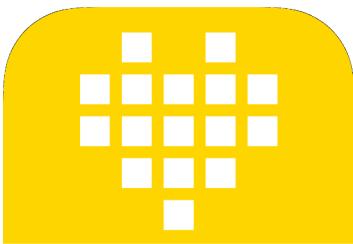


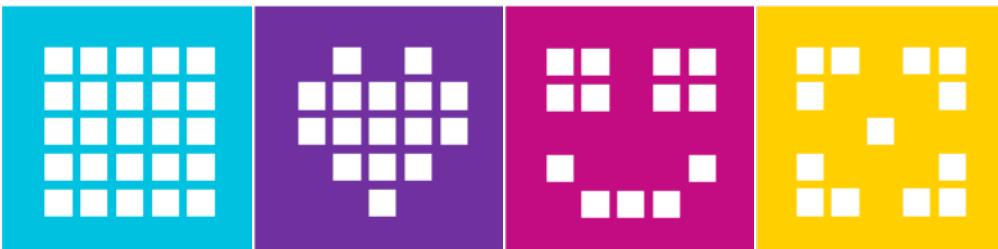
SPIKE PRIME LESSONS

By the Creators of EV3Lessons



INTRODUCTION TO HUB & SOFTWARE

BY SANJAY AND ARVIND SESAN



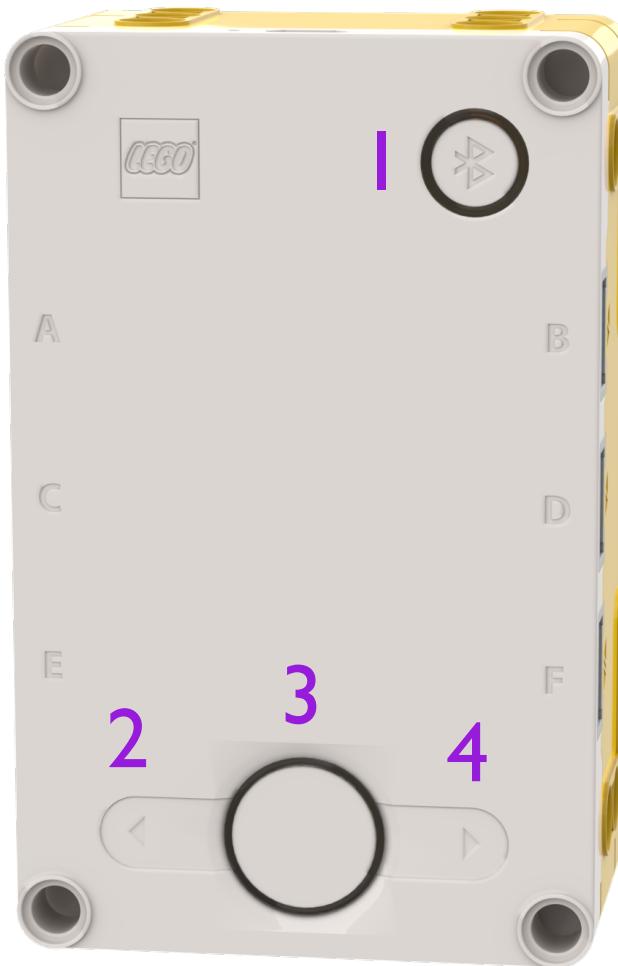
LESSON OBJECTIVES

- Learn how the SPIKE Prime Hub operates
- Learn about the main components of the SPIKE Prime 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



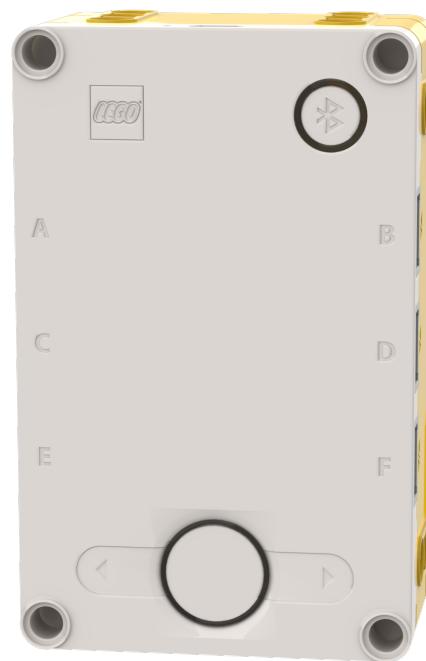
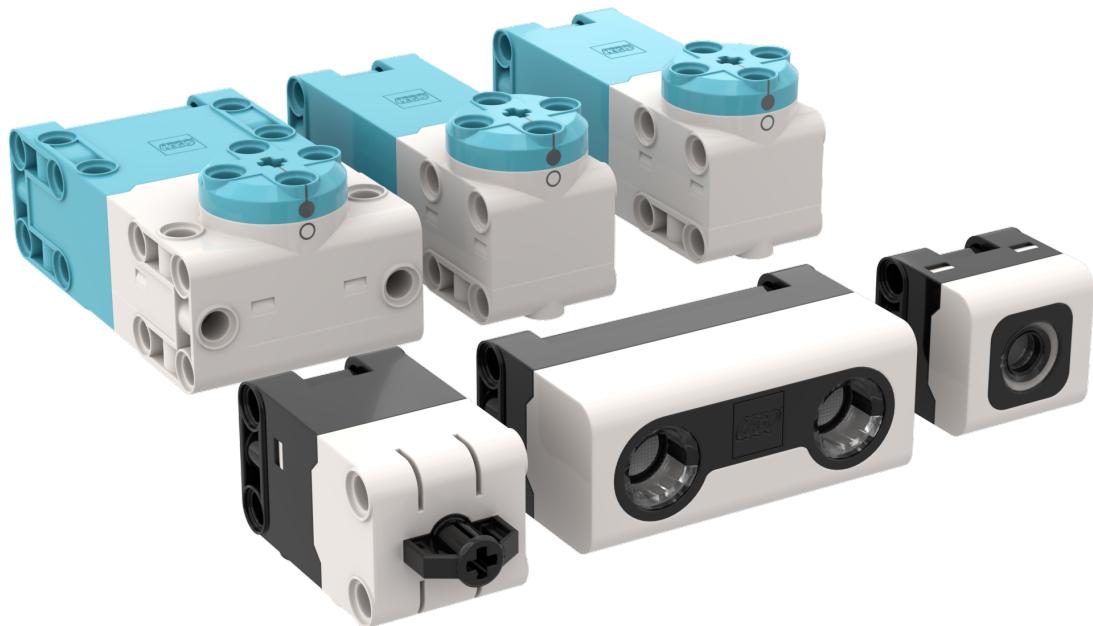
THE HUB SCREEN

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

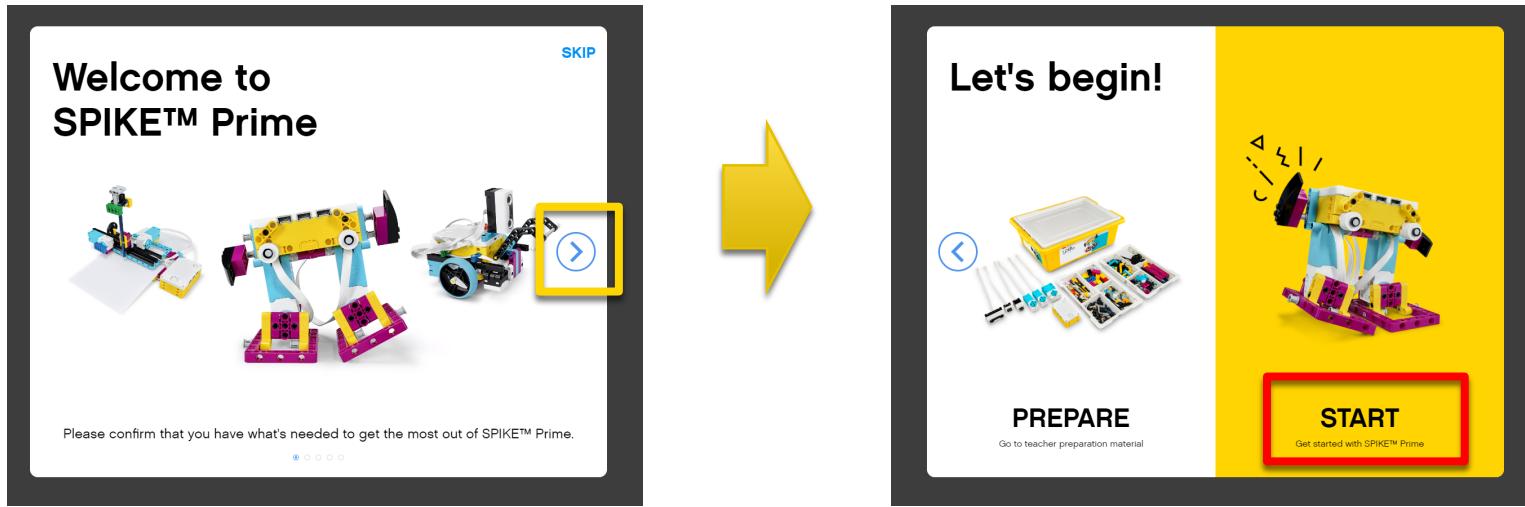


PORTS, MOTORS AND SENSORS

- The hub has 6 built-in ports (A-F)
- Any port can be used for any motor or sensor
- The basic 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)

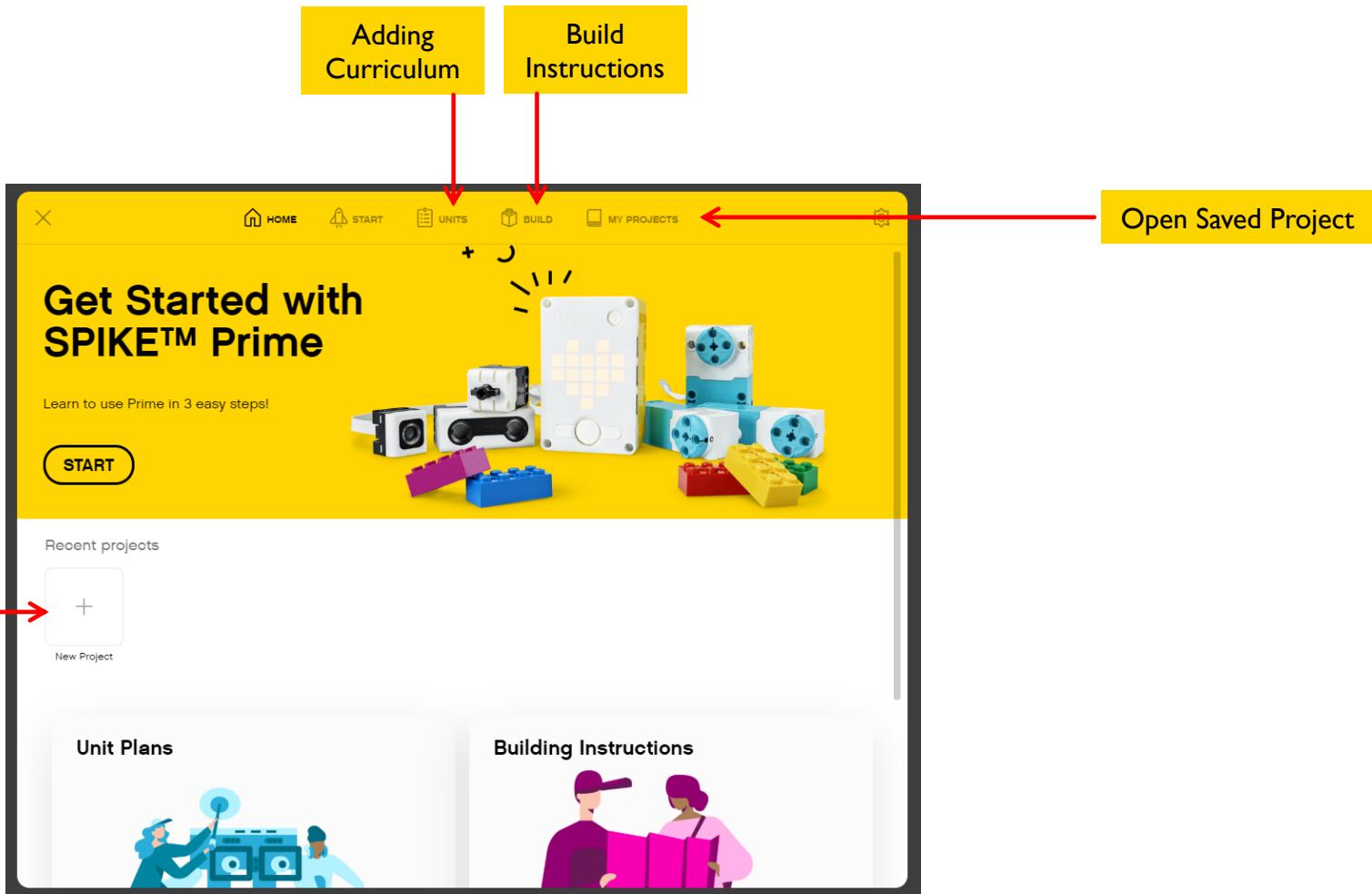


GETTING STARTED



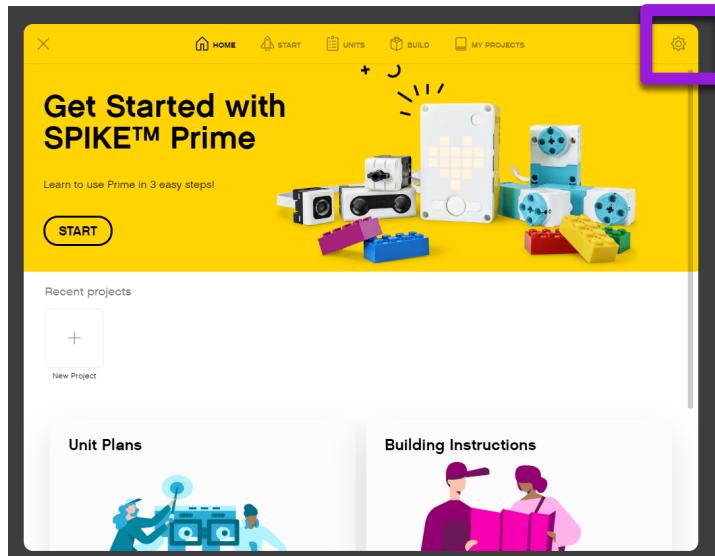
Follow the onscreen steps and then click “START” to access the programming environment

HOME MENU



ACCESSING THE HELP MENU

1. Click the Settings icon in the Home screen
2. Navigate to Help on the left hand column



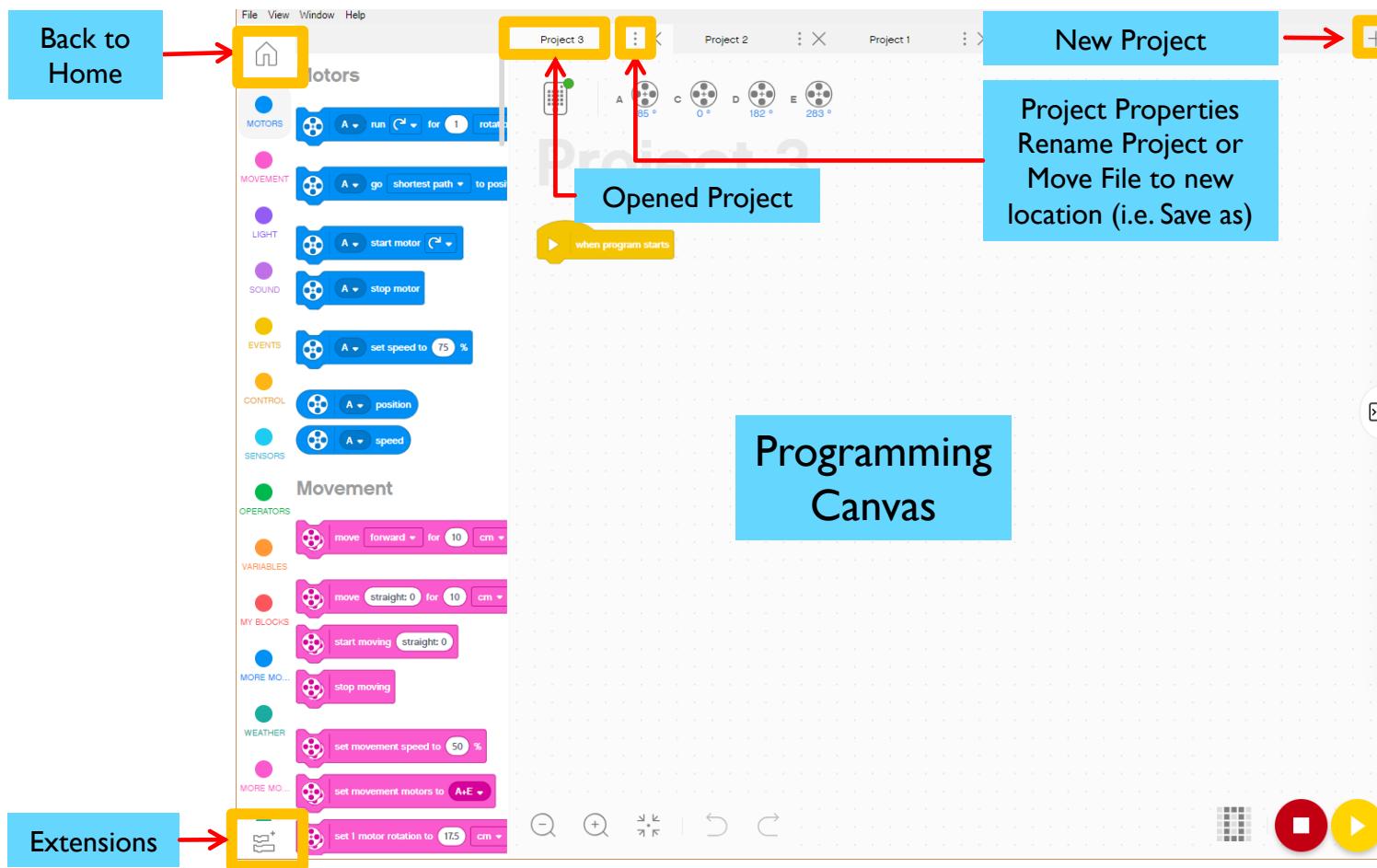
A screenshot of the SPIKE Prime app's Help menu. The title "Help" is at the top. Below it is a "Help Files" section with a sub-section titled "Interacting with the App". This section contains information about pairing with a Hub, including a note about using a micro USB cable or pairing via Bluetooth. It also includes sections for "Hub Pairing", "Micro USB", and "Help Files" (which lists "Interacting with the App", "Hardware Overview", "Block Types", "Block Description", and "Block Tips"). A yellow square highlights the "Help Files" section.

ADDING CURRICULUM - UNITS

- Lesson Plans can be found in the Units Section from the Home Menu.
- Section which unit you want to add and hit Download
- The FIRST LEGO League Curriculum is called “Competition Ready”

The image displays two side-by-side screenshots of the SPIKE Prime Lessons website. Both screenshots show the 'Unit Plans' section under the 'UNITS' tab in the top navigation bar. The left screenshot shows three unit cards: 'Invention Squad' (STEAM, Engineering, Grades 6-8), 'Kickstart a Business' (Computer Science, STEAM, Grades 6-8), and 'Life Hacks' (STEAM, Computer Science, Grades 6-8). Each card has a large 'DOWNLOAD' button with a downward arrow. The right screenshot shows the same three units, with the 'Invention Squad' and 'Kickstart a Business' cards visible. A download progress bar for 'Life Hacks' is shown at 80%, with a 'CANCEL DOWNLOAD' button below it. The 'Competition Ready' unit is partially visible at the bottom right.

PROGRAMMING CANVAS ESSENTIALS



EXTENSIONS: ADDING MORE BLOCKS



- When you open the 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...

READ MORE

More Motors

Make motors hold their position or run motors with unregulated power.

READ MORE

More Movement

Set the individual motor speed on a Driving Base or make it hold its position.

READ MORE

Music

Play instruments and drums. Music will play from your computer or tablet.

READ MORE

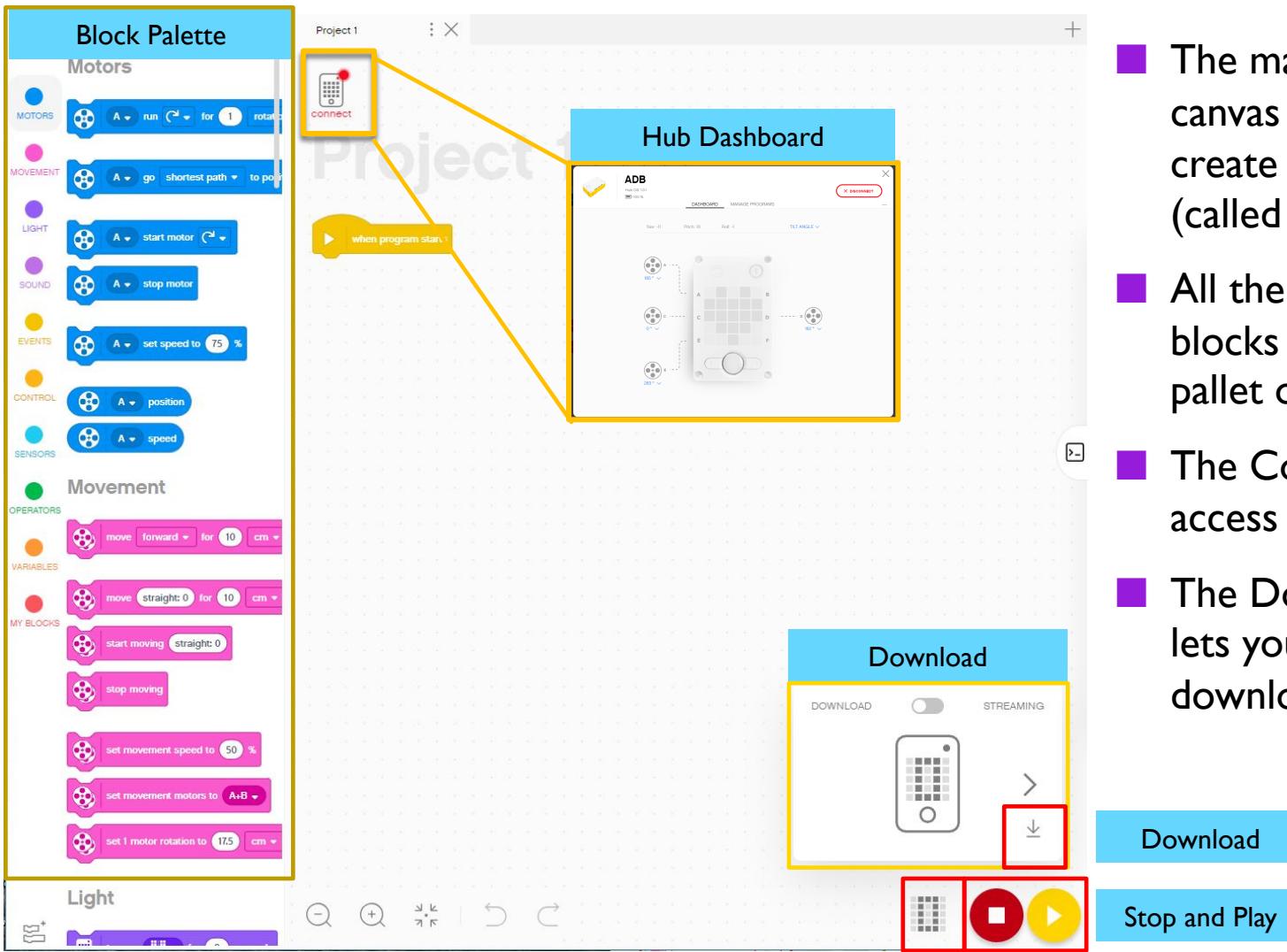
More Motors

| MOTORS | MOVEMENT |
|--------------------------------|----------------------------------|
| A ▾ run for 1 rotations ▾ | move for 10 cm at 50 % |
| A ▾ start motor at 75 % speed | start moving at 50 50 % speed |
| A ▾ set degrees counted to 0 | move straight: 0 for 10 cm |
| A ▾ degrees counted | start moving straight: 0 at 50 % |
| A ▾ start motor at 100 % power | start moving at 50 50 % power |
| A ▾ power | start moving straight: 0 at 50 % |
| A ▾ set motors to brake at s | set movement motors to brake |
| A ▾ turn stall detection on | Was movement interrupted? |
| A ▾ was the motor interrupted? | |

More Movement

| MOVEMENT | LIGHT | SOUND | EVENTS | CONTROL | SENSORS | OPERATORS | VARIABLES |
|----------------------------------|-------|-------|--------|---------|---------|-----------|-----------|
| move for 10 cm at 50 % | | | | | | | |
| start moving at 50 50 % speed | | | | | | | |
| move straight: 0 for 10 cm | | | | | | | |
| start moving straight: 0 at 50 % | | | | | | | |
| start moving at 50 50 % power | | | | | | | |
| start moving straight: 0 at 50 % | | | | | | | |
| set movement motors to brake | | | | | | | |
| Was movement interrupted? | | | | | | | |

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

BLOCK PALETTE OVERVIEW



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 block



More Motors – Additional motor blocks



Weather – Access weather information and forecasts



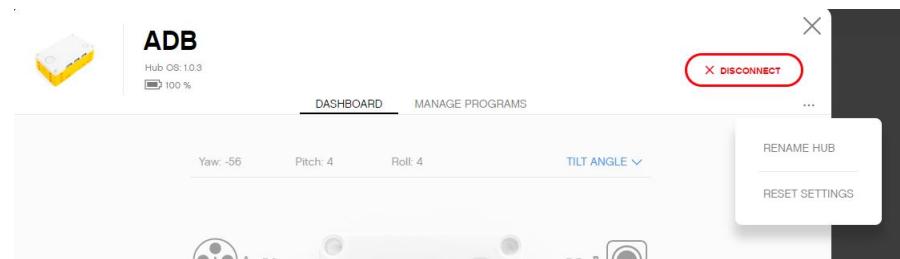
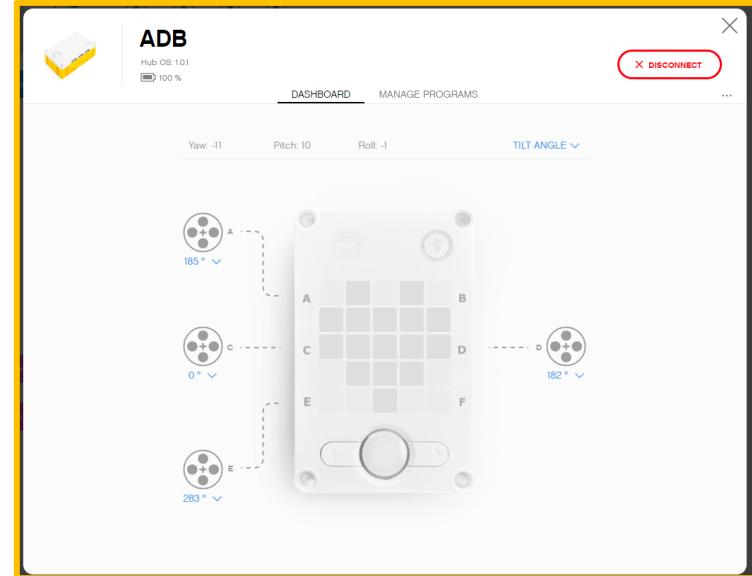
Music – Play musical notes and select instrument



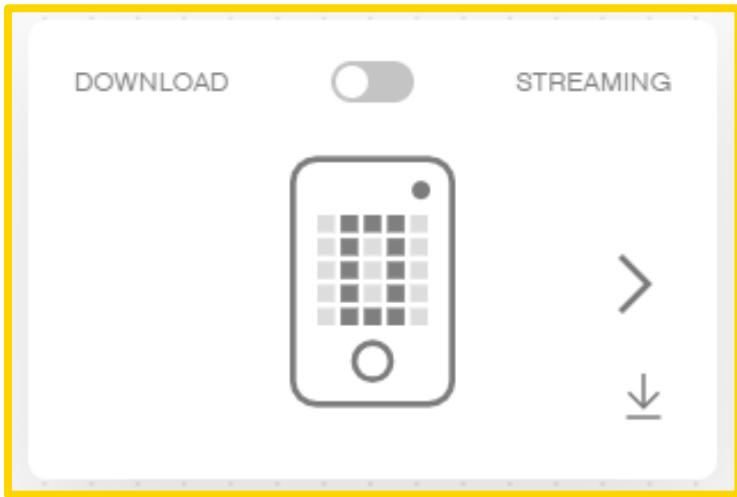
HUB DASHBOARD



- You must connect your Hub to access this section
- 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
- You can also rename your Hub in this panel by clicking on the three dots (...)
- 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.

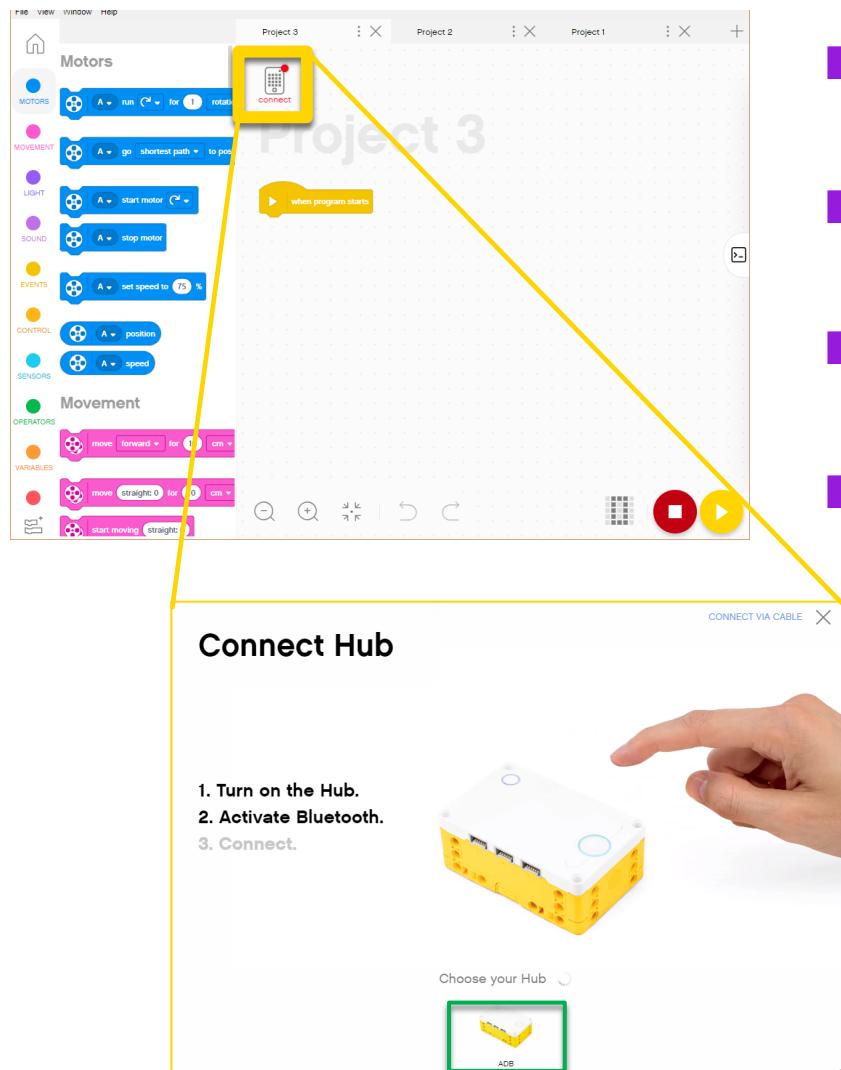


DOWNLOAD VS. STREAMING MODE



- 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 BRICK



- The software will auto-connect to the brick if you are using USB
- To connect over Bluetooth, click the connect icon in the software.
- Enable Bluetooth by pressing the Bluetooth button on the brick.
- Your brick will show up in the list at the bottom. Click connect on your hub

CREDITS

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



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