

Lesson 5

The Secret Code

Overview

Lesson 5 will introduce the concept of sequencing in the context of Morse Code communication. Students will design sequential algorithms to code and decode Morse Code through the built-in LED bulbs in mBot. First, students will learn the meaning of sequencing. Students will explore the use of Morse Code and learn to create a piece of message based on the rules of Morse Code communication.

Objectives

By the end of class, students will be able to...

- Use appropriate programming scripts to make a Morse Code message that makes sense to others;
- Demonstrate the understanding of the sequence that well-defined sequential algorithms affect the execution of programs.

Materials

- mBot
- mBlock
- Lesson 5 Activity Sheet
- Lesson 5 Slideshow

Content Standards

Type	Indicator	Standard
ISTE	1d	Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences.
	3c, 3d	Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others.
	6a, 6d	Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals.
CSTA	1B-NI-04	Model how information is broken down into smaller pieces, transmitted as packets through multiple devices over networks and the Internet, and reassembled at the destination.
	1B-DA-07	Use data to highlight or propose cause-and-effect relationships, predict outcomes, or communicate an idea.
	1B-AP-10	Create programs that include sequences, events, loops, and conditionals.
	1B-AP-11	Decompose (break down) problems into smaller, manageable subproblems to facilitate the program development process.
	1B-IC-18	Discuss computing technologies that have changed the world, and express how those technologies influence, and are influenced by, cultural practices.



Vocabulary

Term	Definition
Morse Code*	Uses short and long sound or light signals to represent a specific English letter according to a set of rules.
Sequencing*	A set of ordered steps for accomplishing a task.
LED	Stands for Light Emitting Diode and is a type of light.

* New term



Pre-lesson Checklist

- Print out and/or digitally distribute the Lesson 5 Activity Sheet.
 - If students will paper versions of activity sheets, make sure the resources are easily available for students. This can be done by providing the links on your LMS, etc., or printing the resources out for each group to utilize during the class.
- Make sure any necessary computer equipment is ready to go.
- Familiarize yourself with key points and notes detailed within this lesson plan and Lesson 5 slideshow.
- Here below is the International Morse Code Communication for reference:
 1. The length of a dot is one unit.
 2. A dash is three units.
 3. The space between parts of the same letter is one unit.
 4. The space between letters is three units.
 5. The space between words is seven units.

A ● ■■■
 B ■■■ ● ● ●
 C ■■■ ● ■■■ ●
 D ■■■ ● ●
 E ●
 F ● ● ■■■ ●
 G ■■■ ■■■ ●
 H ● ● ● ●
 I ● ●
 J ● ■■■ ■■■ ■■■
 K ■■■ ● ■■■
 L ● ■■■ ● ●
 M ■■■ ■■■
 N ■■■ ●
 O ■■■ ■■■ ■■■
 P ● ■■■ ■■■ ●
 Q ■■■ ■■■ ● ■■■
 R ● ■■■ ●
 S ● ● ●
 T ■■■

U ● ● ■■■
 V ● ● ● ■■■
 W ● ■■■ ■■■
 X ■■■ ● ● ■■■
 Y ■■■ ● ■■■ ■■■
 Z ■■■ ■■■ ● ●

1 ● ■■■ ■■■ ■■■ ■■■
 2 ● ● ■■■ ■■■ ■■■
 3 ● ● ● ■■■ ■■■
 4 ● ● ● ● ■■■
 5 ● ● ● ● ●
 6 ■■■ ● ● ● ●
 7 ■■■ ■■■ ● ● ●
 8 ■■■ ■■■ ■■■ ● ●
 9 ■■■ ■■■ ■■■ ■■■ ●
 0 ■■■ ■■■ ■■■ ■■■ ■■■

**Agenda (60 minutes)**

Time Interval	Content
5 minutes	Warm Up This phase aims to introduce the Morse Code communication. Students will discuss the means they would use to call for help.
15 minutes	Phase 1 In this phase, students will be introduced to the concept of sequencing. Students need to understand the logical order of programming scripts.
15 minutes	Phase 2 In this phase, students will create Morse Code messages to represent English letters through built-in LED bulbs. They will also deliver some common call-for-help messages such as “SOS” or “HELP”.
15 minutes	Practice Students will try to create a bit longer and complex Morse Code message to communicate with their partner(s).
5 minutes	Wrap Up
5 minutes	Clean Up

 Activities**Warm Up: Slides 2-4**
[5 minutes]**Objectives:**

- This phase aims to introduce the Morse Code communication. Students will discuss the means they would use to call for help.

Procedures:**Slide 2**

- Show Slide 2 to inform the class about the agenda and tasks in this lesson.

Slide 4

- Have students discuss the ways of calling for help:
 - Let students talk about what they would do if they need helps from someone in an everyday context.
 - Ask students to consider the following situation:
 - *"What would you do if they need helps in ...:*
 - *"the unknown street;*
 - *"the desert;*
 - *"the forest;*
 - *"an isolated island;*
 - *"the sea; etc."*
 - Encourage them to brainstorm the possible means.

Phase 1: Slides 5-8
[10 minutes]**Objectives:**

- In this phase, students will be introduced to the concept of sequencing. Students need to understand the logical order of programming scripts.

Procedures:**Slides 6-7**

- Explain the concept of sequencing.
 - Use real-life examples to illustrate the sequencing.
 - The slideshow uses the example of putting a watermelon into the fridge to demonstrate the meaning of sequencing.
 - However, you are welcome to use any other real-life example that you think is appropriate to facilitate students' understanding of sequencing.

Slide 8

- Have students discuss the use of sequencing in real life, for example:
 - Still use the example of putting the watermelon in the fridge:
 - *"What if we did not follow the three steps, what would happen?"*
 - *"Do you know anything that the sequence should not change (otherwise it leads to different results)?"*

Phase 2: Slides 9-15 [20 minutes]

Objectives:

- In this phase, students will create Morse Code messages to represent English letters through built-in LED bulbs. They will also deliver some common call-for-help messages such as “SOS” or “HELP”.

Procedures:

Slide 10

- Briefly introduce the historical background of Morse Code.

Slide 11

- Show a video clip to provide a demonstration on Morse Code further.
 - Due to the copyright, the slideshow cannot provide the video clip.
 - However, a recommended source is indicated in this slide which is available from: <https://study.com/academy/lesson/morse-code-lesson-for-kids-history-alphabet-facts.html>.

Slides 12-14

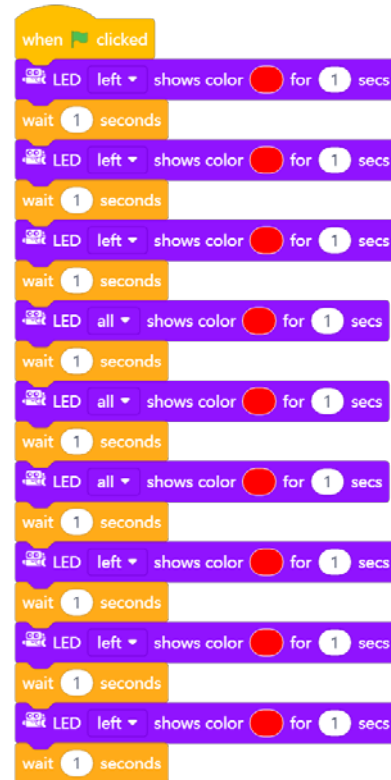
- Instruct students to refer to the glossary of Morse Code in the activity sheet.
- Show Slide 14 to indicate the rules of using LED signals to represent the Morse Code.
 - Remind students that they can change the color of the LED as an indicator of a break.
 - The meaning of the light signals depends upon the display seconds.

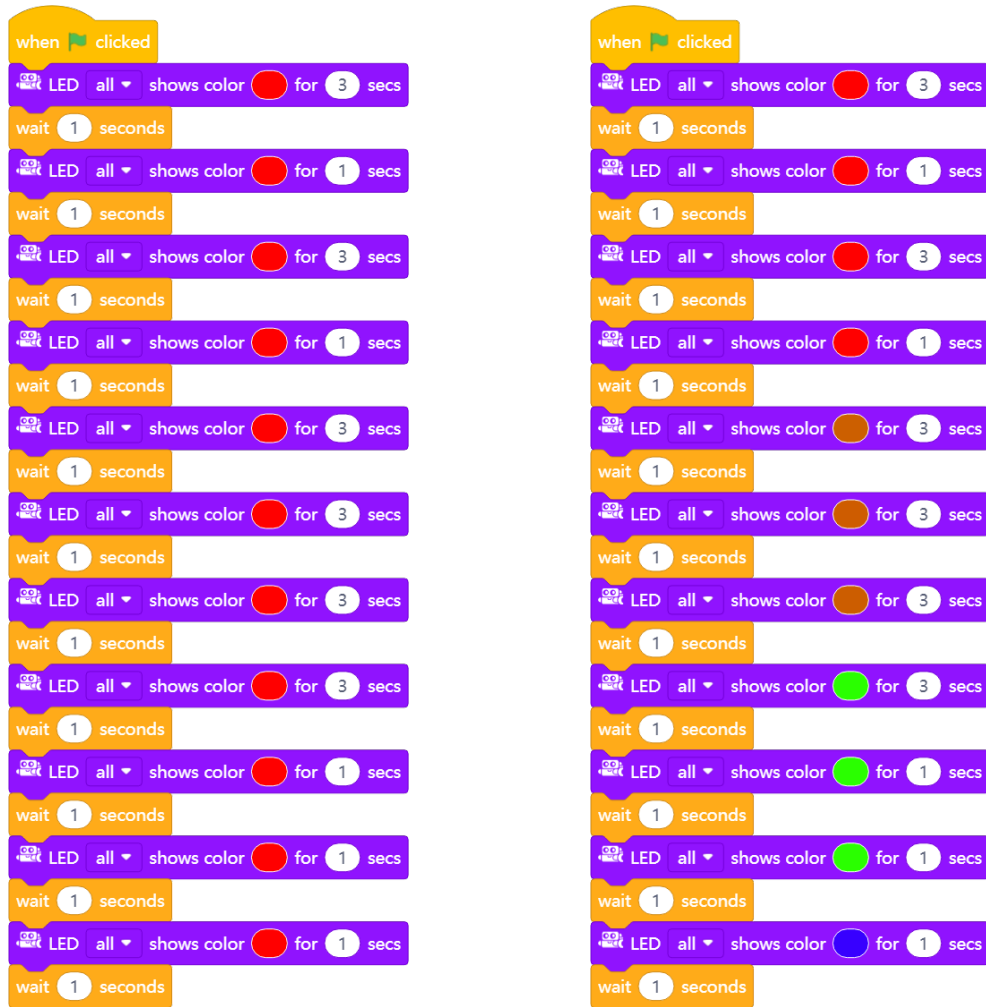
Slide 15

- Instruct students to create some simple messages that combine several letters, for example:
 - SOS: S – dot, dot, dot; O – dash, dash, dash; S – dot, dot, dot
 - CODE: C – dash, dot, dash, dot; O – dash, dash, dash; D – dash, dot, dot; E – dot
 - HELP: H – dot, dot, dot, dot; E – dot; L – dot, dash, dot, dot; P – dot, dash, dash, dot



SOS





CODE

- **Differentiation:**
- Encourage students to reflect on the light signals.
 - For example, run and test the program in mBot, observe whether it is easy to recognize and make sense or not. If not, how is it possible to modify.
 - Possible Solution 1: Use lighting up one bulb to represent the dot, and lighting up two bulbs to represent the dash. Control the display second at the same time. (Please refer to the “SOS” program on the right)
 - Possible Solution 2: Use different colors to indicate the break between the two letters.

Practice: Slides 16-21 [15 minutes]

Objectives:

- Students will try to create a bit longer and complex Morse Code message to communicate with their partner(s).

Procedures:

Slide 17

- Instruct students to work in pairs and code a Morse Code message. Have the partners guess what the light signals try to say.

- Remind students that they may need a bit longer waiting time between the two light signals if it would be too fast to record the signals.
- Encourage students to try and use different modes of Morse Code representation – for example, use the buzzer in mBot to produce sound signals.

Slide 18

- After they have experienced the translation of Morse Code, instruct students to reflect on the coursework and discuss the importance of the sequence of light signals.

Slide 20

- Summarize the key features in the understanding of sequencing.

Wrap Up & Clean Up
[10 minutes]