photon

LOOPS

www.photonrobot.com

LOOPS 5.1.1

Introduction

author: Sebastian Pontus

1. Introduce the new terms to the class.

2. Explain the terms and make sure that the students understand the importance of the newly learned words.

NEW TERMS

loop - is a fragment of a program repeated a certain number of times,

nested loop - is a loop within a loop,

3. Explain more specifically what loops are:

Loop is one of the most basic and important programming instructions. It allows for the repeating of a series of instructions for a specified period of time, a specified number of times or until the specified condition is interrupted (eg until the distance sensor locates an obstacle at a given distance).

Loops, which are repeated a certain number of times are called count-controlled loops. Loops, which are repeated until some conditions set by the programmer are changed are called condition-controlled loops.

Example of a loop use:
We want the robot to go until it stops 20 cm from the wall. We write the following instructions (simple version): „Go straight for 10 cm. Repeat until you are less than 20 cm from the wall.” After switching on, the robot measures the distance from the wall. The distance sensor indicates that there is more than 20 cm. The robot moves 10 cm forward. The robot measures the distance again. The distance sensor indicates that it is more than 20 cm. It repeats the task (goes 10 cm forward). It measures again and repeats the task. And so on, and so on. In the end, the robot measures the distance as 19 cm from the wall. The sensor gives the signal „there is less than 20 cm – finish loop”. The program comes out of the sequence of this loop and goes to the rest of programmed instructions.

LOOPS 5.2.1

Offline task

author: Sebastian Pontus

Activity 1. Rock – Paper – Scissors

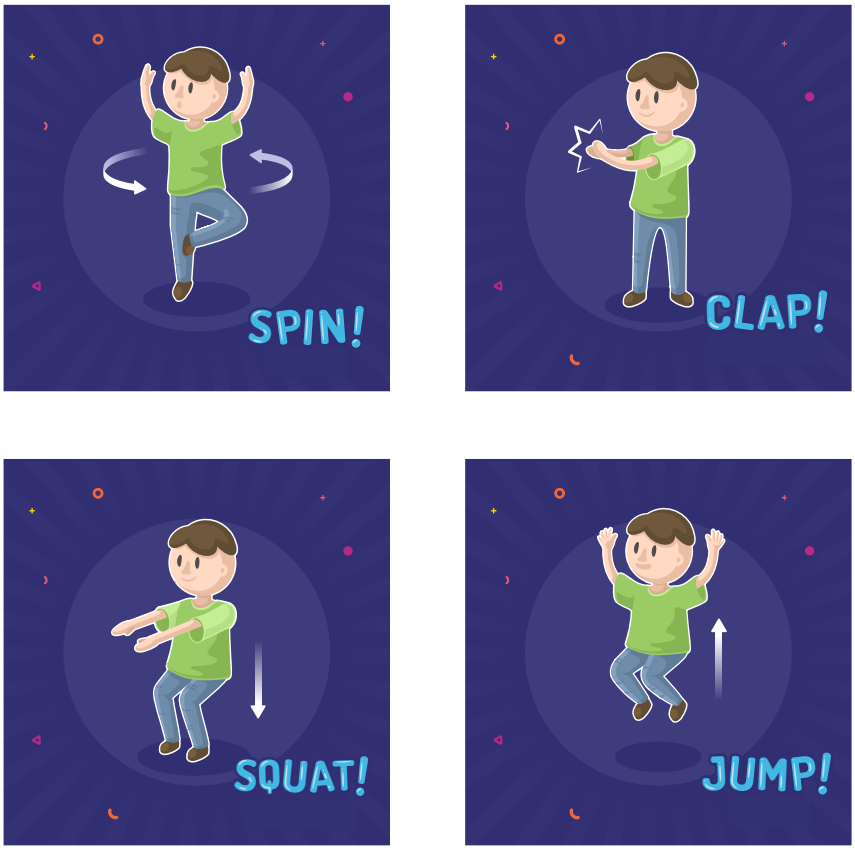
1. Divide your students into pairs.

2. Each pair cuts or receives cut-out cards (task + number of repetitions).

3. First have the pairs of students play rock-paper-scissors until one person has won three games. The student who lost draws two cards: one task card and one repetition card. This student then performs the task the given number of times. After completing the task the students play rock-paper-scissors again and the game continues.

Note: After going through their task and repetition cards, the pairs can create their own task cards and trade with another pair.

Sample Task Cards:



Sample Repetition Cards:

LOOPS 5.2.2

Offline task

author: Sebastian Pontus

Activity 1. Nested sets.

1. Pass out the worksheets found below.

2. Your students need to tell Photon how to collect each fruit that has been placed on the board using a loop program.

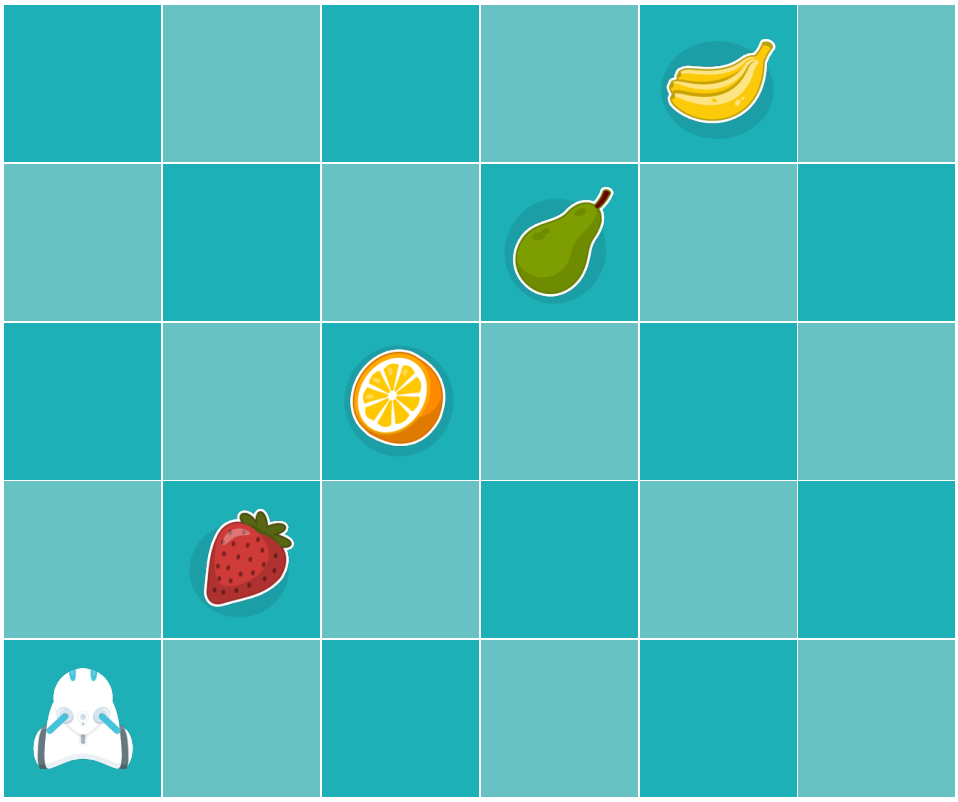
3. Do the first task together. Let them continue with the remaining worksheets. They can work in groups if you would like

WORKSHEET

name: _____ class: _____

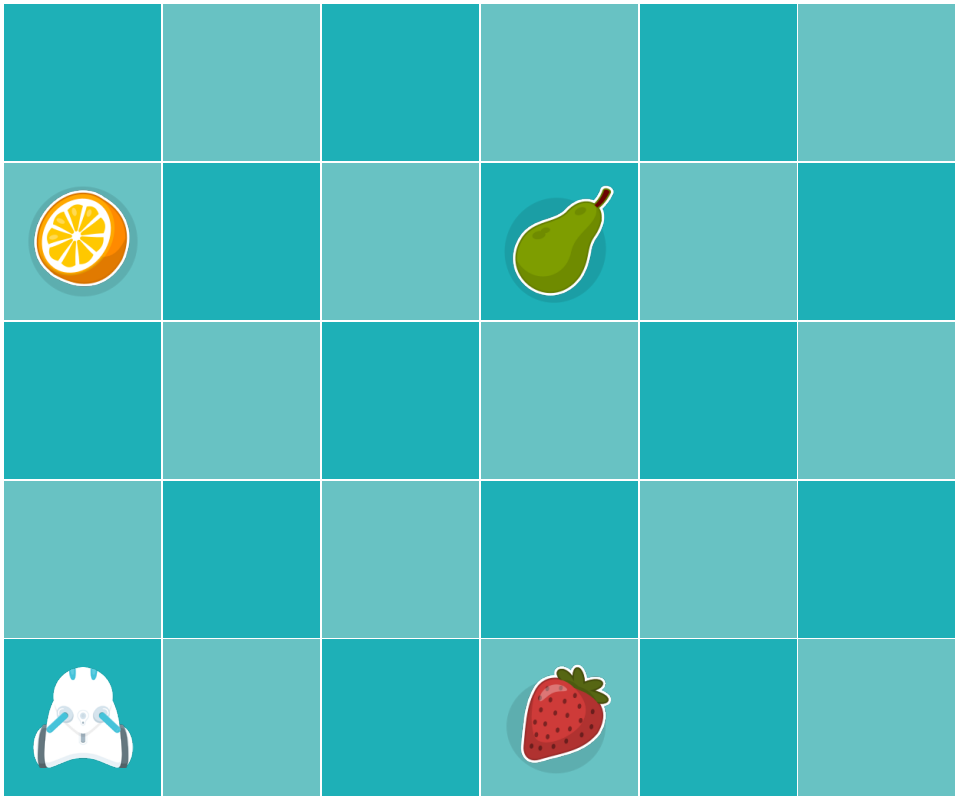
Activity 1. Fruits are spread on the boards. Using the arrows, write one sequence of movements, which will collect all the fruit after being repeated several times.

Task 1



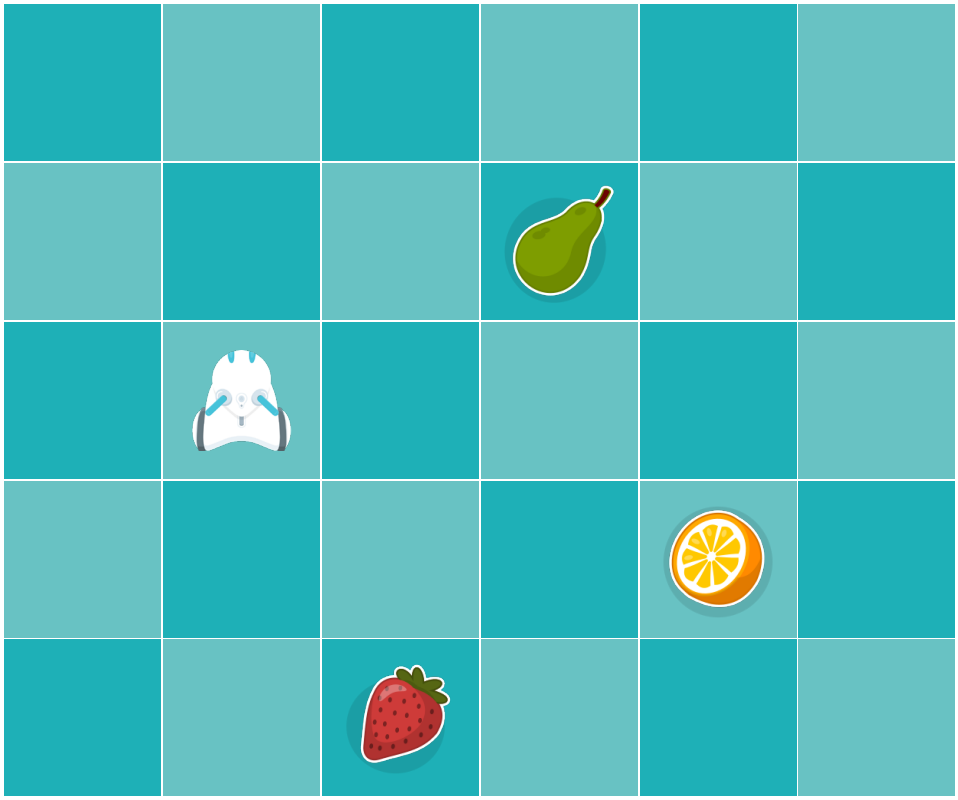
Space for answer:

Task 2 ★★



Space for answer:

Task 3 ★★★



Space for answer:

LOOPS 5.2.3

Offline task

author: Sebastian Pontus

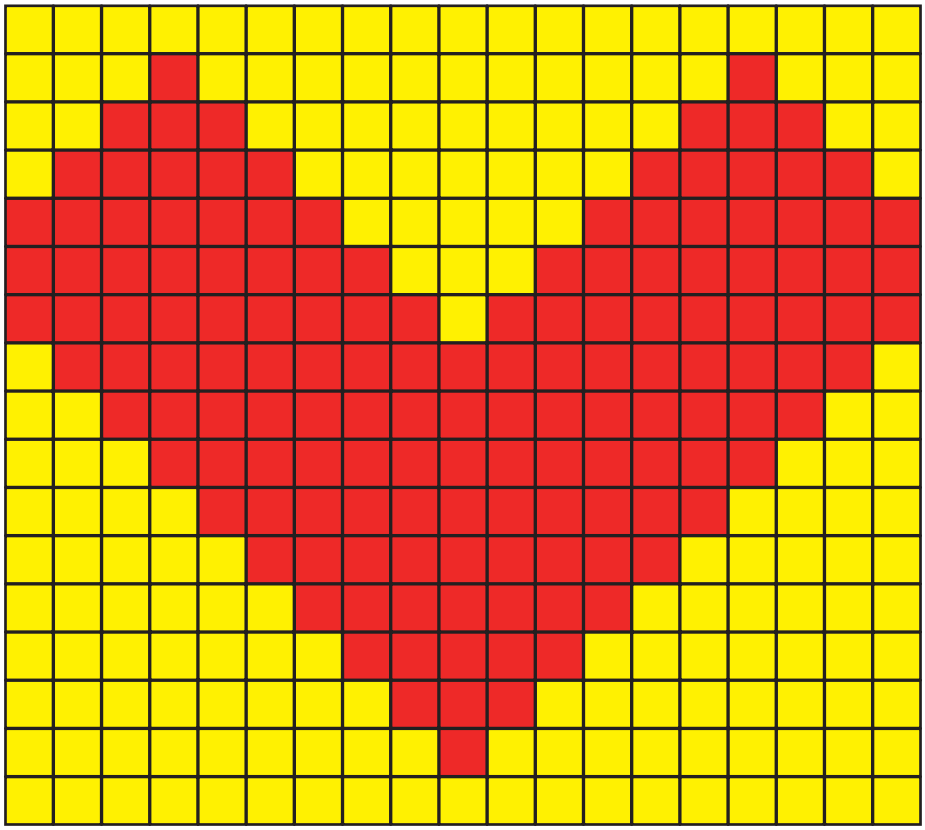
Activity 1. Coded Boxes

1. Pass out the worksheet found on the next page.

2. They have been given a code and will use it to create an image on the provided grid.

3. Each row of the image has been encoded using a color and number of repetitions. Starting with the first row, color the boxes going across according to the code. For example if it says Green - 5 times, Blue 2 times, you will color the first five boxes of the row green, and the next two boxes blue. Finish one row at a time, then go to the next row. When you are finished you will have decoded the image!

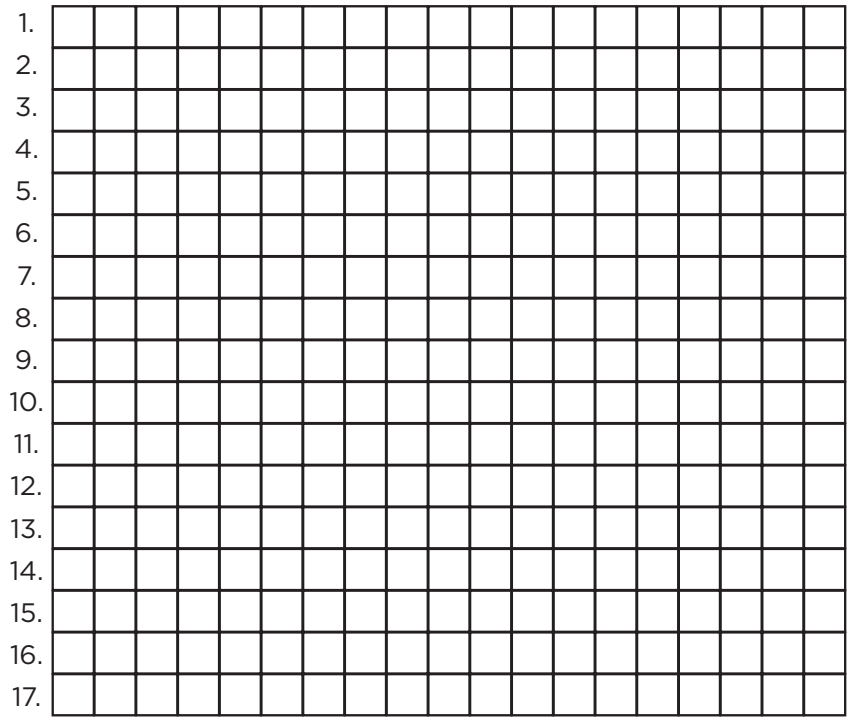
Solution:



WORKSHEET

name: _____ class: _____

Activity 1. Your goal is to decode the image provided in the instructions below. Start with the first row and color each square as indicated by the code. Continue with each row until you have completed the image!



Repeat:

1. yellow - 19 times

2. yellow - 3 times, **red** - 1 time, yellow - 11 times, **red** - 1 time, yellow - 3 times

3. yellow - 2 times, **red** - 3 times, yellow - 9 times, **red** - 3 times, yellow - 2 times

4. yellow - 1 time, **red** - 5 times, yellow - 7 times, **red** - 5 times, yellow 1 time

5. **red** - 7 times, yellow- 5 times, **red** - 7 times

6. **red** - 8 times, yellow - 3 times, **red** - 8 times

7. **red** - 9 times, yellow - 1 time, **red** - 9 times

8. yellow - 1 time, **red** - 17 times, yellow - 1 time

9. yellow - 2 times, **red** - 15 times, yellow - 2 times

10. yellow - 3 times, **red** - 13 times, yellow - 3 times

11. yellow - 4 times, **red** - 11 times, yellow - 4 times

12. yellow - 5 times, **red** - 9 times, yellow - 5 times

13. yellow - 6 times, **red** - 7 times, yellow - 6 times

14. yellow - 7 times, **red** - 5 times, yellow - 7 times

15. yellow - 8 times, **red** - 3 times, yellow - 8 times

16. yellow - 9 times, **red** - 1 time, yellow - 9 times

17. yellow - 19 times

LOOPS 5.3.1BL

Introduction to programming: **Photon Blocks**

Access code: 

Author: Zuzanna Olechno

1. Turn on the robot and open the Photon Edu app. If you can, share the tablet screen via project so that all students can see exactly what is happening on the screen.

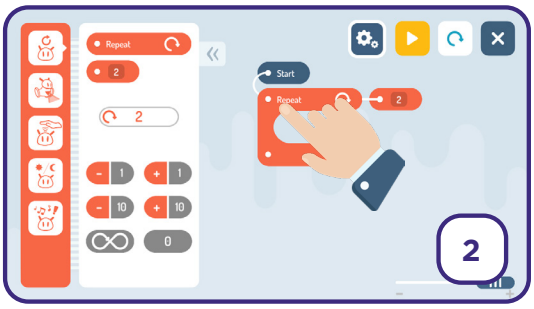
2. When connected to the robot, launch the Photon Blocks interface using the access code.

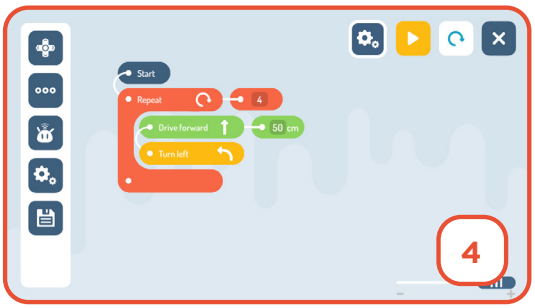
3. Show your students what loops are, and how to use them.

Tell your students that they will write a program that will follow a sequence of movements 4 times.

Objective: Write a program that will allow Photon to move around the perimeter of a square that is 50 cm on each side, using a loop:

[1] Open the interactions category,
[2] add a “repeat” block to the program,
[3] set the parameter to 4 times,
[4] place the blocks ‘go forward 50 cm’ and ‘turn left’ in the middle of the repeat block.





4. Write 4 instructions on the board: jump, step left, step right, rotate around your own axis.

5. Ask your students to stand up. Together they will all follow the instructions written on the board and repeat them three times: **jump, step left, step right, rotate around your own axis, jump, step left, step right, rotate around your own axis, jump, step left, step right, rotate around you own axis.**

6. Then ask them to repeat each instruction separately three times: **jump, jump, jump, step left, step left, step left, step right, step right, step right, turn around your own axis, turn around your own axis, turn around your own axis, turn around your own axis.**

7. Now it's time to program the robot's dance system.

8. Using the application, place the block in the program and set it to 2 repetitions.

9. Ask your students to think about what movement they would like the Photon to do in the dance system. Each student chooses one block from among those available in the application.

10. Let your children approach the tablet one by one and add the blocks they have selected to the loop you previously inserted in the program.

11. After adding all the commands, start the program and see how Photon dances!

LOOPS 5.3.1CO

Introduction to programming **Photon Code**

Access code:

author: Zuzanna Olechno

1. Turn on the robot and open the Photon Edu app. If you can, share the tablet screen via project so that all students can see exactly what is happening on the screen.

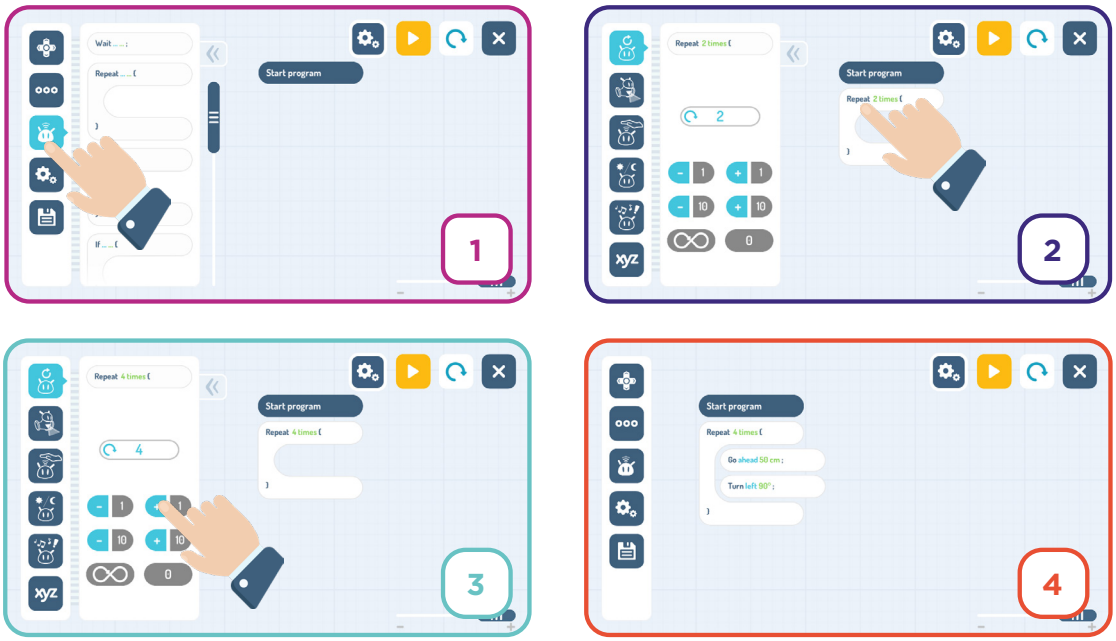
2. When connected to the robot, launch the Photon Code interface using the access code.

3. Show your students what loops are, and how to use them.

Tell your students that they will write a program that will follow a sequence of movements 4 times.

Objective: Write a program that will allow Photon to move around the perimeter of a square that is 50 cm on each side, using a loop:

[1] Open the interactions category,
[2] add a “repeat” block to the program,
[3] set the parameter to 4 times,
[4] place the blocks ‘go forward 50 cm’ and ‘turn left’ in the middle of the repeat block.



4. Write 4 instructions on the board: jump, step left, step right, rotate around your own axis.

5. Ask your students to stand up. Together they will all follow the instructions written on the board and repeat them three times: **jump, step left, step right, rotate around your own axis, jump, step left, step right, rotate around your own axis, jump, step left, step right, rotate around you own axis.**

6. Then ask them to repeat each instruction separately three times: **jump, jump, jump, step left, step left, step left, step right, step right, step right, turn around your own axis, turn around your own axis, turn around your own axis, turn around your own axis.**

7. Now it's time to program the robot's dance system.

8. Using the application, place the block in the program and set it to 2 repetitions.

9. Ask your students to think about what movement they would like the Photon to do in the dance system. Each student chooses one block from among those available in the application.

10. Let your children approach the tablet one by one and add the blocks they have selected to the loop you previously inserted in the program.

11. After adding all the commands, start the program and see how Photon dances!

LOOPS 5.4.1BL

Activity **Photon Blocks**

Access code:

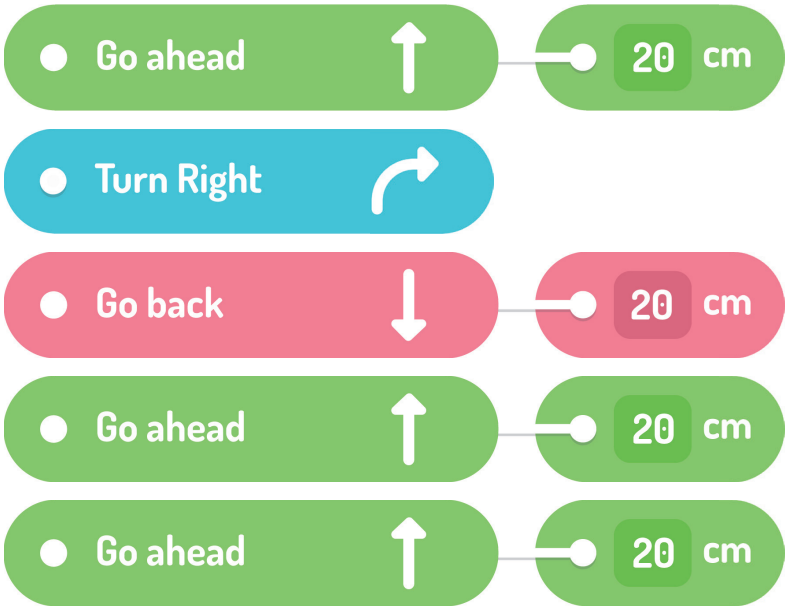
author: Sebastian Pontus

1. Divide the students into teams of two. Give each team a Photon, a tablet with the Photon Edu application and an educational mat.

2. Pass out the worksheets and movement instructions from the Photon Blocks application (students need to cut them out). Their task is to design the program for Photon using the cut-out instructions. Each team should design a route consisting of 5 commands or tasks. The program should be repeated 3 times. Before starting the program, students will estimate where, in the room, the robot will stop after completing the program. You can use colored tape, threads, strips of paper, etc. to mark their estimate.

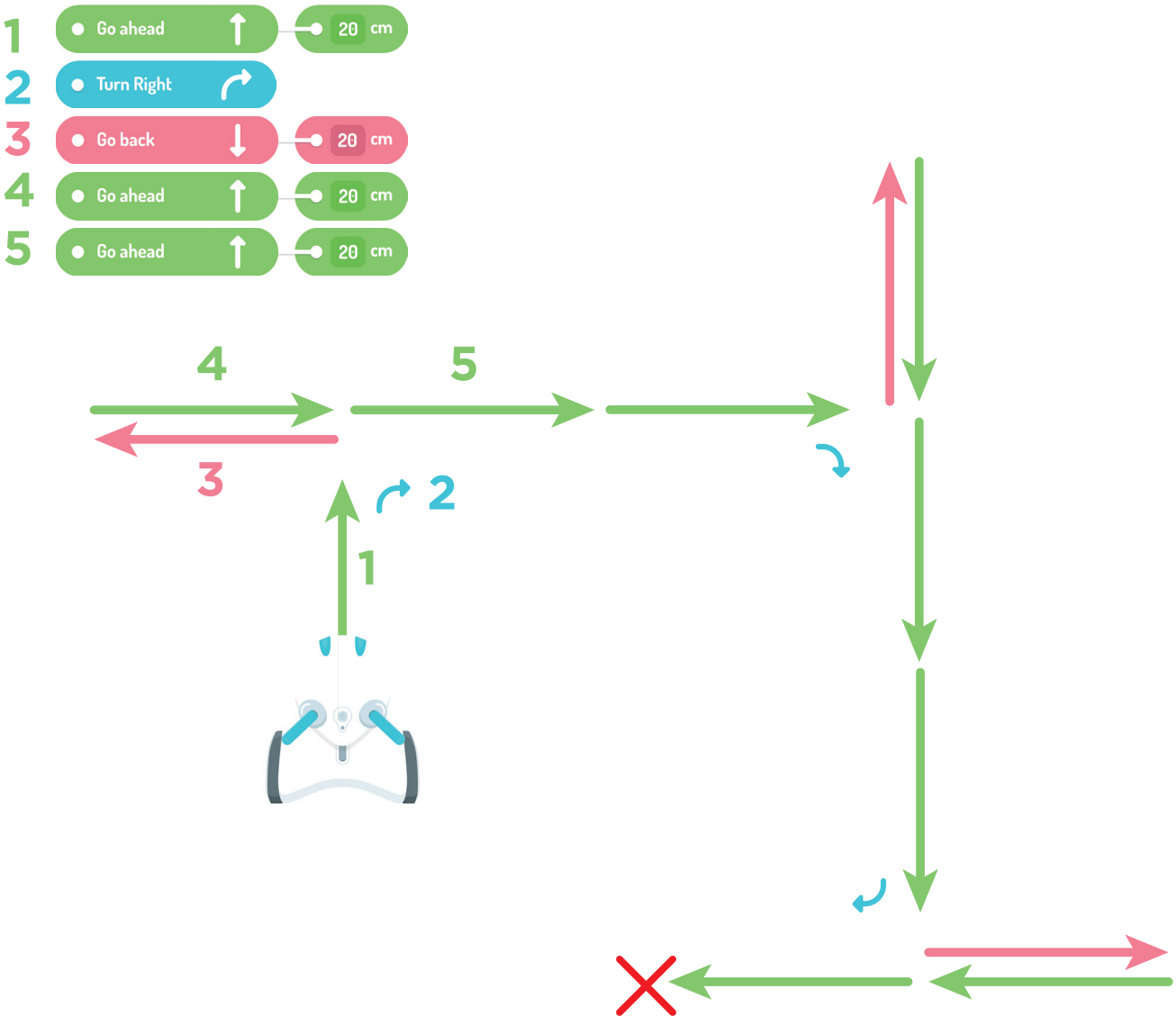
3. Have the students take turn in their teams. One student from the team designe the program, the other one estimates where the robot will stop. Then this student starts the program and checks how close they were to the correct solution. Then they change tasks.

Example:
Examples of commands:



The program transfered to the application, placed in a loop:

Measurements and where the robot stops after 3 repetitions:



LOOPS 5.4.1CO

Activity: **Photon Code**

Access code:

author: Sebastian Pontus

1. Divide the students into teams of two. Give each team a Photon, a tablet with the Photon Edu application and an educational mat.

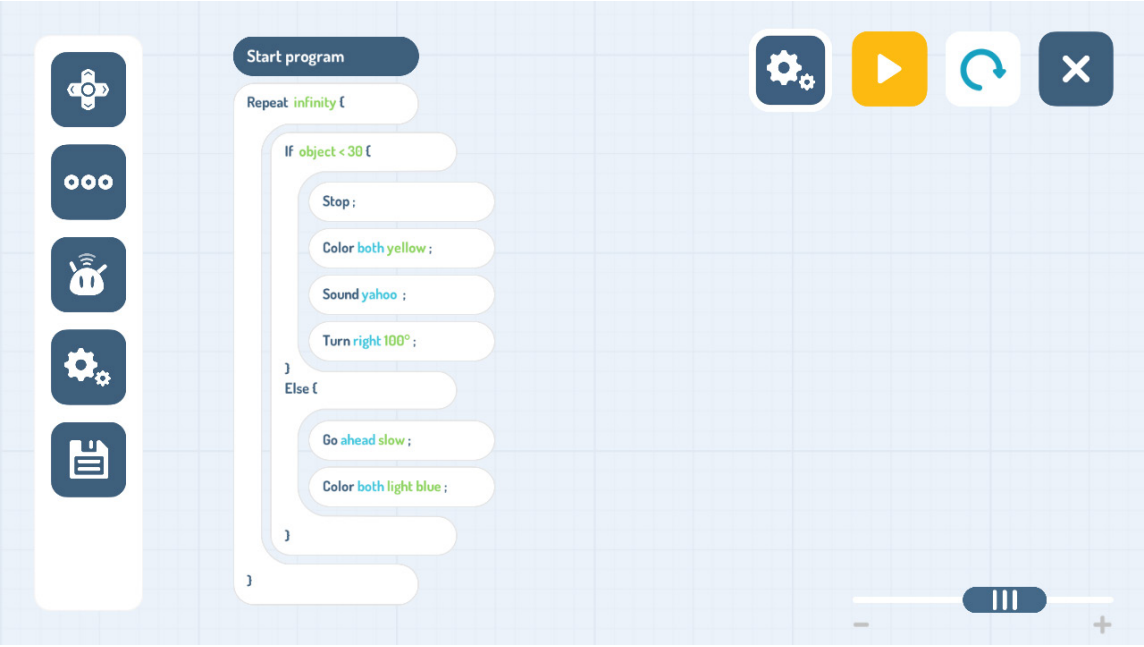
2. Print and give each group a task to do. For example: „Our Photon loves to travel around the rooms (it has a blue antennal then) but it is careful. Whenever it is close to an obstacle (30 cm), it stops, turns yellow and makes „Oh" sound. Then it turns around 100 degrees and continues travelling until it encounters another obstacle, then it repeats the process.

3. The task of the students is to program their robot using the "infinite loop" to perform the task they have been given the task written on the sheet.

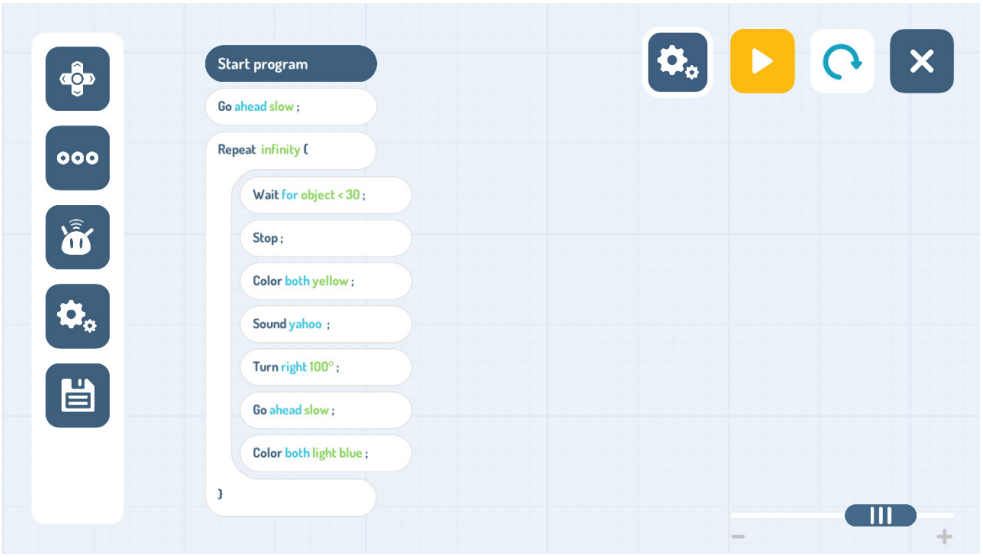
4. Compare the solutions the teams came up with If you find differences, look at the programs and decide which one is the shortest and which is the one longest.

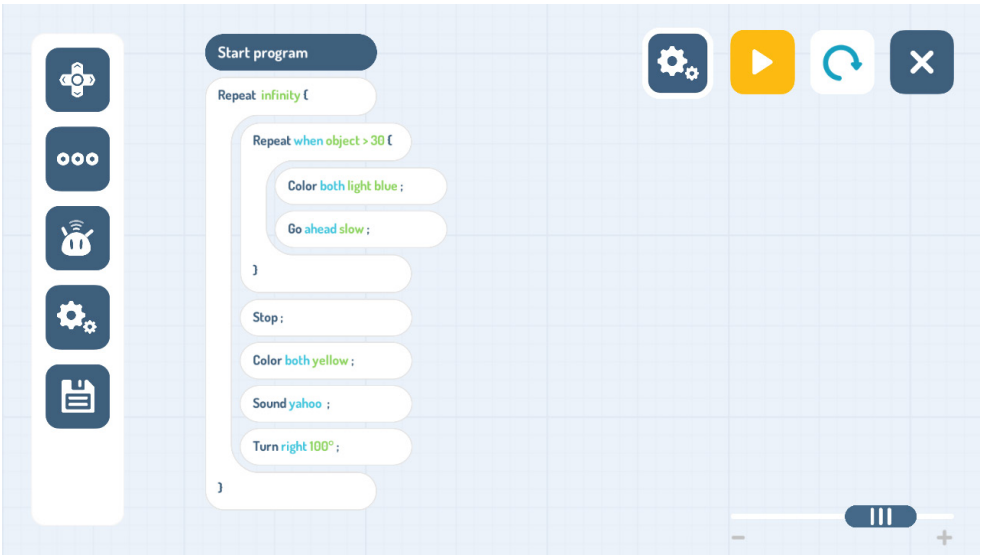
5. See if the students can find two solutions that have the same timing but a different program.

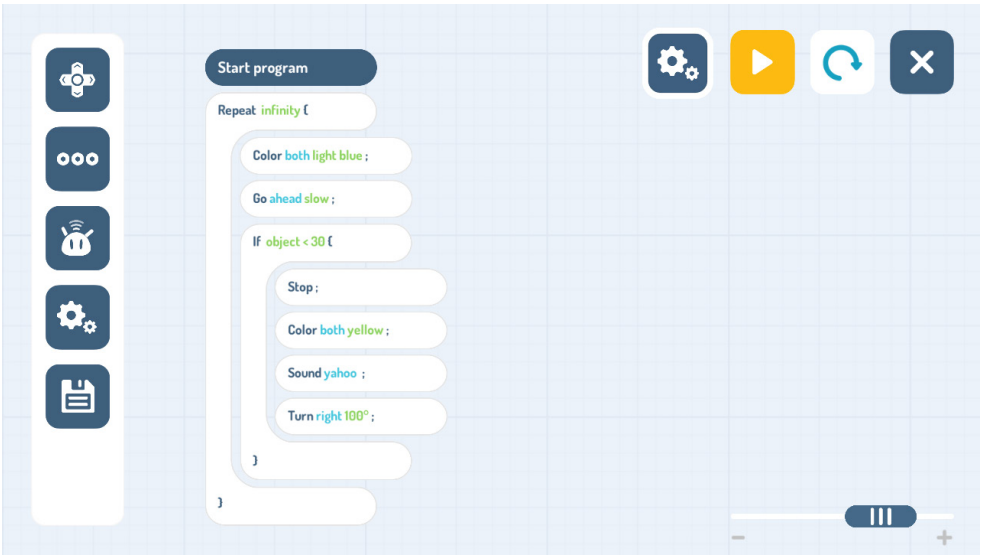
Sample solution:



Other solutions:







LOOPS 5.5.1

Summary

Summary of the lessons:

1. Ask your students to give examples of how to use “loops” in everyday life. How can they help us??