

# Hardware and Software

Ages: 11-14

Length: 1 hour

Equipment: PDF print out

## Introduction

This lesson introduces the relevant words; **hardware** and **software** through activities that link to student's lives to help them relate to the concepts introduced.

<b>Curriculum Alignment</b>	<ul style="list-style-type: none"><li>• UK National Curriculum Computing Key Stage 3</li></ul>
<b>Learning Objective</b>	<ul style="list-style-type: none"><li>• To describe the difference between hardware and software</li><li>• To demonstrate the use of simulation software</li><li>• To recognise the link between sensors and software</li></ul>
<b>Keywords</b>	<ul style="list-style-type: none"><li>• Hardware</li><li>• Software</li><li>• Sensor</li></ul>
<b>Resources</b>	<ul style="list-style-type: none"><li>• MiRo Lesson – Hardware and Software – Student tasks</li></ul>
<b>Lesson Sections</b>	<ul style="list-style-type: none"><li>• Setting the Scene</li><li>• Activity 1 – Hardware and Software</li><li>• Activity 2 – MiRo simulator vs MiRo Robot</li><li>• Summary</li></ul>

## Setting the Scene

Can you tell the difference between hardware and software?

We rely on both in all computer systems around us.

Concept	How it is used
<p>Hardware is anything you <b>can</b> touch within a computer system.</p> <p>Software is anything you <b>cannot</b> touch within a computer system.</p> <p><i>Can you name one piece of software and one piece of hardware you have used?</i></p>	<p>Computer systems are all around us and made up of hardware components.</p> <p>The software is a series of instructions that allow the user to interact with the computing hardware.</p>

Computing systems are all around you from, washing machines to mobile phones. They all contain hardware and software.

First let us look at what **hardware** and **software** is.

## Scenario

The scenario below is focused on getting students to think about what **hardware** and **software** is and relate this to their everyday tasks.

Scenario 1	Scenario 2
<p>You have a mobile phone.</p> <ul style="list-style-type: none"><li>• What can you touch – the hardware?</li><li>• How do you interact with the hardware – software?</li></ul>	<p>You have a games console.</p> <ul style="list-style-type: none"><li>• What can you touch – the hardware?</li><li>• How do you interact with the hardware – software?</li></ul>

What technology devices do you use daily?

## Small Group Activities

Split the students into small groups of 3 or partners, and give them a list of tasks (either the simple tasks below or of your choice).

### Activity 1

Create a drawing of a device, labelling hardware components. The aim is to understand the many different components that are built into an everyday computing device they interact with.

- Consider a mobile phone or smart watch.
- Draw out the device.
- Label the hardware components you can see.
- Can you think of a new piece of hardware that could be added to the device?

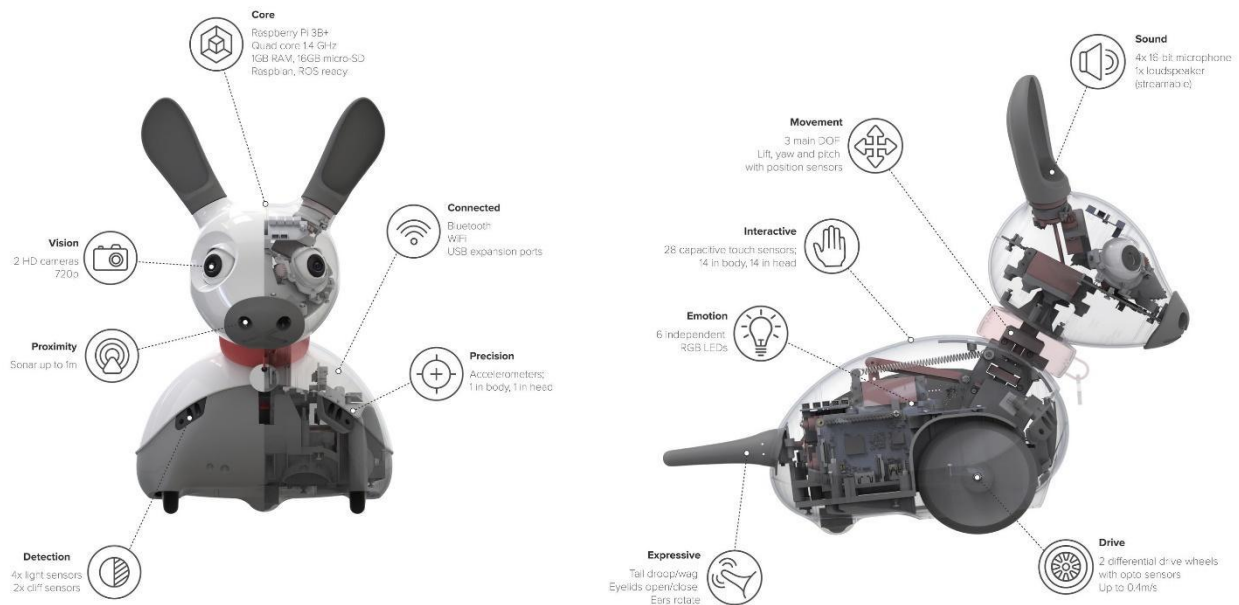
### Activity 2 – MiRo Software

Students look at the software MiRoCode and look at the icons given to create their own fact file document of what they mean and what is contained within the icon. The aim is to understand that the software contains direct programming to allow it to function as expected.

### Activity 3 – MiRo Hardware

MiRo-E is a highly specified, flexible, programmable AI robotic platform, developed to mimic familiar domestic animal-like behaviour.

MiRo-E is jam-packed with a wide range of sensors, significant degrees of freedom of which many provide MiRo-E's excellent expressive communication abilities. A Raspberry Pi 3B+ core provides a familiar and versatile base for coders of all ages!



MiRo-E is programmed to react to humans and to other MiRo's through recognition, movement, sound and light. It is autonomous in demonstration / pastoral care mode. It responds to touch, stroking and sound.

MiRo-E arrives with the required software loaded, and the software is frequently updated by the development team. MiRoCODE allows students to code to program MiRo-E.

**Students have two worksheets:**

- 1. label the diagram of MiRo – draw the icons and label what each part of MiRo does**
- 2. label the icons – what does each icon mean?**

### Differentiation

- If pupils need extra support, working together can aid brainstorming and development of ideas.
- For higher ability pupils ask them to consider a new device that has not been invented and what hardware and software would be combined.

How can we get MiRo to use the hardware and the software combined?

We are going to create a program for MiRo to react via its sensors.

Predict what will happen:

```
Program Start
Wait for body touch
Raise/Lower Head Lower
Turn MiRo one full turn to the left
```

```
Program Start
repeat while not Body Touch sensor 1
do Move Both Ear(s) to face Outwards
Start Wagging Tail Fastest
Wait for 2 Seconds
```

```
Program Start
Periodic Control Loop
do if Any Body Touch
do Start Wagging Tail Fastest
Wait for 0.1 Seconds
Stop Wagging Tail
```

What sensors did MiRo have?

Remember there is no fail in computing only debugging, fixing and learning!



## Summary

Have a discussion with the class about what they have learnt in the lesson. Discuss the new words learnt **hardware and software** and talk through any difficulties they had.

Ask students to complete the self-assessment and can be done by thumbs up, down and centre or using the images; on the following 3 questions

Questions
Can you describe the difference between hardware and software?
Can you demonstrate the use of simulation software?
Can you recognise the link between sensors and software?