

Tracking our physical activity

Content summary:

A whole class data collection activity that uses the BBC micro:bit as a wearable activity tracker to identify pupil's physical movements in the school playground. Pupils analyse the accuracy of this data.

Time: Approx. 1 hour, 40 mins (55 mins before morning breaktime and 45 mins after lunchtime).

Session 1: Introduction and planning (15 min)

| Resources required | Prior learning | Before the lesson |
|--|--|--|
| <ul style="list-style-type: none"> Tracking our activity video on BBC Teach activity guide. Playground survey glossary. Playground survey poster. | <p>Data privacy</p> <ul style="list-style-type: none"> See Getting started activity. | <ul style="list-style-type: none"> Gather all resources required. Check pupil computers allow micro:bit drive to display (more info here). Go to the micro:bit data upload tool webpage and enter details to receive your class code – pupils will need this later. Record the class code on the playground survey poster. |

Differentiation and accessibility

If you have pupils in your class who use a wheelchair or have a mobility impairment, the activity tracker may not be appropriate as it classifies activities as 'running', 'walking' and 'jumping'. In this case, there are a number of ways to tailor this lesson:

- The whole class takes part, but specific pupils use the *Movement level hex file* instead of *Tracking activity hex file*. This means they will analyse their data in a different way to the others because they won't see any data from the machine learning model when they review their data log. They can still download an image of their movement level over time graph and annotate it with the actual activities they were doing in the playground.
- The whole class takes part, but everyone uses the *Movement level hex file* and teaching is focused on the learning objectives that are **not** linked to machine learning. Everyone downloads their movement levels over time graphs and annotates them with activities.
- Move straight on to Exploring machine learning and use the micro:bit machine learning tool to investigate machine learning instead.

NOTE: Depending on the individual's mobility, when using the *Movement level hex file*, it may be more appropriate to mount the micro:bit on a different part of the body, on a walking aid, or on the wheel of a wheelchair.

Session details

- Recap the BBC micro:bit playground survey and remind pupils of previous learning around data from the Getting started activity through questions similar to these:
 - Why is the ONS interested in this movement data?
 - What do you think it may tell them?
 - What is consent and why is this important?
- Introduce this survey activity using the Tracking our physical activity video on BBC Teach.
- Highlight the key questions we want to answer:

What types of activity do we do in the school playground?

How accurate is the data?

4. Emphasise that pupils will be wearing the micro:bit to track their usual movements. They should try to forget they're wearing it and have a normal break/lunchtime, choosing to move as much or as little as they usually do.
5. Highlight that only a small portion of their day is being logged and that we would expect to see a range of activity levels. Some people may take the chance to rest, some may need to burn off energy. A balanced lifestyle includes every type of activity from sleeping through to sitting eating a meal to exercising. We want to explore if your playground helps you achieve this balance, alongside everything else you do in your day. (Skip to step 8 if using *movement level hex file*.)
6. If using the activity tracker hex, explain that the micro:bit is not automatically programmed to be an activity tracker, but a special program has been created so it can become one.
7. Explain how the activity tracker program used machine learning – it used movement data samples from children to 'train' a model to recognise your movements when you wear it today.
8. Explain that your class will log their movement data for morning breaktime and lunchtime. They will start logging data as they leave the classroom and stop logging data when they re-enter the classroom at the end of breaktime. They will re-start logging when they leave for lunchtime and stop logging again when they return to the classroom after lunch. Let the class know when you plan to do the data logging.

Session 2: Transferring code, checking batteries & explaining how it works (30 min)

| Resources required | Prior learning | Before the lesson |
|--|---|---|
| <ul style="list-style-type: none"> Class set of micro:bits, battery packs, batteries, flexible micro:bit holders and wearable straps (all included in the next gen box). How to use equipment video. Activity tracker hex file and/or Movement level hex file (See differentiation & accessibility note above to decide which to use). To put this code on your micro:bit you will need one of the following: A computer (e.g. laptop or Chrome-book) and a micro:bit USB lead. An Android tablet with the micro:bit USB lead and an adaptor (support article with more detail for Android tablets). An Apple iPad with Bluetooth enabled and the micro:bit app (support article with more detail for Apple iPads). | <p>Computing</p> <ul style="list-style-type: none"> Helpful to know where to locate the micro:bit drive and how to drag and drop the hex file but not necessary if modelled by the teacher. | <ul style="list-style-type: none"> Make sure fresh batteries are available in case you get a low battery warning. Have the Tracking our physical activity micro:bit how to guide and ready to refer to. |

Planning

If you want to skip transferring the code in class, you will need to make sure the code is transferred to the micro:bits in advance. You can download the activity tracker hex file and movement level hex file from the micro:bit how to guide.

Session details

1. Share the relevant hex files with your class so they can download the program onto their laptop/computer/tablet. There are 2 hex files available from the micro:bit how to guide. See advice on how to use them in the differentiation and accessibility note above.
2. Attach a micro:bit using a USB cable and show pupils where to find the micro:bit drive on their laptop/computer. If you are using Apple iPads then there is an alternative method to transfer code.
3. Model how to drag and drop the hex file onto the micro:bit drive to transfer the code (yellow light flashing means it is working).
4. Allow pupils time to transfer their code.
5. Disconnect micro:bits from computers and attach a battery pack to check battery power (if animation appears then batteries need changing).
6. Make it clear that pupils must **NOT** start logging yet.
7. Power off or disconnect battery wire to save battery for now.
8. Demonstrate how to assemble the micro:bits, battery packs, micro:bit holders and straps using the video provided **but ask the class to leave the batteries unplugged for now.**
9. Model how to start/stop logging (press button A & B together) so they know what to do later.

NOTE: Pupils do not need to keep the same micro:bits that they have prepared at this point. They can be gathered up, powered off, and the code will stay on the micro:bit ready to use at morning breaktime.

However, once they have started recording their activity data at morning breaktime, pupils need to keep the same micro:bit to continue recording their data at lunchtime.

Session 3: Set up for fieldwork (10 min before break)

| Resources required | Prior learning | Before the session |
|---|--|--|
| <ul style="list-style-type: none"> • Pre-coded and pre-assembled micro:bits and battery packs on straps. | <p>Computing/ICT</p> <ul style="list-style-type: none"> • An understanding of how the micro:bit they are wearing works and that the accelerometer is being used while they are wearing it. | <ul style="list-style-type: none"> • If you need to recap how pupils position micro:bits on wrists then watch/share the how to use equipment video. It can be worn on either wrist. |

Support over break/lunch

If children have questions or problems with micro:bits while they are in the playground, let them know that they can help each other. Let the lunchtime supervisors know the activity is taking place and some pupils may ask for help reattaching a micro:bit strap that has come undone. Reassure pupils that if it stops logging for any reason the data is still saved until that point, so everyone should have some data to review afterwards.

Session details

Put on micro:bits before breaktime

Just before breaktime, attach micro:bits to either wrist.

Go through the checklist to make sure everyone is prepared

- Make sure you wear it with the logo facing upwards as you look at it.
- Make sure it is tight, wear it over cuff if more comfortable/secure.
- Push in the battery wire fully to turn it on.
- Ensure the micro:bit displays a small square or heart when turned on – if a battery animation appears then the batteries need changing.
- Remind pupils how to start and stop logging (pressing buttons A & B together).

- Explain the tick icon means they are logging and the square or heart icon means they are not logging



= Logging



or



= Not logging

- Make sure pupils know they can stop logging while in the toilets, just make sure to re-start afterwards.
- Remind pupils not to put them near water when washing hands.
- Ensure micro:bits are turned on and data logging has started as each pupil leaves the classroom.
- Remind pupils to enjoy breaktime as normal and move naturally while wearing the micro:bit.
- Stop** data logging when back in class.
- Restart** data logging when leaving the classroom for lunchtime.
- Stop** data logging when back in class.

NOTE:

The micro:bits can be removed from wrists after lunch **as long as pupils keep track of which micro:bit they were wearing** so they can use it for the next session, otherwise they won't get to view their own individual data. Alternatively, they can keep wearing them provided **data logging is turned off**.

Troubleshooting:

- Ensure battery pack wires are clicked in fully before beginning.
- If batteries die or the micro:bit is turned off, the data will remain on the micro:bit.
- If a skull appears on the display it means the data log is full, but pupils will still be able to view the data logged up until that point.

Session 4: Data analysis and recording (45 min)

| Resources required | Prior learning | Before the lesson |
|--|---|---|
| <ul style="list-style-type: none"> Pupils need to have the micro:bit they used to log their individual movement data. To view their data they will need one of the following: <ul style="list-style-type: none"> A computer (e.g. laptop or Chrome-book) and a micro:bit USB lead. An Android tablet with the micro:bit USB lead and an adaptor (support article with more detail for Android tablets). An Apple iPad with Bluetooth enabled and the micro:bit app (support article with more detail for Apple iPads). | <p>Maths</p> <ul style="list-style-type: none"> How to read data from tables, graphs and charts. <p>Computing/ICT</p> <ul style="list-style-type: none"> How to find the micro:bit drive when the USB lead is plugged in. | <ul style="list-style-type: none"> Log into the playground survey data upload tool and click on View class data in the Tracking our physical activity section. When your class start sending you data, your teacher view will update. <div> <p>Tracking our physical activity</p> <p>What types of activity do we do in the playground?</p> <p>BBC Teach guide View class data →</p> </div> |

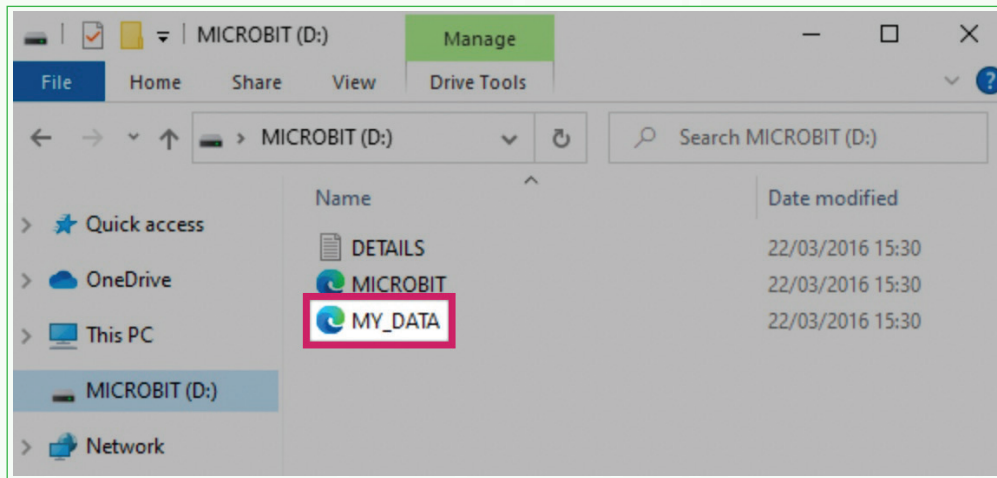
Differentiation

It may be helpful to group pupils in mixed ability pairs in order to share equipment and support discussion about the graphs.

Session details

View movement data (10 min)

- Ask pupils to attach the micro:bit they wore during break time and lunchtime to a computer/laptop using the USB data cable. If you are using Apple iPads or Android tablets then there are alternative methods, please see links in the resources section above.
- Pupils locate the micro:bit drive and double click on the MY_DATA file. This opens a web page where pupils can view graphs and tables showing their individual movement data. See image on next page.



3. At this point a prompt will appear on screen asking for the class code along with a note about consent and a 'Send' button. Ask the class to wait before clicking anything.
4. First, highlight that consent is needed and discuss why it is important. Ensure pupils know that clicking 'Send' will:
 - (a) transfer their data to the teacher view so the teacher can share all the combined class data
 - (b) submit their data to the BBC micro:bit playground survey UK-wide results.
5. Share the teacher view of the class data from the Playground survey data upload tool – this will enable you to share the class code on screen or you can refer to it on the class poster. Teachers will have received a class code when they first entered class details on the Playground survey data upload tool, but if you do not have this code, you can resubmit school details to receive a new one.
6. Pupils enter the code and press 'Send'.
Note: if a pupil does not want to send their data, they can still view it on screen when they close the dialogue box. The option to click 'Send' at a later point will then appear in the menu.
7. The teacher's class view on the data upload tool shows the number of pupils submissions so a teacher can easily see if everyone has submitted their data or not. This page also lets teachers confirm immediate submission of class data to the BBC micro:bit playground survey.
(All class data will be automatically submitted on the closing date of 31st July 2024)

Explore data and discuss findings (35 min)

1. **Write up the key questions:**
 - *What types of activities do we do in our school playground?*
 - *How accurate is the data?*
2. Encourage pupils to **think about how they spent their break/lunch times** and challenge them to identify specific activities or movements on the graphs.
3. **Compare the graphs** and check if they match.
4. **Explore some of the questions below.** You could have a whole class discussion or ask pupils to work in pairs and make notes.

Suggested questions:

1. *How long were you in the playground logging movement?*
2. *Does your data look different at different parts of the break/lunchtime?*
3. *Does the graph reflect the different types of activity you did while you were in the playground?*

Analysing estimated activities:

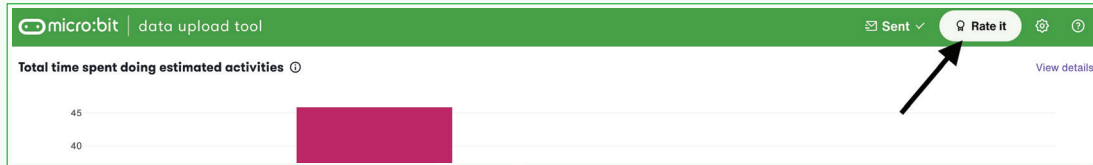
4. *What estimated activity did the micro:bit detect most? Does this seem accurate?*
5. *Are the estimated activities over time accurate?*
6. *Discuss why the machine learning estimated activities may not be accurate – this can be explored in more detail in the next session: Exploring machine learning.*

Analysing movement levels:

7. *Did your movement register at different movement levels?*
8. *Which movement level did the micro:bit detect the most? Can you tell if this was accurate?*
9. *Are the movement levels over time accurate?*

5. Rate data accuracy

Once pupils have spent time analysing their data, highlight the Rate it button and ask them to use it to evaluate the accuracy of their data.



6. Share the class data collated on the teacher's view of the data upload tool and discuss:

Has everyone sent their data to the class view?

Does the graph show different estimated activities/movement levels in the playground?

What can you tell from the graph? Did the class spend time on activities at each movement level?

Could someone else with this data tell what activities the class were doing when?

7. Link back to what we wanted to find out:

What types of activities do we do in our school playground? How accurate is the data?

Using data in other lessons:

If you would like to use individual pupil data for lessons on data handling or statistics, export data as a table, or save images of the graphs.

Click on View details to the right of each graph you want to download, then choose to download the image of the data, or download the data in a table (csv file) which can be opened in a spreadsheet.

Bar charts can also be viewed as pie charts by changing chart type in the drop-down menu in the detailed view.

Downloading or copying the *Movement level over time* graph and annotating it with the exact activities pupils were doing while in the playground is an ideal way to evaluate the data. Pupils could paste the image into a document or slide and add notes.