Lesson Plan

Lesson 2: Introduction to ML

**Ages:** 7 – 14

**Programming language:** MakeCode (in micro:bit CreateAI)

**Topics**: AI literacy: Human role in AI design, collecting training data, testing ML models, iterating ML models, how machines learn.

## Overview

This lesson introduces you and your students to ML (machine learning). Beginning by collecting data from two different kinds of movement – walking and jumping – students will train and test an ML model. They will use existing code and modify it to create a program which they will download and test on their BBC micro:bit.

## Learning objectives

* I can collect data, and train and test a machine learning (ML) model to react to different kinds of movements.
* I can describe that an ML model matches new data to types of data it has been trained on.
* I know that an ML model can only match movements it has been trained on.

# Preparation: before the lesson

### What you need

* You may find the video on <https://createai.microbit.org/> useful to understand more about how micro:bit CreateAI works. It is a free online tool for using AI with code on the micro:bit.
* Advanced users can find more detailed information in the User guide. <https://microbit.org/get-started/user-guide/microbit-createai/>
* A PowerPoint slide presentation is included with this download.
* Optional: print out the micro:bit CreateAI glossary for your classroom: <https://microbit.org/teach/classroom-resources/microbit-createai-glossary/>The glossary includes explanations of core terms used in micro:bit CreateAI.

### Equipment needed per pair of students

* A computer (laptop, Chromebook, or desktop) with Chrome or Edge web browsers and access to <https://createai.microbit.org/> (iPads and Android tablets are not currently supported).
* One micro:bit V2 per pair – if Bluetooth is not enabled on the computers, you will need one extra micro:bit V2 per pair.
* One battery pack and USB cable per pair.
* Optional: micro:bit wearable / wrist strap or other way of attaching the micro:bit to your wrist or ankle.

### ML content

In advance of the lesson, familiarise yourself with the following:

* Watch the four videos embedded in the presentation on slides 3, 7, 9 & 11.
* Read slides 8, 10 & 12. Ideally demonstrate the steps for the students.
* Create a project – note, for walking and jumping students need to train and test the micro:bit on the same hand or leg AND in the same orientation. When recording samples for the ‘still’ action, students need to hold their micro:bits still but in different positions, for example, upright, and facing left and right.

### Decide how to deliver

* Play the videos, or demonstrate, or both.
* Consider whether to deliver the content in one or two lessons. A suggested break is after slide 10, after training and testing ML models but before coding:
  + If you would like to deliver the content across two lessons, students need to click ‘save’ and download their HEX file to somewhere they and you can find it in the next session.
  + At the start of the next session, go to the CreateAI homepage – <https://createai.microbit.org/new> and click the ‘Continue a saved session’ button. Then click ‘Train model’. Locate their saved HEX file. There is no need to connect the data collection micro:bit again.
  + If students use the same micro:bit that they used for data collection, the data collection HEX file will be replaced with their micro:bit AI project: data, the model and code.

### Decide if you are going to deliver the Extend activity

* Look at the optional extend activity on slide 13 which may suit older students.

# Teaching: during the lesson

## Lesson structure

|  |  |  |
| --- | --- | --- |
| **Slide number** | **Focus** | **Teacher/student led** |
| **2** | Learning objectives | Teacher/student-led |
| **3** | What is ML? | Teacher-led  Class discussion |
| **4** | Types of AI | Teacher-led |
| **5** | micro:bit CreateAI | Teacher-led |
| **6** | Machine learning model | Teacher-led |
| **7-8** | Collecting and labelling data | Teacher-led/student-led |
| **9-10** | Training and testing ML models | Teacher/student-led |
| *Break here if content delivered across two sessions* | | |
| **11-12** | Using ML models in MakeCode | Teacher/student-led |
| **Optional 13** | Extend - Improve your model | Student-led |
| **14** | Reflect on your learning | Teacher/student-led |
| **15** | Look ahead... |  |

# Assessment: after the lesson

Here are some questions which you might want to include when assessing your students:

* Describe what ML is (check that human qualities are not used to describe ML).
* Name a technology that incorporates the use of ML.
* Describe how to collect, train, and test a machine learning (ML) model to react to different kinds of movements.

Explore the [simple AI exercise timer project](https://microbit.org/projects/make-it-code-it/simple-ai-exercise-timer/) and other [micro:bit CreateAI projects](https://microbit.org/projects/make-it-code-it/?filters=bd4c25b7-652b-4d0d-94c8-9815d8f32cf4).