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| **Lesson 1 - Baseline testing and Introduction to Micro:bits** | |
| **Learning Objectives** | * Demonstrate your current knowledge of programming concepts * Summarise your understanding of a Micro:bit |
| **Discussion** | Explain unit  Students will be completing a project for Open Lab at Newcastle University.  The Researchers at Open Lab will set a project to be completed and returned to them so they can see the outcome.  In order to complete the project students will learn how to use a Micro:bit which is a small computer that can be coded using the text based programming language Micro Python. |
| **Task** | Students to complete baseline test.  This is in the format of a google quiz which is self marking and allows students to gain immediate feedback.  NOTE: The quiz should be shared with students prior to the start of the lesson. |
| **Discussion** | Introduce the challenge.  Stress the fact that this is a real project and they will create an end product that can be used.  The end result of their project will be recorded and sent to the researchers at Newcastle University so they can see what has been created.  There is also the potential to create a showcase event in school should that be appropriate.  Explain to students that for the purposes of the Project they will be using a Micro:bit, these are small, pocket sized computers with 25 red LED lights that can flash messages and be used to create games.  There are two programmable buttons that can be used to control games or pause and skip songs on a playlist.  It has an accelerometer so it can detect motion and knows when you're moving.  The built-in compass knows which direction you're heading in and it can use a low energy Bluetooth connection to interact with other devices and the Internet. |
| **Task** | Students to research Micro:bits and record their findings in their Workbook |
| **Plenary** | Share the findings of their research with the person next to them.  They are then to share their partners’ findings with the class. |

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| **Lesson 2** | |
| **Learning Objectives** | * Demonstrate a program you have created for a micro:bit * Give examples of code that a micro:bit could understand * Show you can download programs onto the micro:bit |
| **Starter** | Recap the previous lesson and remind students of the Micro:bit research that they completed.  Ask students to share some of the facts they remember with the class.  Allow time for students to open their workbook and write two facts that have been shared that they don’t have from their own research. |
| **Active** | Handout Micro:bits and ask students to open the box so they can see them |
| **Discussion** | Using the lesson slides talk students through the Micro:bit, explaining the features. |
| **Active** | Students to plug Micro:bits into computers  Then, USING GOOGLE CHROME open the following web site  [**python.microbit.org**](https://python.microbit.org/v/1.1) |
| **Discussion** | Talk students through the code in the web page.  This is the first program that they will run  # Add your Python code here. E.g. ……. This is a comment, identified by starting with a hash #  from microbit import \* ……. This tells the program to use code from the microbit code library.  while True:   …… This is a loop that tells the micro:bit to run the code underneath it continuously      display.scroll('Hello, World!') …… display.scroll tells the Micro:bit to show the words in the brackets scrolling across the LEDs on the front      display.show(Image.HEART) ….. This tells the Micro:bit to show an image that has already been created and is in the Microbit Library.  The image was saved with the name HEART      sleep(2000) …… This tells the Micro:bit to wait for 2000 microseconds (2 seconds) before carrying out any more instructions.  In this case it will leave the HEART image on the screen for 2 seconds. |
| **Discussion** | Using the lesson slides explain to students how to download the program onto the Micro:bit  NOTE: You could allow the students to run the program before you explain it and encourage them to work out what the code does |
| **Task 2.2** | Students to create a program that will display their name and one of five images.  This should then be downloaded to the Micro:bit to check it works  Once they are happy with their code it should be copied and pasted into [Task 2.2](https://docs.google.com/document/d/1EbFADtLLbHirGCUcYJFSu2zbo1sHZLts-VaY-JUcWDk/edit#bookmark=id.bj1agfby8553) of the handbook |
| **Discussion** | Explain Task 3a (extension task)  Students will find a list of images that could be used in their [handbook](https://docs.google.com/document/d/1BKTeGCAsQD4oPODNRQHefm9OwzNB1-b5-ohg662qooA/edit#bookmark=id.5n5kfpqvww5e)  This task is quite open ended and could be extended by asking students to display more images, additional lines of text etc.  Remind students that every time a change is made to the program it needs to be downloaded to the Microbit to see the effect of that change. |
| **Task 2.3** | Students to create a program to display their name, an image, then a pause, then their age, then a different image then pause for 2 seconds (2000 milliseconds). |
| **Plenary** | Discuss the code with the students and focus on two main questions - What would happen if the sleep code was removed and what measure is used?  Without the sleep code the program would not display the image, Sleep tells the microbit to wait for the allocated amount of time before it moves on to the next thing so in this case show the chessboard image, wait 1 second thus leaving the LEDs that make the chessboard lit up for 1 second giving the illusion that that the image is being shown for 1 second.    Sleep(1000) is 1 second or 1000 milliseconds |

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| **Lesson 3 -  Introduce the project, generate ideas** | |
| **Lesson Objectives** | * Demonstrate your understanding of Open Lab * Explain the challenge you will be doing * Formulate your ideas in an Ideation Square |
| **Starter** | Think about how computers are used to help people.  Write on Post-It note, share and discuss with partner, partner to discuss with class |
| **Discussion** | Using the slides explain Open Lab to students.  Open Lab is an HCI research lab at Newcastle University, there are over 100 researchers from many backgrounds completing projects and qualifications.  One of the topics currently being investigated is how to make Computing Education more fun while still teaching everything students need to learn.  This Project has evolved from that research.  In 2004 Researchers developed a voting project using the Raspberry Pi computers and this project follows that theme.  Talk students through the idea that they are going to develop an electronic voting system using school as a theme.  They are going to learn about ideation squares, which is a technique used in the university to help generate project ideas. |
| **Task** | Task 3.1  Use the [Open Lab website](https://openlab.ncl.ac.uk/) to help you list three research projects that are going on in Open Lab  Students to record their findings in [Task 3.1](https://docs.google.com/document/d/1EbFADtLLbHirGCUcYJFSu2zbo1sHZLts-VaY-JUcWDk/edit#bookmark=id.1mqamb2s9mbi) in their workbook |
| **Discussion** | Introduce students to the project.  They are going to use a Micro:bit to create a voting system based around a multiple choice question about improvements that could be made in school  This topic is huge and many students struggle to narrow it down.  The Researchers in Open Lab use Ideation Squares to get ideas about projects and narrow down the scope to stop the project getting too big.  https://lh4.googleusercontent.com/OB6E08gi2e_48LSsXvKhlYCd1qmdRCtKYYTopLFv9j3-0fUjd6Lbizv30SfWY74Bfc5oRHxdJKq-ABYDm06pgqwJYK6ckMmmiAtwiu5XeXRMgkmFrmp4suRjF6XwQ7Kqd_8tw9t8  The idea of this square is to help with ideas.  Each of the three colours represent a topic, in this instance Yellow is location, blue is people and orange is Micro:bit output.  The Micro:Vote will think about an area in school that could be improved by the use of an output on a Micro:bit for a specific group of people  There are slides to allow showing a blank Ideation Square and completing a trial one as a class or to show an example of a completed square.  Some classes may respond better to talking through what to do then allowing them to complete the square. |
| **Task** | Students to work though completing an Ideation Square.  This is [Task 3.2](https://docs.google.com/document/d/1EbFADtLLbHirGCUcYJFSu2zbo1sHZLts-VaY-JUcWDk/edit#bookmark=id.fqf4v7a12ga8) in the workbook.  Once the Ideation Square is complete students should then pick the two ideas they think are the most interesting.  They should then narrow that down to one final idea |
| **Plenary** | Please share your final ideas with the rest of the class and explain what sort of question you could ask to define the improvement that could be made.  For example if the final idea was to help Year 8 with lunch queues the final multiple choice on the Micro:Vote poster could be  How do we manage queues better  with the options of  Each Year group has lunch at a different time during the same lunch break  Staggered lunch in school  Drinks / sandwiches sold in different part of the hall  Obviously what you talk to the students about here could be personalised to your school and particular problems you face, alternatively the students could address a problem in their local community. |