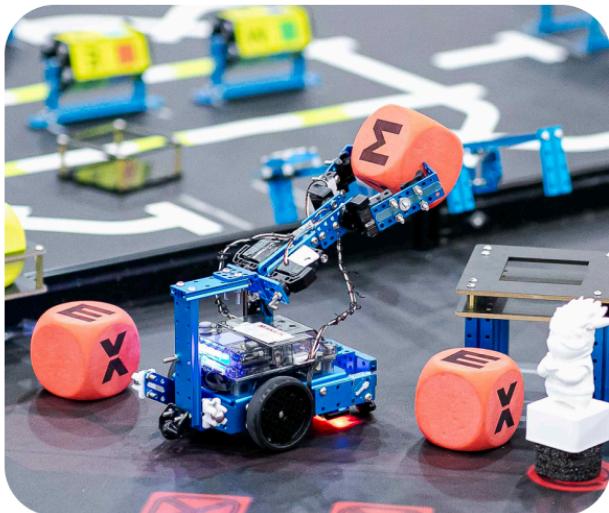
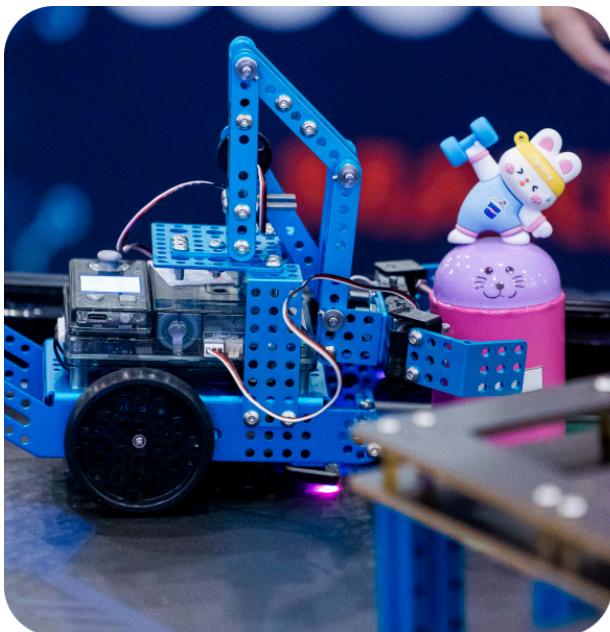




After-school Program Guide for Makeblock mBot2



Welcome

Why mBot2 for STEAM in the After-school Program?

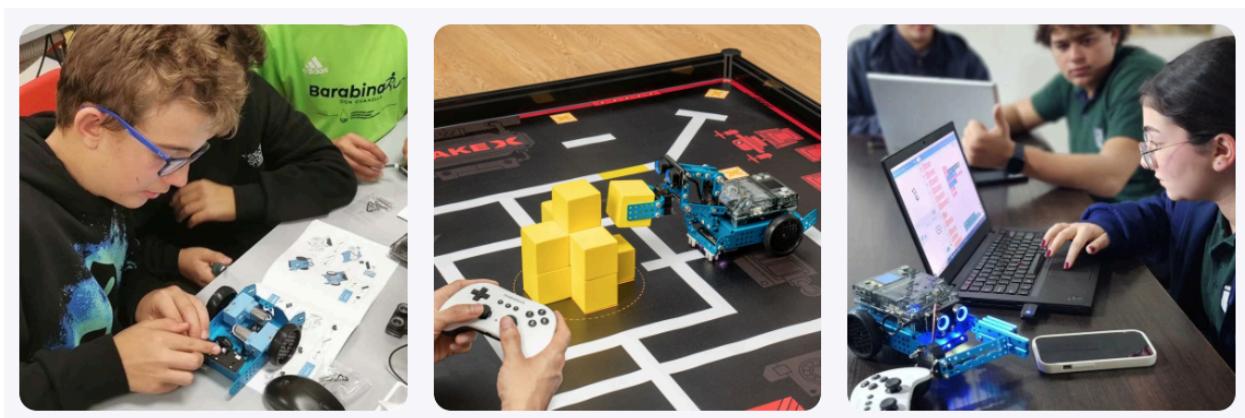
STEAM education is crucial for nurturing creative problem-solving in today's fast-paced technological world. Robotics, a vital component of STEAM, sparks student interest and helps them grasp fundamental concepts that will shape future technologies.

Makeblock mBot2, as an educational robot, empowers students to delve into mechanical, electrical, and software engineering through hands-on building and programming. This guide is tailored to assist teachers in facilitating engaging robotics activities. Whether you're a programming novice or a seasoned educator, you'll find valuable resources to inspire your students and enhance the learning experience.

What You Get in this Guide

This guide will walk you through assembling, programming, and utilizing the mBot2 and incorporating the mBot2 Smart-world Add-on Pack to tackle the 'Smart Logistics' activity competition.

We've structured the content from beginner to advanced to ensure every student can progress significantly in their technological journey. Additionally, we encourage teachers to foster creativity, teamwork, and problem-solving abilities through collaborative projects.



Facilitation Options

This guide provides a fun and flexible approach to introducing STEAM in after-school programs using the [mBot2 Inspire Activity Bundle for STEAM Activities](#). With open-ended projects and group work, students can learn coding and engineering while having fun. Each activity is based on mBot2 robots and is easy to follow.

We know that extracurricular activities vary widely in terms of age groups, goals, and scheduling. This guide applies to the following:



Work with the same students for 1 to 2 hours a day



Running a weekly program in which students choose to participate



Running summer camps that students choose to attend

The mBot2 Inspire Activity Bundle caters for up to 12 students at a time. If you are conducting small group instruction with fewer than 12 students or large classes with more than 12 students, we also offer ways to select products based on the actual number of participants.

There is some flexibility in the activities and resources in this guide. Each activity begins with a link to a resource created by mBot2 that is simple to start. The activities are then intentionally left open to encourage student exploration and curiosity.

Materials

What You Need in this Activity

We highly recommend that you go straight to the [mBot2 Activity Bundle](#), as all the materials used in this guide are already packaged into this bundle. We offer 4 options to meet the needs of classrooms with 2, 4, 6, or 12 students at a time.



[mBot2 Activity Bundle](#)

	X2 Packs		
+	+	+	+
x 2	x 1	x 3	x 6
		x 1	

How to Choose based on the Number of the Students?

You also have the flexibility to choose the materials depending on the number of students. For teaching aids, we recommend using one mBot2 for 2 students.

mBot2

A single mBot2 is perfect for up to 2 students.

mBot2 is an AI learning STEAM coding education robot kit (upgraded version of mBot), supporting block-based and Python programming. Ideal for K-12 educators and learners to experience the power of programming and robotics through IoT fun.



mBot2 Smart-world Add-on Pack

A single mBot2 Smart-world add-on pack is perfect for up to 2 students.

The mBot2 Smart World Plug-In Kit is an expansion kit based on the mBot2 development design and includes Makeblock metal parts and servos. In combination with the original mBot2, students can carry out a variety of projects themed around smart farming, city building, mechanical engineering, and learning.



Bluetooth Remote Controller

A single remote controller is perfect for up to 1 student.

The Makeblock Bluetooth controller comes equipped with 14 buttons and 2 joysticks that can be programmed to perform a wide range of functions. It's compatible with numerous Makeblock robots that feature built-in Bluetooth modules, and it also offers a corresponding application that you can upload for immediate use. Whether you're in a classroom, at home, or on a competition field, you can enjoy a clearer and more professional robot control experience.



MakeX Inspire Smart Logistics Arena

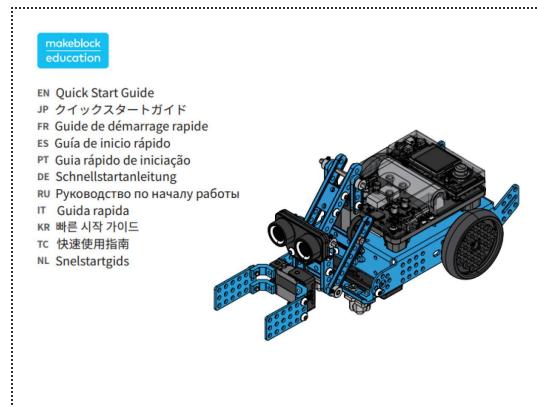
A single arena is perfect for up to 6 students.

The MakeX Inspire Competition Arena simulates a modern factory logistics scenario, allowing students to fully learn about the Internet of Things, artificial intelligence, and other advanced technologies experienced in the scenario, and to comprehensively utilize the knowledge of mechanical structures, sensors, and programming to complete automated handling, fixed-point placement, and safe storage tasks.



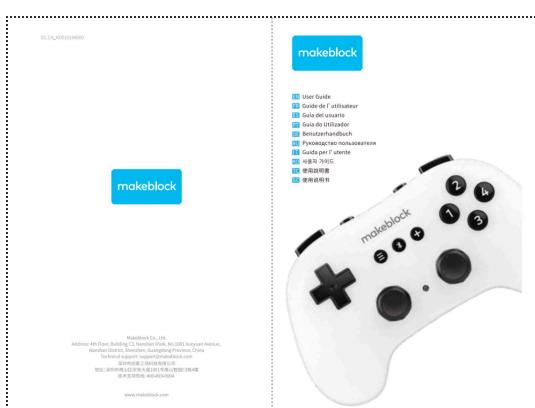
How to Get Started

Each product contains an instruction manual that will help you quickly familiarize yourself with and use the product. At the beginning of each lesson, you will need to organize the students to build the corresponding form according to the manual, and then organize the teaching according to the content of the lesson.



mBot2

Step-by-step illustrated guide for how to assemble mBot2 from scratch



Bluetooth Remote Controller

Step-by-step Illustrated guide on how to program the Bluetooth Remote Controller

mBot2 Smart-world Add-on Pack

Step-by-step illustrated guide for how to expand mBot2 into 3 advanced robot forms: robotic carrier, surveying robot, or robotic arm.



Smart Logistics Arena

Step-by-step Illustrated guide to establishing the Smart Logistics Competition Venue

Introduce to Activities

By combining hands-on activities in the "Lessons-Challenge-Competition" scope, we foster a love of STEAM and equip students with valuable skills for the future, such as problem-solving and collaborative mindsets.

Lessons	Programming Focus
<u>Lesson 1 - Let's move</u>	<ul style="list-style-type: none">Precise movements and corresponding coding blocks.
<u>Lesson 2 - Sensing = data</u>	<ul style="list-style-type: none">Mode of operation of the sensors.Different approaches to display and visualize data on the display.Differences between Live and Upload mode in mBot2.Block 5.
<u>Lesson 3 - Listen to mBot2</u>	<ul style="list-style-type: none">Text-to-speech (TTS) and Voice recognition (Speech to Text, STT) using the built-in speaker and microphone.Running multiple tasks side by side.
<u>Lesson 4 - Seeing with sound</u>	<ul style="list-style-type: none">Detecting an obstacle or a range by using the ultrasonic sensor.Using loops and conditional statements for making the mBot2 drive while avoiding obstacles.
<u>Lesson 5 - Sightseeing</u>	<ul style="list-style-type: none">Mode of operation (physics of light) of the color sensor/line follower.Color and line identification- Making the mBot2 follow a line and having it perform actions based on color detection.
<u>Lesson 6 - Careful drive</u>	<ul style="list-style-type: none">Mode of operation of gyroscopes and accelerometers (as Inertial Measurement Units, IMU).Coding the mBot2 to adapt to road conditions based on IMU data.
<u>Lesson 7 - A network game</u>	<ul style="list-style-type: none">Wireless data transfer in ad-hoc networks.Data exchange in loops and events.

<u>Lesson 8 - mBot2 at your service</u>	<ul style="list-style-type: none"> • Using WIFI infrastructure mode with the mBot2 for speech recognition and speech synthesis. • Offloading heavy computing like speech recognition to cloud services. • Structuring code by applying "own blocks" (functions).
<u>Lesson 9 - mBot2 in the wild</u>	<ul style="list-style-type: none"> • Learning about Machine Learning and applying it with local processing only on block-based programming. • Establishing a new communication protocol between the mBot2 and the computer.

Challenges	Programming Focus
<u>Challenge - Monitoring vertical crops</u>	<ul style="list-style-type: none"> • Precisely steer the robot to keep a constant distance to a barrier/guide on one side • ("maintenance work" or "smart farming") • Identify colored objects in different heights on or above the barrier/guide • Advanced: transmit the position of the objects to another robot
<u>Challenge - Transporting goods around the farm</u>	<ul style="list-style-type: none"> • Using the Quad RGB sensor, the robot should identify different locations in a work area (a farm). • Program the robot to transport objects between different locations in the work area.
<u>Challenge - Processing waste</u>	<ul style="list-style-type: none"> • Create a program that distinguishes different kinds of objects based on the image • recognition using the Teachable Machine extension in mBlock and a webcam. • To program the Robotic Arm to manipulate and transport the identified objects to specific locations within a work area (a waste processing plant).

Activities	Programming Focus
<u>Use Bluetooth Controller to Make mBot2 Vertically move and turn</u>	<ul style="list-style-type: none"> • What Bluetooth controller is and how to apply it • How to use the buttons or joysticks of a Bluetooth controller for coding • Use the buttons and joystick of the Bluetooth controller to control the robot's vertical movement and turning.

<u>Use Bluetooth Controller to Make mBot2 Grab, Carry and Release</u>	<ul style="list-style-type: none"> • Understand the functions of the robotic gripper and robotic arm. • Learn to use the Bluetooth controller to control the robot to grab, carry, and release objects.
<u>Smart Logistics Competition</u>	<ul style="list-style-type: none"> • Organize a competition on the theme of "Intelligent Logistics" through the contents of the study.

Recommended Schedule

Below are plans for 7 and 14 activities respectively. The suggested time for each activity is 1-2 hours, and depending on the topic, each activity will consist of a lesson (or activity presentation) and hands-on time. We recommend that you complete the lesson portion in 45 or 90 minutes, leaving the rest of the time free for student exploration.

7 Activities

Lessons

Lesson 1 - Let's move
 Lesson 4 - Seeing with sound
 Lesson 5 - Sightseeing

Challenge

Challenge 1 - Monitoring vertical crops

Activities

Use Bluetooth Controller to Make mBot2 Vertically move and turn
 Use Bluetooth Controller to Make mBot2 Grab, Carry and Release
 Smart Logistics Competition

14 Activities

Lessons

Lesson 1 - Let's move
 Lesson 2 - Sensing = data
 Lesson 3 - Listen to mBot2
 Lesson 4 - Seeing with sound
 Lesson 5 - Sightseeing
 Lesson 6 - Careful drive
 Lesson 7 - A network game
 Lesson 8 - mBot2 at your service
 Lesson 9 - mBot2 in the wild

Challenges

Challenge 1 - Monitoring vertical crops
 Challenge 2 - Transporting goods around the farm
 Challenge 3 - Processing waste

Activities

Use Bluetooth Controller to Make mBot2 Vertically move and turn
 Use Bluetooth Controller to Make mBot2 Grab, Carry and Release
 Smart Logistics Competition

Go Further with mBot2

Want to design your arena for creative after-school programs? Follow this [map design guide!](#)