Loop

Overview

Concept Explanation	**Forever**——Repeat over and over again **Repeat（）times**——Repeat specific times Example：Walk, Breathe, Brush teeth, Sunrise, Sunset, etc.
Learning Objectives	1. Understand the concept of Loop； 2. Distinguish between Counting Loop and Infinite Loop; 3. Design animations using counting loops and infinite loops.
Teaching Preparation	1. A whiteboard and a whiteboard marker (or you can use a blackboard and chalks); 2. One Codey and a Bluetooth dongle (or the USB cable) for each student but it's fine if 2 or 3 students share one set; 3. A computer with installed mBlock 5 per student, but it's fine if 2 or 3 students share a computer; 4. Hand out a self-review report and a project report for each student.
Time Frame	60-90min

Teaching Procedure

Step 1：Review - Sequencing

Review：

- What is **Sequencing**?
- Can students think of any cases of sequencing in everyday lives?
- What are **Bug** and **Debug**?
- How to find bugs?

Sequencing refers to a set of steps for accomplishing a task. For example, putting the watermelon in the refrigerator, brushing teeth, washing hair, etc.

Bugs are the mistakes that cause the failure of a computer program to run as programmed. **Debug** is a process of finding bugs and fixing them. To find bugs, we need to go over the programs from top to bottom.

Step 2：Explain New Knowledge - Loop

To make our environments better, sanitation workers are going to plant trees alongside the pavement. The exact steps to plant a tree are: dig a hole, put down a sapling, cover it with soil and move forward 5 meters to plant another tree. If the road is 20 meters in length, then sanitation workers will have to repeat the same sequence of steps four times.

In computer programs, we sometimes use counting loops to repeat the piece of codes a specific number of times. On other occasions, the loop might be forever, or in other words, having no terminating conditions. In everyday life, infinite loops are happening around us, like sunset and sunrise. Similarly, when writing programs, we use the **forever** blocks to run the piece of codes endlessly.

Loop and **Repeat** have the same meaning. If you repeat doing something, you are performing a loop. Ask students if they can think of any repetitive behaviors and how many times they repeat. Teachers can give cues here: brush teeth, two times each day; breathe, forever.

Step 3：Lead-in Game – Tap to the beat

Game Rule:

1. The letter A represents tapping the table with the left hand; B represents tapping the table with the right hand; C represents tapping the table with both hands. Tap the table by following the beats below:

ABABABC ABABABC

Chaos might ensue when students are required to tap the table at a rapid speed. In this case, we suggest that teachers ask students if it's necessary to make the process smoother by simplifying the beats. Simplify the beats to be：

ABABABC Repeat two times

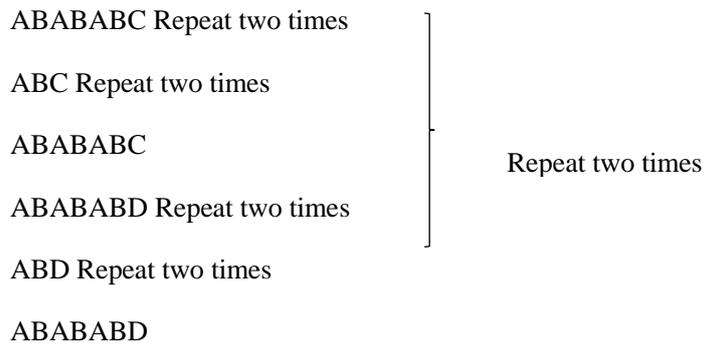2. What if we introduce another beat? Add an action, D for clapping the hands:

ABABABC ABABABC ABCABC ABABABC

ABABABD ABABABD ABDABD ABABABD

ABABABC ABABABC ABCABC ABABABC

ABABABD ABABABD ABDABD ABABABD

Simplify the beats：

ABABABC Repeat two times

ABC Repeat two times

ABABABC

ABABABD Repeat two times   Repeat two times

ABD Repeat two times

ABABABD

Tips：

1. Teachers write beats on the blackboard and can mark the beats while working with students to figure out the rules;

2. Make sure the beats are simple if you are to design the rhythm yourself. Also, don't make the game too long, or otherwise students might lose interest soon.

Step 4： **Student Activity**

When writing programs, we often use the **Repeat** blocks to make our programs neat. They can save us from dragging the same block over and over again. With the Repeat blocks, Codey Rocky can perform the same sequence of instructions repeatedly. When the Repeat block is executed once, we count it as one cycle or one iteration.

The repeat can be forever or happens specific times. For instance, we brush our teeth twice or three times a day while the sunrise and the sunset happen around us endlessly. The two different loops blocks are as follows:
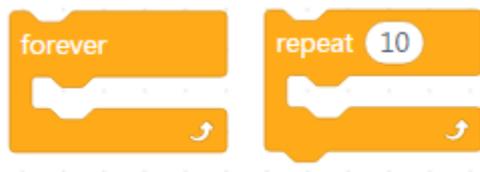
Ask students a question: what is the difference between **forever** and **repeat ( ) times**. Direct the attention of students to one fact: the **forever** block has no bump at the bottom that enables it to interlock other blocks. The forever block is designed to repeat the codes endlessly, so we can't affix other blocks to it.

Task 1：The Steamed Bread Can't Jump

Story: The steamed bread is persisting in learning how to jumping up. It tried many times but failed to make it. Teachers show the animation of a steamed bread failing to jump and demonstrate how to make the animation. Next, it's time for students to work on their animations in the same way as teachers do. Sample project: *The Steamed Bread Can't Jump*
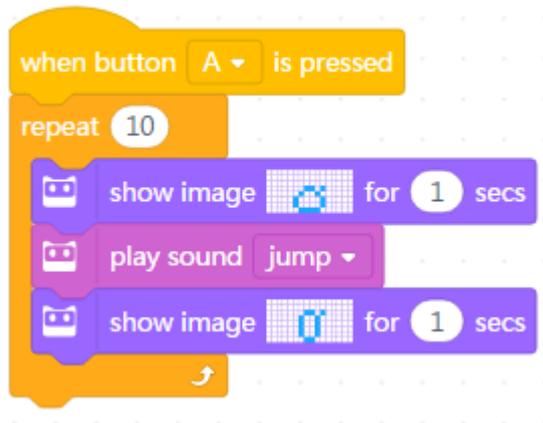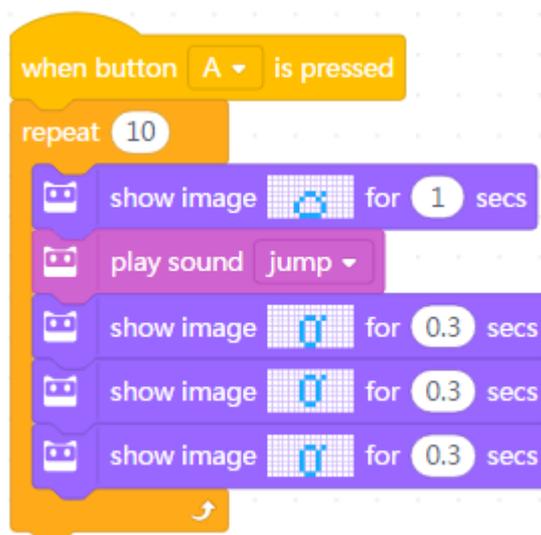

Program Story:

The steamed bread wants to jump up. It tried ten times but still can't make it.

Task 2：The Jumping Steamed Bread

Story: One day, the steamed bread finally knows how to jump. It keeps hopping and can go anywhere it likes. Have student design a program *The Jumping Steamed Bread* using **forever** blocks. Teachers can refer to the sample project: The Jumping Steamed Bread (Not recommended to show it to students too soon. Have them practice by themselves first).

Program Story：

The steamed bread is finally off the ground and keeps bouncing;

Each bounce comes with a sound;

The program will be executed endlessly.

Challenge：Use another event **"when Codey is shaking"**

Task 3：**DIY Project**

Students work in pairs to design animations using infinite loops or counting loops. They need to present their works but should complete the project report first. Students should display their works by following the questions from the report.

Tips：

1. If students have enough time and are quick learners, tell them to design animations using multiple counting loops or nested loops.

2. Teachers can tailor the time limit according to teaching purposes and the personality of the class. Recommended time: 20 min.

Extensions：

1. Design different animations: triggered by different events(buttons) and made up by a combination of counting loops and infinite loops;

2. Add a mix of sounds and RGB LED effects to make your animation emotional,

 for example:
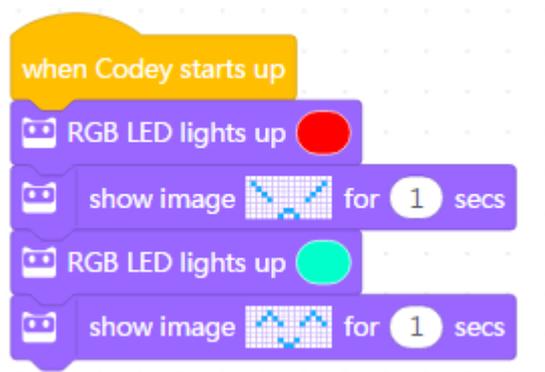
Step 5：Wrap up

Describe what the concept of **Loop** refers to. Loop means that the machine repeats pieces of codes endlessly or a specific number of times.

Students complete the self-review report.

Self-review Report

Name：   **Age**：

- Answer the following questions and record your outcome：

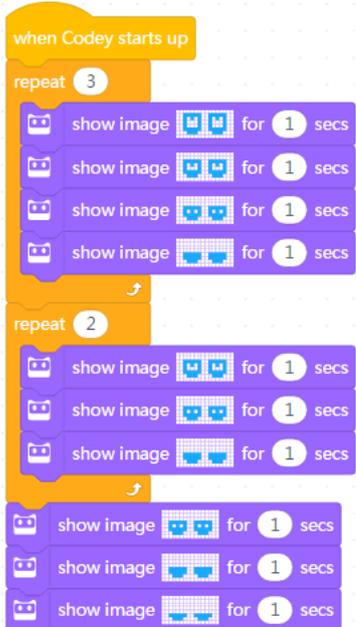Describe what you've learned with one or two sentences.

Describe what you like most and least about this class session briefly

What I like most
What I like least

Draw a Counting Loop and an Infinite Loop that happened around you today：

Counting Loop	Infinite Loop

Tell us a brief story（Describe how the following codes run from top to bottom）

	When Codey is shaking,

when Codey starts up
repeat 3
  show image for 1 secs
  show image for 1 secs
  show image for 1 secs
  show image for 1 secs
repeat 2
  show image for 1 secs
  show image for 1 secs
  show image for 1 secs
show image for 1 secs
show image for 1 secs
show image for 1 secs	

You can paint how you feel about this class session in the upper right corner of the self-review report.

Project Report

Name：   **Group Name：**

- Follow these questions to present your work and you need to give your answers during the presentation.

What tasks did you take on? Describe it in one or two sentences.

Did you have any ideas on how to fulfill the tasks?

Write down or draw every single bit of inspiration, being it good or bad. You are doing this to explore more possibilities. Use more papers to record your ideas as you like.

Describe the final effect of your project and why you choose the effect in one or two sentences

Effect
Example：When button A pressed, the steamed bread bounces ten times.

Why you choose this (these) effect?
Example：It's funny and it's easy to design steamed bread.

Did you come across any obstacles? Did you have any solutions? Describe it with one or two sentences. (The solution can be a rough plan)

Difficulties	Solutions
Example: Failed to connect Codey Rocky to mBlock; Couldn't upload codes; Failed to achieve consensus…	*Example: Power on Codey Rocky; Rock Paper Scissors…*

Students can answer the following questions after the sharing session.

Do you like your design? Describe what you like most and least about the project with one or two sentences. And any improvements in the future?

○Love it ○Like it ○ So-so ○Don't like it ○Hate it
What I like most *Example: The animation is vivid; the sound matches the animation.*
What I like least *Example: It's challenging for people to tell what the animation is about at first glance.*
Improve *Example: Redesign the animation and make it simpler this time; add sounds and lights.*

Instructor's Assessment

1. Cooperation (30%): Evaluate how the group performs regarding labor division, collaboration, and coordination.

2. Completeness（20%): Evaluate whether the project is complete enough. Of course, the project must stick to the topic first.

3. Innovation（20%）: Evaluate how creative the project is.

4. Functionality（20%): Evaluate whether the work is functional enough?

5. Difficulty（10%）: Evaluate what is the difficulty level of the work?