

SPIKE App + The Hub

Getting Started with SPIKE Essential

NOTE: Students will need a device with access to the SPIKE App for this lesson (regular app version or [web version](#)).



ENGAGE

Introduce today's lesson.

Today, we are going to continue working with SPIKE Essential. We are going to investigate one of the hardware components in SPIKE Essential. Hardware is the physical parts or components of a computer. However, we have a very special type of hardware in our SPIKE Essential set. Instead of a traditional computer, we have the hub. The hub is the device that will act as our computer. It is a programmable hub with 2 input/output ports. It will help us to use other components within the set. This hub will be directed by the software, which is the SPIKE App.

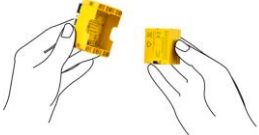


EXPLORE



Have students partner up for this task. When situated, provide one SPIKE Essential for each set of partners. Students should remove the Hub and the white USB cord from the set. Students should look to identify the key parts of the Hub:

- Rechargeable battery
- Micro USB charging and connecting port
- Mounting holes
- Input/output ports
- Power button

EXPLAIN

After exploration, pull the students back together to discuss and define the key parts of the Hub. You should point out and call attention to each of these parts.

	<p>The Hub has a rechargeable battery built into it. You will not need to take the battery out. The battery should stay inside of the hub.</p>
	<p>This white micro USB cable is what will allow us to charge our battery AND it is going to help communicate between our devices and the hub. There is a connection (and charging!) port located here.</p>
	<p>The mounting holes (located on the top, sides, and bottom) will allow you to use pins to connect the hub to bricks and elements.</p>

	<p>These input/output ports allow you to connect the Hub to motors and sensors, which we will spend more time learning about in the next couple of sessions. There are 2 ports located on the hub—they are on either side of the charging/connection port.</p>
	<p>This is the power button—the color light is also located directly underneath it. This is a color-coded message system. This light will sometimes flash or turn a different color. These colors mean the following:</p> <ul style="list-style-type: none"> • The Light is flashing orange. The Hub's battery is running low. Connect the Hub to your device via the USB cable to begin charging the battery. • The Light is flashing red. There's an extended load on the Hub. Turn off the Hub and let it cool down for 15 minutes. • The Light is blue. The Hub is connected to your device using BLE (Bluetooth Low Energy). • The Light is white. The Hub is connected to your device using a USB cable. • The Light is flashing white. The Hub is waiting to be connected. • The Light is flashing violet/green/blue. The Hub OS has been updated, and it's restarting.

ELABORATE

Have students use the micro USB cable and plug it into the charging/connecting port. Help students locate the USB port on the device they are using. Have students practice opening the SPIKE App (regular app or web version). The SPIKE App is the software needed to run the hardware (i.e., the device and the Hub).

- Select “SPIKE Essential”.



- Select “Skip”.

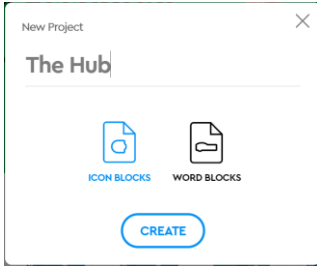


- Select “New Project”.

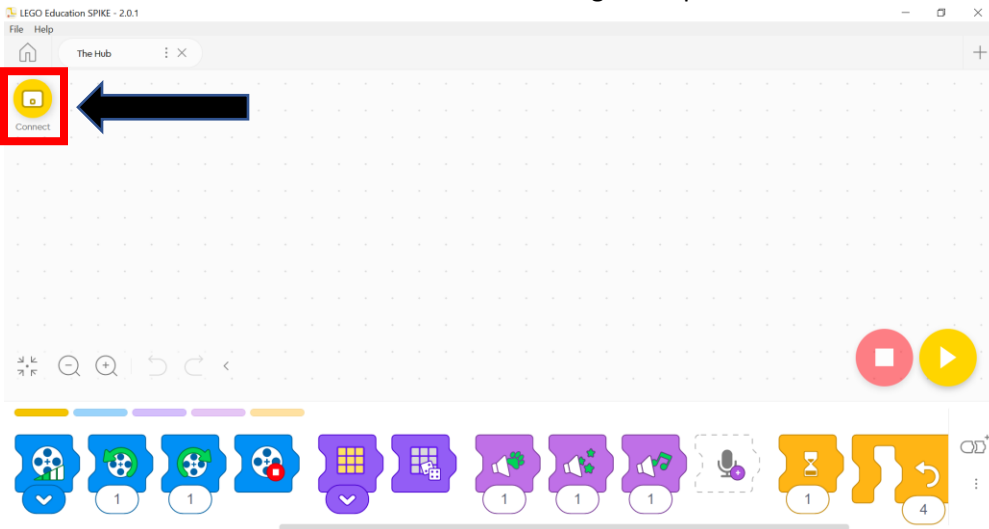


New Project

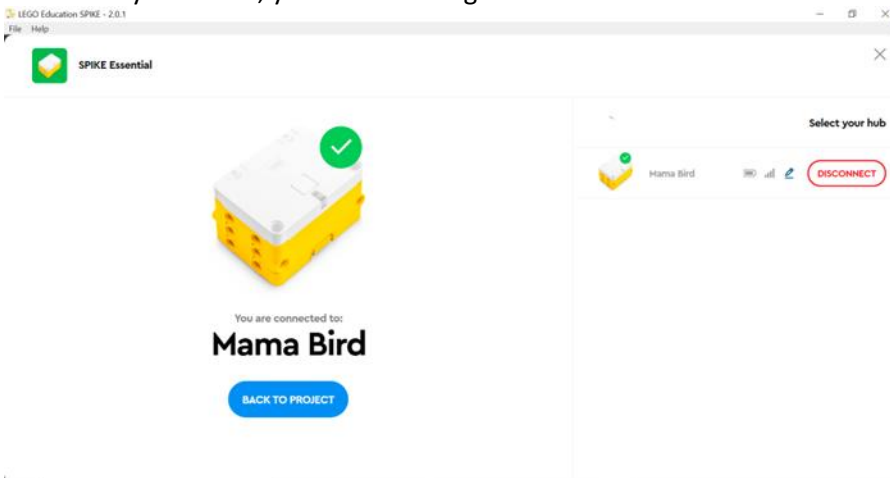
- Select “Icon Blocks” and then select “Create”.



- Select the “Connect” button located on the coding workspace.



- Make sure your Hub is turned on and then find the name of your Hub. Select your Hub. If the Hub successfully connects, you will see the green check mark.



NOTE: If you have never connected the Hub before, it will require an update and you will have to rename the hub. When connecting to a Hub that hasn't been renamed, the LEGO® Education SPIKE App will automatically ask you to rename it. Giving each Hub a unique name will help you differentiate between multiple Hubs in close proximity (e.g., when using Bluetooth).

EXTEND

There is a LOT of unique vocabulary when using our SPIKE Essential sets. Consider making a LEGO Word Wall or even have students create their own “brick-tionary” to help them remember all these new and important vocabulary words.

The Motor

Getting Started with SPIKE Essential: Tutorial 1

ENGAGE

Introduce today's lesson.

Today, we are going to continue working with SPIKE Essential. We previously learned about some important parts of SPIKE Essential.

Review previous learning by asking students the following questions:

- What is hardware? *Hardware is the physical parts or components of a computer.*
- What is the Hub? What does it do? *The device that will act as our computer. It is programmable, has 2 input/output ports and helps us use other components from the set.*
- What is software?
- What software do we use with SPIKE Essential? *The SPIKE app*

Our focus for today is going to be the motor. The motor is another piece of hardware in SPIKE Essential. Facilitate a quick discussion with students:

- What is a motor?
- What types of objects have motors?
- Why are motors helpful in robots and/or prototypes?

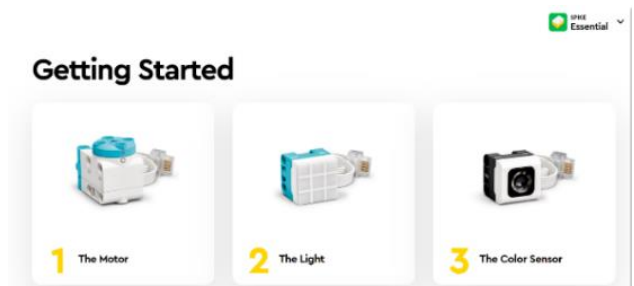
EXPLORE

Have students partner up for this task. When situated, provide one SPIKE Essential for each set of partners. Students should also have access to a device with the SPIKE App. Provide time for the partners to access the SPIKE app.

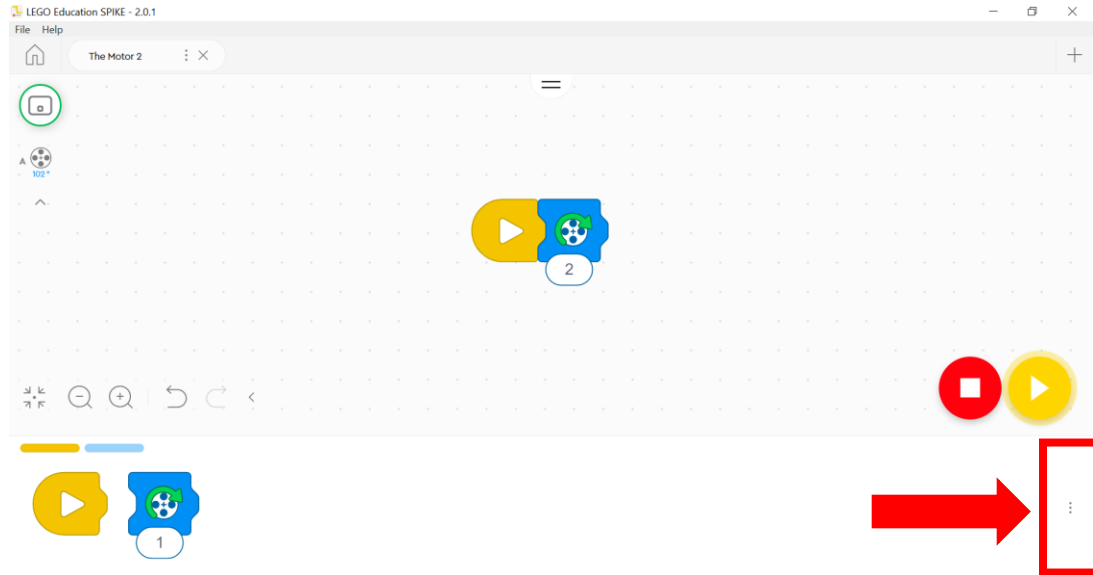
When they are in the SPIKE App, students should select the "Start" button on the home page.



Students should select "The Motor" to begin the tutorial.



If time permits, allow students to freely explore with the motor blocks.



Select the 3 dots in the bottom, right corner. Select to show blocks from “SPIKE Essential”. Students will then have full access to the entire coding palette and all the icon blocks included.

EXPLAIN

After exploration, pull the students back together to discuss what they learned about the motor and its corresponding blocks. Prompt their reflection using the following guiding questions:

- *Which port did you plug the motor into?*
- *What did the number “2” represent?*
- *What does the arrow on this motor block mean?*

ELABORATE

Have students return to the SPIKE App and go back to the coding workspace. Ask students to right-click (keyboard) or tap and hold (touch) the motor block. Three different options will appear—click through each one and explain what will happen when selected:

- **Duplicate:** *This will create a copy of these exact blocks*
- **Delete Block:** *This will remove (delete) the block from the coding workspace*
- **Help:** *This is a reference tool—if you are unsure what the block is or what it does, select the “Help” option to see more*

Ask students to reflect on this learning:

- *Why might these options be helpful when we are coding?*

EXTEND

Provide an opportunity for students to further explore the possibilities with the Hub and the motor. Prompt their exploration using the following guiding questions:

- *Did you try changing the number on the icon block?*
- *Would the motor work the same if you plugged into Port B?*
- *How many motor blocks are there? What do these motor blocks do?*

[LEGO® Education SPIKE Essential](#)

The Light

Getting Started with SPIKE Essential: Tutorial 2



ENGAGE

Introduce today's lesson.

Today, we are going to continue working with SPIKE Essential. We previously learned about some important parts of SPIKE Essential.

Review previous learning with the following questions:

- *What is a motor?*
- *What blocks are associated with the motor?*
- *Why are motors helpful in prototypes?*

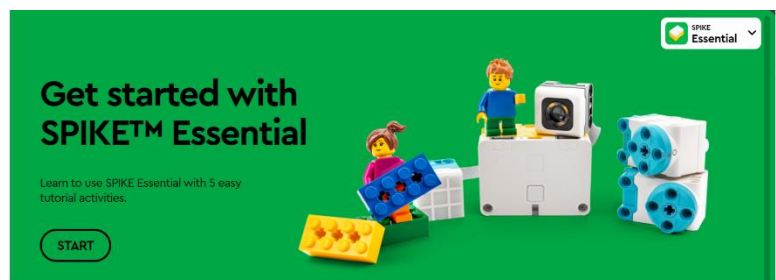
Our focus for today is going to be the light matrix. The light matrix is another piece of hardware in SPIKE Essential. Facilitate a quick discussion with students:

- *What is light?*
- *Can light be different colors?*
- *Why is light helpful?*
- *How do we use light in our everyday lives?*

EXPLORE

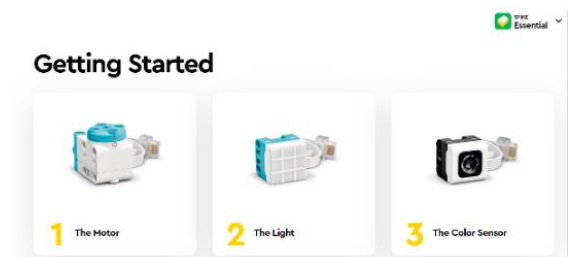
Have students partner up for this task. When situated, provide one SPIKE Essential for each set of partners. Students should also have access to a device with the SPIKE App. Provide time for the partners to access the SPIKE app.

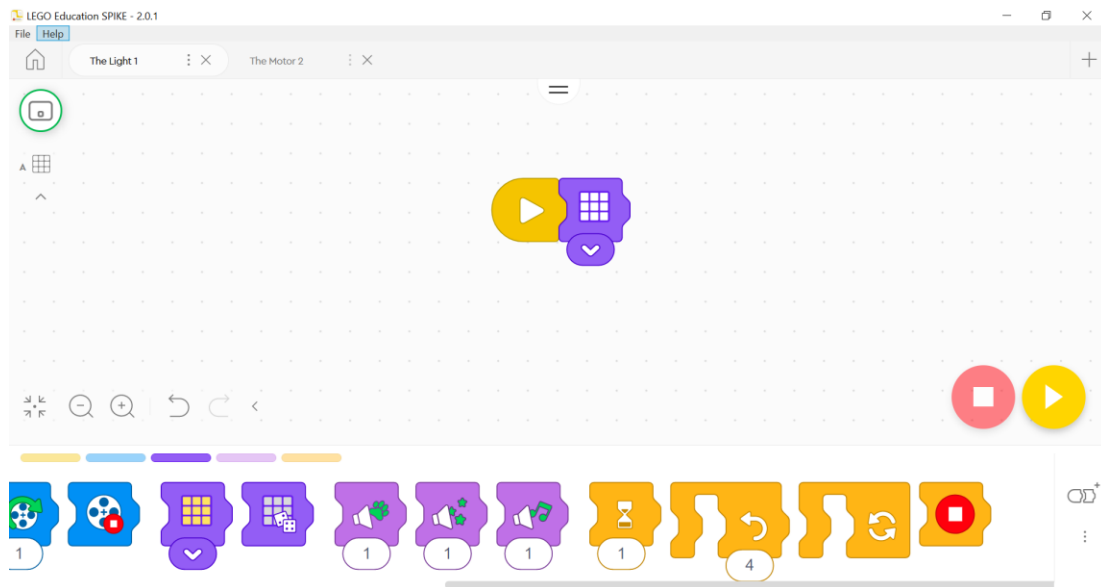
When they are in the SPIKE App, students should select the **"Start"** button on the home page.



Students should select **"The Light"** to begin the tutorial, where they will learn how to turn on the light in the light matrix.

If time permits, allow students to freely explore with the light blocks.





EXPLAIN

After exploration, pull the students back together to discuss what they learned about the motor and its corresponding blocks. Prompt their reflection using the following guiding questions:

- *Does it matter which port you plug the light matrix into?*
- *How did you change the light pattern?*
- *What colors are available?*

ELABORATE

Have students return to the SPIKE App and back to the coding workspace. Ask students to right-click (keyboard) or tap and hold (touch) the light block.

- *How can you randomize the colors of the light block?*
- *Can you create a program that will start on one color and then change to another?*

EXTEND

Provide an opportunity for students to further explore the possibilities with the light matrix. Prompt their exploration using the following guiding questions:

- *Can you make a pattern on the light matrix?*
- *Can you make a letter from the alphabet?*
- *Can you make a number to display?*

LEGO® Education SPIKE Essential

The Color Sensor

Getting Started with SPIKE Essential: Tutorial 3



ENGAGE

Introduce today's lesson.

Today, we are going to continue working with SPIKE Essential. We previously learned about some important parts of SPIKE Essential.

Review previous learning with the following questions:

- *What is the light matrix?*
- *What colors are available in the light matrix?*
- *How many "squares" are on the light matrix?*

*Our focus for today is going to be the color sensor. The color sensor is another piece of hardware in SPIKE Essential. A **sensor** is a device that measures physical input from its environment. Facilitate a quick discussion with students:*

- *Can you name a color?*
- *Can you give an example of something in (specified color)?*
- *Why is light helpful?*
- *How do we use light in our everyday lives?*

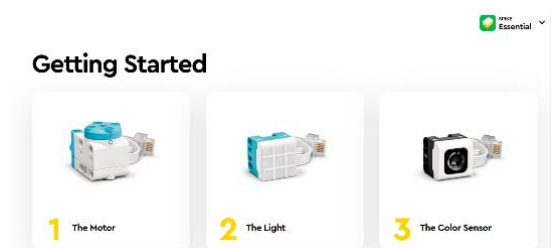
EXPLORE

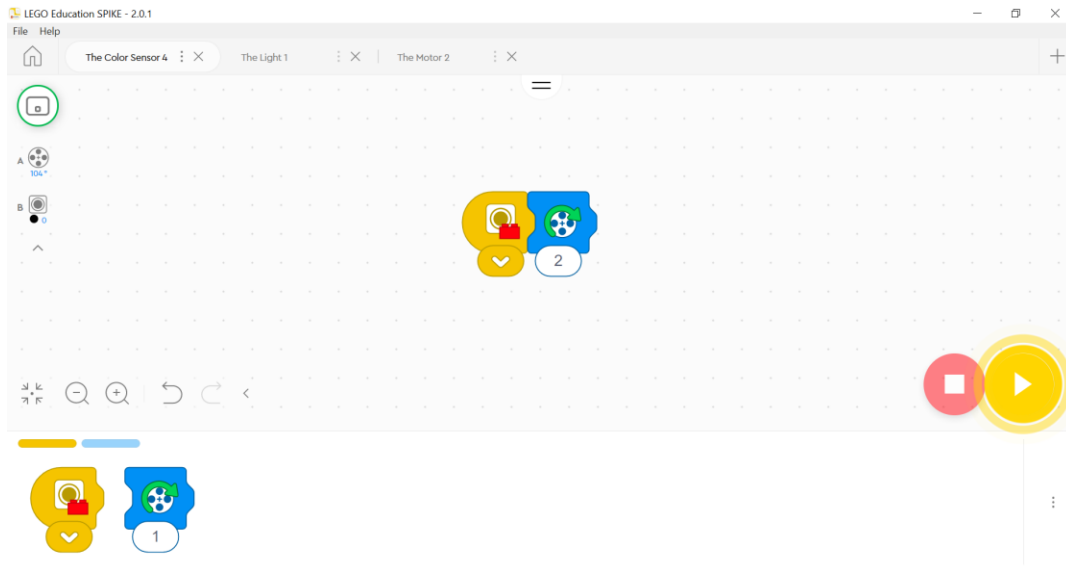
Have students partner up for this task. When situated, provide one SPIKE Essential for each set of partners. Students should also have access to a device with the SPIKE App. Provide time for the partners to access the SPIKE app.

When they are in the SPIKE App, students should select the "Start" button on the home page.



Students should select "The Color Sensor" to begin the tutorial, where they will learn how to turn on the light in the light matrix.





EXPLAIN

After exploration, pull the students back together to discuss what they learned about the motor and its corresponding blocks. Prompt their reflection using the following guiding questions:

- *For this program, did it matter what port you plugged the motor and color sensor into?*
- *What happened (in the first program- as shown above) if you put a red brick in front of the color sensor?*
- *What happened (in the first program- as shown above) if you put a blue brick in front of the color sensor?*

ELABORATE

Allow students to go back and test the rest of the color sensor blocks.



- *What do each of the blocks allow you to do in your program?*

EXTEND

The color sensor detects the color of objects. Rather than just use LEGO bricks, can you find other colored items around the classroom and see if the color sensor is able to detect it? Make a list of all the items you test out with the color sensor.

Built-In Gyro Sensor

Getting Started with SPIKE Essential: Tutorial 4

ENGAGE

Introduce today's lesson.

Today, we are going to continue working with SPIKE Essential. We previously learned about some important parts of SPIKE Essential.

Review previous learning with the following questions:

- *What is the color sensor?*
- *Does the color sensor only detect LEGO bricks?*
- *How could you use the color sensor?*

Our focus for today is going to be the built-in gyro sensor. The gyro sensor is another piece of hardware in SPIKE Essential. It is actually located inside of the hub! The gyro sensor recognizes movement and when things tilt.

Facilitate a quick discussion with students by asking the following questions:

- *What is movement?*
- *How can different things move?*
- *Can you demonstrate what it means to tilt?*
- *What direction can things tilt?*

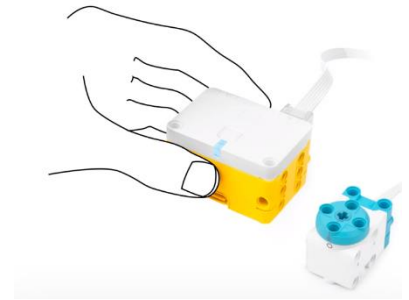
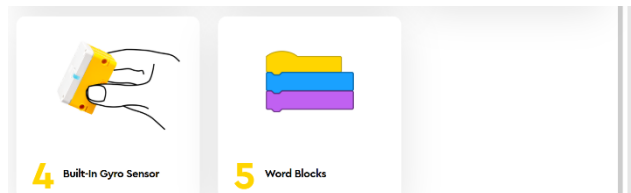
EXPLORE

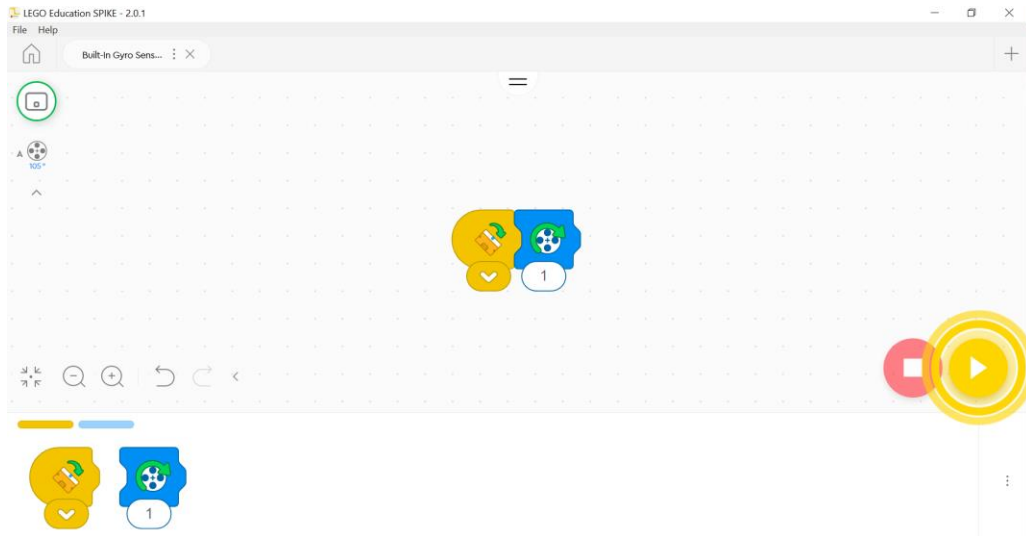
Have students partner up for this task. When situated, provide one SPIKE Essential for each set of partners. Students should also have access to a device with the SPIKE App. Provide time for the partners to access the SPIKE app.

When they are in the SPIKE App, students should select the **“Start”** button on the home page.



Students should select **“Built-In Gyro Sensor”** to begin the tutorial, where they will learn how to use the gyro sensor.





EXPLAIN

After exploration, pull the students back together to discuss what they learned about the motor and its corresponding blocks. Prompt their reflection using the following guiding questions:

- *For this program, when does the motor turn?*
- *If the hub is tilted the opposite direction, does it turn?*
- *Does the direction of the hub matter for this program?*

ELABORATE

Allow students to go back and test how to change the directions in the gyro sensor.



EXTEND

Brainstorm some ideas on how a gyro sensor might be useful when creating robots or any other kind of models. Allow students to expand the coding palette and test out creating programs with the icon blocks.

Word Blocks

Getting Started with SPIKE Essential: Tutorial 5



ENGAGE

Introduce today's lesson.

Today, we are going to continue working with SPIKE Essential. We previously learned about some important parts of SPIKE Essential.

Review previous learning with the following questions:

- *What is a gyro sensor?*
- *Where is the gyro sensor located?*
- *Can you define the word "tilt" for us?*

Our focus for today is going to be the word blocks. The word blocks are a part of the software in SPIKE app. This is how we are able to code. Code is how we are able to tell a computer (or device) what we want it to do. We have to be very specific and accurate when we are coding (also known as programming). Before we get into the SPIKE app, we are going to practice with an unplugged activity, "Write the Code". (see handout)

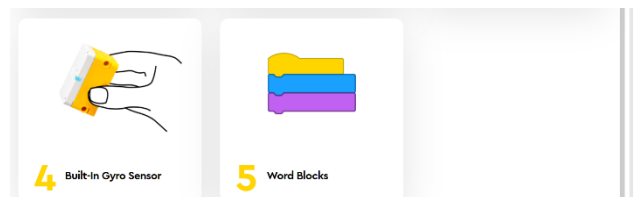
EXPLORE

Have students partner up for this task. When situated, provide one SPIKE Essential for each set of partners. Students should also have access to a device with the SPIKE App. Provide time for the partners to access the SPIKE app.

When they are in the SPIKE App, students should select the "Start" button on the home page.



Students should select "**Word Blocks**" to begin the tutorial, where they will learn how to use word blocks to create code.



EXPLAIN

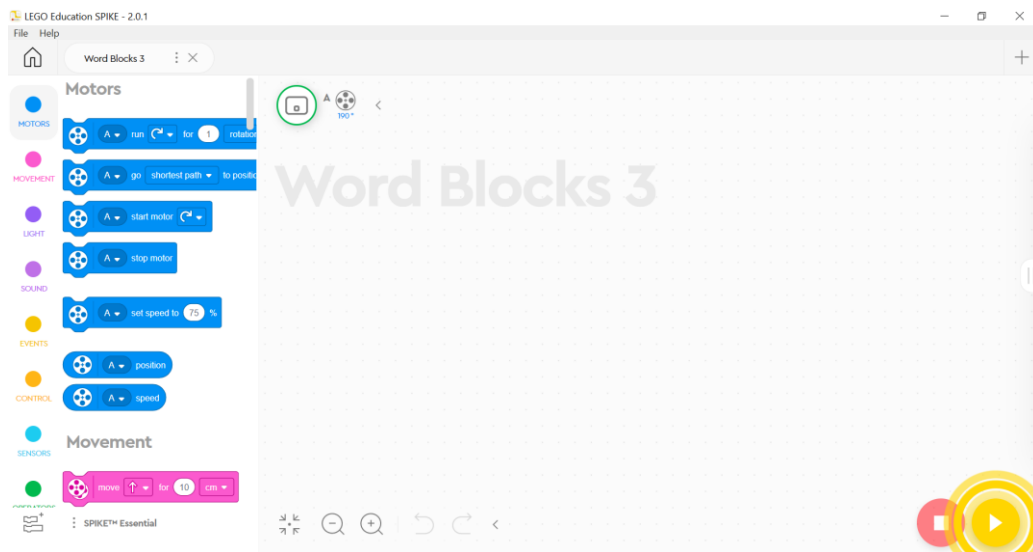
After exploration, pull the students back together to discuss what they learned about the word blocks:

- *How are word blocks different than icon blocks?*
- *Which has more blocks: icon or word?*
- *How does the direction of the blocks change when using word blocks?*

ELABORATE

Allow students to go back and expand the entire coding palette.

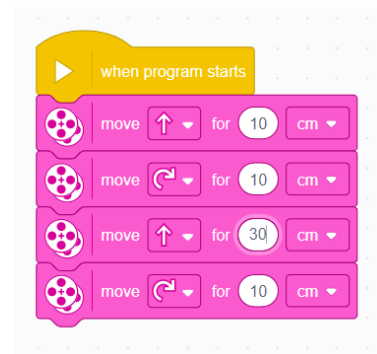
- *What kind of word blocks can you find?*
- *Which word blocks are really interesting?*
- *Which blocks do you have questions about?*



EXTEND


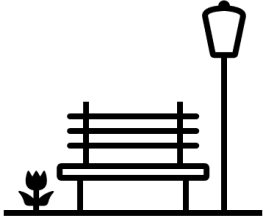

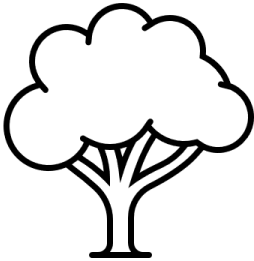
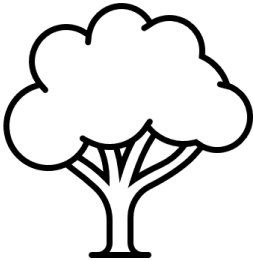


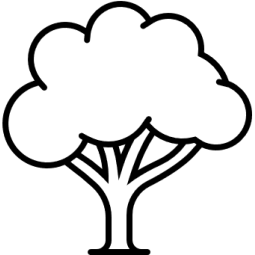
Using the word blocks, could you create a program for the unplugged activity we completed earlier? What would that algorithm look like in word blocks? Let's assume that each "square" is 10cm.

Sample Code: (there are multiple ways to complete this!)



UNPLUGGED ACTIVITY: WRITE THE CODE

Can you use the arrows to write “code” to get the student to the school building? If something is already in the square, you are not able to move in that square. You will need to find another way.

		 (END HERE)	
			
			
			
 (START HERE)			

UNPLUGGED ACTIVITY: WRITE THE CODE

Use the arrows to help the girl move from her current spot to the school building.

