Where are my wearables?!

Year level band: Year 5-6

Description: In this learning sequence students explore wearable technology. Through this exploration they learn about digital systems, data collection and representation, designing a product for a purpose or to solve a problem.

Resources: BBC Micro:bit Kit including Micro:bit, Battery and holder, USB micro cord.
Fabric
Needles and thread
Velcro hook and loop strips
Cable ties
Materials, sewing kits - anything that would support attaching the Micro:bit to the body)
Computer connected to the Internet
Make Code for Micro:bit site - https://makecode.Micro:bit.org/
Optional - Wearable Playlist
https://www.youtube.com/playlist?list=PLF5HEj4xFkVGcjYUr_iNfRbpxKn-jacFL

Prior Student Learning: Students may benefit from having some experience with visual programming but this is not entirely necessary. An understanding of the term “variables” would also help students.

Australian Curriculum alignment summary: Technologies Learning Area

Digital Technologies: Students learn about digital systems and visual programming

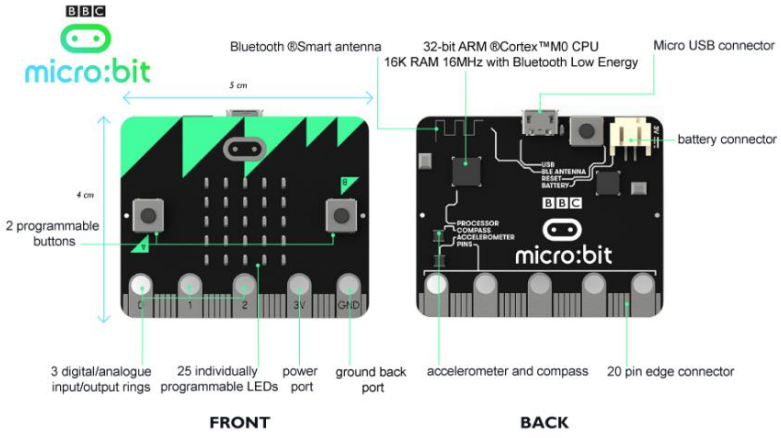
Design and Technologies: Students identify a problem and consider designed solutions.

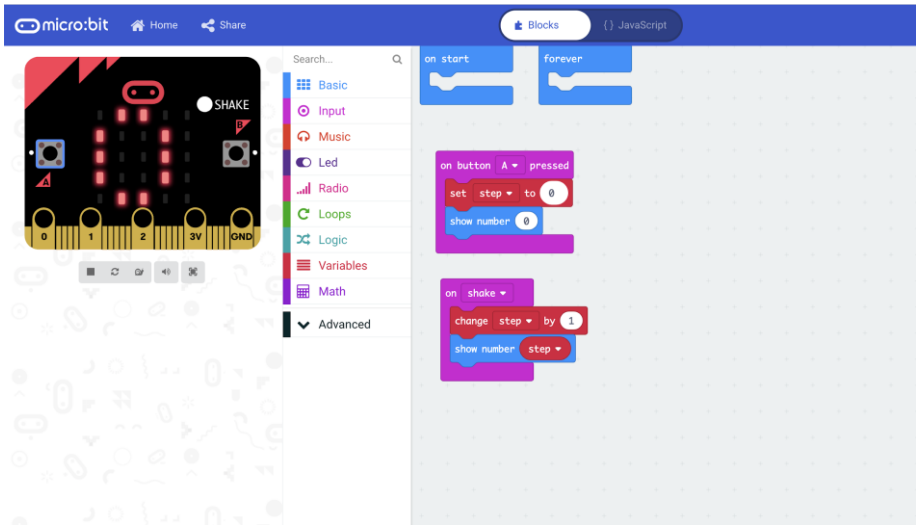
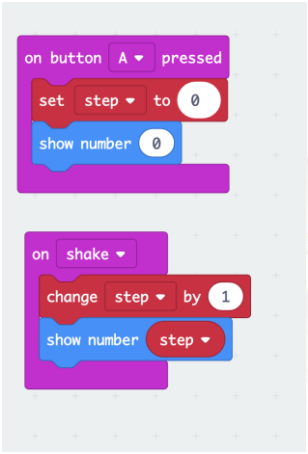
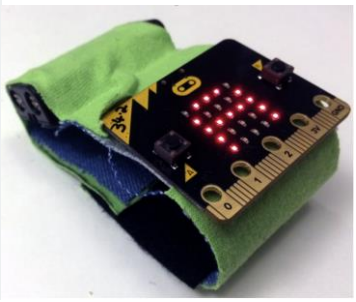
Mathematics: Students explore statistics and probability through creating tables and graphs and making inferences.

Year	**Content Descriptors**
5-6	**Digital Technologies** Knowledge and Understanding ● Examine the main components of common digital systems and how they may connect together to form networks to transmit data Process and Production Skills ● Design, modify and follow simple algorithms involving sequences of steps, branching, and iteration ● Implement digital solutions as simple visual programs involving branching, iteration (repetition), and user input ● Explain how student solutions and existing information systems are sustainable and meet current and future local community needs **Design and Technologies** Knowledge and understanding

	● Investigate characteristics and properties of a range of materials, systems, components, tools and equipment and evaluate the impact of their use Process and production skills ● Critique needs or opportunities for designing, and investigate materials, components, tools, equipment and processes to achieve intended designed solutions ● Select appropriate materials, components, tools, equipment and techniques and apply safe procedures to make designed solutions **Mathematics** **Statistics and Probability** Year 5: Pose questions and collect categorical or numerical data by observation or survey Year 6: Conduct chance experiments with both small and large numbers of trials using appropriate digital technologies
	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 **Numeracy -** **Interpret data displays** collect, compare, describe and interpret data as 2-way tables, double column graphs and sector graphs, including from digital media

Element	Summary of tasks
Learning hook	The teacher looks at some information from the Heart foundation about the benefits of walking https://walking.heartfoundation.org.au/benefits-of-walking/ and consider how you could get to 10,000 steps https://www.10000stepsaustralia.com/ What are wearable technologies? Brainstorm and share experiences with wearable technologies. Ask students if they could make any wearable technology to improve fitness – what would it be. Get them to design their wearable tech using a drawing with explanations on how it works and what it does. Ask students to come up with a success criteria for a wearable technology that helps improve fitness. Ask students to consider how these wearable devices work? Discuss sensors, perhaps consider terms like "accelerometer" get them to add these to their diagrams. Suggest that they are going to find out how one wearable technology works and consider how Technologists create the wearable technologies we use today by making a prototype with Micro:bit.
Achievement Standards	**Digital technologies** By the end of year 6 Students define problems in terms of data and functional requirements and design solutions by developing algorithms to address the problems. They incorporate decision-making, repetition and user interface design into their designs and implement their digital solutions, including a visual program. They explain how information systems and their solutions meet needs and consider sustainability. **Design and Technologies** By the end of year 6 Students describe competing considerations in the design of products, services and environments, taking into account sustainability. They describe how design and technologies contribute to meeting present and future needs. Students explain how the features of technologies impact on designed solutions for each of the prescribed technologies contexts. **Mathematics** Students compare observed and expected frequencies. They interpret and compare a variety of data displays including those displays for two categorical variables.

Learning Map (Sequence)	• students consider wearables to improve fitness and investigate the variety and purpose of wearable technologies • students participate in creating a prototype stepometer using BBC Micro:bit • Students investigate where the Micro:bit could be placed on the body to get the most accurate data by comparing and recording manual calculations with those of the Micro:bit. • Students design and create a way to attach the Micro:bit to the body so that the Micro:bit becomes a “wearable” • Students assess their stepometer according to mutually agreed success criteria.
Learning input	The teacher introduces the Micro:bit and asks students to look at the equipment. https://www.youtube.com/watch?v=Wuza5WXiMkc *What do they notice?* *How do they think it works?* Look at a labelled diagram of the Micro:bit and get to know the parts.  The teacher then introduces the Make Code site and demonstrated how to build the code for a stepometer

	   The teacher demonstrates how to build the stepometer code making terms like “variable” and “branching” visible. Explore the terms *Accelerometer* *LEDs (light emitting diodes)* *compass* *variable* *loops* *branching* Add words to a word wall to support learning
Learning construction	After the teacher has demonstrated how to build the code and download it to a Micro:bit, students have a go themselves. They troubleshoot any difficulties they have getting the Micro:bit 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 Micro:bit. Students test the Micro:bit by running up and down stairs and/or on a flat surface. They hold the Micro:bit in their hand or experiment with other places e.g. in a sock or pocket. They investigate where they get the most accurate result by comparing their manual count to the Micro:bit.
Learning demo	The teacher asks the class to reconsider their original design criteria and come up with a set of success criteria for prototyping a way to hold the Micro:bit onto the body. e.g. ● It needs to be secure ● You need to be able to see the LED lights clearly ● It needs to be secured on the most accurate place ● It must look nice for the user Students then design a way of holding the Micro:bit on the body – wrist strap, sock pocket, necklace etc.  Students test their Micro:bit on using manual and Micro:bit recordings and represent their data in tables and graphs. They investigate if the Micro:bit gave consistent data when counting steps across positions on the body. Students share and demonstrate their Micro:bit stepometer with the group and report on the data they collected. They make decisions about whether their designs were effective and how accurate the Micro:bit is.
Learning reflection	Students document their findings in a poster created using photographs, graphs and tables and written text (or oral via video) on the success of their project. They show annotated algorithms from screen shots of their blocks. They seek feedback from others based on the agreed criteria for success. Students could showcase their work to others and allow users to test their design and get written/video feedback.

Assessment:

Formative Assessment

Students can explain orally how the “code” is constructed using plain English

Students annotate their Micro:bit code (right click on the blocks)

Teachers observe whether students begin to tinker with the “code” and change the values experimenting with different results.

Students identify the elements of graphical representations and whether their data representations reflect those elements e.g. x and y axis, title, statements making comparisons, infographic with results.

	Quantity of knowledge			**Quality of understanding**	
Criteria	**Pre-structural**	**Uni-structural**	**Multi-structural**	**Relational**	**Extended abstract**
Digital Technologies Understand the components of a digital system	Student was unable to identify components of the Micro:bit system	Student can identify components in the Micro:bit system using one or minimal technical terms (e.g. input, output)	Student can accurately identify numerous component parts on the Micro:bit system works using technical terms	Student accurately explains how and why the Micro:bit system works through identifying and explaining the role of the component parts	The student confidently explains how and why the Micro:bit system works through explaining how the component parts work together and can identify how to add to the system to make it more complex and versatile (e.g. adding sound)
Digital Technologies: Creation of an algorithm for a stepometer	Student cannot identify or place the blocks in a correct sequence	Student could identify the blocks but required support to place them accurately.	Student was able to reproduce the code and test it on the virtual Micro:bit	Student was able to reproduce the algorithm and could explain how and why each block was selected and placed and how it works as a sequence.	Student was able to reproduce the algorithm and could explain how and why each block was selected and placed and how it works as a sequence. Student was able to tinker with the blocks to create their own version of an algorithm.
Design and Technologies: Design of a way to hold the Micro:bit on the body.	Rudimentary attachment of stepometer to the body.	Student has considered the user in the design of the holder and has demonstrated an understanding	Student has considered the design of the holder in terms of the user and aesthetics. They have	Holder is functional and meets the purpose. Student has sought and received feedback against criteria	Holder is secure, aesthetically pleasing and shows good design decisions.

		of the best place to attach the stepometer.	considered best place to get accurate readings.		Feedback indicates the success criteria was met.
Mathematics: Compare and interpret sample data using tables and graphs and tatements.	Student has developed a table and graph that is inaccurate.	Student has developed tables and graphs that reflect manual and stepometer recordings.	Students have developed graphs or tables that reflect a manual and Micro:bit record of data related to the position of the stepometer on the body and the number of steps. Student can explain how they controlled each of the variables (e.g. number of steps recorded. User – wrist and staircase),	Student can compare, explain the data they have collected in both manual and Micro:bit recordings. Student can compare and interpret results in order to recommend most accurate position on the body.	Students can make inferences based on comparisons and interpretations of the data they have collected.

Teacher/Student Instructions:

To understand what a Micro:bit is

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

Explore projects on the Micro:bit site

https://Micro:bit.org/

To see a similar project on the BBC Micro:bit site

https://Micro:bit0.blob.core.windows.net/pub/hmnneldh/Stepometer-Main.docx

Design Thinking video connected to fitness trackers

https://youtu.be/0V5BwTrQOCs

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:

Micro:bit tutorials and projects
https://makecode.Micro:bit.org/

Wearable technologies on Wikipedia

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

Wearable Technologies Playlist from Youtube

https://www.youtube.com/playlist?list=PLF5HEj4xFkVGcjYUr_iNfRbpxKn-jacFL

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