

INPUTS AND OUTPUTS



LESSON OVERVIEW

Students will complete the inputs & outputs code tutorials in the Create.tokylabs.com web to learn how to control the Inputs, like Touch buttons, push buttons, sensors, etc, and the outputs, like the screen, LEDs, etc.

Essential Question: How do you use the Tokymaker to control the screen, detect inputs, make sounds and motions?



LESSON TAGS

GRADE LEVEL

elementary, middle school

SUBJECTS

STEM/STEAM, engineering, computer science

DIFFICULTY

beginner

DURATION

50 minutes

PREREQUISITE KNOWLEDGE

Hello World: Knows how to use Tokymaker platform, code blocks in sequence and upload code to the Tokymaker

SUPPLIES

Starter kit (1 kit per group of 2-3 students) MacBook OSX, or Chromebook, or Android Tablet or Android Smartphone with version 6.0 up. Internet

ASSESSMENT

Use this guide to assess students' understanding of the concepts taught in the tutorials.

RESOURCES

[Tokymaker Workbook](#) Inputs & Outputs Answer Key (included at the end of this document)



STANDARDS

CSTA

1B-A-3-7: Construct and execute an algorithm (set of step-by-step instructions) which includes sequencing, loops, and conditionals to accomplish a task, both independently and collaboratively, with or without a computing device.

1B-A-5-4: Construct programs, in order to solve a problem or for creative expression, that include sequencing, events, loops, conditionals, parallelism, and variables, using a block-based visual programming language or text-based language, both independently and collaboratively (e.g., pair programming).



VOCABULARY

Sensors, actuators, modules
inputs, outputs, Tokymaker, blocks, Screen, Display, LED, RGB
game controllers, Light effects, touchpad, Refresh, Value

INSTRUCTIONAL STEPS



STEP 1: SETUP - Prior to Class

Duration: 30 minutes

This lesson can be done individually or in small groups (2-3 students).

The tutorials are well explained and do not require teacher guidance to complete, so teachers can focus on supporting students when they need extra help.

Each group will need at least one Tokymaker, a compatible computer, plus one [Tokymaker Workbook](#) per student. Craft materials like cardboard and straws are recommended but not essential.

NOTES

- Set up a screen or a projector to watch the inputs and outputs video as a class (see Step 2: Introduce). Note that this video has sound. If you don't have access to a projector, students can view on their laptops.
- Print out one Tokymaker Workbook per student. They will use that throughout the code tutorial lessons.
- Watch the video and do one tutorial beforehand to get accustomed to the interface.
- [Optional] Print out the Inputs & Outputs Answer Key beforehand (see Appendix below). The answer key provides the end code for each tutorial and an explanation of how it works, block by block.



STEP 2: INTRODUCE- What is an Input? What is an Output?

Duration: 10 minutes

Go to https://www.youtube.com/watch?v=v25PCV_IJCw and as a group, watch the inputs and outputs tutorial video.

Suggested group activity after the video ends:

- Ask each group of students to choose an Output module (Actuator) from their Starter Kit and discuss what it does with their peers?
- Do the same with the Input module (sensors), and if time allows, ask them to give examples of things they can do with them.
- Discuss how the Tokymaker works with inputs and outputs. How is the Tokymaker like a brain? What other examples from the real world can you think of?



STEP 3: TUTORIALS- Let's Make Controllers!

Duration: 30 minutes

Students head to the web create.tokylabs.com, turn on the Tokymaker and pair it. Once this is done, start the activity in this order:

1.0 Your Very First Light Effect

Students will make a simple light intensity controller. They will learn how to convert the signal from the sensor in their kit to control the LED of the Tokymaker.

1.1 Interactive Display

Students will control the display based on the Inputs. They will learn how to control how and when to show text and sensors information in the display.

[Optional] 1.2 Extreme Agility Game

Students will make a game based on agility.

They will learn how to convert the signal from three Push buttons into a game that controls the colours of the LED and shows in the screen what colour is the most intense. The winner is the one who pushes the button with highest frequency.



STEP 4: SHARE - What Did You Learn? What Do You Need Help With?

Duration: 10 minutes

Introduce students to the Tokymaker Master Workbook. Ask them to fill in the inputs & outputs section.

[Optional] Ask students to share on a Post-It: One thing they learned and one thing they need help with.

Post their reflections on a designated wall or board. Encourage them to read the Post-Its and use them as a tool to help each other during the next class.



STEP 5: CLOSE

Duration: 5 minutes

Students should take apart their circuits and put away the modules according to the diagram on box. Students should clean up their workspace and close out their laptop. Ask students to hand in their Tokymaker Workbook.

1.0 YOUR VERY FIRST LIGHT EFFECT

FINAL CODE



HOW IT WORKS

1.1 How it works?



The input gives a number, that will define the Intensity percentage of the colour. For example, If the input one senses a 100%, then the LED will be Red with 100% of Intensity.

Each input is related to a color of the LED.

- Input 1 → Red
- Input 2 → Green
- Input 3 → Blue

The green [repeat] loop block tells the code that is inside it to keep running forever once and again.

The brown [Set LED] block sets the LED included in our Tokymaker (above the display) to light up in specific red, green and blue percentages. 0 is minimum intensity of light and 100 is maximum.

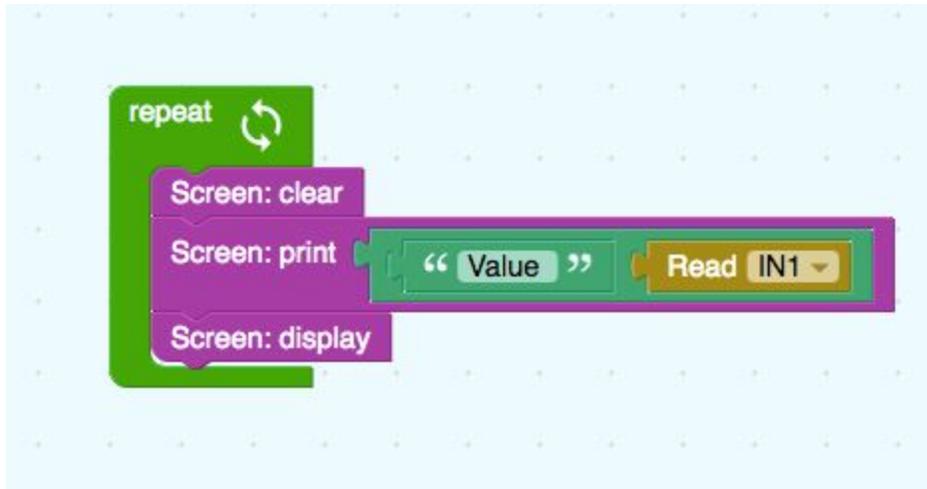
The Yellow [Read IN1] block is getting the value from the sensor attached in the input 1. Minimum value is 0 and maximum value is 100. This block is setting the value of the Red color intensity.

Same thing happens with [Read IN2] and [Read IN3], with green and blue.

(The blue block [1] is not necessary to explain to the students in this Lesson. It refers to the position of the LED that has to be lighted up. Since we are using the "On Head" LED, we only have one. But if we connect a set of 50 LEDs in the Ouput, we could specify which one of those 50 to turn on by changing the value of this block, from 1 to 50.

1.1 INTERACTIVE DISPLAY

FINAL CODE



HOW IT WORKS

The green [Repeat] loop block tells the code that is inside it to keep running forever, repeating what is inside once and again.

We include the purple [Screen: clear] display block to clear the screen, put the cursor back to the origin of the coordinate axis and leave it ready to start one more iteration of the Repeat block. We need to do that because the value of the yellow [Read IN1] is changing in each iteration, and we need to delete (clear) the previous value before we print the new one.

The purple [Screen: print : "Value" : Read IN1] display block tells our screen to get information to be shown.

In this case, the information is a Text+value, therefore, inside the purple block we have included a green ["Value"]text block and a yellow [Read IN1] Input block.

The green ["value"] text block is just printing that word, followed by ":", and as value we are using the yellow [Read IN1] Input block, which will get the value (0 minimum and 100 maximum) from the sensor attached to the Input 1.

After the information is collected, we need to actually show it in the screen. We are using the purple block [Screen: display] display block. This is the one who really makes the screen turn on.

1.2 EXTREME AGILITY GAME

THE FINAL CODE

```

repeat
  if Touch Pad 1 clicked?
  do
    if Green >= 5
    do
      change Green by -5
    if Blue >= 5
    do
      change Blue by -5
    if Red <= 95
    do
      change Red by 5
  if Touch Pad 2 clicked?
  do
    if Green <= 95
    do
      change Green by 5
    if Red >= 5
    do
      change Red by -5
    if Blue >= 5
    do
      change Blue by -5
  if Touch Pad 3 clicked?
  do
    if Red >= 5
    do
      change Red by -5
    if Green >= 5
    do
      change Green by -5
    if Blue <= 95
    do
      change Blue by 5
  Set LED onHead red Red green Green blue Blue at 1
  
```

HOW IT WORKS

The complexity of this code is out of the scope at this level. Nevertheless, will be briefly explained.

The objective of it is to recreate a game with three touch buttons interacting with LED colours. Once is clicked, each touch button (touchpad) is in charge of increasing the light intensity of one colour (Red, Gren or Blue) and decreasing the intensity of the rest of



colours.

For example, the more the Touch button 1 is pressed, the higher the red light intensity and the lower the Green and Blue light intensity will be. And so on.

As a result, three players have to compete, pressing the touch button with a frequency as higher as possible, to have his color shown in the LED.