

Loops

Ages: 7-11

Length: 1 hour

Equipment: PDF print out

Introduction

This lesson introduces the relevant words; **Loops** and **Repetition** through activities that link to student's lives to help them relate to the concepts introduced. This lesson will build upon prior learning relating to algorithms.

Curriculum Alignment	✔ UK National Curriculum Computing Key Stage 2
Learning Objective	✔ To identify how to use a loop in a set of instructions ✔ To demonstrate how loops can be used in a robotic system
Keywords	✔ Repetition ✔ Loops
Resources	✔ Paper and pens
Lesson Sections	✔ Setting the Scene ✔ Activity 1 – Identifying where to add a loop ✔ Activity 2 – MiRo simulator ✔ Summary

Setting the Scene

How do we repeat the code we create?

We can save time by using loops instead of retyping it.

Concept	How it is used
A part of the program that can continuously run the code inside until it is stopped, or the condition of the loop is met. <i>Can you think of any types of loop you know about?</i>	When code is written you may have sections of the code that are repeated, this is where loops come in. Loops can save time as you do not need to type the same code every time it is required.

There are different types of **loops** available to a programmer and selecting the correct one is essential for a working program.

First let us look at what a **loop** is.

Activity 1

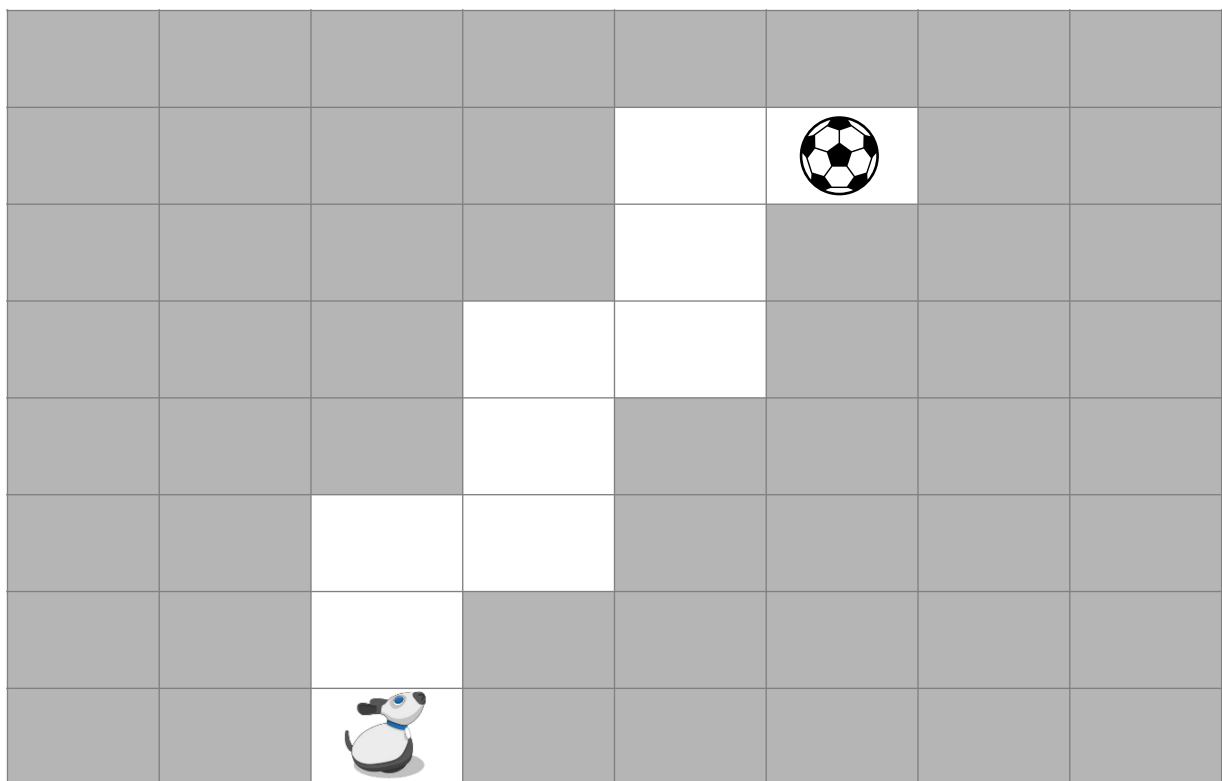
Activity 1 is focused on getting students to think about what a **loop** is and relate this to their everyday tasks.

Scenario 1	Scenario 2
<p>You need to brush your teeth and given the following instructions:</p> <ul style="list-style-type: none">👉 Brush up and down👉 You have a loop given here that states – repeat for 2 minutes.	<p>You are competing in a track event on sports day.</p> <ul style="list-style-type: none">👉 You need to run the circuit👉 You have a loop with a set amount of times to run.

Where else have you used 'loops' in your life?

Whole Class Activity

Explain to the group that they need to write the instructions to get MiRo to the football.



Whole Class Activity Answers

Option 1 - <u>No Loop</u>	Option 2 - <u>Loop</u>
<p>Forward x2 Right x 1 Forward x2 Right x1 Forward x2 Right x1</p>	<p>Repeat 3 times: Forward x2 Right x 1</p>

Repetition – is the use of loops as you are repeating the code within it.

There are different types of loops:

- 👉 **Forever loop** – the code is run continuously until they are stopped
- 👉 **Repeat [set amount of times] loop** – the code within is run the amount of times set on the loop.
- 👉 **Repeat while** – the code is run 'while' a condition is being met
- 👉 **Repeat 'until'** – the code is run 'until' a condition is met

Small Group Activity

Split the students into small groups and give them a blank piece of paper.

In your group, I want you to follow these instructions to draw a shape.

*Draw a 5cm straight line
Turn 90 degrees to the right
Draw a 5cm straight line
Turn 90 degrees to the right
Draw a 5cm straight line
Turn 90 degrees to the right
Draw a 5cm straight line
Turn 90 degrees to the right*

Encourage discussion in the groups.

Ask how could these instructions be simplified using a loop?

Repeat 4 times:

*Draw a 5cm straight line
Turn 90 degrees to the right*

* Notice the indent and for higher ability pupils this would be used in writing the code correctly.

Extension Solution

For higher ability pupils ask them to look again at the MiRo to the bone task and how an 'until' loop could be used. How did they complete the task?



- 👉 Could you complete the remaining squares by saying repeat the pattern a set amount of times? This is a repeat [set amount of times] loop.

For higher ability pupils ask them to look again at the MiRo to the bone task and how an 'until' loop could be used. How did they complete the task? Colour the first red, the second green, the third yellow and fourth blue.

Activity 2

How do we work out how many times the loop should run?

Example answer...

Can you write some instructions out for the algorithm to blink below?

Algorithm for nodding: Repeat 3 times Close eyelids Wait 1 second Open eyelids Wait 1 second	Algorithm for blinking: Repeat 3 times Lift head up Wait 1 second Lift head down Wait 1 second
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Students are now guided step by step on how to create the algorithm above, this may change due to what they have written.

Students are guided to create + run an algorithm to get MiRo to blink and twitch ears.

For advanced students, the **Step-by-Step** guide can be left off and they can work their way through the steps on their own.

Activity 2 - Program solution - Wait for Clap

NB. There can be more than one solution in programming, encourage experimentation and use solution below as a guide

Step 1-5

- 👉 Add 'program start' from 'Setup'
- 👉 Add 1 x wait for clap block
- 👉 Add 1 x repeat 10 times block
- 👉 Add 1 x move left ear(s) to face forwards block
- 👉 Set block to 'both' on the first dropdown menu

** The wait for clap block adds interactivity to the program and the program will not run until a clap is heard on the physical MiRo or simulated on MiRoCODE.

** The repeat loop is default to 10 but can be experimented with when the program is constructed to observe the effect.

** For higher ability pupils, there is the opportunity to look at the block to move the direction of the ear and see that two could be added to control one ear at a time.

Step 6-11

- 👉 Add 1 x wait block
- 👉 Set the number of seconds to '0.1'
- 👉 Add 1 x move left ear(s) to face forwards block
- 👉 Set block to 'both' on the first dropdown menu
- 👉 Set block to 'outwards' on the second dropdown menu
- 👉 Add 1 x wait block
- 👉 Set the number of seconds to '0.1'

** The wait block allows the program time to execute the first ear move before executing the next instruction to turn it the other way.

Step 12

- 👉 Click Simulator Play OR
- 👉 Click Robot play

** If you are using the physical MiRo ensure the IP address is correctly added to the onscreen code to allow the code to be communicated to MiRo to action.

** If you are using the simulator it is recommended to zoom in to see MiRo clearly but not essential

Activity 2 - Program solution - Clap for Set Time

Step 1-7

- 👉 Add 'program start' from 'Setup'
- 👉 Add 1 x wait for clap block
- 👉 Add 1 x repeat while block
- 👉 Add 1 x clap detected in previous 2 seconds block
- 👉 Add 1 x Raise/Lower Head [raise] block
- 👉 Add 1 x wait block
- 👉 Set the number of seconds to '0.1'

** the 'clap' will activate the program and the contents of the while loop will continue for two seconds after the 'clap' was detected.

** This will simulate a reaction to the sound of the clap with MiRo raising its head for 0.1 seconds

Step 8-15

- 👉 Add 1 x move left Ear(s) to face (forwards) block
- 👉 Set the block to 'both' and 'outwards' on the drop-down menus
- 👉 Add 1 x wait blocks
- 👉 Set the number of seconds to '0.1'
- 👉 Add 1 x Raise/Lower Head [raise] block
- 👉 Set the head to raise to 'middle' on the drop-down menu
- 👉 Add 1 x wait blocks
- 👉 Set the number of seconds to '0.1'

**By placing additional code outside the while loop, the program will action these instructions when 2 seconds has elapsed. This will simulate MiRo's head returning to its normal place after reacting to the 'clap' sound.

** If you are using the simulator it is recommended to zoom in to see MiRo clearly but not essential

Extension

** By asking the pupil's to switch the view to look at the python code it offers the opportunity to narrate any aspects that they can link with the blocks they have used.

Summary

Have a discussion with the class about what they have learnt in the lesson. Discuss the new words learnt loop and repetition 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 identify how to use a loop to a set of instructions?

Can you describe how loops can be used?

Can you create a program using loops to control MiRo in MiRoSIM?