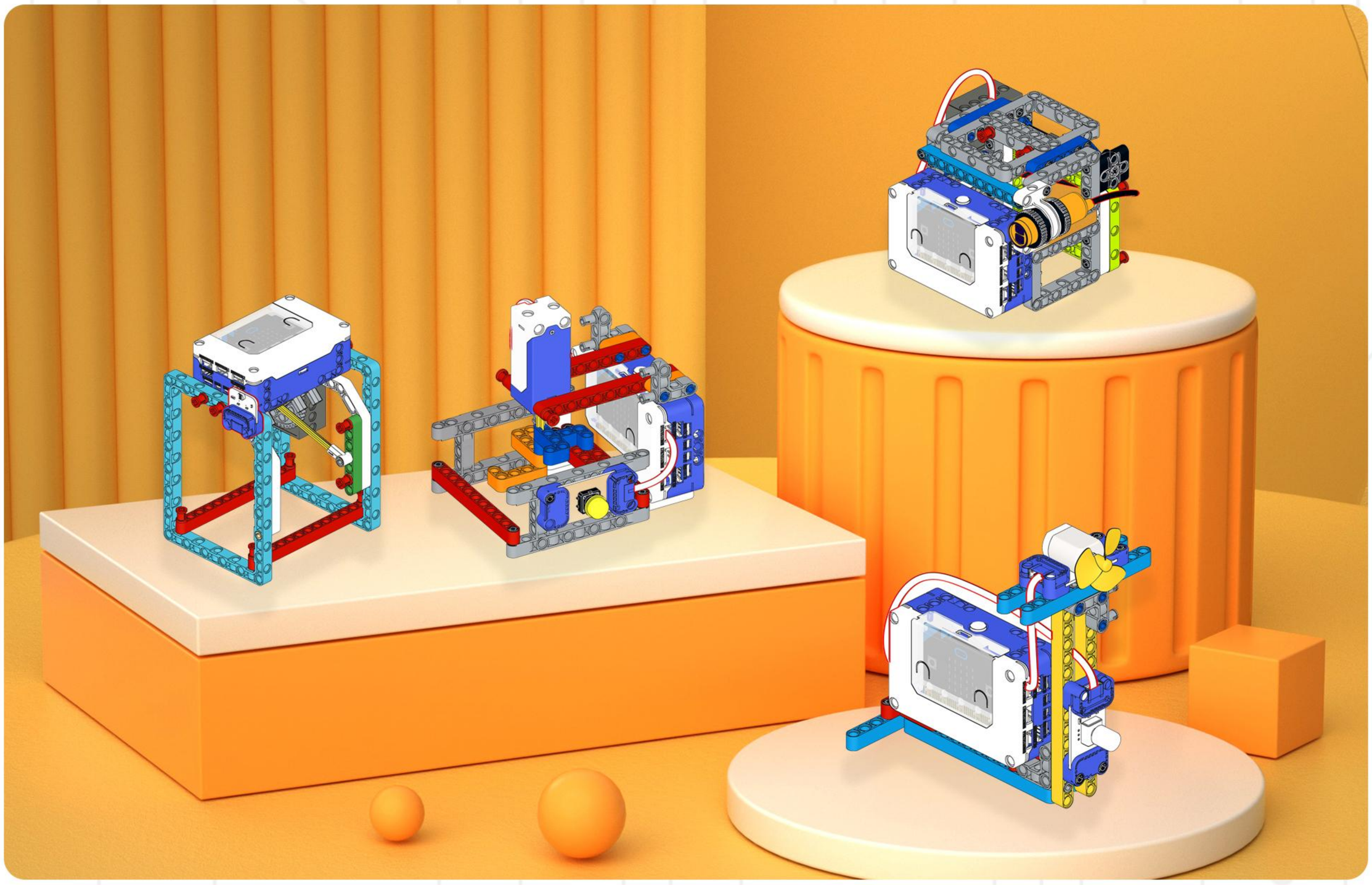
I Create Robot
艾克瑞特机器人教育

micro:bit

Open-Source Hardware Coding Course



Edited by I Create Robot Education R&D Center

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Rock, Paper, Scissors Game

I .Course Overview

Using the micro: bit smart hub, students will control the random display of different icons representing scissors, rock, and paper by pressing buttons A or B to play the game.

II .Key Learning Points

1、Learn the micro:bit smart hub

2、Learn how to use MakeCode software.

3、Learn random number statements.

4、Learn display statement.

5、Learn if-else statements.

III .Preparation

Stuff	Quantity
micro:bit smart hub	1
micro:bit main board	1

IV .Introduction

Rock, Paper, Scissors, also known as "Jan-Ken," is an ancient and simple game primarily used to resolve disputes. The three choices interact with each other, ensuring that, regardless of ties, there will eventually be a winner.

V. Class Flow

1、Introduction to the micro:bit hub.

2、Overview of MakeCode.

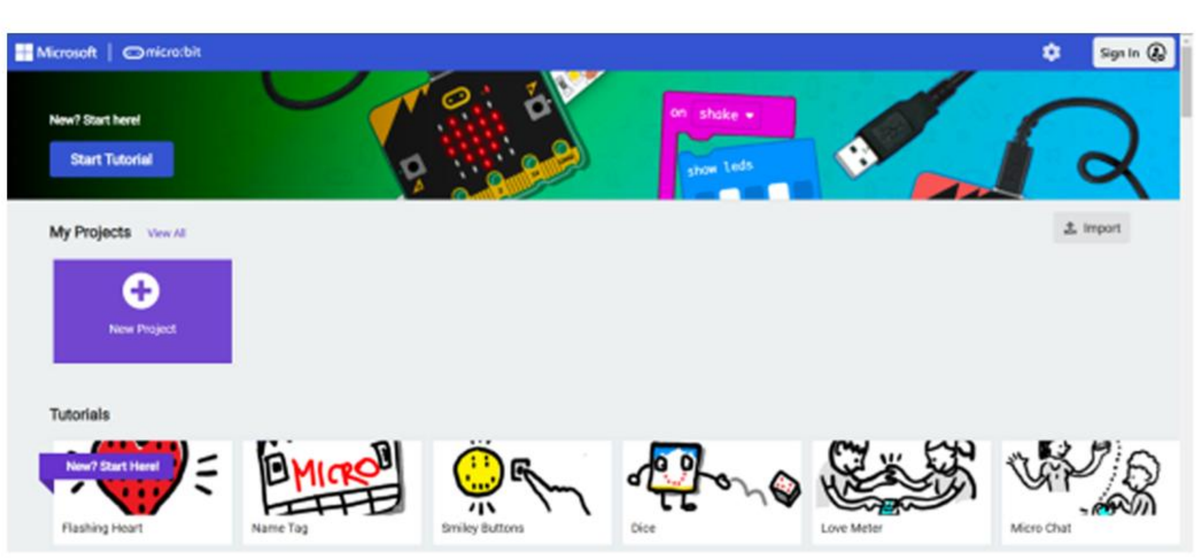
3、Display icons on the micro:bit

4、Write the program.

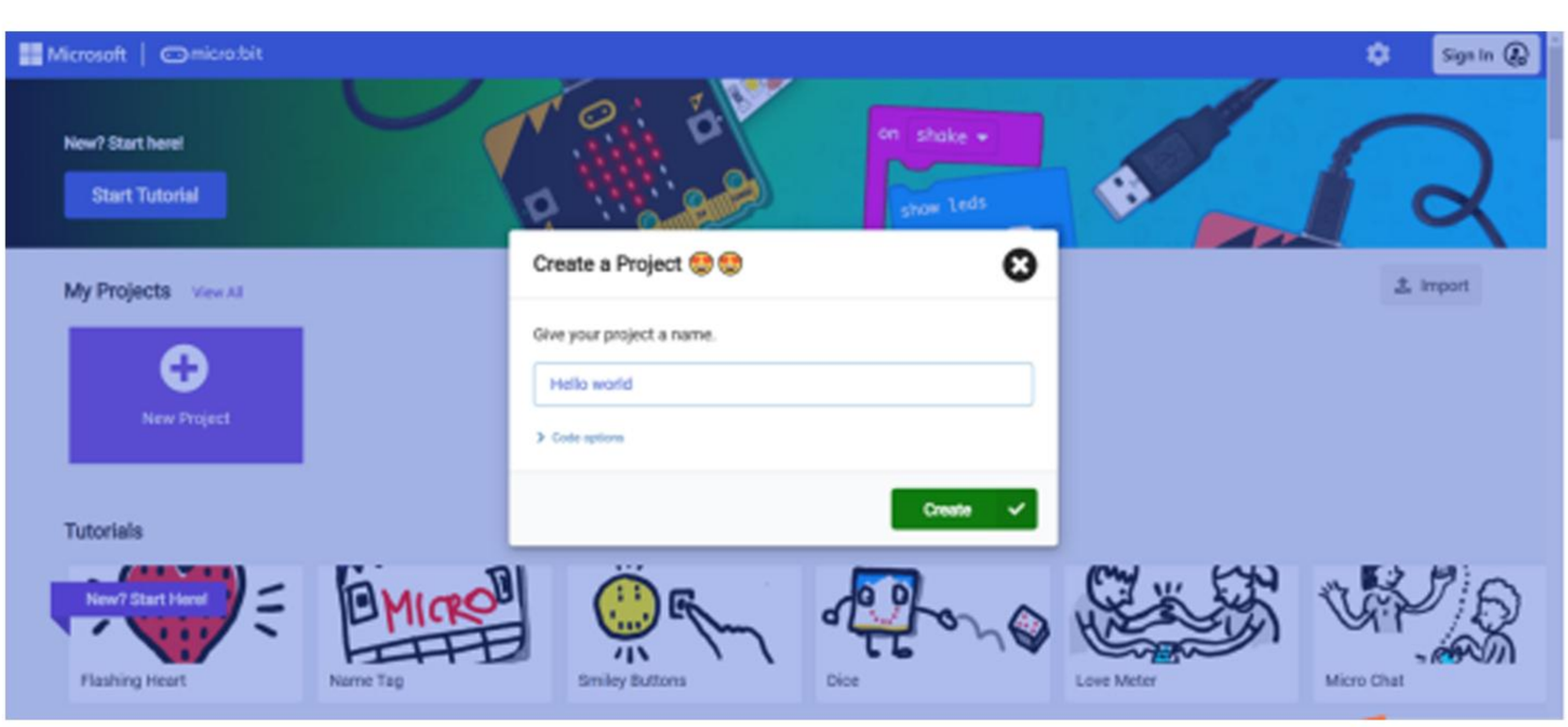
VII. Program Explanation

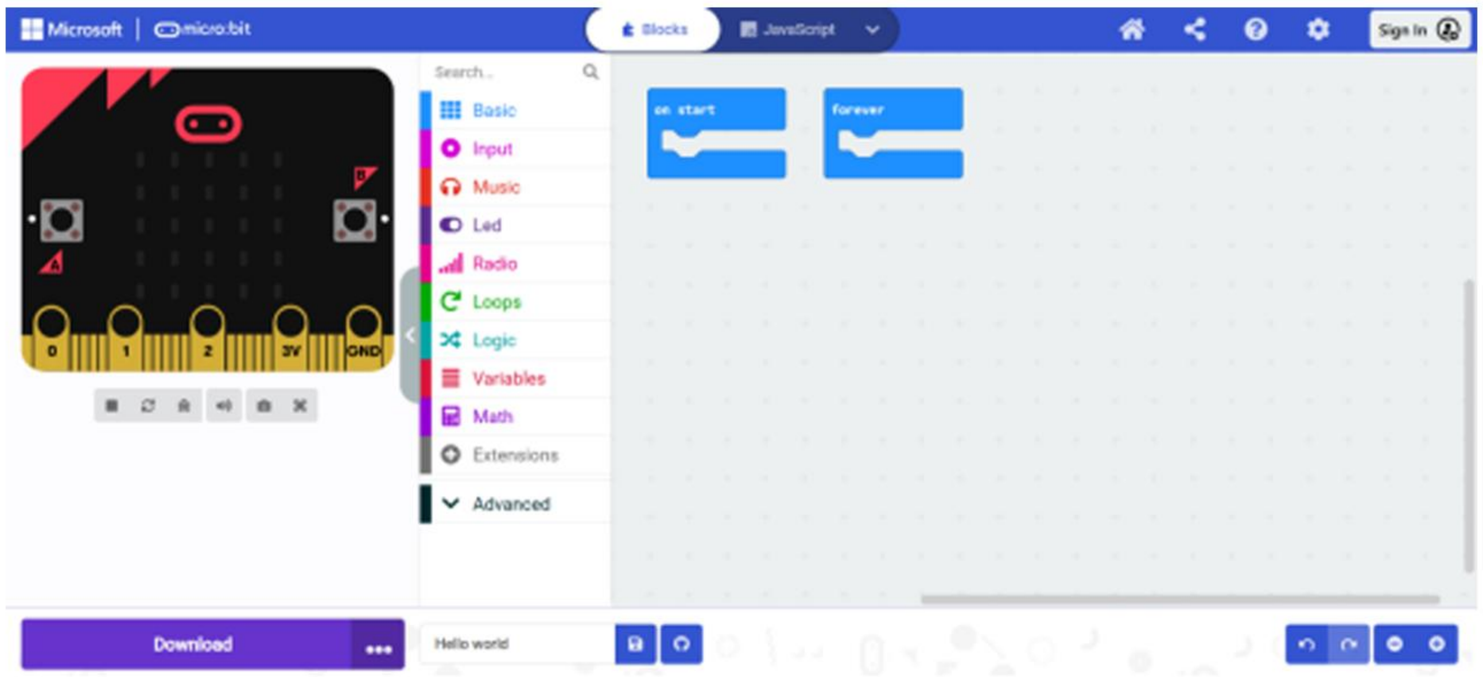
This task utilizes the micro:bit smart hub to display different icons. Students will manually press buttons A or B to randomly switch between the icons.Connect the micro:bit development board to the computer via USB, then double-click to open MakeCode to start programming. The programming interface of MakeCode is shown below.



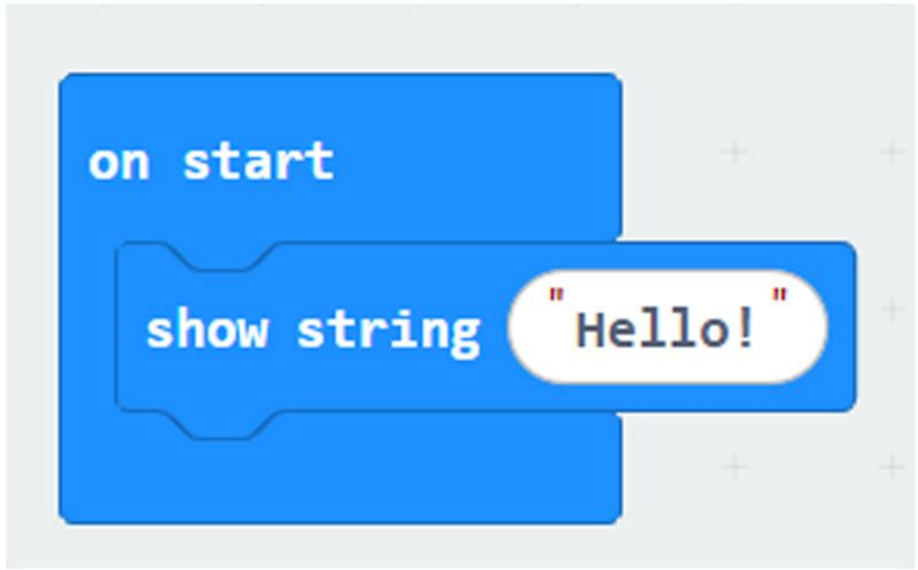


Click on "New Project," give the new project the name "Hello World," and then click "Create" to open it.





Find the show string block labeled "Hello" in the basic module group of the command toolbar, drag it into the "On Start" section, click "Download," and you will see the demonstration effect.



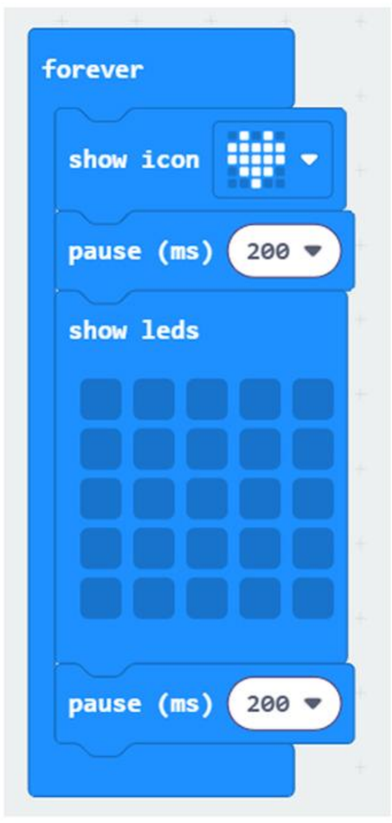
Write the program for a "Blinking Heart" to make the heart pattern start flashing. In the basic toolbox, find the infinite cycle block and drag it into the workspace. Once placed, the infinite cycle block will be blue and feature white text that says "infinite cycle."



Find the "Show LED" block in the Basic toolbox, drag it, and embed it into the： infinite cycle block. Then, draw a heart pattern on the Show LED block.



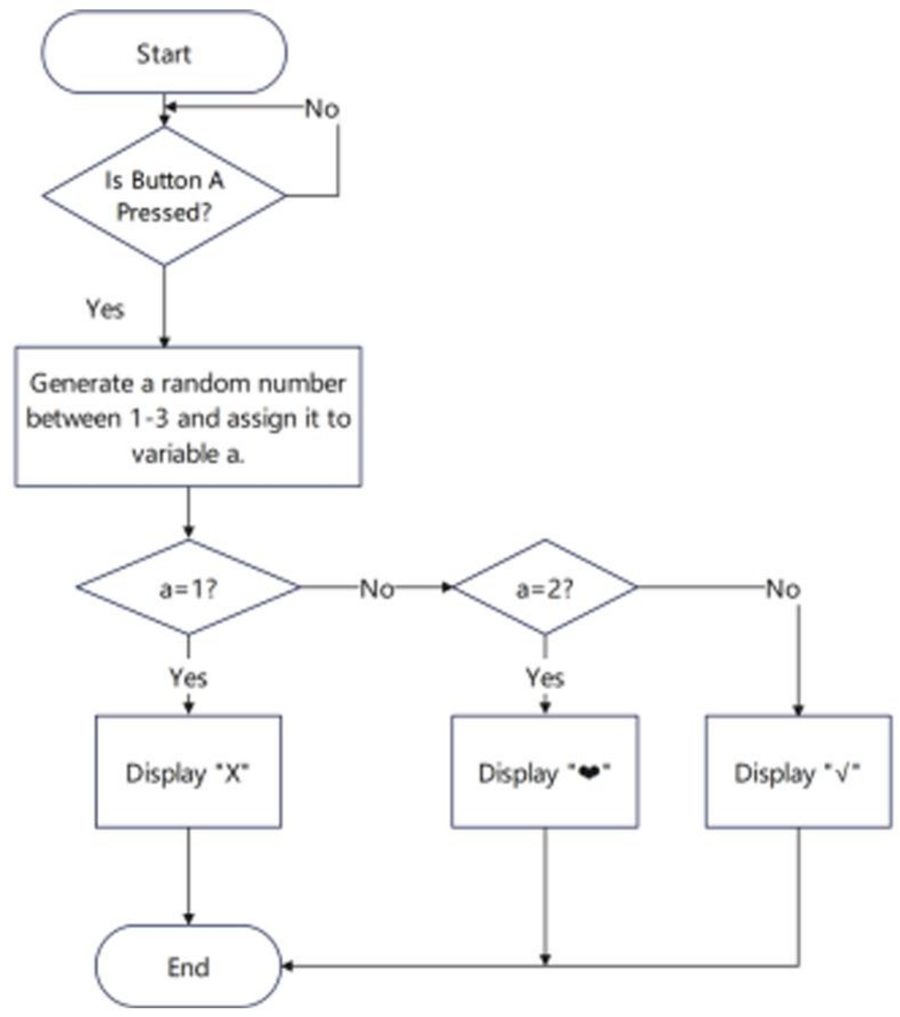
Drag a pause (ms) module from the base tools class, set 200ms, then drag a new display LED module, empty all the lattice leds, drag a pause (ms) module, set 200ms, and finally complete the code.

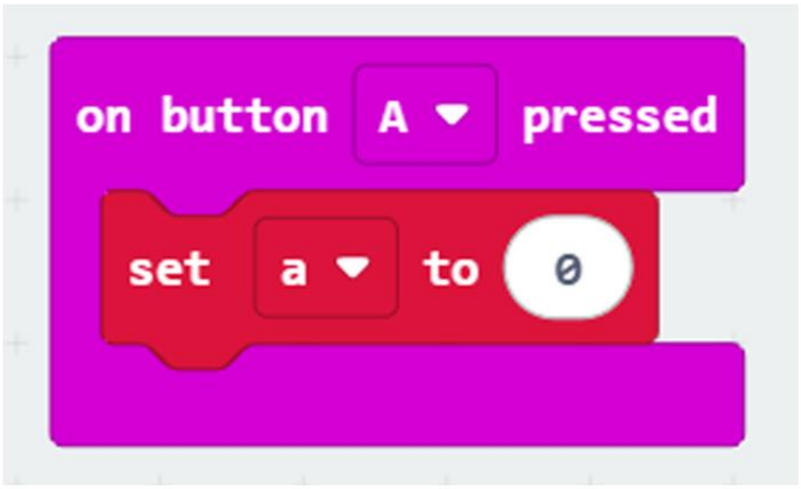


Click the download button at the bottom left of the MakeCode programming interface, and change the save path to the MICROBIT mobile disk in the dialog box that pops up. Wait a few seconds for the download to complete, and you'll see that the micro:bit is already automatically playing the set animation.

Through the key A or B on the micro:bit development board, randomly control the display of different patterns to complete the game of scissors, rock, and paper.

Drag the "when button A/B is pressed" input blocks into the workspace. Then, click on the variable section to create a variable named a and set the value of a to 0.

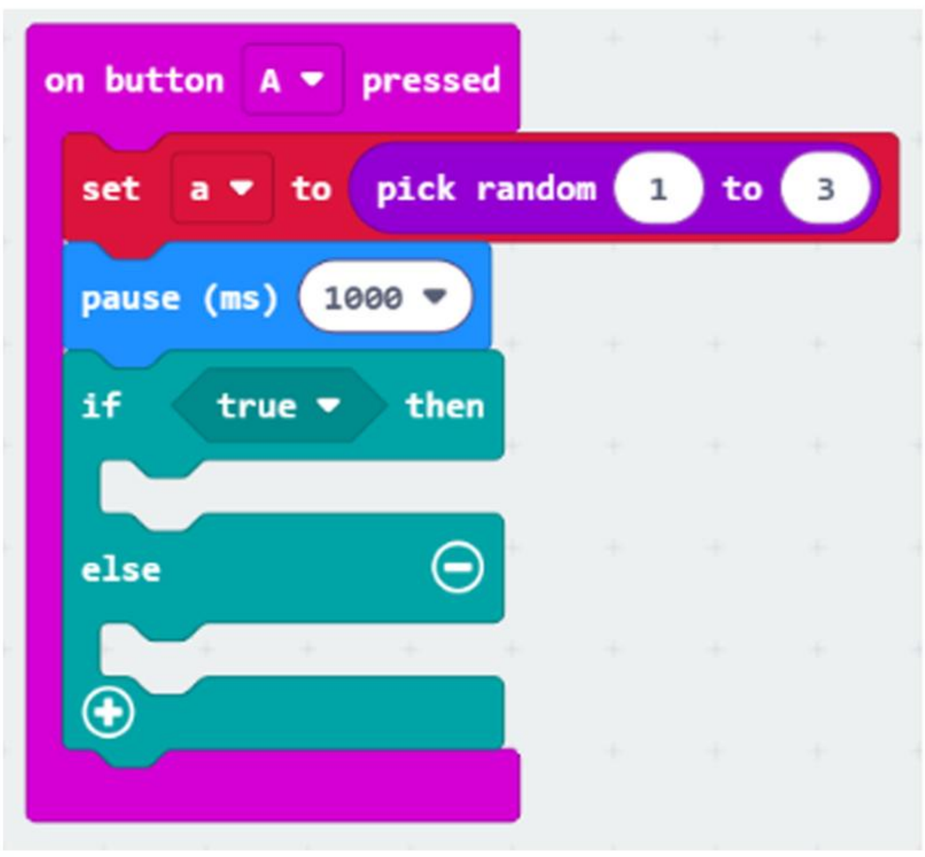


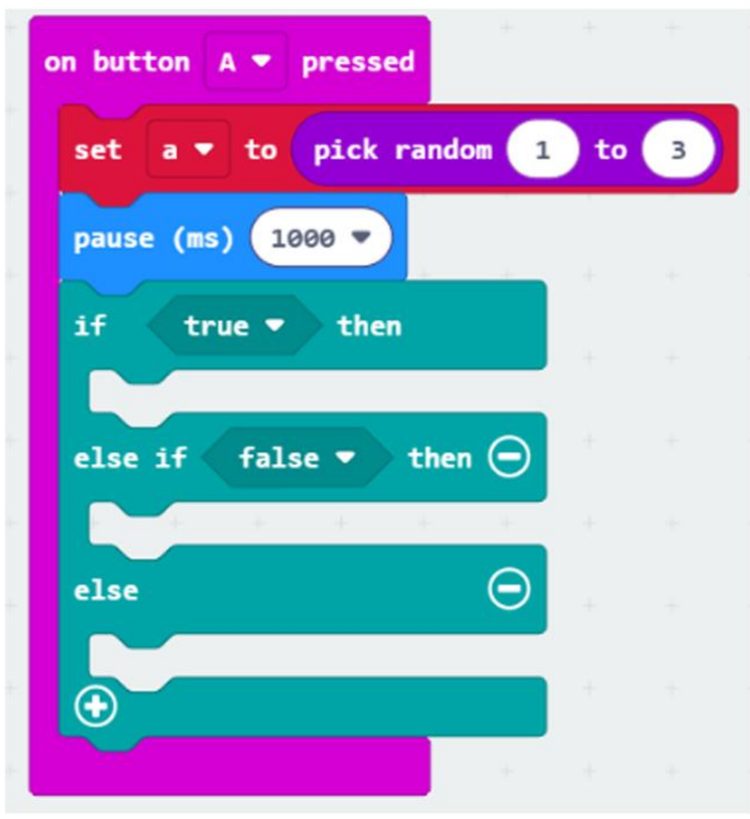


In the math block, find the "pick random number "block with a range of 0 to 10. Set the variable to pick a random number with a range of 1 to 3.

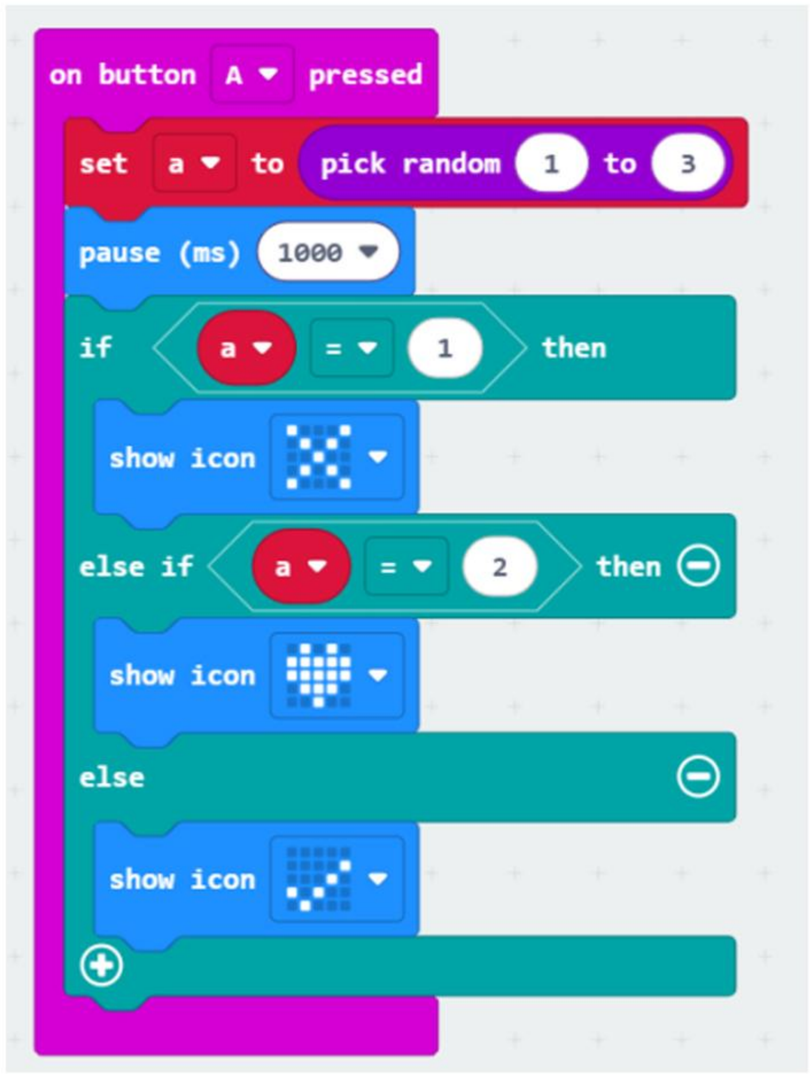
Wait for 1 second to generate a random number and make a decision. In the logic module, drag a conditional statement; if true, execute one case; otherwise, execute another. Click the "+" button in the bottom left corner to add another case.







If variable a = 1, display the "X" icon; if a = 2, display the "heart" icon; and if a = 3**, display the "checkmark" icon. These three icons represent rock, paper, and scissors respectively, or you can customize your own icons. That’ s it! Our program is now complete. Download it to the micro:bit smart hub, and you’ re ready to challenge your friends!



Summary

This section introduced how to use the micro:bit smart hub to play a game of rock, paper, scissors. To start, power on the micro:bit hub, count down “3…2…1…”, and press button A on the controller to randomly display an icon on the LED matrix. With this project, teachers can organize a rock-paper-scissors tournament among students. Start with pairs for one-on-one matches in a best-of-three format. The winners advance, then randomly form new pairs to continue competing until the final champion is determined.

Traffic Light

I. Course Overview

Using red, yellow, and green LED modules along with the micro:bit smart hub, students will build a traffic light to simulate the working principle of traffic lights on the road.

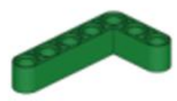
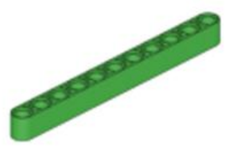
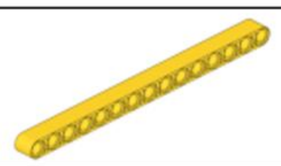
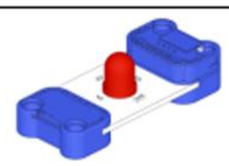
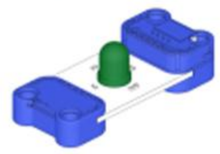
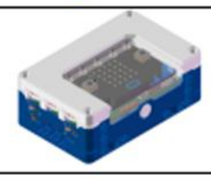
II. Key Learning Points

1、Understanding LED modules

2、Familiarizing with pin connections

3、Learning about high and low voltage levels

III. Preparation

Equipment Checklist			
Item Type	Item Name	Part Image	Quantity
Building blocks	Friction Pins		14
	3x5 L-Shaped Beam		2
	1x11 Beam		1
	1x15 Beam		1
micro:bit AI Programming Modules	Red LED Module		1
	Yellow LED Module		1
	Green LED Module		1
	micro:bit Smart Hub		1

IV. Introduction

At intersections, traffic lights with red, yellow, and green signals act as silent "traffic police."

V. Lesson Flow

1、Learn about LED modules

2、Understand pins and voltage levels

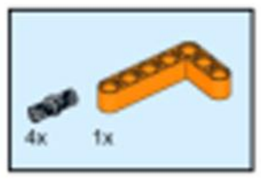
3、Test the LED modules

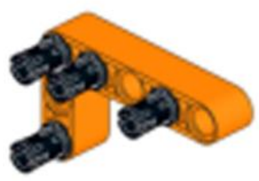
4、Build the traffic light

5、Write the program.

VI. Building the Project

1





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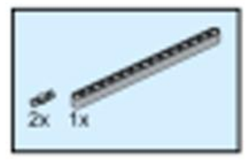

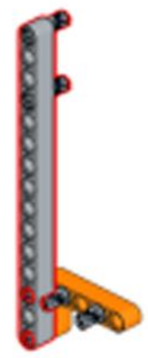

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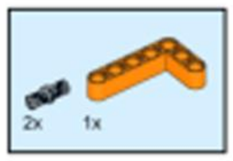



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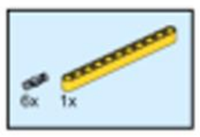
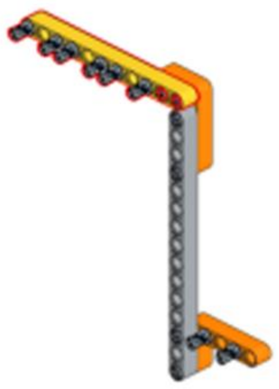
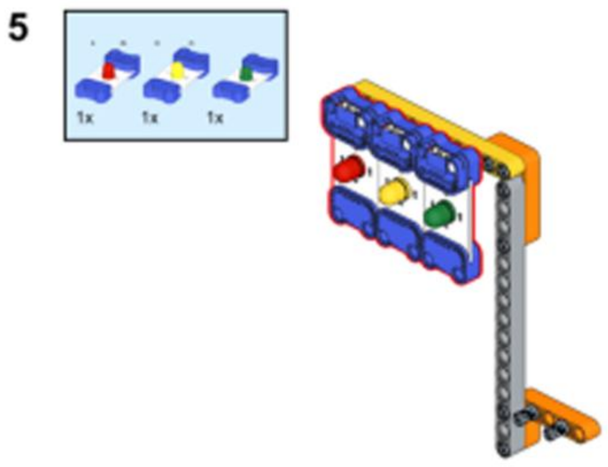
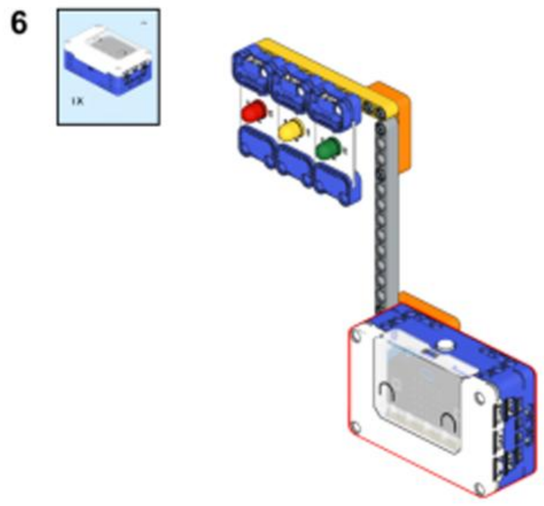
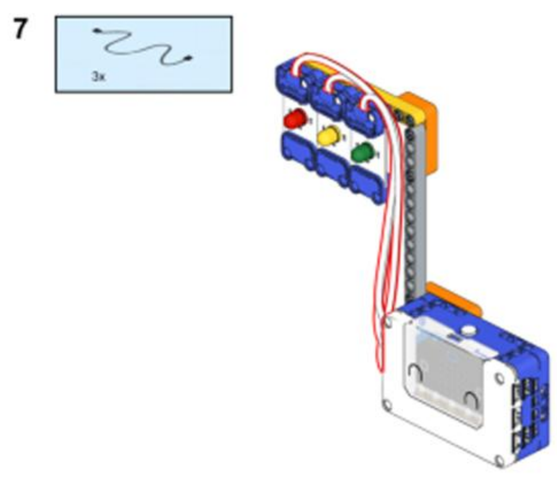






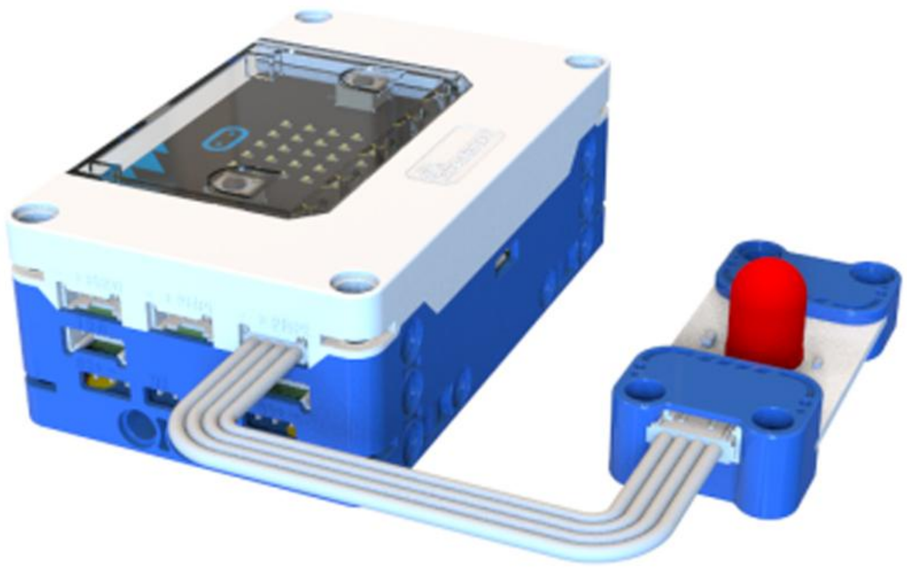




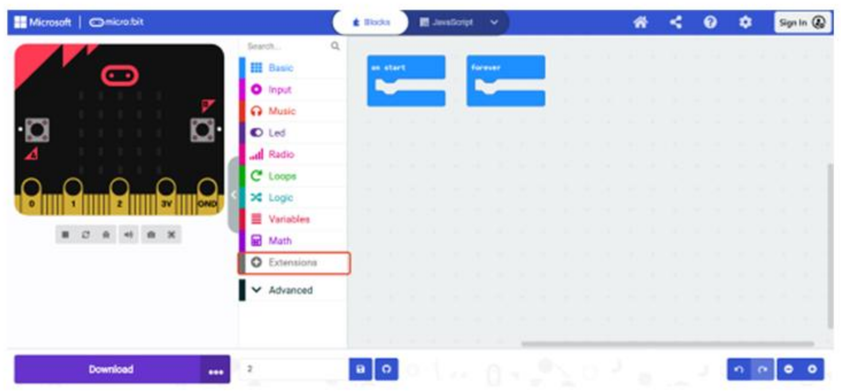
VII. Program Explanation

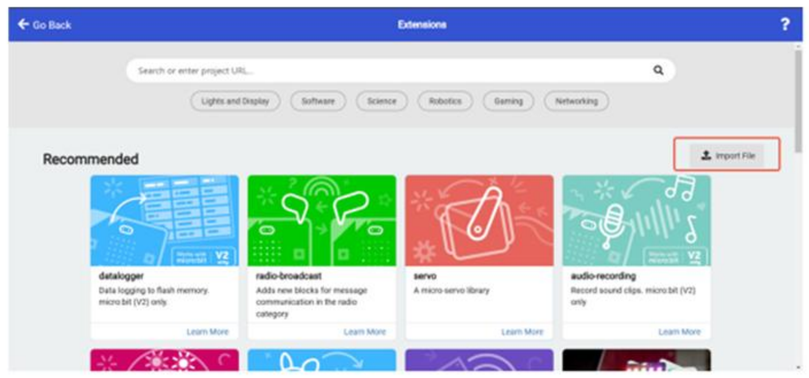
An LED, or Light Emitting Diode, is a solid-state semiconductor device that converts electrical energy into visible light.

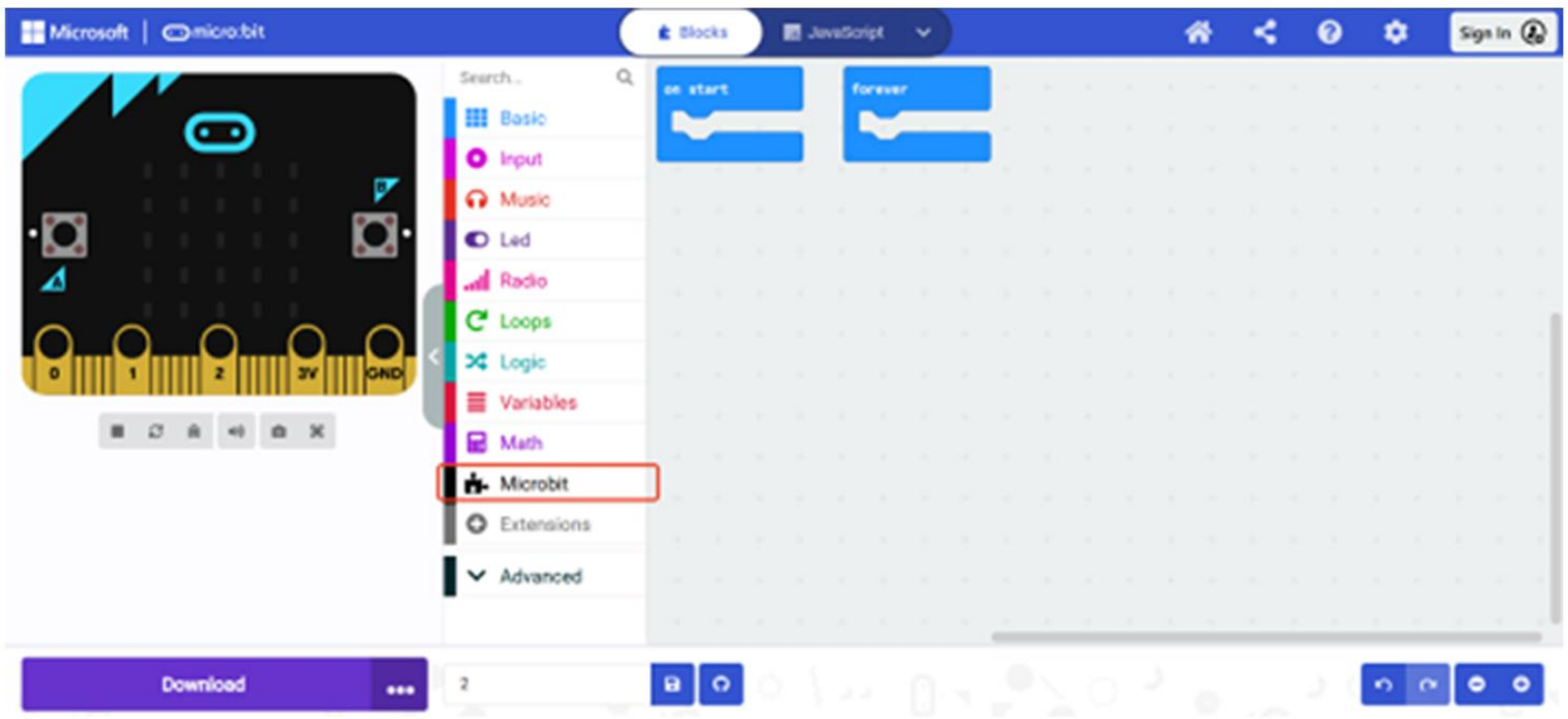
Through MakeCode programming, students will learn to use the LED modules with the micro:bit. Connect the red LED module to the P2 port on the micro:bit smart hub.



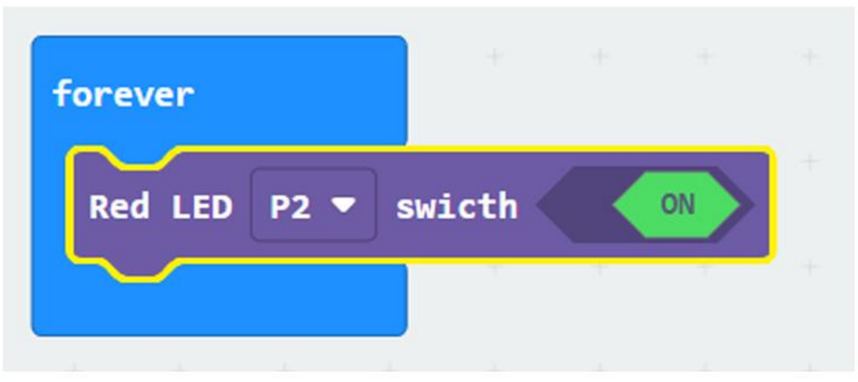
In the MakeCode software, open the advanced block, then import the micro:bit extension file.



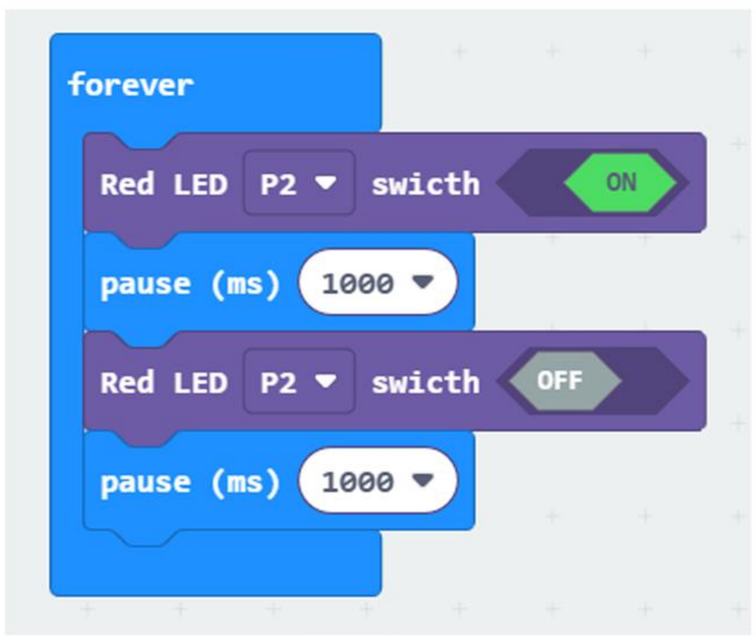




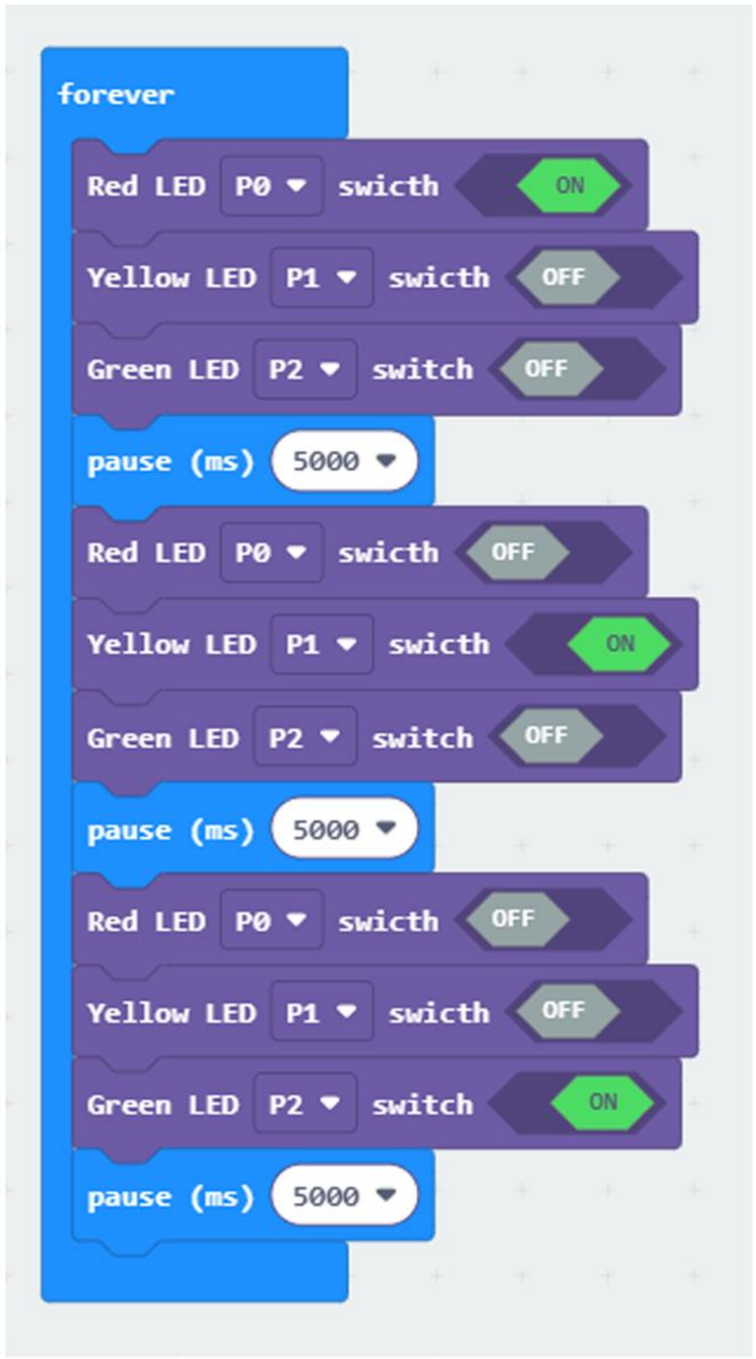
Find the micro:bit blocks and set the red LED to "On".



The Red LED on for a period of time, and off for a period of time, to achieve the flashing effect of the red LED light..



To simulate traffic lights, the red, yellow, and green LED blocks are connected to the P0, P1, and P2 ports of the micro:bit smart hub. The traffic light code will be as shown in the following example:



VIII. Summary

This lesson covered how to create a "traffic light." Once the power switch is on and the program downloaded, the traffic light will operate: the red light stays on for 5 seconds, followed by the yellow light for 5 seconds, and then the green light for 5 seconds. The cycle then repeats. After completing the traffic light project, teachers can organize a hands-on activity where students use toy cars to simulate orderly traffic, promoting traffic safety awareness.

Smart Street Light

I. Course Overview

The use of a photosensor can automatically detect changes in light, control the lighting of street lights, and make smart street lights.

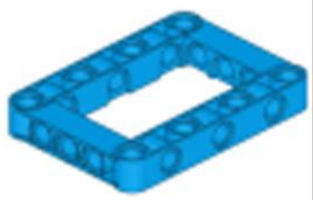
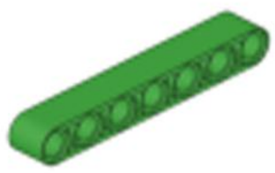
II. Key Learning Points

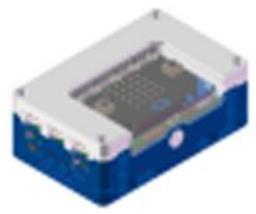
1、Understanding the photosensor

2、Familiarizing with analog and digital signals

3、Learning the range of analog signals

III. Preparation

Equipment Checklist			
Item Type	Item Name	Part Image	Quantity
Building blocks	Friction Pins		8
	4x4 Vertical Connector		2
	5x7 Frame		1
	1x7 Beam		1
	1x13 Beam		2

micro:bit AI Programming Modules	Photosensor		1
	Yellow LED Module		1
	micro:bit Smart Hub		1

IV. Introduction

Let’ s start with a riddle: "Tall bald tree hanging a melon, fruit during the day and flowering at night." "What’s the answer? As some of you may have guessed, the answer is "street lights." On the side of the road, countless streetlights illuminated the way for us to travel. Have you ever wondered how streetlights work on the side of the road?

V. Lesson Flow

1、Learn about the photosensor

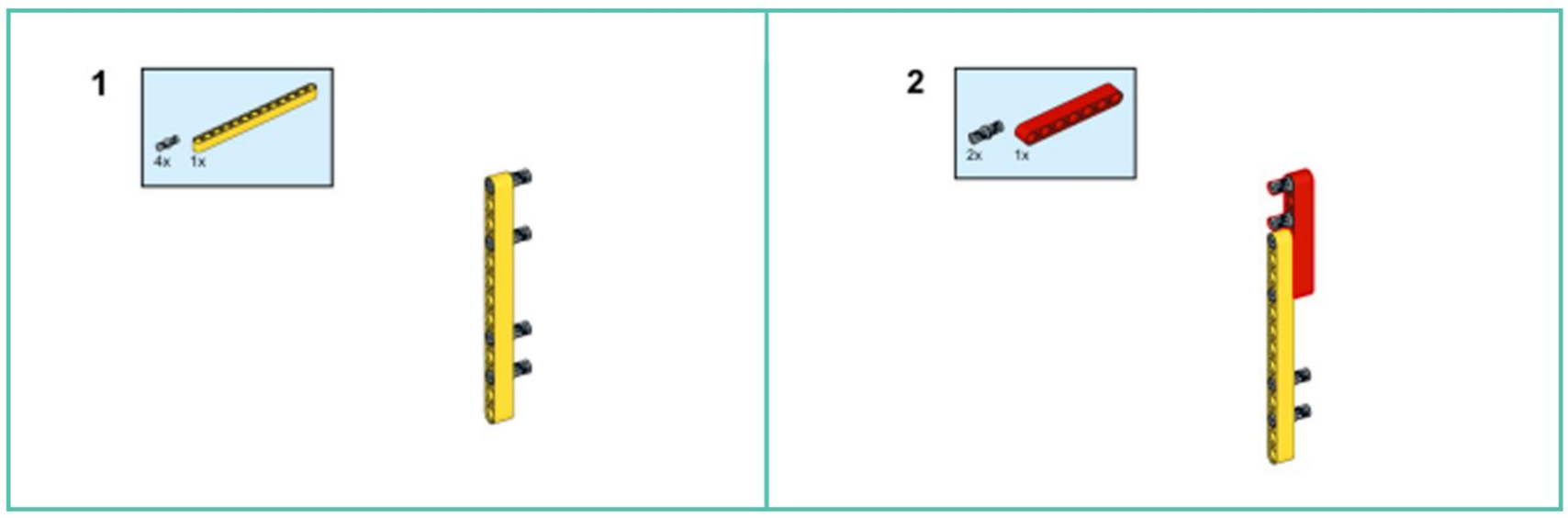
2、Understand analog and digital signals

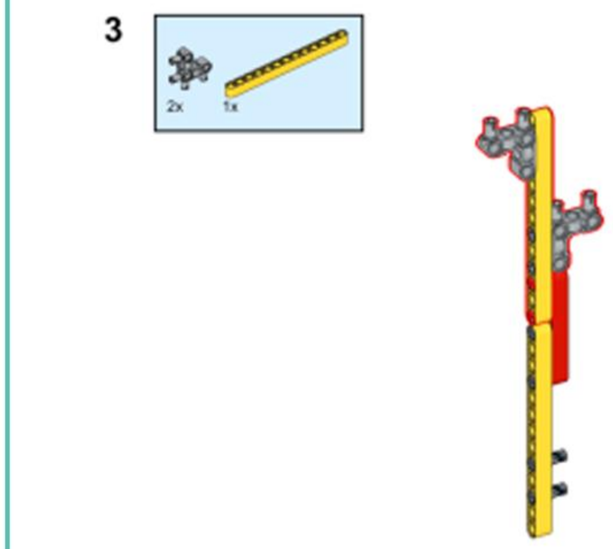
3、Learn the range of analog signals

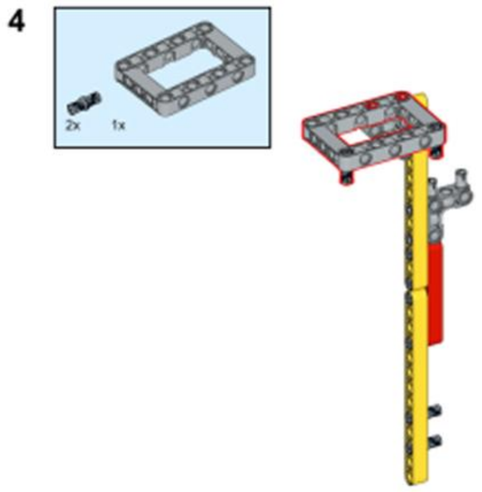
4、Build the traffic light

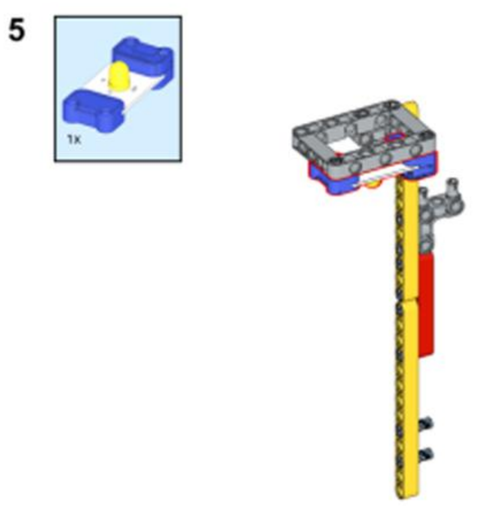
5、Write the program.

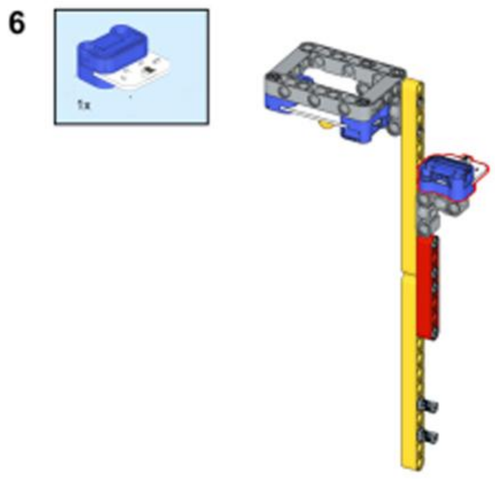
VI. Building the Project

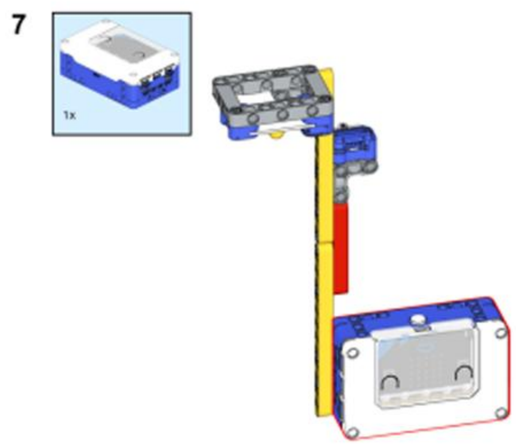


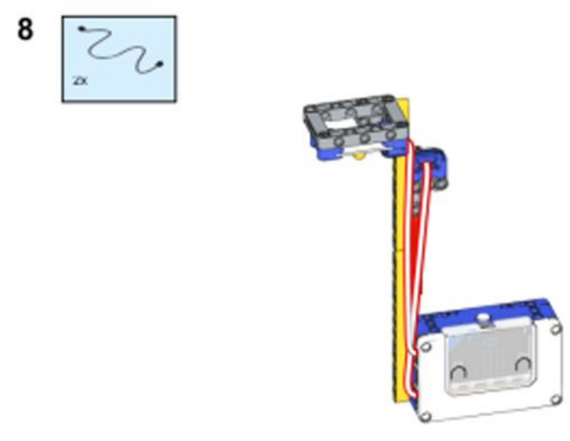












VII. Program Explanation

A light sensor module is a sensor that converts light signals into electrical signals using a photoelectric element. Its sensitive wavelength is around the visible light wavelength, including infrared and ultraviolet wavelengths. It is mainly used in light-controlled street lamps, solar lawn lamps, cameras, surveillance devices, light-controlled toys, sound and light control switches,

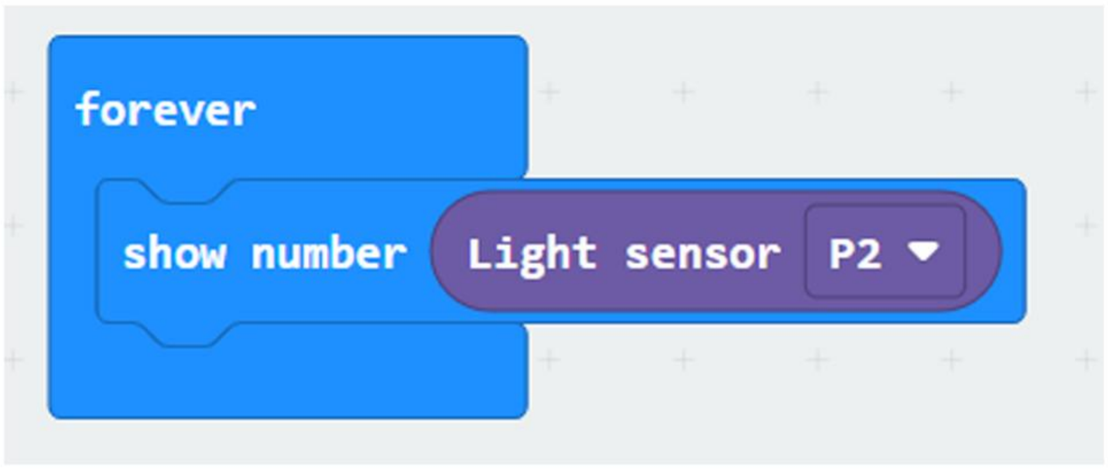
cameras, human body sensing switches, and other electronic products in the field of light automatic control. The simplest electronic device in a light sensor module is a light-sensitive resistor, which can sense changes in light intensity and output a weak electrical signal. By amplifying and processing this signal through a simple electronic circuit, it can control the automatic on and off of LED lighting fixtures.



Next, we’ ll use MakeCode programming to test how the light sensor module detects changes in light. We’ ll use the micro:bit smart hub and connect the light sensor module to the P2 port.

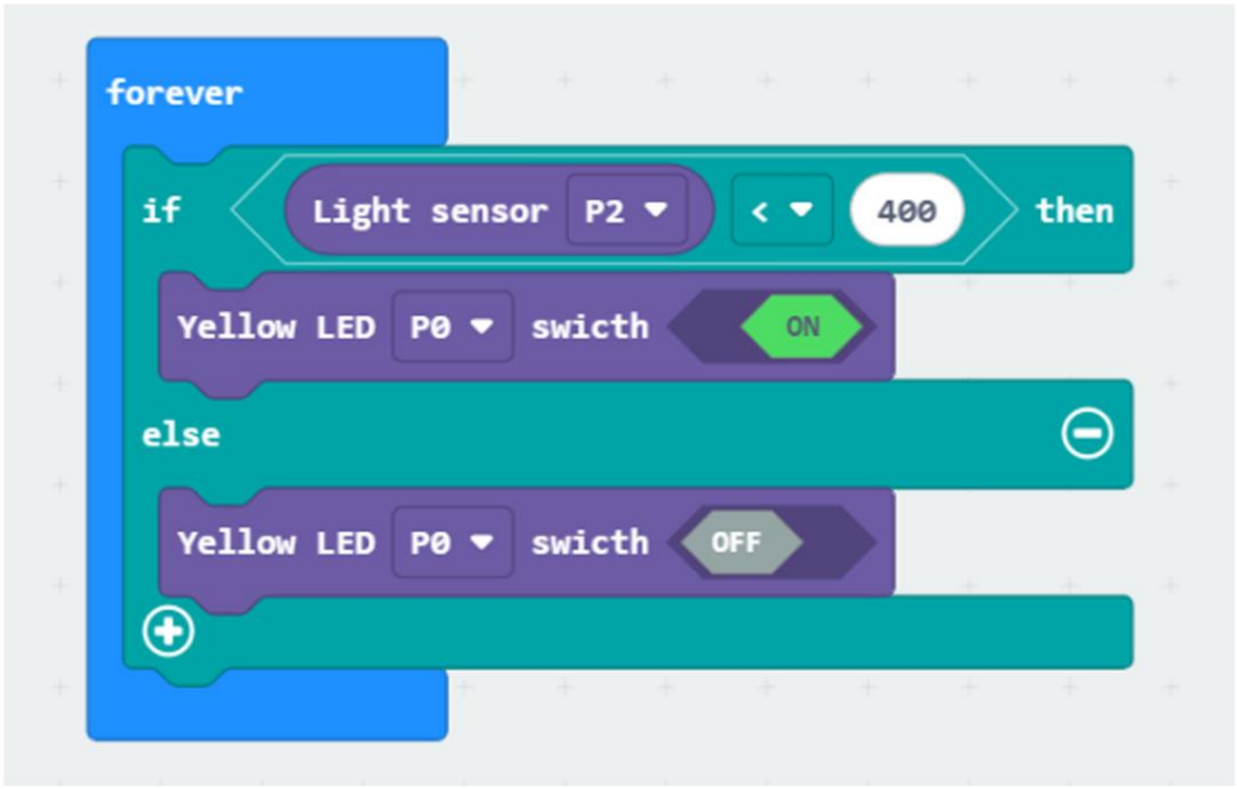


In the extended micro:bit module of MakeCode programming software, find the light sensor module, the default value is P0, you can use this command to test the read status of the light sensor, the light sensor is connected to port P2, change the default P0 to P2



When the light sensor is in a bright environment (daytime) or illuminated by a flashlight, it reads around 900 (actual values may vary). In a dark environment (nighttime) or when covered by a hand, the sensor reads around 200. Using this feature, we can determine if it' s day or night and control the streetlight' s state accordingly.The light sensor is used to detect the light intensity of the surrounding ambient light, in the light is relatively bright (during the day) environment or use a flashlight to illuminate the photosensitive sensor, the street light is turned off; When the light is low (at night) or the light sensor is covered by the hand, the street light is turned on.

The light sensor is connected to the P2 port of the micro:bit smart hub and the LED light is connected to the P0 port of the micro:bit smart hub. When the light is dark, the light will turn on; otherwise, when the light is strong, the light will turn off.



VIII. Summary

This lesson covered how to create an automatically controlled smart streetlight. When powered on in bright surroundings, the LED stays off; when the light sensor is covered (simulating nighttime), the LED lights up. After completing the smart streetlight project, students can spend about 10 minutes on creative modifications. Then, hold a creative streetlight showcase where each student presents their customized streetlight, with awards for the most innovative designs.

Distance Meter

I. Course Overview

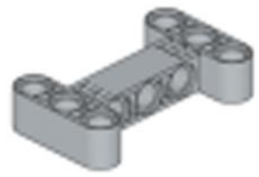
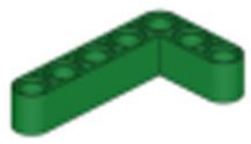
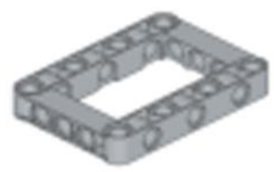
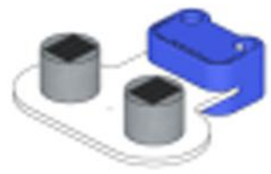
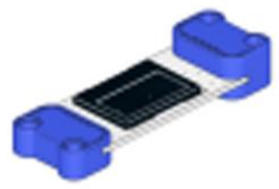
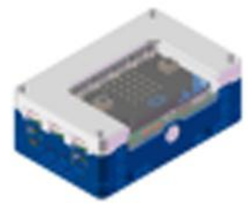
In this lesson, we will build a distance meter using the micro:bit smart hub, ultrasonic sensor module, and OLED display module. The OLED display will show the distance detected by the ultrasonic sensor.

II.Key Learning Points

1. Understanding the ultrasonic sensor module
2. Understanding the OLED display module

III.Preparation

Equipment Checklist			
Item Type	Item Name	Part Image	Quantity
Building blocks	Friction Pins		31
	Beige Axle Pin		2
	Blue Long Pin		2
	3x3 T-shaped Hole Beam		4
	3×3 Bolt Connector		2
	1×5 Hole Beam		1

	4×4 Vertical Connector		2
	3×3 H-shaped Hole Beam		1
	3×5 L-shaped Beam		4
	4×4 Curved Hole Beam		2
	5×7 Hole Circular Beam		2
	11.5 Curved Hole Beam		2
micro:bit AI Programming Modules	Ultrasonic Sensor		1
	OLED Display Module		1
	micro:bit Smart Hub		1

IV. Introduction

A distance meter is a tool used to measure length or distance. Common types of distance meters can be categorized by range: short-range, medium-range, and long-range. They can also be classified by the modulation type they use: photoelectric distance meters and sound wave distance meters.

V.Lesson Flow

1.Learn about the ultrasonic sensor module

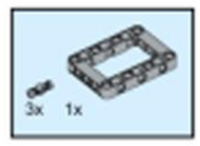
2.Learn about the OLED display module

3.Build the distance meter

4.Program the device

VI.Building the Project

1





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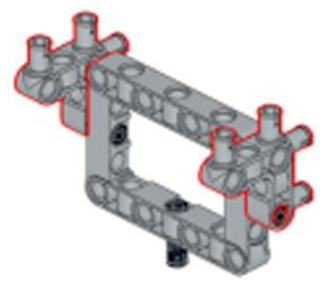

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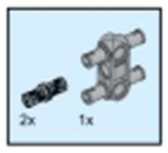

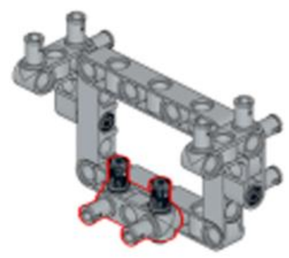

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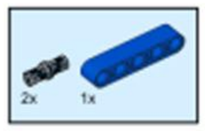

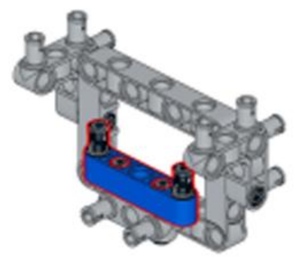

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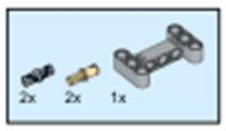

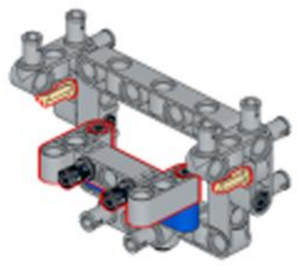

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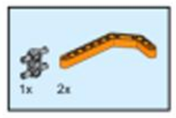

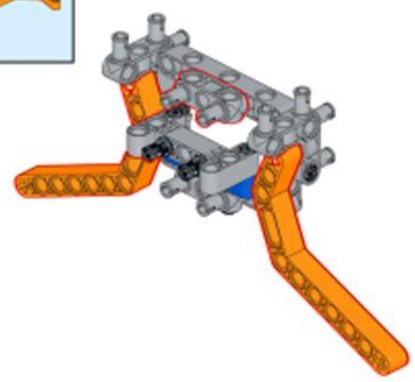

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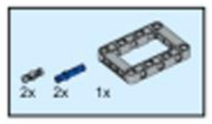

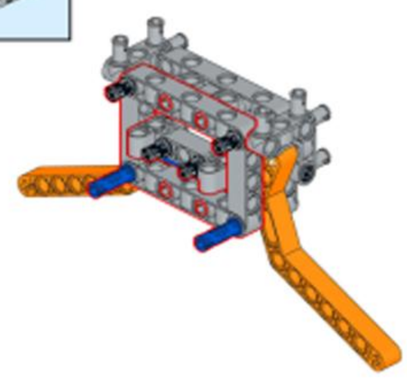

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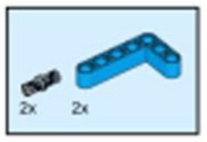

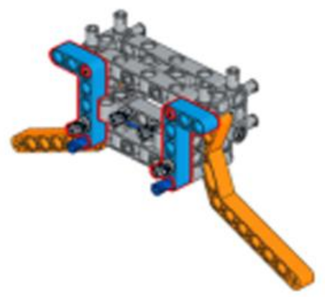

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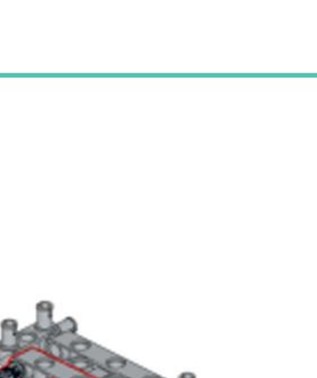

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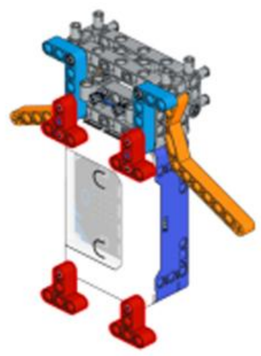

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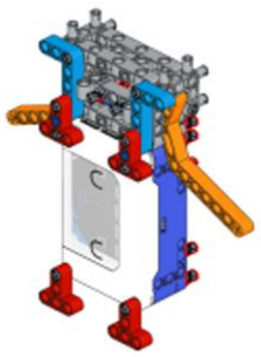

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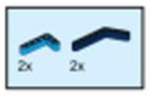

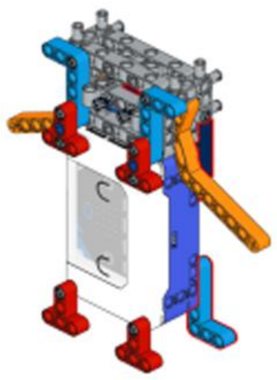

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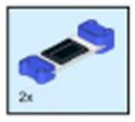
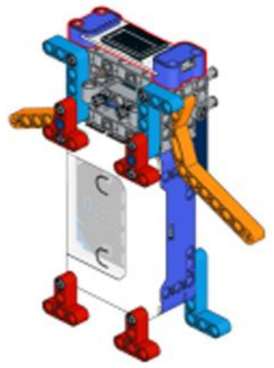
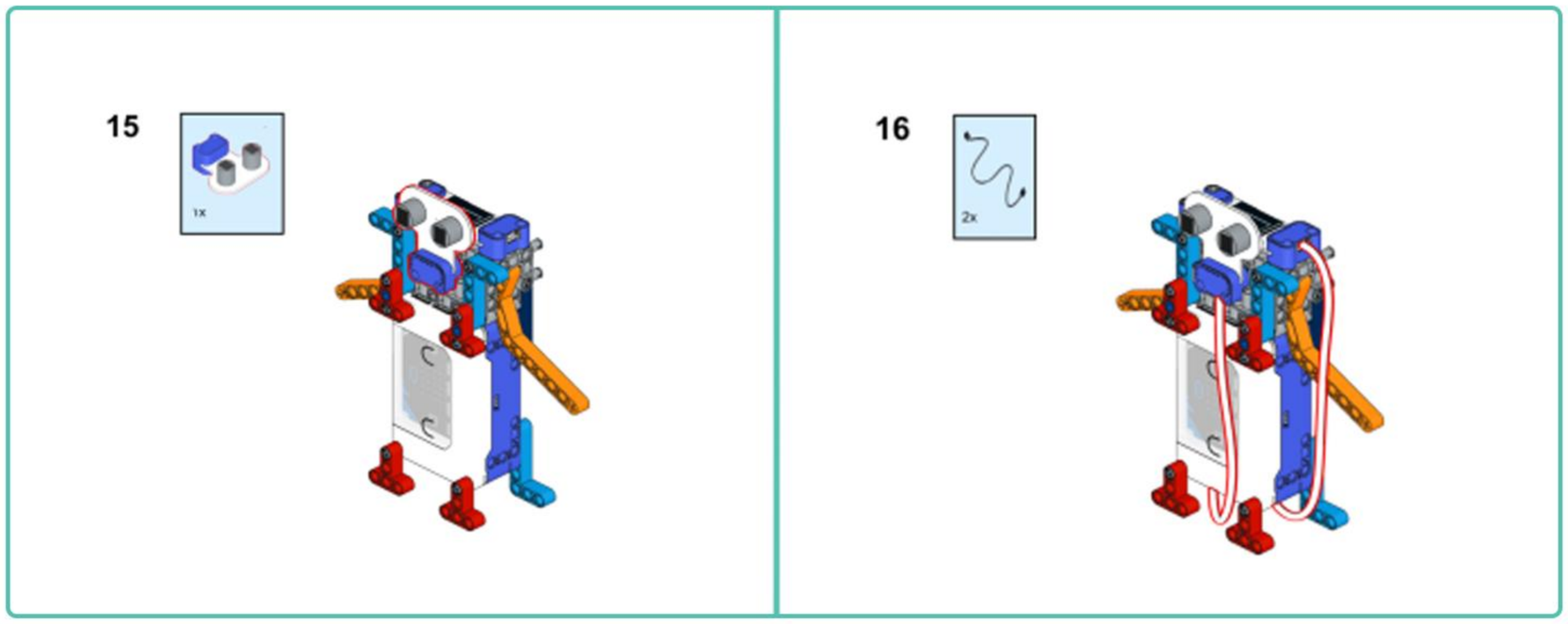




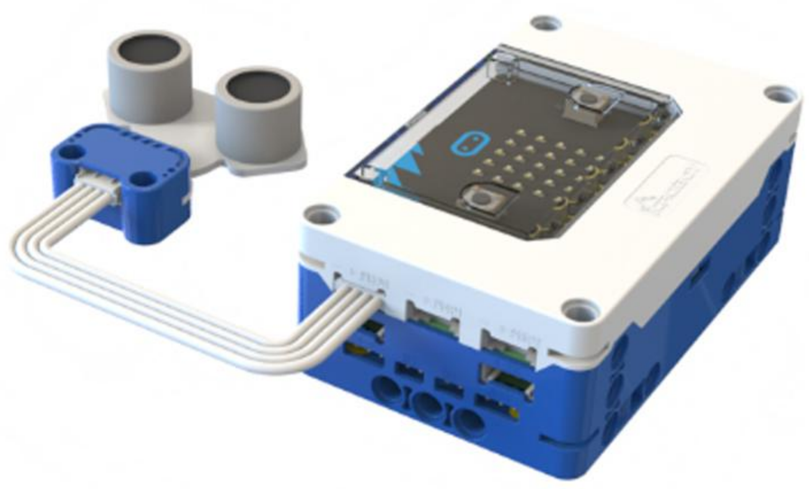


VII.Program Explanation

Ultrasonic Distance Measurement Module is a product used to measure the distance by sending and receiving ultrasonic waves, using the time difference and the speed of sound propagation to calculate the distance from the module to the obstacle in front of it. The ultrasonic sensor module should be connected to any standard I/O port on the micro:bit smart hub when used.



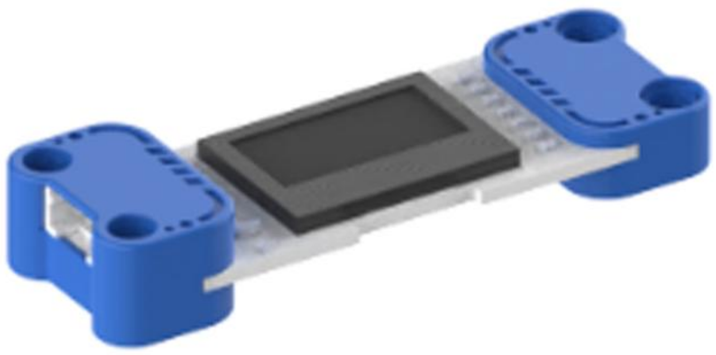
The next step is to test how to use the ultrasonic module through MakeCode programming. This task will use the micro:bit smart hub, and the ultrasonic module, and the ultrasonic module is connected to ports P13 and P0 of the micro:bit smart hub.



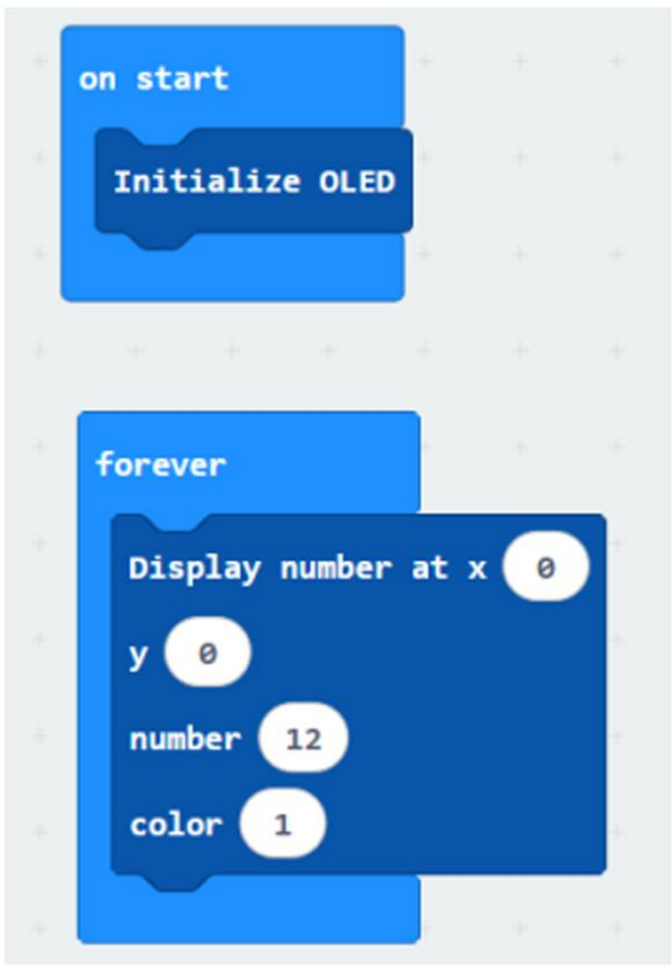
In the MakeCode programming software, the distance detected by the ultrasound is displayed.



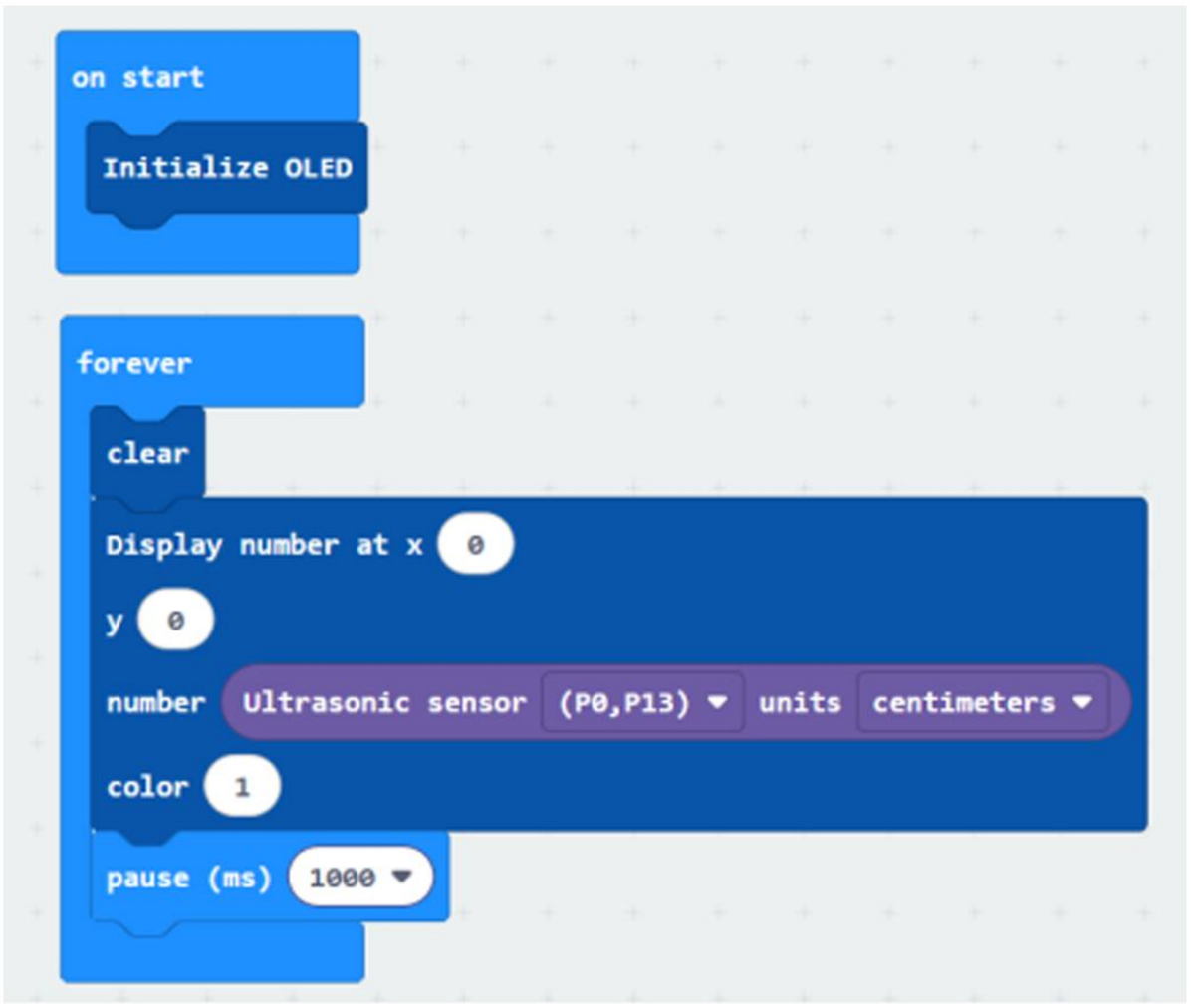
The OLED display module is also known as the OLED12864 display, The OLED screen is a new display technology, that can be luminous, and bright, with high contrast, low power consumption, a screen resolution of 128x64, a size of 0.96 inches.
The OLED display module should be connected to any I2C port on the micro:bit smart hub when used.



The next step is to test how to use the OLED display module through MakeCode programming. This task will use the micro:bit smart hub, the OLED display module, and the OLED display module connected to the IIC port of the micro:bit smart hub. Use the MakeCode programming software to make the OLED display show what you want to show.



Displays the distance detected by the ultrasonic waves to the display.



VIII.Summary

This lesson demonstrates how to create a distance meter. Turn on the main controller, download the program, and you can use the device to measure the distance between the sensor and an obstacle. Students can use this method to measure the size of a desk or even check the size of the desks in the classroom.

Gas Monitoring Station

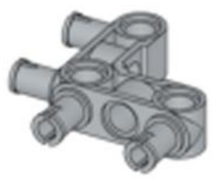
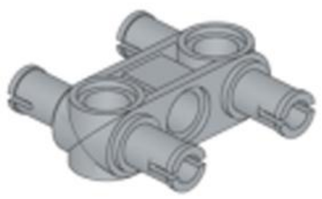
I. Course Overview

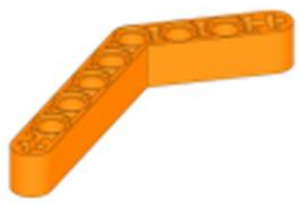
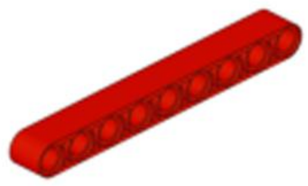
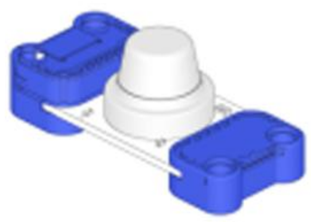
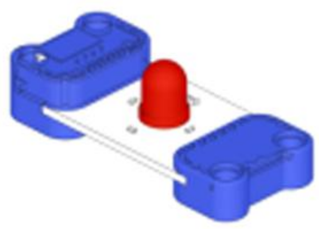
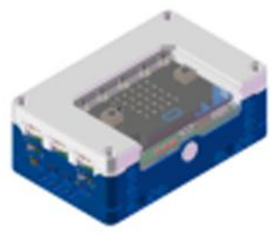
In this lesson, we use a combustible gas sensor to build a device that can detect gas leaks and alert the police - a gas detection robot.

II.Key Learning Points

1、Understanding the combustible gas sensor module

III.Preparation

Equipment Checklist			
Item Type	Item Name	Part Image	Quantity
Building blocks	Friction Pins		10
	Blue Long Pin		4
	4×4 Vertical Connector		6
	3×3 Bolt Connector		2
	3×5 L-shaped Beam		2

	4×6 Curved Hole Beam		2
	1×9 Hole Beam		2
micro:bit AI Programming Modules	Combustible Gas Sensor		1
	Red LED Module		1
	micro:bit Smart Hub		1

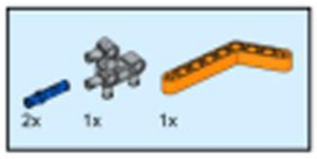
IV.Introduction

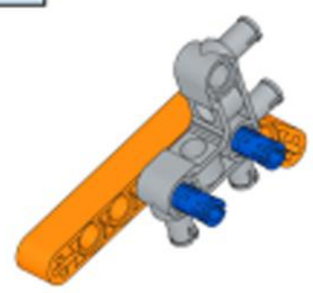
Gas, also known as biogas or natural gas, is mainly composed of methane. It is a colorless, odorless, tasteless, highly flammable, and explosive gas. When the concentration of gas in the air is between 5.5% and 16%, an explosion can occur if there is an open flame. Gas explosions create high temperatures, pressure, and shock waves, and release toxic gases. In coal mines, gas explosions are among the most severe hazards, often causing extensive damage, casualties, and property loss.

V.Lesson Flow

1、Understand the combustible gas sensor module

1





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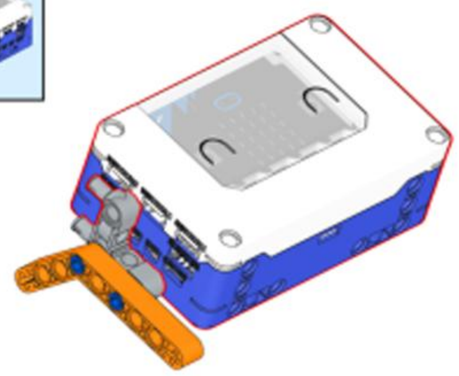

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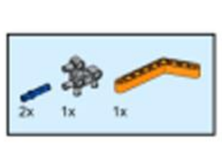

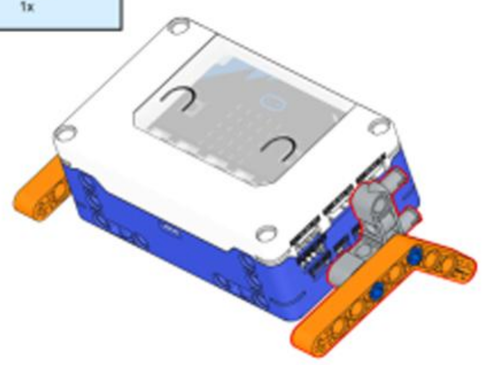

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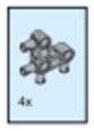

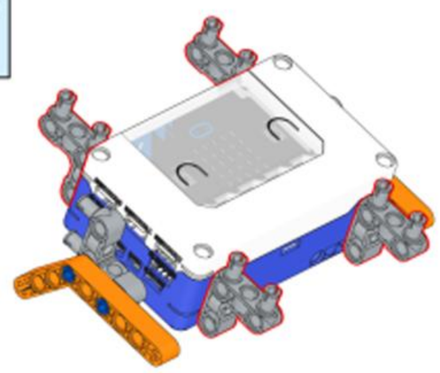

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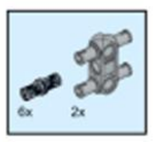

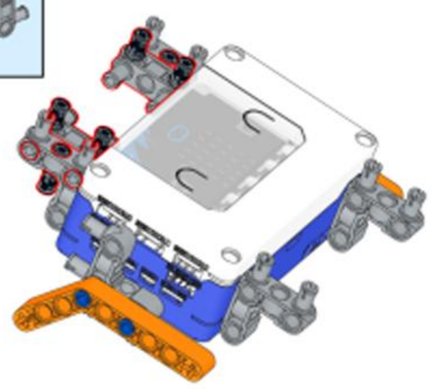

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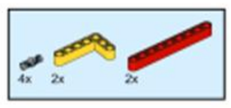

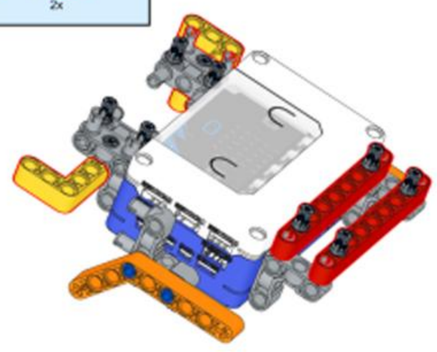

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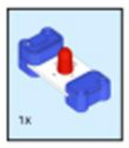

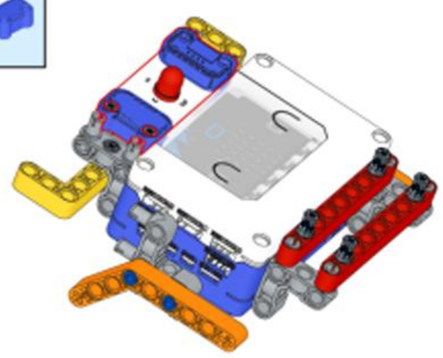

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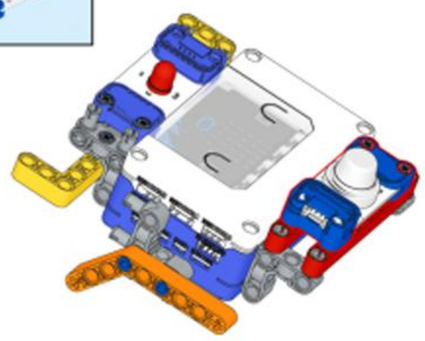
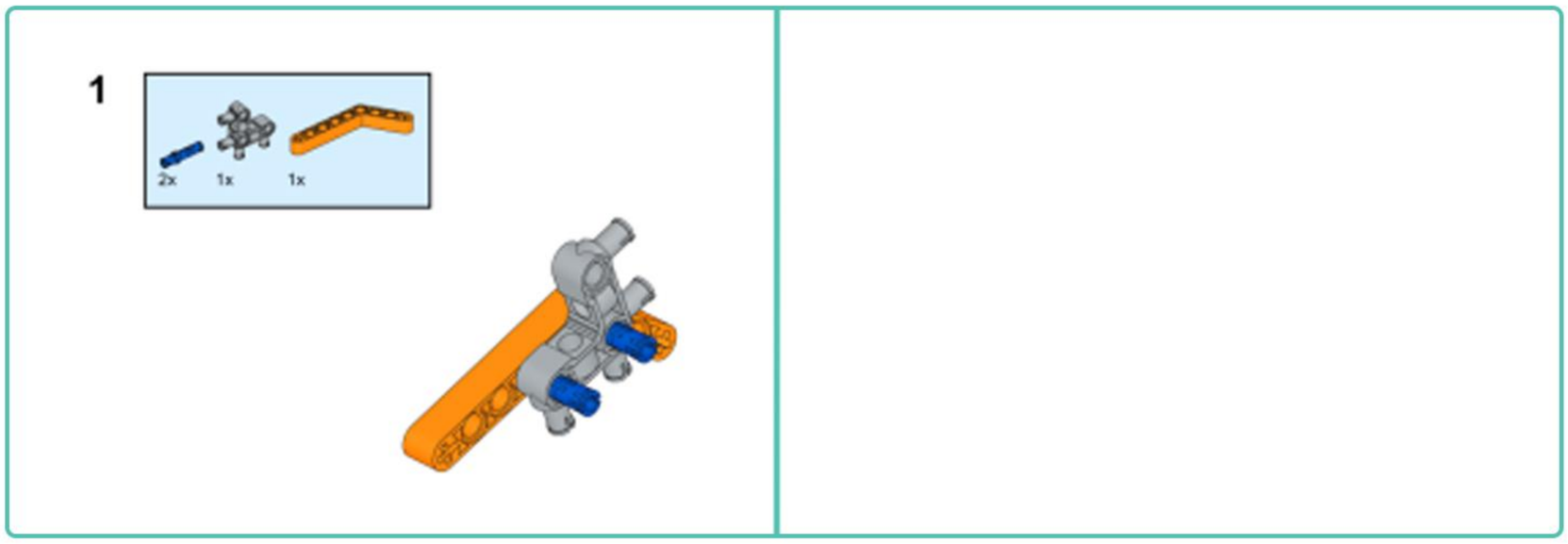




VII.Program Explanation

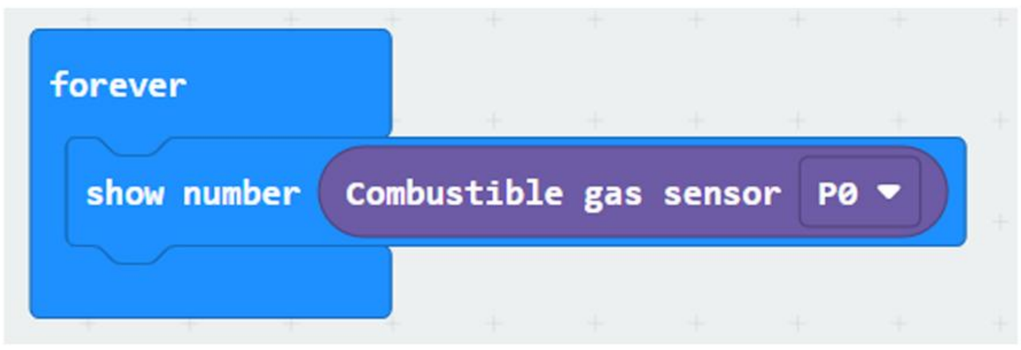
The combustible gas sensor detects gas concentration by measuring the change in resistance of the heated platinum wire. When combustible gas enters the sensor, it causes an oxidation reaction on the platinum surface (flameless combustion), producing heat that increases the temperature of the platinum wire, thus changing its resistance.



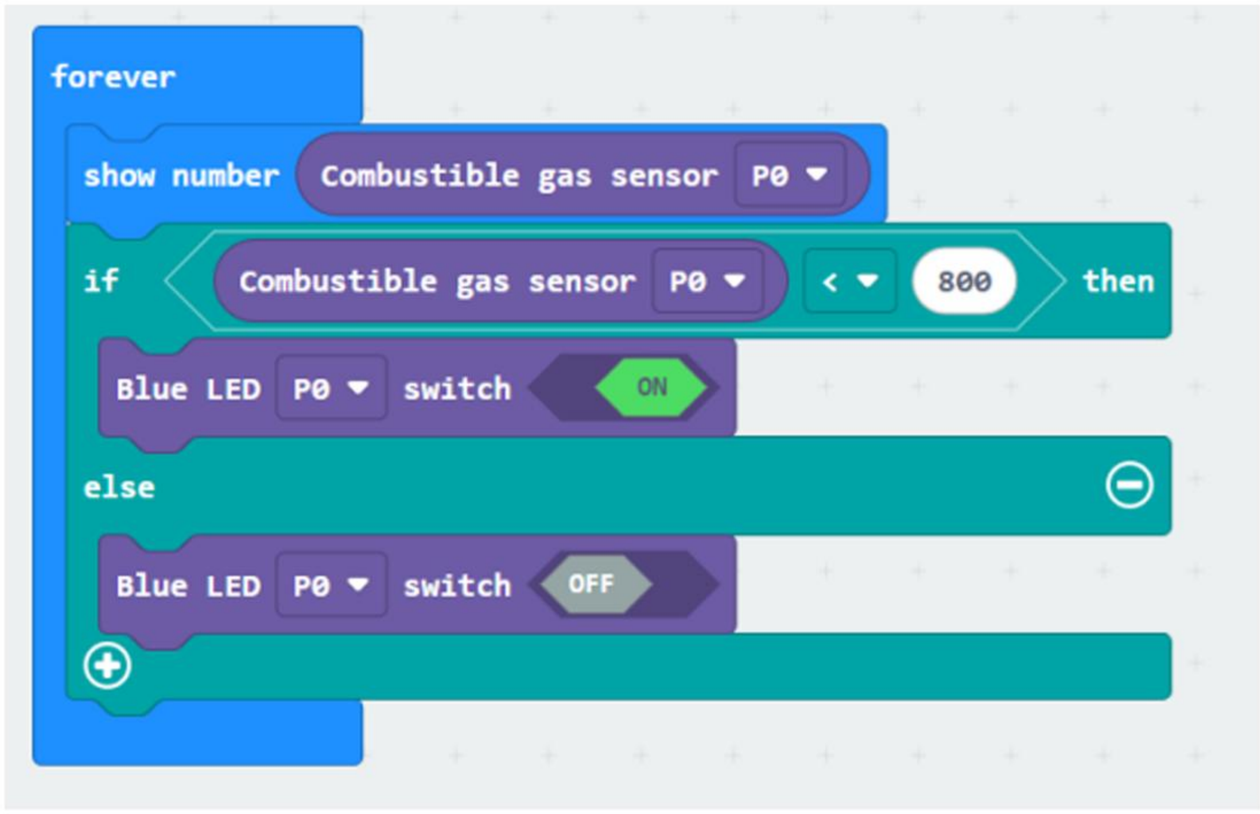
Connection of the combustible gas sensor module to the P2 port of the micro:bit smart hub.



In the MakeCode programming software, the values detected for combustible gases are displayed.



In MakeCode, display the gas concentration detected by the sensor. When the sensor detects combustible gas, the indicator light will turn on, signaling a hazardous condition.



VIII.Summary

This lesson demonstrates how to create a gas monitoring station. Turn on the micro:bit smart hub, download the program, and you can use this station to detect any potential gas leaks in your home. The principle is similar to the gas leak detectors used in households.

Blender

I. Course Overview

A blender is a kitchen and laboratory appliance used to mix, crush, puree, or emulsify food and other substances. It consists of a motor at the top, connected to rotating blades at the bottom through an axle. Some powerful blenders can also crush ice and other frozen foods.



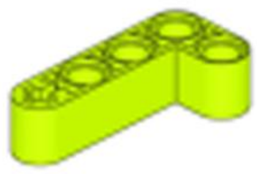
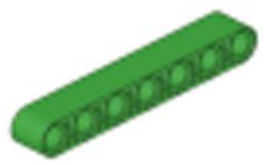
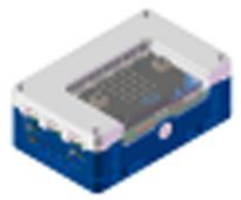
In this lesson, we will build a blender using a button module and a motor module. When the button is pressed, the blender will start to rotate, and when the button is released, the blender will stop.

II.Key Learning Points

1、Understanding the button module

III.Preparation

Equipment Checklist			
Item Type	Item Name	Part Image	Quantity
	Friction Pins		16
	Blue Long Pin		4

	Cross Hole Long Pin		2
	4×4 Vertical Connector		2
	1×3 Hole Beam		2
	2×4 L-shaped Beam		4
	1×7 Hole Beam		2
	1×11 Hole Beam		5
	1×7 Cross Shaft		1
	5×11 H-shaped Circular Beam		2
micro:bit AI Programming Modules	Button Module		1
	Motor Module		1
	micro:bit Smart Hub		1

II.Introduction

A kitchen blender typically consists of a support structure, a drive mechanism, and a mixing bowl. The support structure includes a base, support rods, and a fixed box, while the drive mechanism is made up of a motor and a gearbox. The base is connected to the fixed box via the support rods, with the motor housed inside the fixed box. The gearbox′ s output is connected to the mixer, which is placed between the base and the fixed box. The blender makes it easy to mix various ingredients in the kitchen, is simple to operate, and easy to clean.

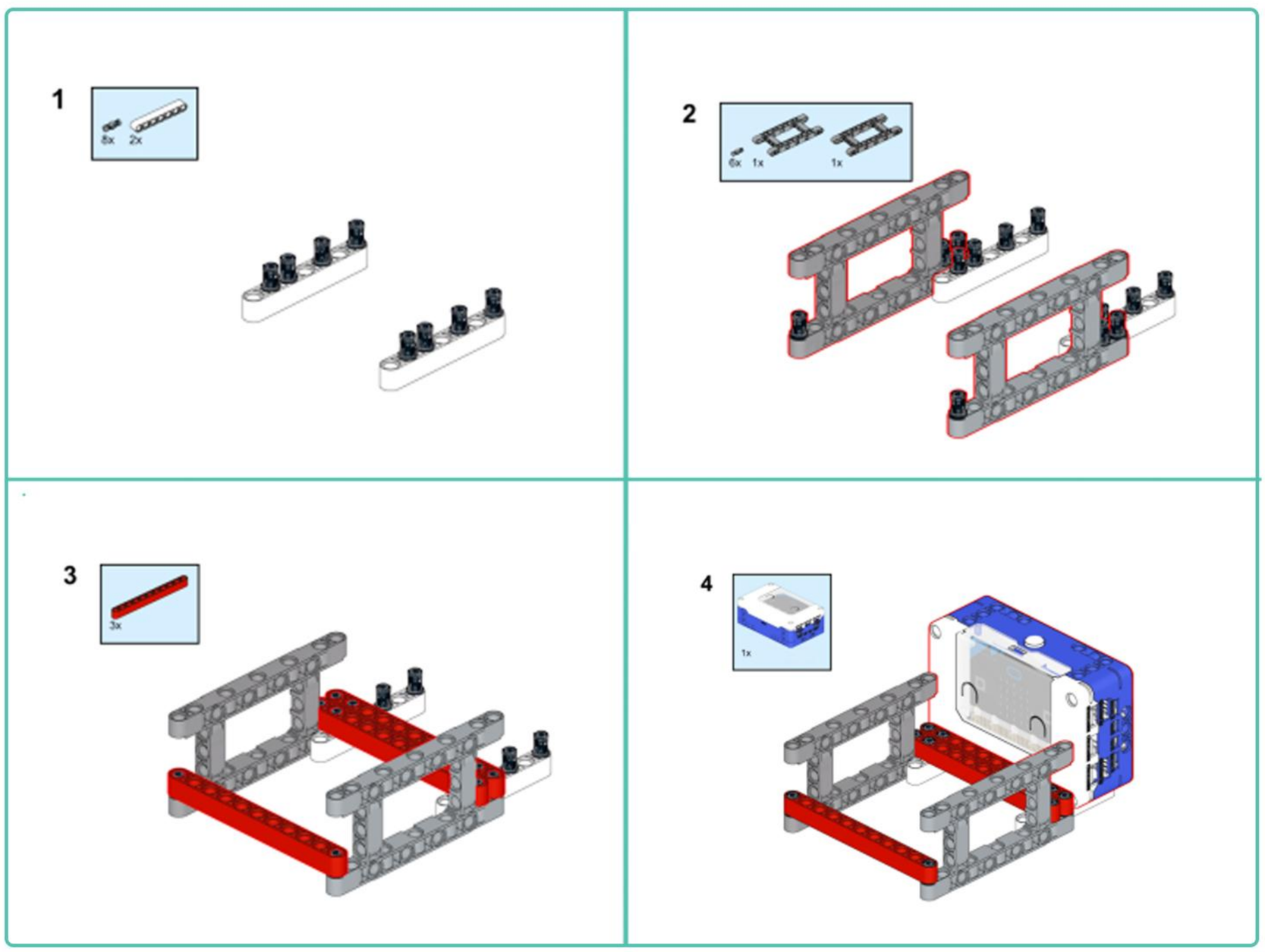
III.Lesson Flow

1、Learn about the button module

2、Build the blender

3、Program the device

IV.Building the Project



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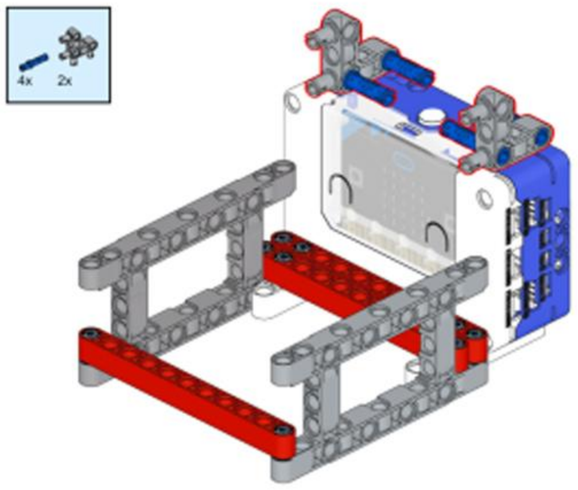

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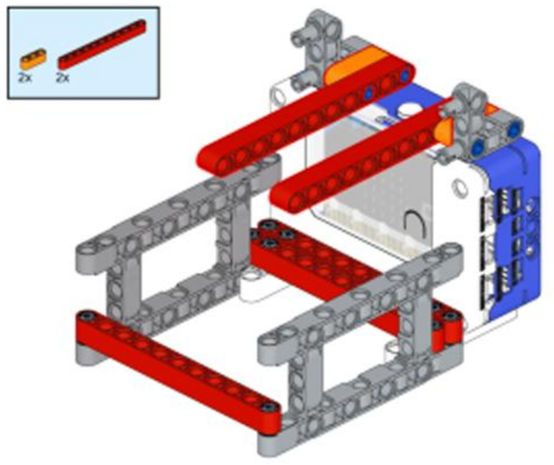

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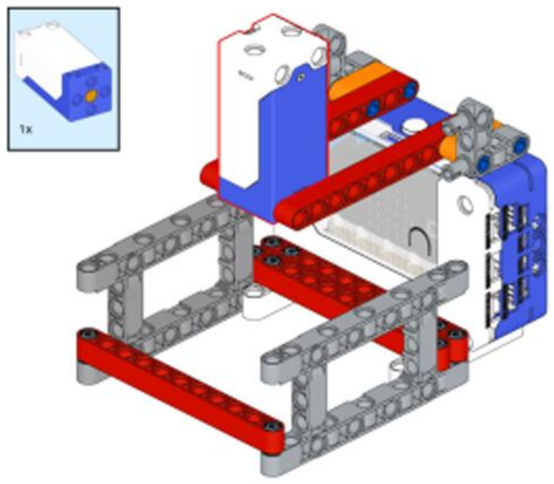

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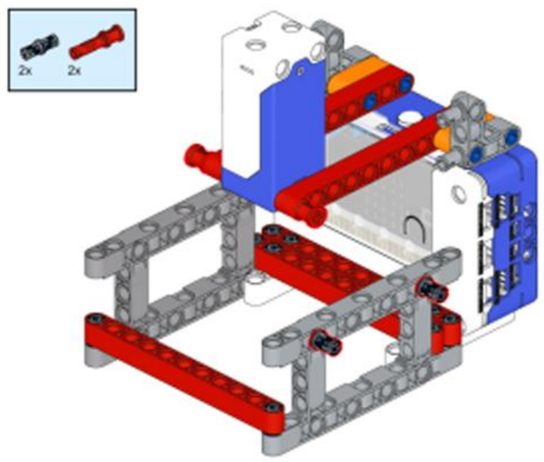

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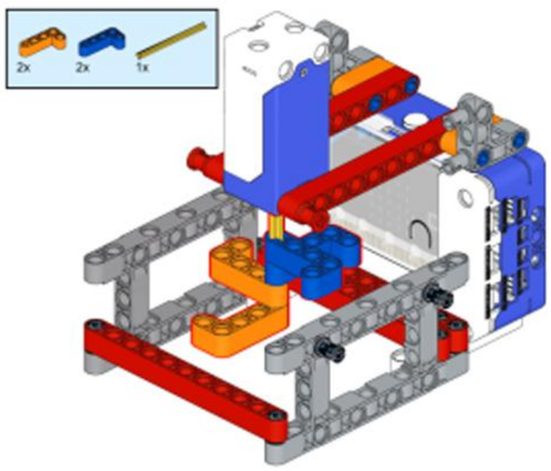

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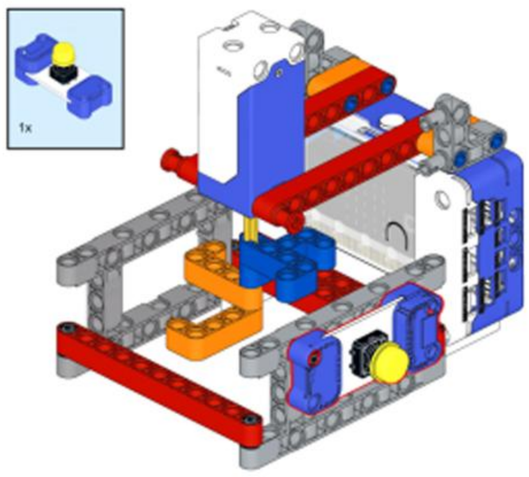

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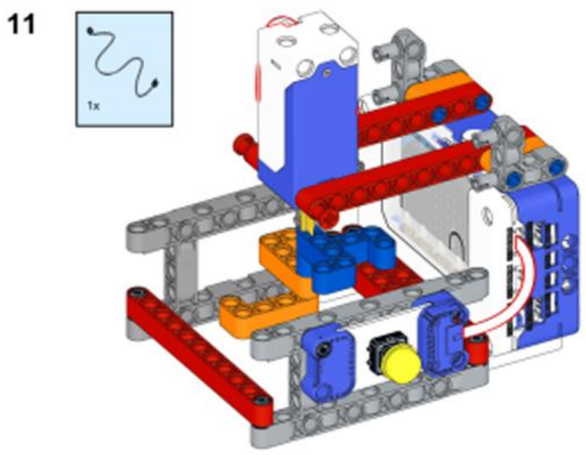
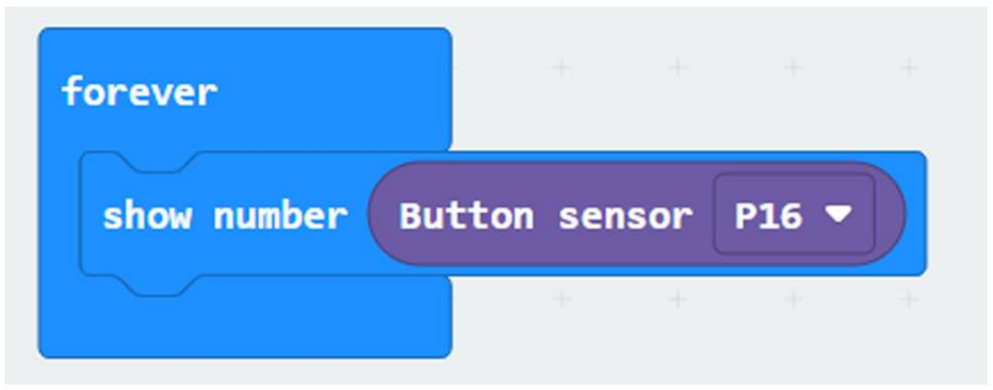


V.Program Explanation

The button module is the equivalent of a switch and is the simplest type of switch-measurement sensor. The button module should be used by connecting to any standard I/O connector on the micro:bit Smart Hub.



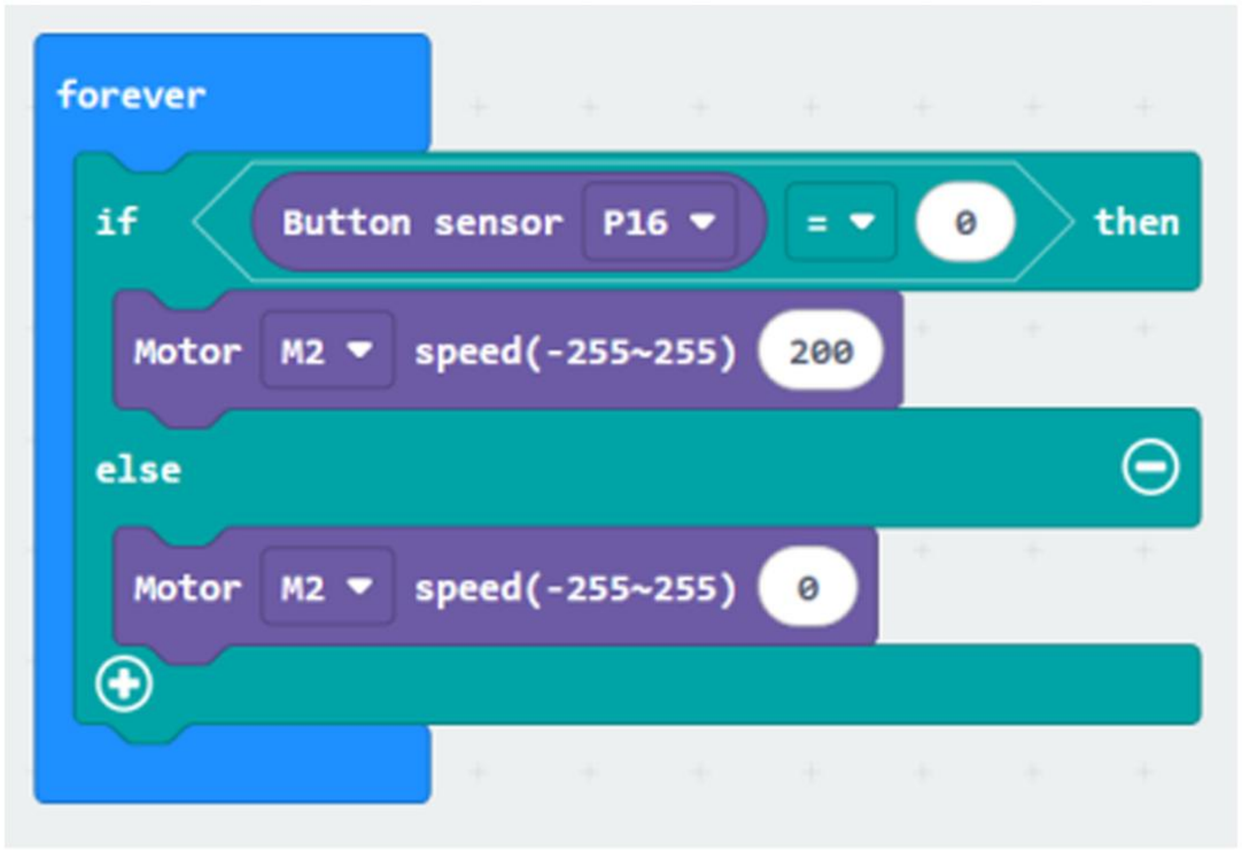
Next, we will use MakeCode to program the button module. In this task, the button module will be connected to port P16 on the micro:bit smart hub.



Drag the motor module to the infinite loop module and adjust the values behind it to control the speed and direction of the motor.



By using the button module and motor module, we will create a blender. When the button is pressed, the motor starts running, and when the button is released, the motor stops.



VI.Summary

This lesson shows how to build a blender. Turn on the micro:bit smart hub, download the program, and with the button and motor modules, you can control the blender to start and stop by pressing and releasing the button.

Automatic Clothes Drying Rack

I. Course Overview

Since the twentieth century with the rapid development of the domestic economy and the rapid expansion of real estate, directly contributing to the rapid development of the decoration of home furnishing industry, which drying racks market has stood out in line with the trend of ten years to rapid development. Intelligent drying racks as an independent industry, gradually from the beginning stage slowly mature.

Due to the hand-cranked drying rack itself exists in the construction of simple, short service life, maintenance and other defects, unable to meet the consumer's increasingly development of intelligent home needs. The original drying rack is only a rope or wire to wear a steel pipe, after the emergence of nylon rope pulling lift, and later invented the nylon rope type hand-cranked drying rack, eighty-nine years, drying rack evolved to the steel wire hand-cranked type. Electric drying racks are booming, conforming to the trend of the intelligent home era, serving the majority of the need to dry the clothes of the world.



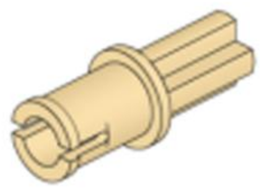
In this lesson, we will use a light sensor module and a servo to create a smart clothes drying rack. When it’ s cloudy or dark, the light sensor detects dim lighting, and the rack retracts. When it’s bright and sunny, the light sensor detects increased light, and the rack extends.

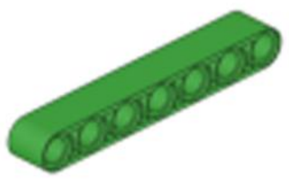
II.Key Learning Points

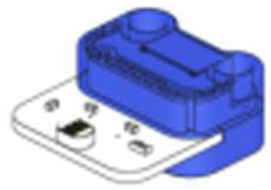
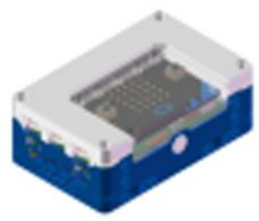
Understanding the light sensor module

Understanding the servo module

III.Preparation

Equipment Checklist			
Item Type	Item Name	Part Image	Quantity
Building Blocks	3/4 Pin		1
	Friction Pin		3
	Smooth Pin		2
	Beige Axle Pin		2
	Cross Hole Long Pin		10

	1X2 Cross Axle		1
	No. 6 Axle Pin Connector		4
	No. 1 Axle Pin Connector		2
	1×2 Cross Axle		1
	1×5 Cross Axle		1
	1×6 Cross Axle		1
	1×9 Cross Axle		1
	40-Tooth Gear		1
	1×7 Beam		1
	1×13 Beam		2

	11.5 Bent Beam		2
	11×15 Beam Frame		2
micro:bit AI Programming Modules	Servo Module		1
	Light Sensor		1
	micro:bit Smart Hub		1

IV.Introduction

An intelligent drying rack is an integrated, multi-functional, intelligent drying rack that is improved on the traditional hand-cranked drying rack. It controls lighting, sterilization, air drying, and drying through the on/off control of circuit board I/O ports. It realizes the functions of lighting, sterilizing, air drying, drying, etc. by turning on and off the I/O ports of the circuit board, and realizes the fun ctions of rising and descending of the clothesline by the forward and reverse rotation of the motor. The system chip control of stopping in case of obstruction makes modern life intelligent and safe fusion, for the sake of family's health and comfort, which prompts the emergence and rapid development of intelligent drying racks.

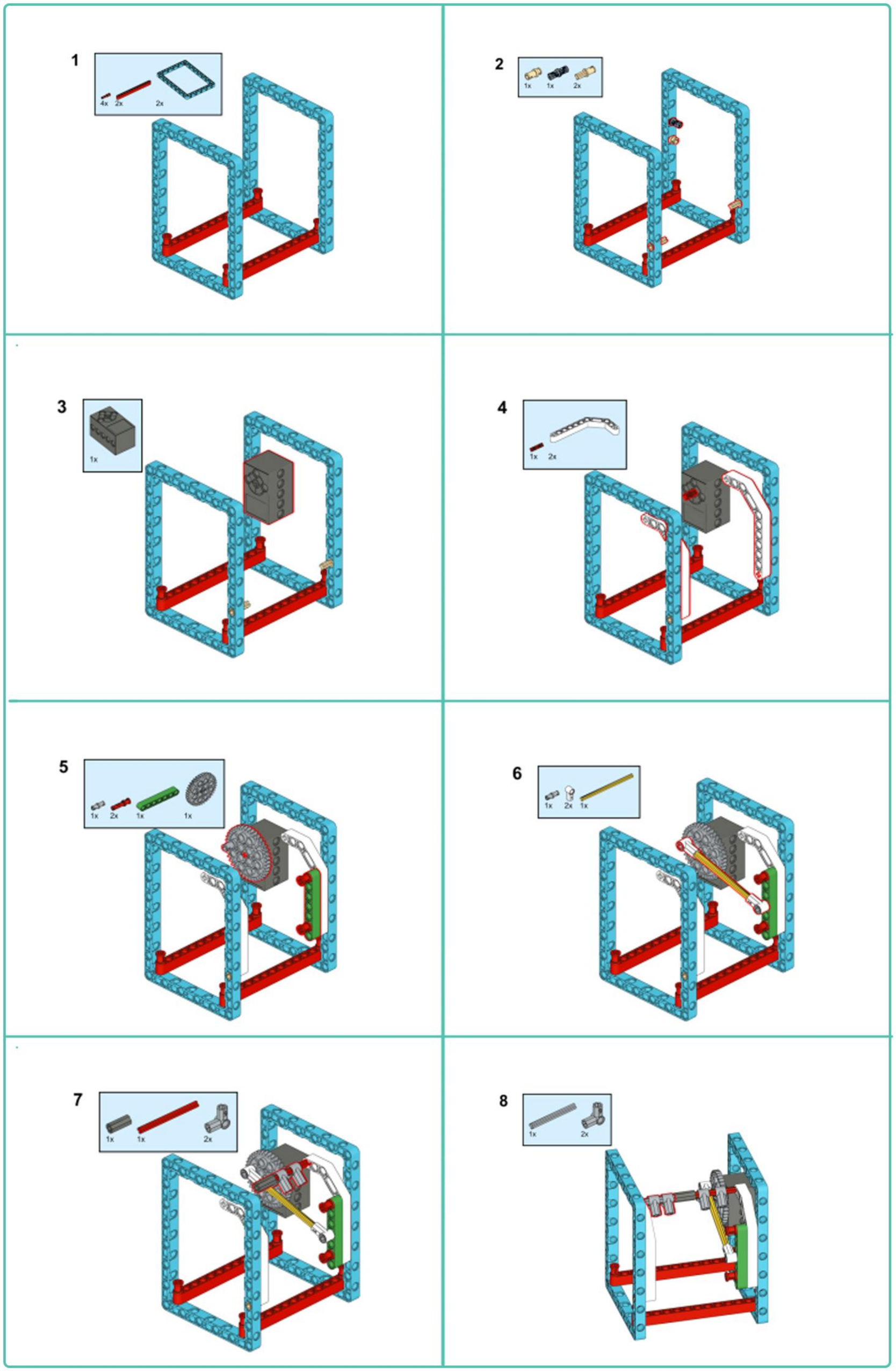
V.Lesson Flow

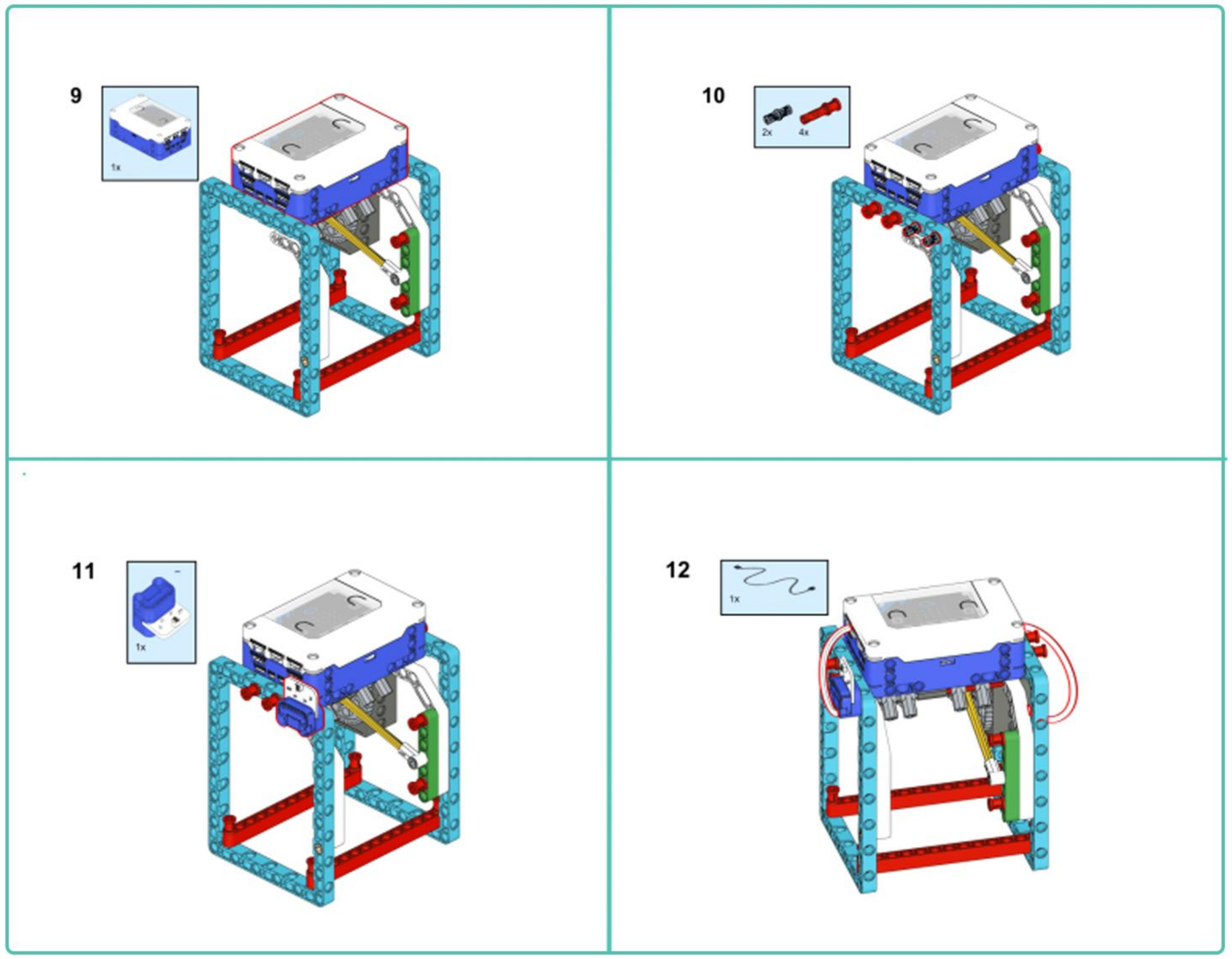
1、Understand the light sensor module

2、Build the automatic clothes drying rack

3、Program the device

VI.Building the Project



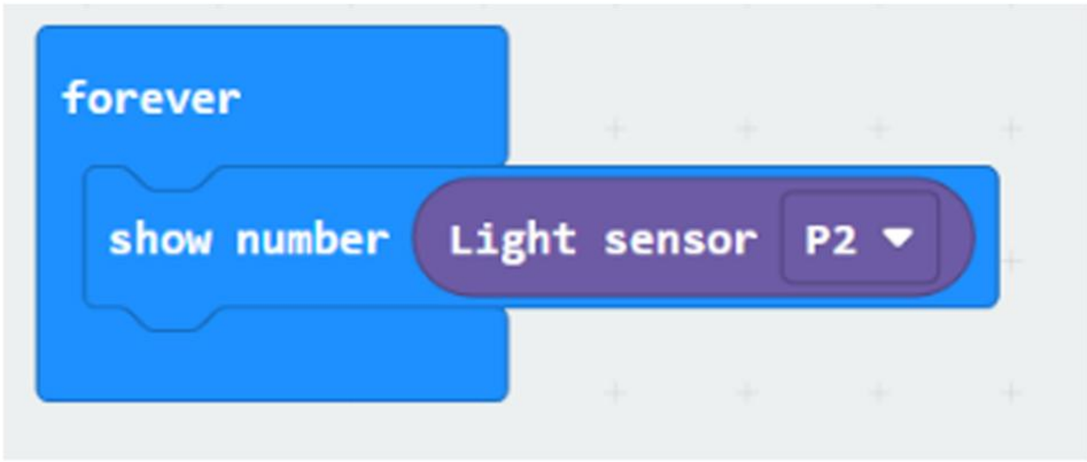


VII.Program Explanation

Photosensitive sensors are sensors that use photosensitive elements to convert light signals into electrical signals. The stronger the light, the smaller the return value, and the weaker the light, the larger the return value. The photosensitive sensor module should be connected to any standard I/O port on the micro:bit smart hub when used.



Next, test the button module working by programming it with MakeCode.
This task will use the micro:bit smart hub and the photosensitive sensor module, and connect the photosensitive sensor module to port P0.



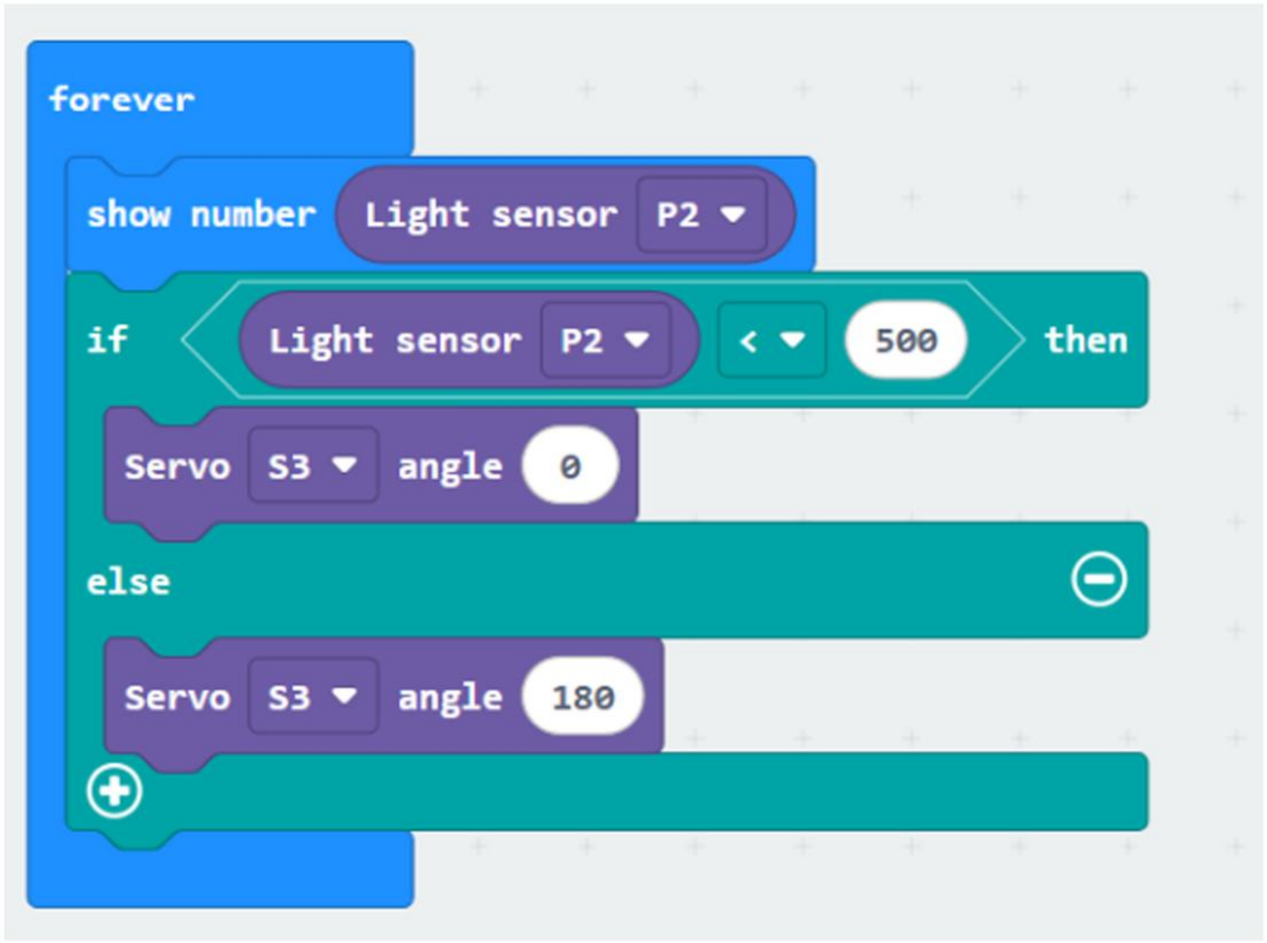
Test the servo module operation by programming MakeCode to rotate the servo to 180 degrees.



At this point the servos are installed and the servos are tested to the 0 degree position.



After the test is completed the whole program is written so that the drying rack is put away when the light is detected by the photosensitive to be weak and when the light is detected by the photosensitive to be strong, the drying rack is put down.



VIII.Summary

This lesson describes how to make a smart drying rack. Turn on the power switch of the micro:bit smart hub, download the program, and we can make a drying rack that can automatically collect clothes.

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