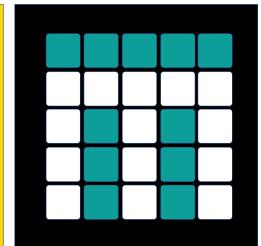
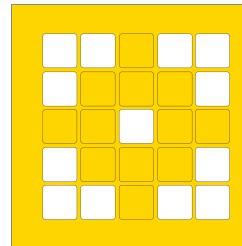


PRIME LESSONS
By the Makers of EV3Lessons



INTRODUCTION TO SPIKE PRIME/ ROBOT INVENTOR HUB & SOFTWARE

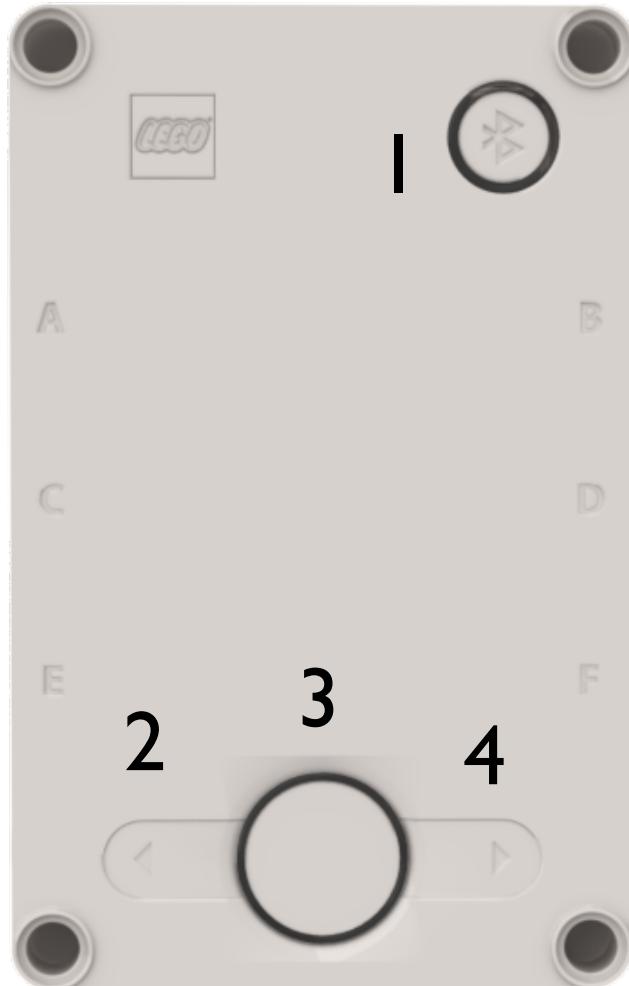
BY SANJAY AND ARVIND SESAN

LESSON OBJECTIVES

- Learn how the SPIKE Prime and Robot Inventor Hub operates
- Learn about the main components of the SPIKE Prime and Robot Inventor Software
- Learn how to connect your Hub

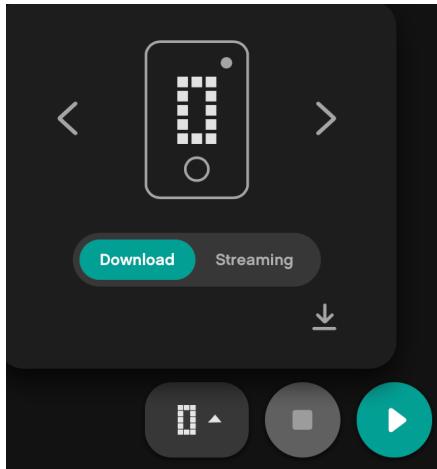
THE HUB BUTTONS

1. Put Hub in Bluetooth pairing mode
2. Left button for program navigation in home menu
3. Select program or exit program when running. Hold down for 5 seconds to power off. Turns on Hub.
4. Right button for program navigation



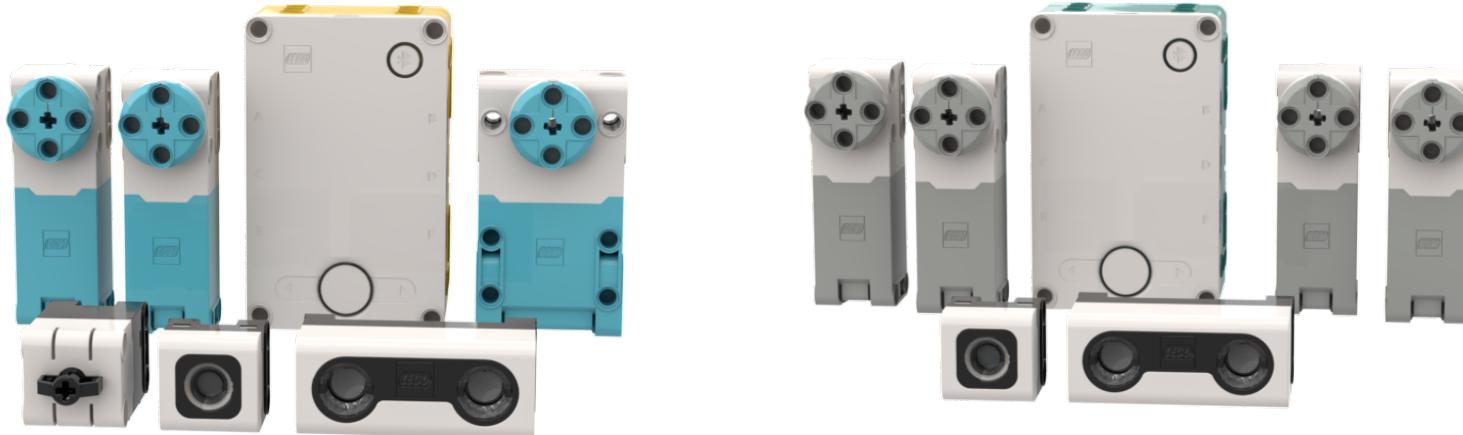
THE HUB SCREEN

- 5x5 LED pixel matrix can be used to make designs, but also pick programs
- Use the arrows and center button to navigate/launch programs
- You can have a maximum of 20 programs

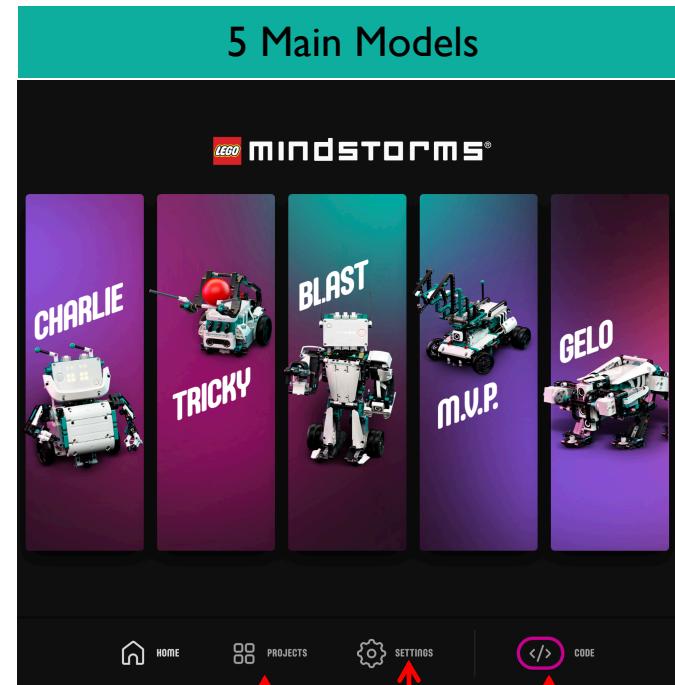
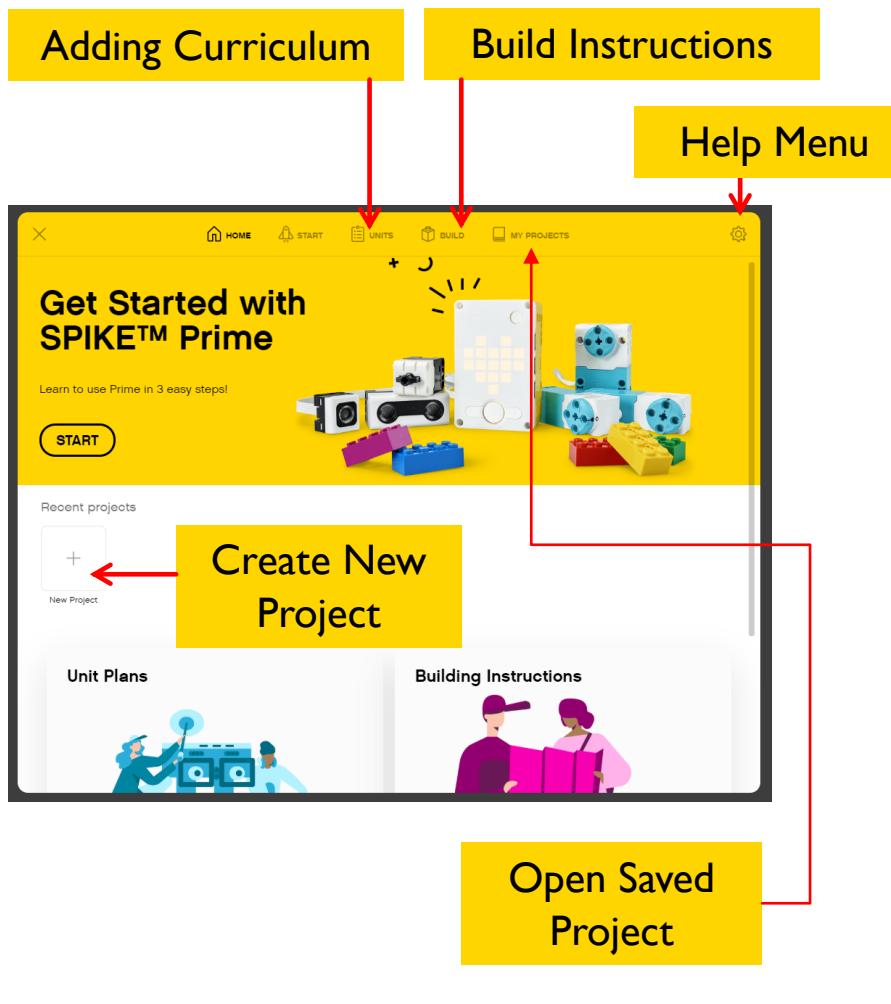


PORTS, MOTORS AND SENSORS

- The hub has 6 built-in ports (A-F)
- Any port can be used for any motor or sensor
- The main SPIKE Prime set comes with 1 Large Motor and 2 Medium Motors, 1 Force Sensor, 1 Distance Sensor, 1 Color Sensor, and a built-in 6-axis IMU (3-axis accelerometer + 3-axis gyro)
- The Robot Inventor set comes with 4 Medium Motors, 1 Distance Sensor, 1 Color Sensor, and a built-in 6-axis IMU (3-axis accelerometer + 3-axis gyro)



HOME MENU



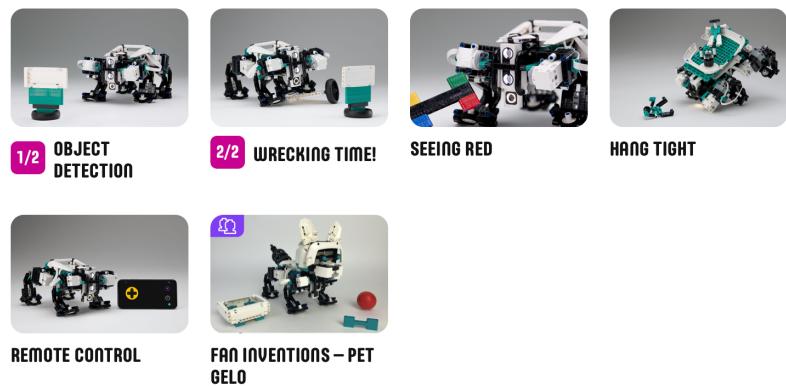
ADDING NEW CONTENT

- In SPIKE Prime, you can download new Units
- The FIRST LEGO League Curriculum is called “Competition Ready”
- In Robot Inventor, you download new Further Activities for the main models

The screenshot shows the SPIKE Prime software interface with a yellow border around the central content area. At the top, there are navigation tabs: HOME, START, UNITS (which is selected), BUILD, and MY PROJECTS. Below the tabs, the title "Unit Plans" is displayed. There are two main cards: one for "Invention Squad" (STEAM, Engineering) and one for "Kickstart a Business" (Computer Science, STEAM). Both cards feature a large "DOWNLOAD" button with a downward arrow icon. The "Invention Squad" card also includes a brief description: "Inventing stuff? Fixing stuff? Always helping people with your ideas? Then you might be an elite member of the...".

- In Robot Inventor, you download new Further Activities for the main models

FURTHER ACTIVITIES



SPIKE PRIME: PROGRAMMING CANVAS ESSENTIALS

The image shows the Spike Prime Programming Canvas interface. On the left, there's a sidebar with categories like Motors, Movement, Light, Sound, Events, Control, Sensors, Operators, Variables, My Blocks, Weather, and Extensions. The main area is labeled "Opened Project" and shows "Project 3" with a "when program starts" script. A red box highlights the "New Project" button in the top right. A central box contains the text: "Project Properties", "Rename Project or", "Move File to new", "location (i.e. Save as)". On the right, there's a "Connect to Hub and Access Hub Dashboard" section with a screenshot of the ADB (Accessory Development Board) dashboard showing sensor data and a robot view.

Back to Home Opened Project

New Project

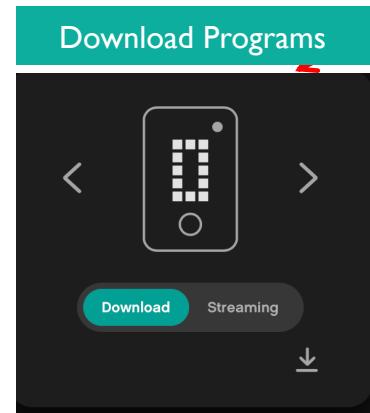
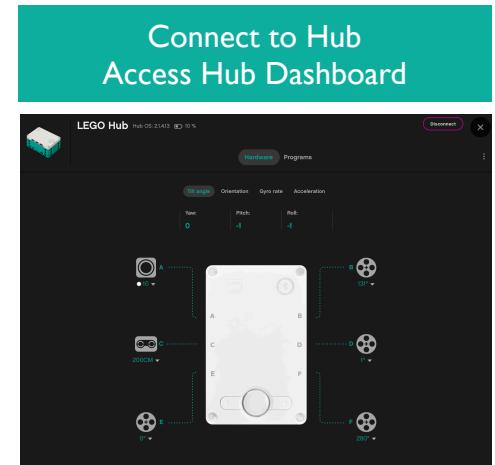
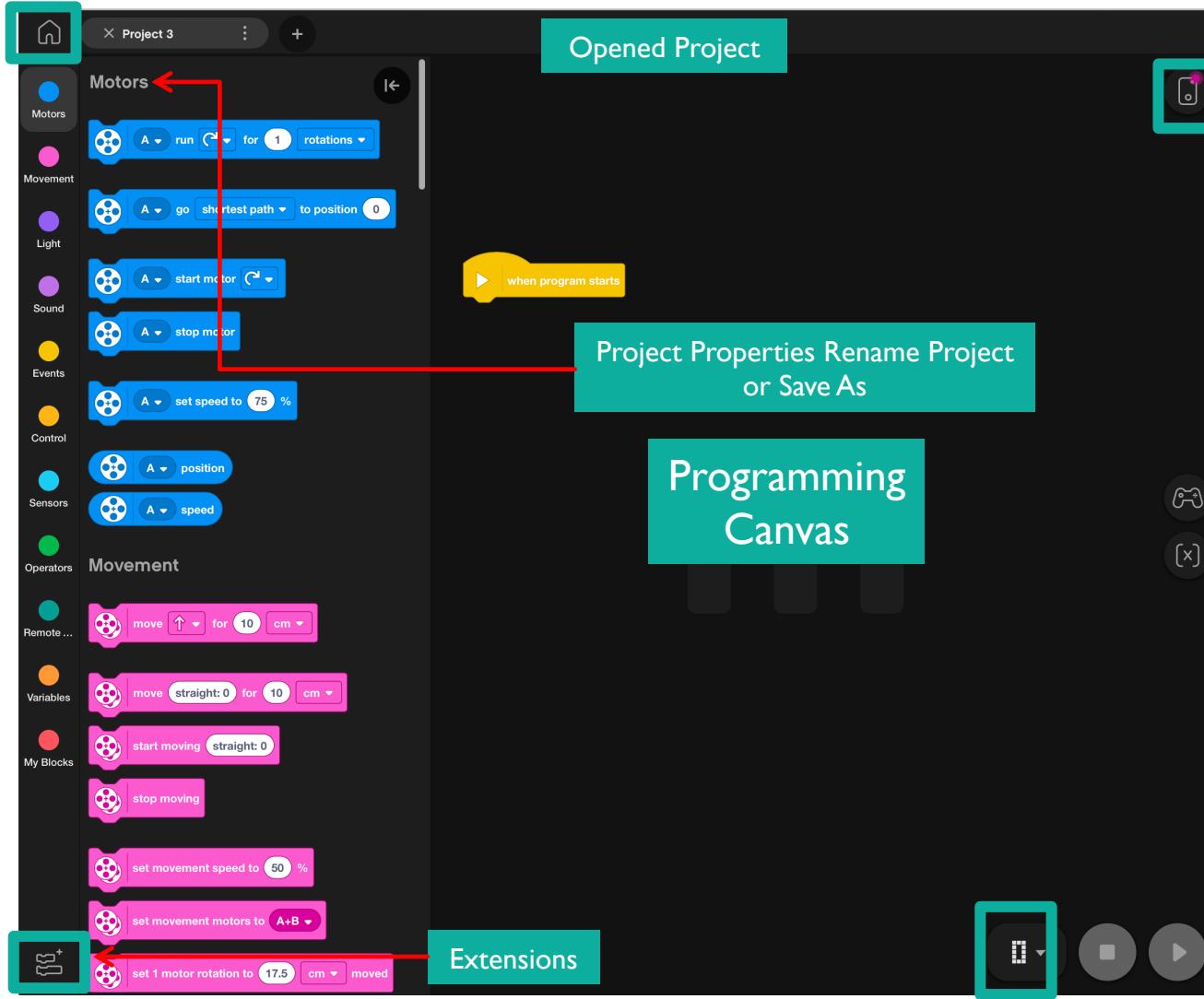
Project Properties
Rename Project or
Move File to new
location (i.e. Save as)

Connect to Hub and Access Hub Dashboard

Programming Canvas

Extensions

ROBOT INVENTOR: PROGRAMMING CANVAS ESSENTIALS



EXTENSIONS: ADDING MORE BLOCKS



- When you open either software, not all available blocks are enabled.
- Click on the Extensions icon at the bottom of the Block Palette panel
- In our lessons, we will use “More Motors” and “More Movement” often
- These blocks will show up as separate tabs in the programming palette once downloaded.

Extensions

Weather Manager
Get this week's weather forecast. Your computer needs to be connected to the internet.
[LEARN MORE](#)

More Motors
Make motors hold their position or run motors with unregulated power.
[LEARN MORE](#)

More Movement
Set the individual motor speed on a Driving Base or make it hold its position.
[LEARN MORE](#)

More Sensors
This extension provides additional sensor data, such as acceleration, peak pressure, etc.
[LEARN MORE](#)

Music
Play instruments and drums. Music will play from your computer or tablet.
[LEARN MORE](#)

Line Graph
This extension allows you to display and experiment with line graphs.
[LEARN MORE](#)

Extensions

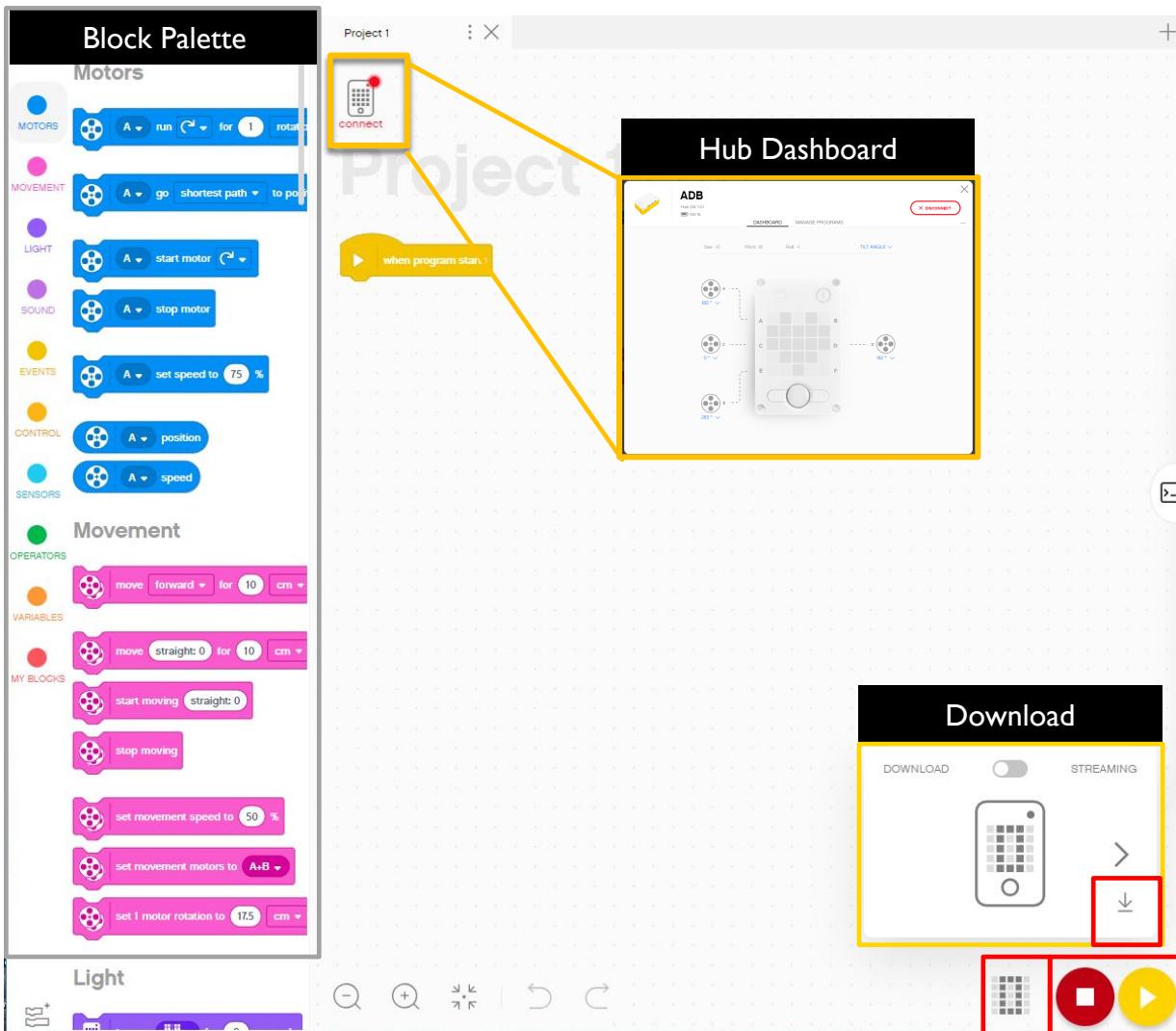
Regular

- More Motors
- More Movement
- Weather Manager
- Music
- Model Blocks

Experimental

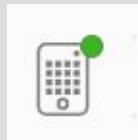
- DualShock®4 Controller
- Xbox One® Controller

PROGRAMMING CANVAS

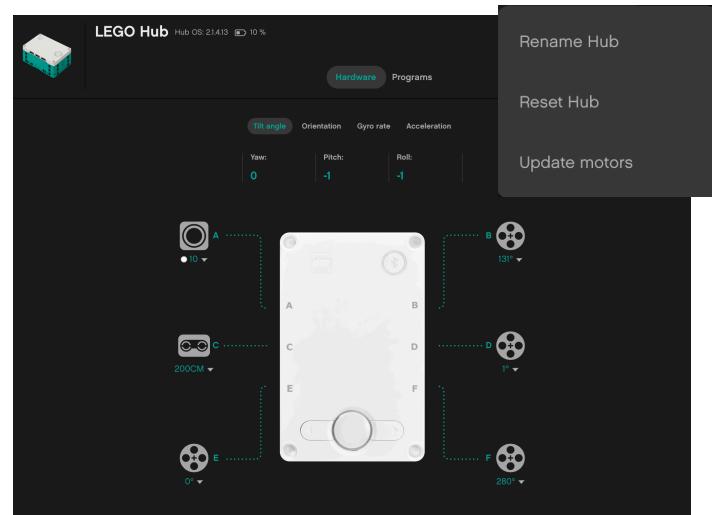
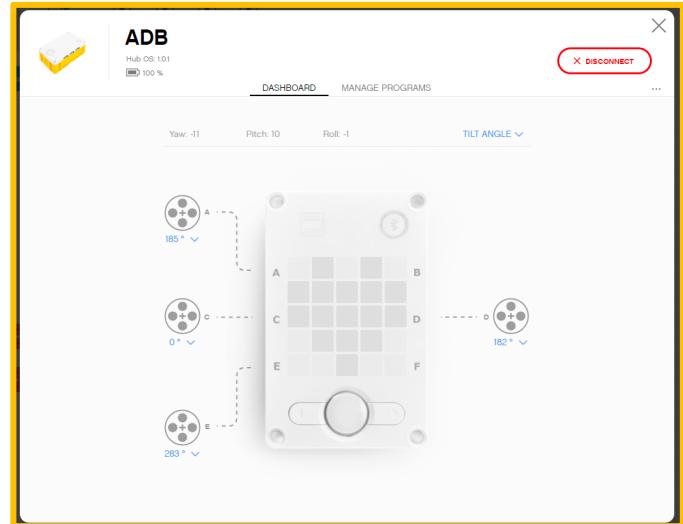


- The main programming canvas is where you will create each program (called 'Project')
- All the programming blocks are on the Block pallet on the left
- The Connect Icon lets you access the Hub Dashboard
- The Download/Run Icon lets you pick the mode to download

HUB DASHBOARD

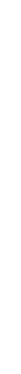


- You must connect your Hub to access this section (click on the small Hub icon)
- This section is very useful for:
 - Checking battery level
 - Hub OS version
 - Gyro Sensor Values
 - See which motors and sensors are connected
 - Get real time values from the motors and sensors
- Clicking three dots (...) lets you rename and reset your hub and calibrate your motors
- The Manage Programs has a list of all programs on the Hub (maximum of 20). Use this section to change the order of the programs.



BLOCK PALETTE OVERVIEW FOR SPIKE PRIME & ROBOT INVENTOR

SPIKE PRIME



Motors – Control an individual motor

Movement – Control two motors at a time with synchronization

Light – Program the 5X5 matrix

Sound – Play a sound

Events – Run actions based on events (e.g. sensor or timer)

Control – Loops, if/else statements, etc.

Sensors – Read a sensor value

Operators – Mathematics and logic

Variables – Store data in a variable or list

My Blocks – Custom defined blocks

More Movement – Additional movement blocks

More Motors – Additional motor blocks

Weather – Access weather information and forecasts

Music – Play musical notes and select instrument

More Sensors – Raw color values, acceleration

Music – Pick instruments and tempo

Line Graph - Datalogging

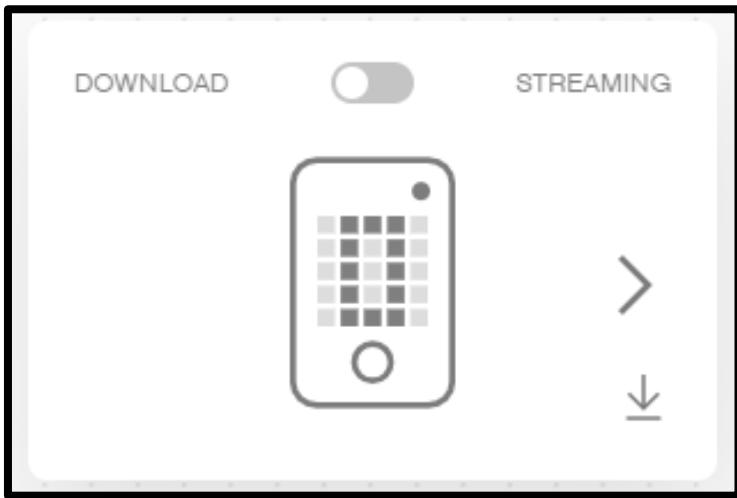
Display – Display images

ROBOT INVENTOR



- 
- Motors** – Control an individual motor
 - Movement** – Control two motors at a time with synchronization
 - Light** – Program the 5X5 matrix
 - Sound** – Play a sound
 - Events** – Run actions based on events (e.g. sensor or timer)
 - Control** – Loops, if/else statements, etc.
 - Sensors** – Read a sensor value
 - Operators** – Mathematics and logic
 - Variables** – Store data in a variable or list
 - My Blocks** – Custom defined blocks
 - More Movement** – Additional movement blocks
 - More Motors** – Additional motor blocks
 - Weather Manager** – Access weather information and forecasts
 - Music** – Play musical notes and select instrument
 - Model Blocks** – Coding Blocks for 5 built-in models
 - DualShock 4 Controller**
 - Xbox One Controller**

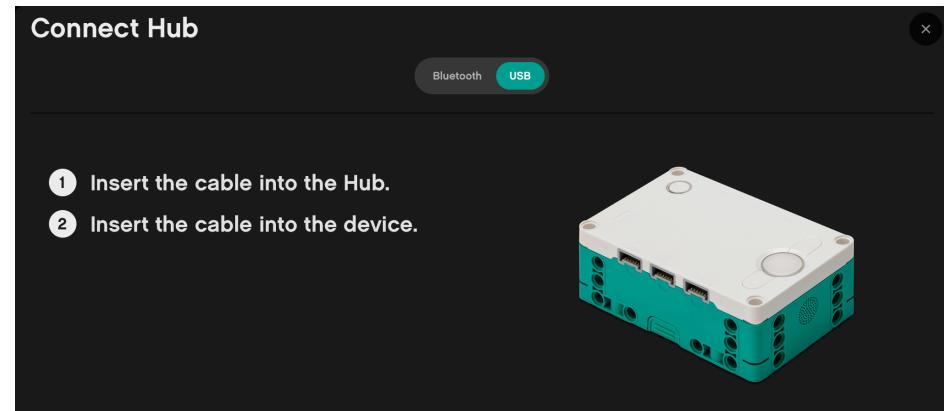
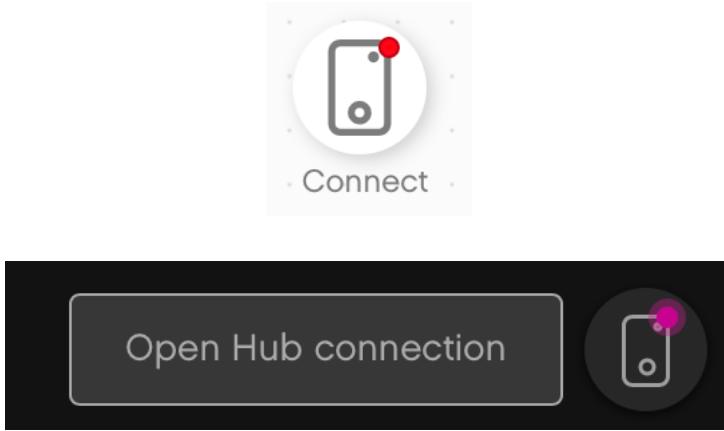
DOWNLOAD VS. STREAMING MODE



- Download: The program runs on the hub and can be run at any time with or without your PC
- Streaming: The program runs on your PC and controls the robot's motors
 - This tends to cause slower response times for the robot, but it allows you to use IOT (Internet of Things) features, such as weather readings
- Note: FIRST LEGO League Teams must use Download mode in competition

CONNECTING TO HUB

- For both SPIKE Prime and Robot Inventor, the software will auto-connect to the Hub if you are using a USB cable
- To connect over Bluetooth, click the connect icon in the software. (the small Hub icon)
- Enable Bluetooth by pressing the Bluetooth button on the Hub.
- Your Hub will show up in the list at the bottom. Select your Hub



CREDITS

- This lesson was created by Sanjay Seshan and Arvind Seshan for Prime Lessons
- More lessons are available at www.primelessons.org



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