buttons. The buttons will override the buttons on the microbit. Students may find time to modify the code to display different emotions or add additional buttons. This will require students to modify their code accordingly.
Learning demo	Students share and demonstrate their microbit board with the group and report on their experience. Did they modify the code and what did they find difficult. What did they learn.
Learning reflection	Students document their findings in a journal or blog format. Students may benefit from some structured questions to assist with their reflection process. Describe the purpose of the project. What did you learn? Describe the problems you experienced. Did you modify the code or add extra buttons. What was the purpose of your modifications? Were you successful?

	Design a housing to hold the microbit. It needs to be sturdy enough for a small child to play with it. Describe the materials you would use to create the design.

Assessment:

Formative Assessment

Check students have been able to correctly wire up the bread board.

- Teachers observe students using the bread boarding, planning and constructing their system. Provide feedback or reteach concepts that have not been mastered.
- Using questioning to elicit students understanding of the functions of the breadboard and their understanding of why mistakes are made.
- Take photos of the students' algorithms and systems to document their progress. Videos of discussions and testing might be also be useful in the testing stage.

	Quantity of knowledge			**Quality of understanding**	
Criteria	**Pre-structural**	**Uni-structural**	**Multi-structural**	**Relational**	**Extended abstract**
Digital Technologies: Creation of the code for a virtual pet.	Code was copied and loaded onto the Microbit	Can explain code and alter one part of the program	Can explain code and was able to trouble shoot when changing 2 or more aspects of the code	Virtual pet was constructed and accurately working.	The virtual pet was constructed and code reflects students ability to alter and change the code to suit their purposes.
Digital Technologies: breadboarding	Student has located and attempted to connect the correct wires and buttons	Buttons are functioning correctly.	Both buttons are functioning correctly and the student can explain how the buttons work.	Student can explain how the breadboard is connected to the microbit and how they work.	Student has demonstrated an understanding of breadboarding and how the board is structured.
Design and Technologies: Design of a way to hold the Microbit on the body.	Basic plan created. Student has drawn a basic plan with label.	student has considered the user in the design of the suggested materials suit the purpose for a small child.	Student has considered the design of the housing in terms of the user and aesthetics. They have considered durability and accessibility	Holder is functional and meets the purpose	Holder is secure, aesthetically pleasing and shows good design decisions.

Teacher/Student Instructions:

To understand what a Microbit is

https://support.microbit.org/support/solutions/articles/19000013983-what-is-a-micro-bit-

Explore projects on the Microbit site

https://microbit.org/

To see a similar project on the BBC Microbit site

https://www.microbit.co.uk/iet/stepometer

CSER Professional Learning:

This lesson plan corresponds to professional learning in the following CSER Digital Technologies MOOCs:

F-6 Digital Technologies: Foundations

https://csermoocs.adelaide.edu.au/moocs/

Unit 7: Visual programming

Further Resources:

Microbit tutorials and projects
https://makecode.microbit.org/

Kiktronic inventor's kit experiments

https://www.kitronik.co.uk/5603-inventors-kit-for-the-bbc-microbit.html

Breadboard information

https://en.wikipedia.org/wiki/Breadboard

Author: Meridith Ebbs