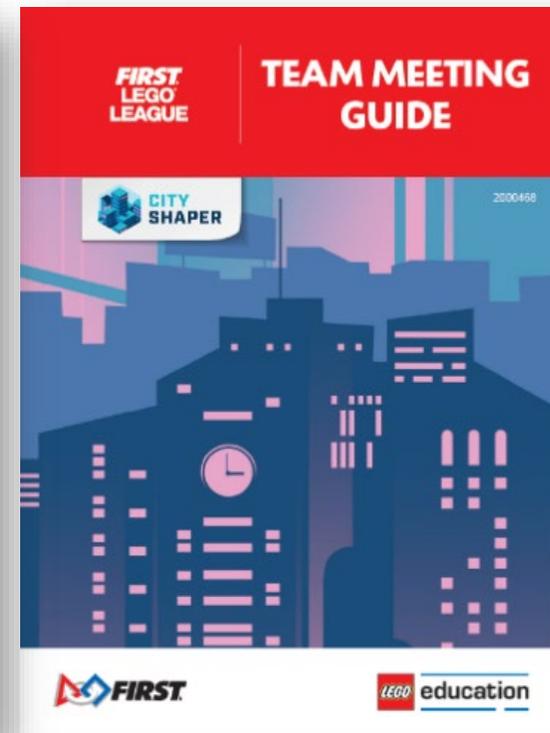
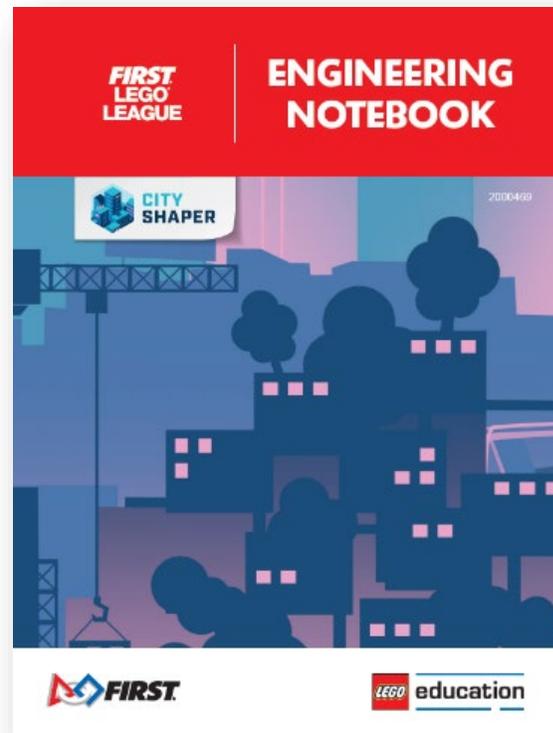


# **FIRST® LEGO® League CITY SHAPER<sup>SM</sup> Challenge**

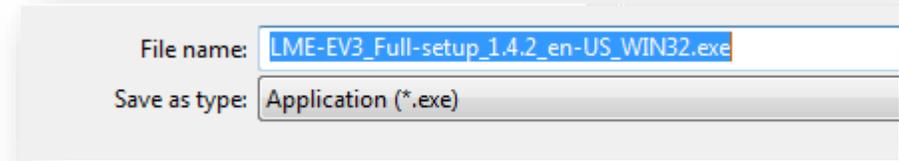
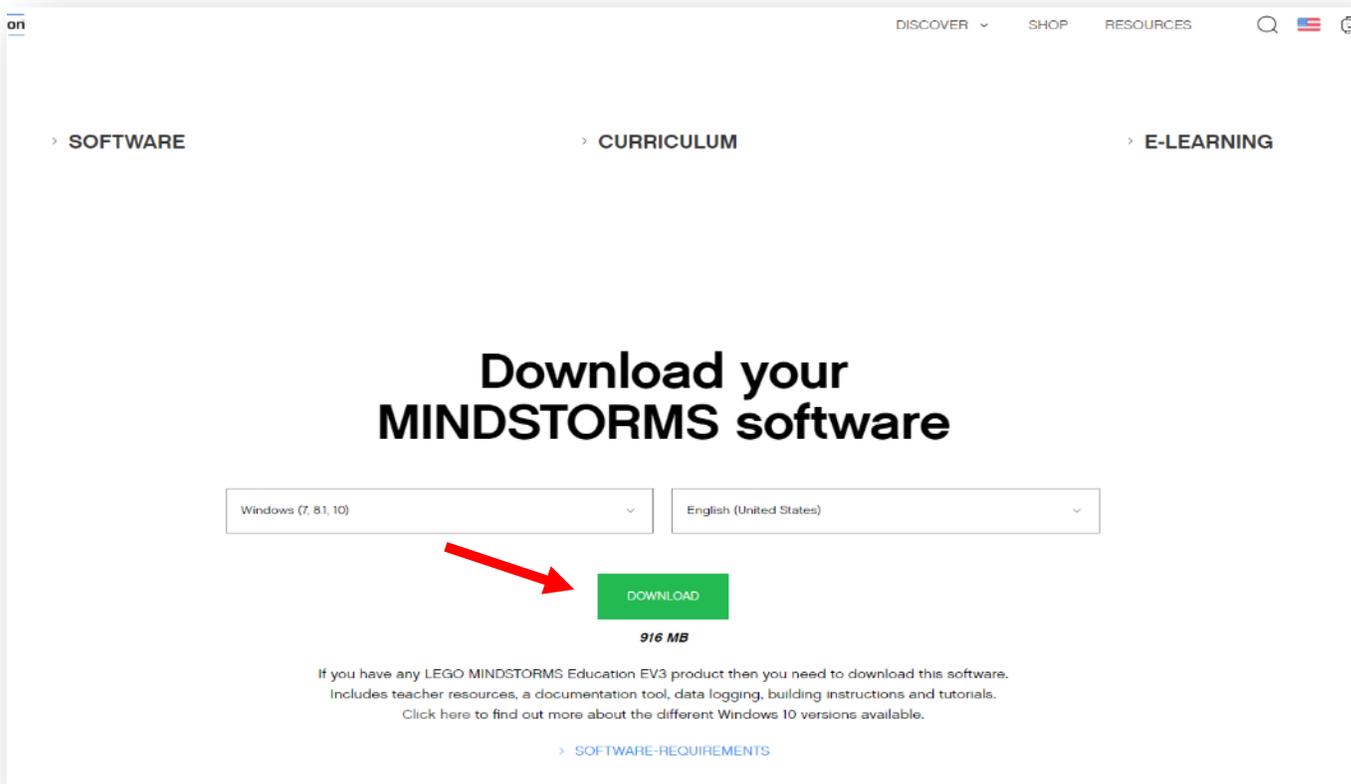
Detailed Guidance for Engineering Notebook Robot Lessons



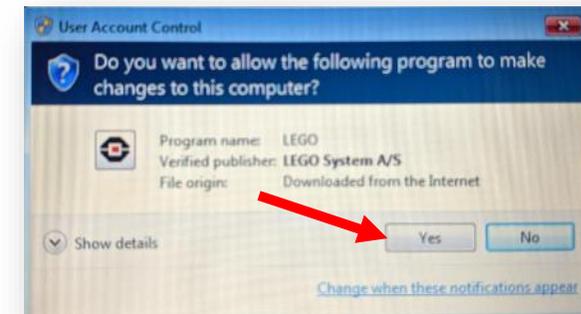
# Download and Install LEGO EV3 Software

If you have not done so already, please download LEGO EV3 software here:  
<https://education.lego.com/en-us/downloads/mindstorms-ev3/software>

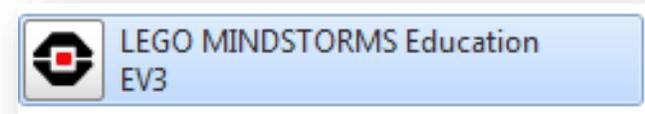
Download



Install



Open



LEGO MINDSTORMS Education EV3 Teacher Edition

File Edit Tools Help

Lobby + ?

**Start Here!**

We are excited to help you get started with LEGO MINDSTORMS Education EV3. Let us guide you through a couple of steps that will enable you to start using it in your classroom.

Prepare  
Try  
Use  
Next Steps

*To navigate around the EV3 software, use the gray arrows located here...*

# Navigating the EV3 Software

LEGO MINDSTORMS Education EV3 Teacher Edition

File Edit Tools Help

Lobby + ?

**...and here.**

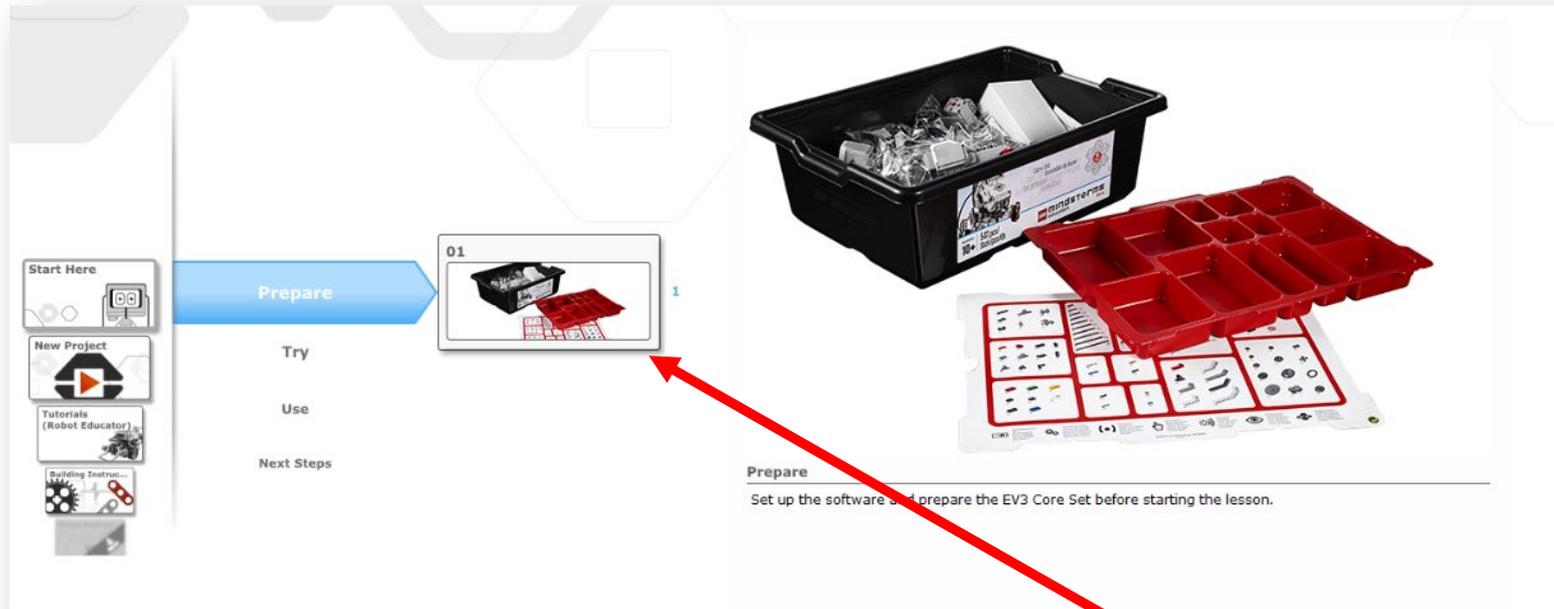
Prepare  
Try  
Use  
Next Steps

**Prepare**

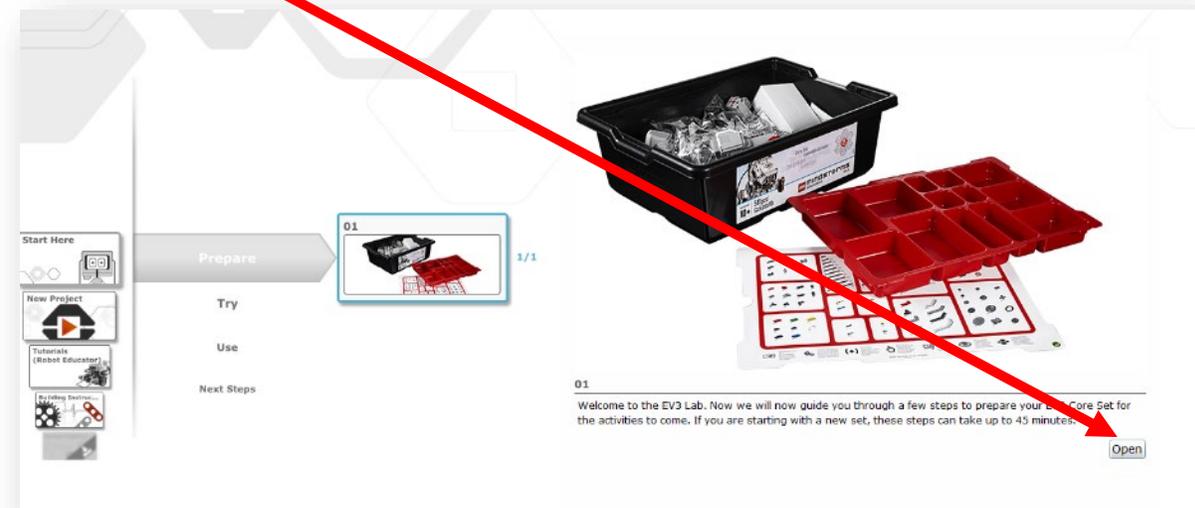
Set up the software and prepare the EV3 Core Set before starting the lesson.

# Opening a Lesson

*Hint: If you are using a brand new EV3 set, you may want to follow the “Prepare,” “Lesson 01” to help you sort and label your robot kit.*



*To open a lesson, select the icon, and then click the “Open” button.*



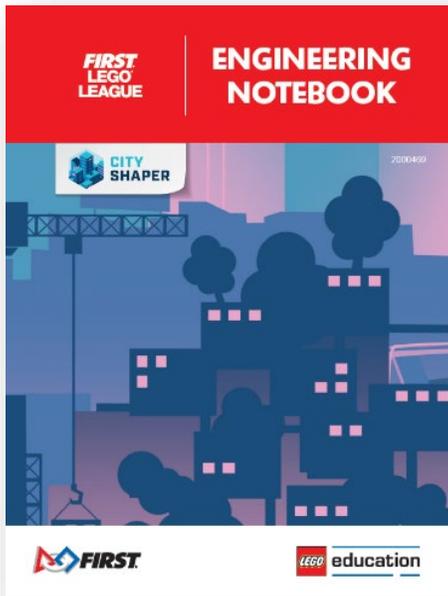
# Getting Started with the CITY SHAPER Engineering Notebook

The EV3 robot lessons begin in **Session 2** on page 23 of the Engineering Notebook. These lessons continue through **Session 7**.

Due to a **printing error in NORTH AMERICA**, the directions in the Engineering Notebook may be a little confusing for teams in that part of the world.

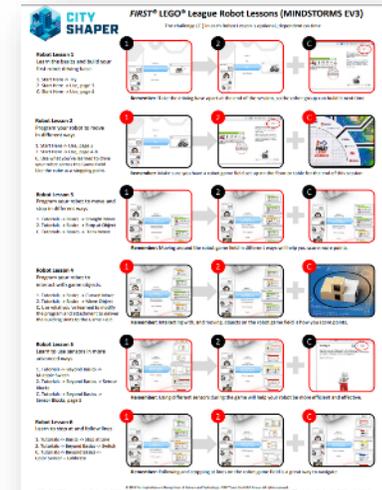
*Hint: If you are a coach, and need more information on how to use the Engineering Notebook, please see page 7, and pages 14 – 37 of the Team Meeting Guide.*

To help teams understand the robot lessons, we created a poster available [here](#). This poster guides teams through the lessons, and this PowerPoint will give you even more support.



**Group 2 tasks**

- Complete the EV3 Robot Educator tutorial called Straight Move, or the SPIKE Prime lesson Training Camp 1.
- Discuss the question below and record your ideas.
- Provide a status update to the other group.



# Using the *FIRST* LEGO League Robot Lessons Poster

## Lesson 1

The directions for **Robot Lesson 1** on the Robot Lessons Poster are copied below. We'll take a little more time to here to explain how to use this poster and explore the EV3 software.

**CITY SHAPER** **FIRST® LEGO® League Robot Lessons (MINDSTORMS EV3)**  
The challenge (C.) in each Robot Lesson is optional, dependent on time

**Robot Lesson 1**  
Learn the basics and build your robot driving base.

1. Start Here → Try
2. Start Here → Use page 4
- C. Start Here → Use, page 4

**Remember:** Take the driving base apart at the end of the session, so the other group can build it next time.

The poster shows three numbered steps: 1. Start Here (with a red box around the 'Try' button), 2. Start Here (with a red box around the 'Use' button), and C. Start Here (with a red box around the 'Use' button). A purple oval highlights the first step in the list.

To open the first part of this lesson, select **Start Here** → **Try** and then select the **small icon box of the EV3 brick** and click **Open**.

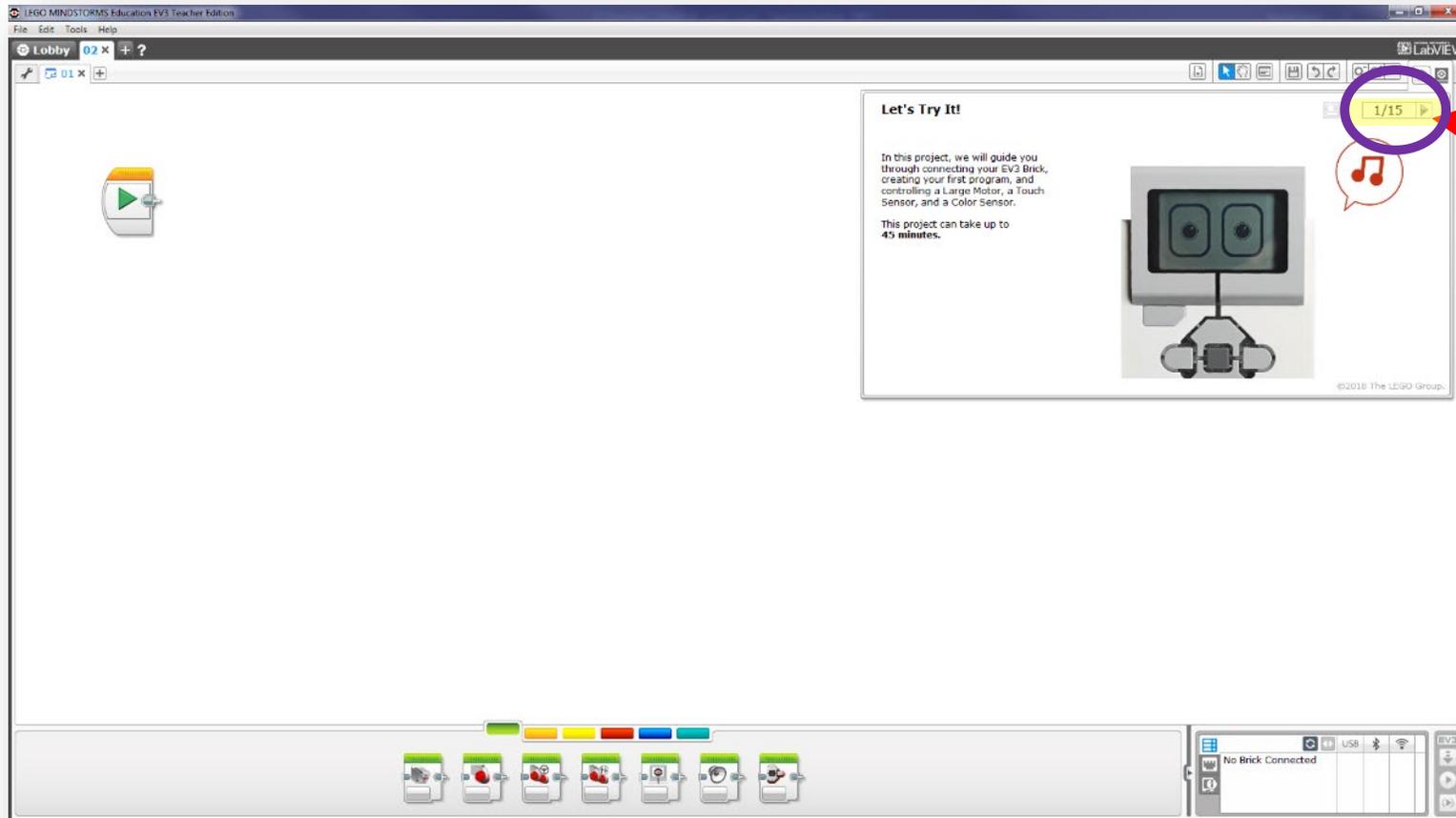
The screenshot shows the EV3 software interface. On the left, there is a sidebar with buttons: 'Start Here', 'New Project', 'Tutorials (Robot Educator)', and 'Exploring Instru...'. In the center, there is a 'Prepare' section with a 'Try' button and a 'Use' button. On the right, there is a 'Next Steps' section with a '02' button. A hand is holding a LEGO MINDSTORMS EV3 brick. Below the hand, there is a yellow 'Open' button. Red arrows point from the text box above to the 'Start Here' button, the 'Try' button, the '02' button, and the 'Open' button.

**02**  
We are excited to help you get started with LEGO® MINDSTORMS® Education EV3! This project will guide you through the process of connecting your EV3 Brick, creating your first program, and controlling a LEGO® Motor, Touch Sensor, and Color Sensor. These steps can take up to 45 minutes.

# Using the *FIRST* LEGO League Robot Lessons Poster

## Lesson 1

***Start Here*** → ***Try*** will open an introductory lesson on how to power-up your brick, connect it to a computer or device, add sensors and motors, and run your first program.



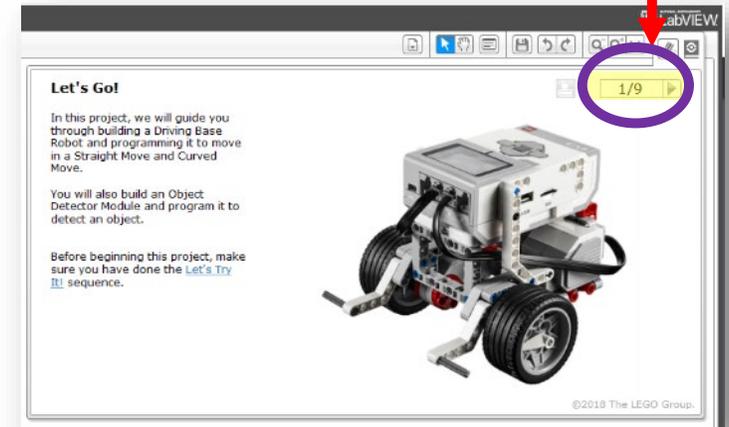
***To navigate through this part of the lesson, use the gray arrow to advance, and follow the 15 steps in this section.***

# Using the *FIRST* LEGO League Robot Lessons Poster

## Lesson 1

The next part of **Robot Lesson 1, Start Here** → **Use** → **Page 3** will open building instructions for your first Driving Base robot.

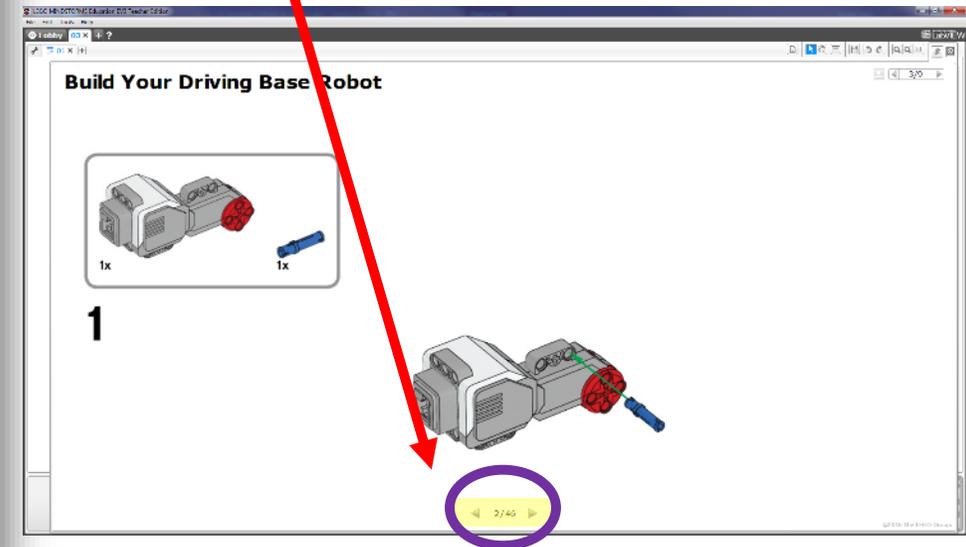
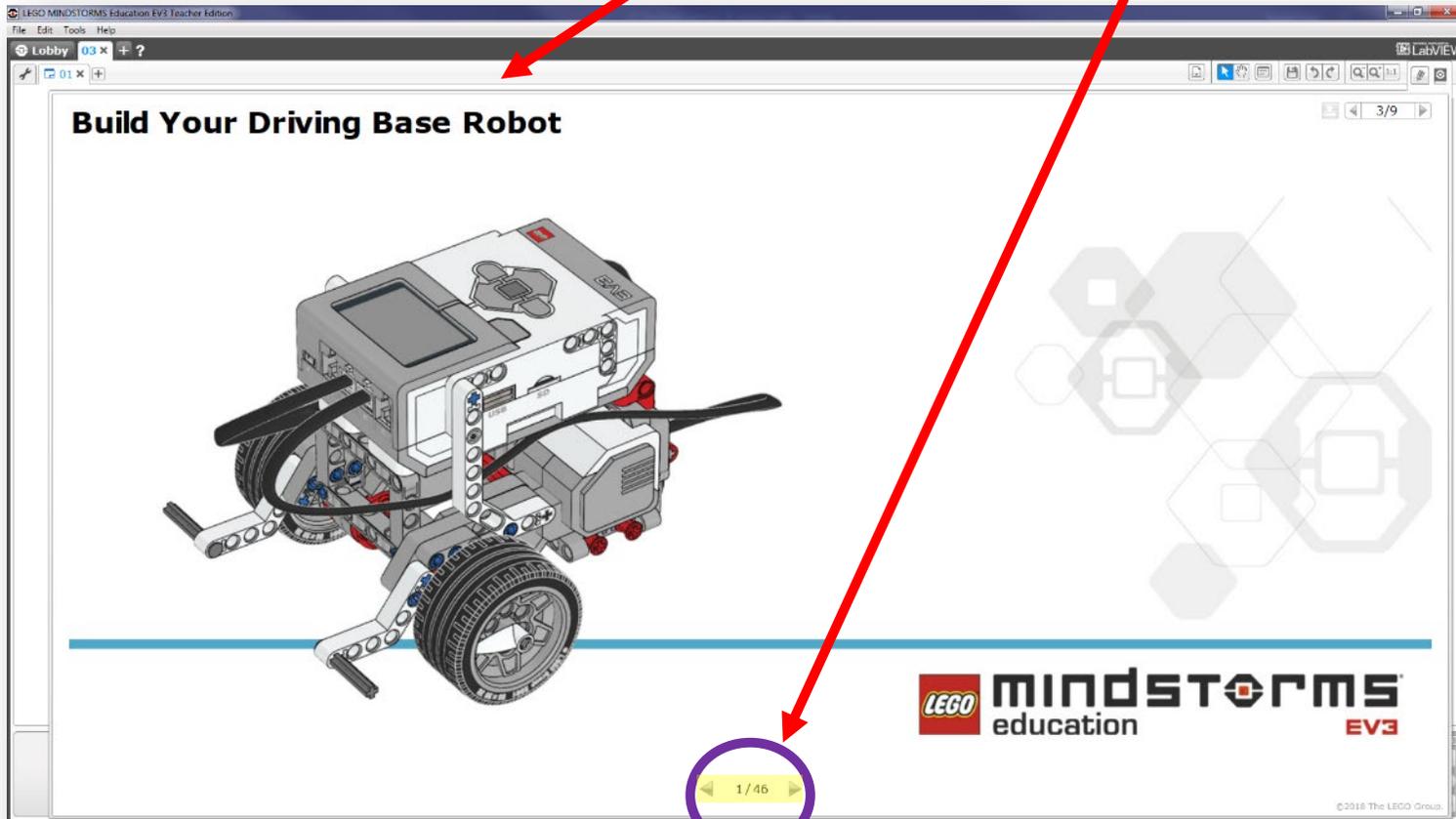
As directed on the poster, you will need to advance to **page 3** of this lesson to open up the building instructions.



# Using the *FIRST* LEGO League [Robot Lessons Poster](#)

## Lesson 1

Once you advance to page 3 of this lesson, the building instructions will open on your computer. Advance the building instructions by using the arrows at the bottom of the instructions.

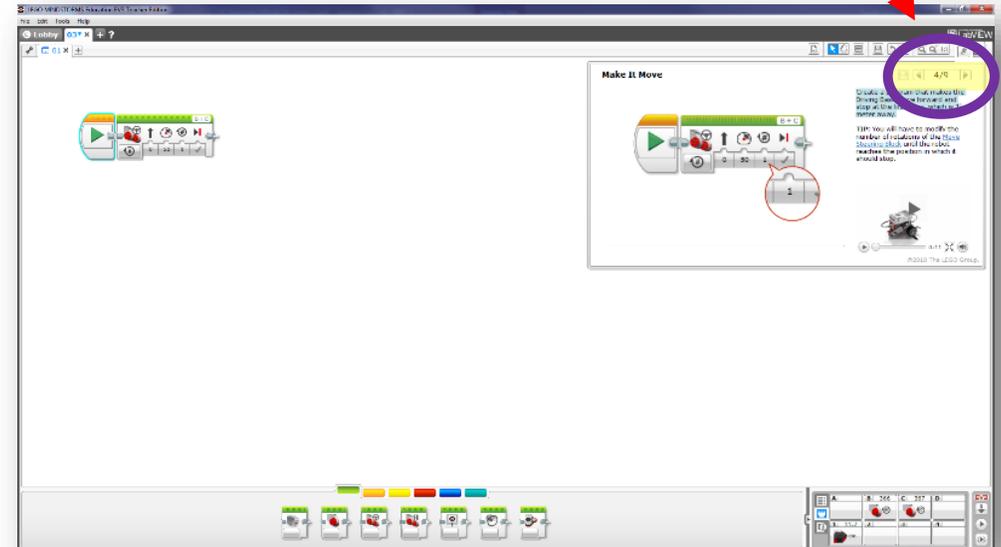
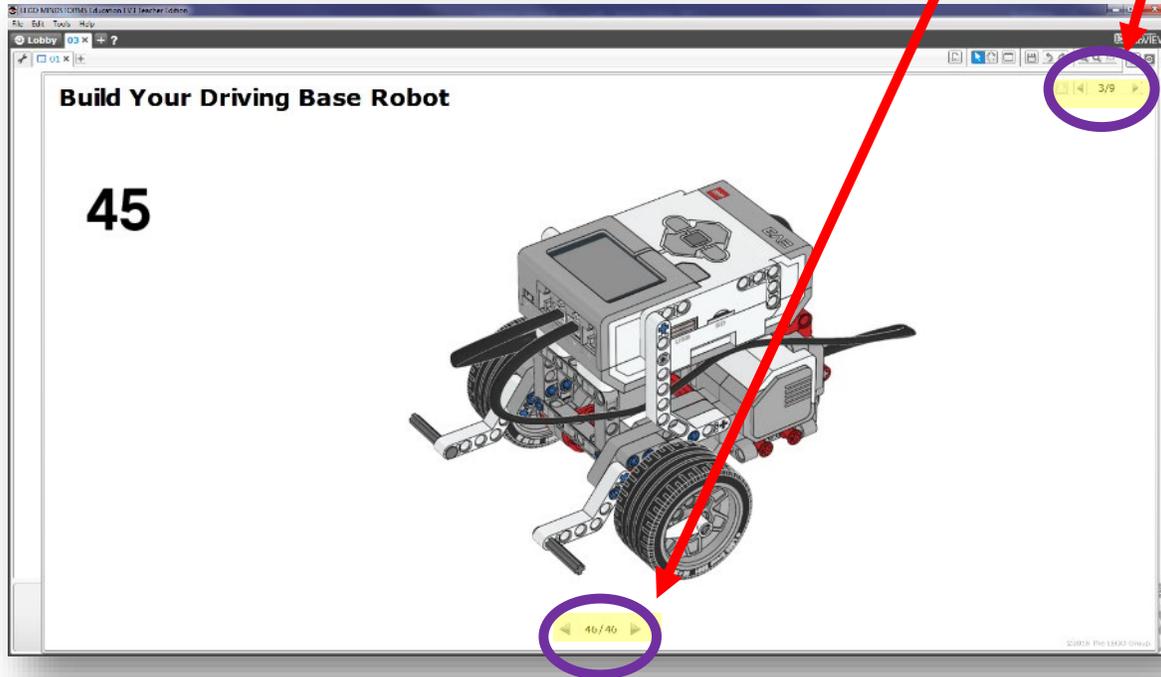


# Using the *FIRST* LEGO League Robot Lessons Poster

## Lesson 1

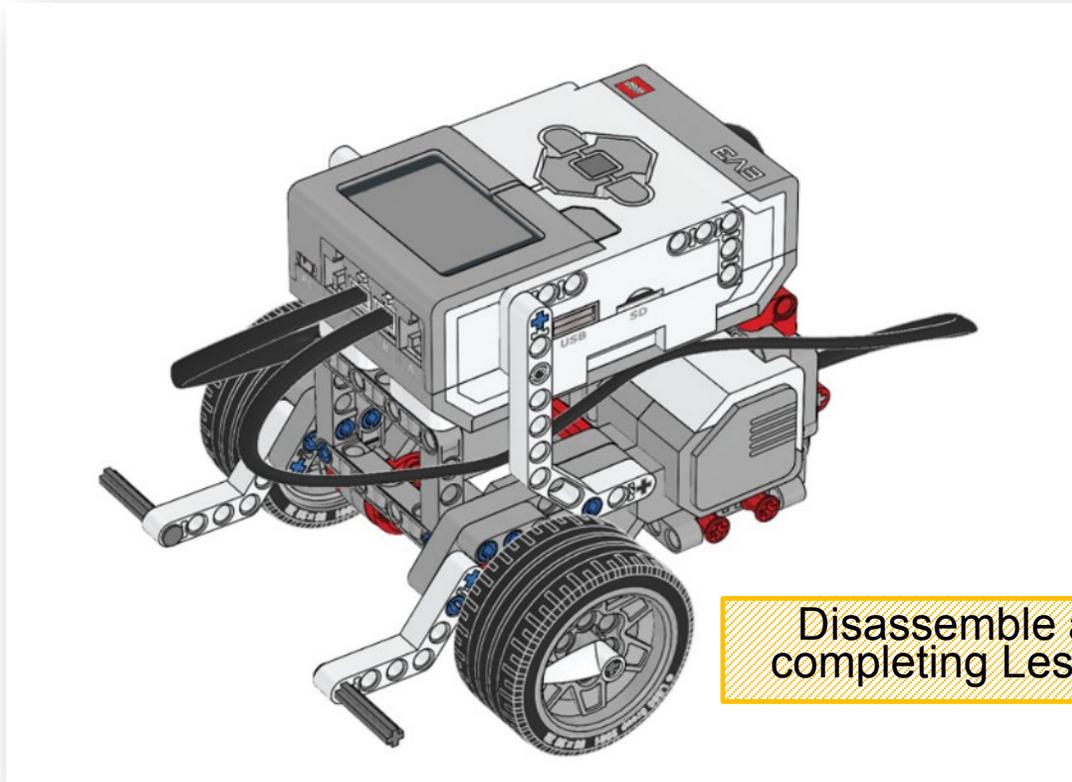
When you have completed the construction of the Driving Base robot, use the arrow at the top right to advance to page 4, the last part of **Robot Lesson 1**.

The last part of **Robot Lesson 1**, **Start Here** → **Use** → **Page 4** will help you create a program that makes the Driving Base move forward and stop at a finish line 1 meter away.



Using the *FIRST* LEGO League  
[Robot Lessons Poster](#)

**Lesson 1**



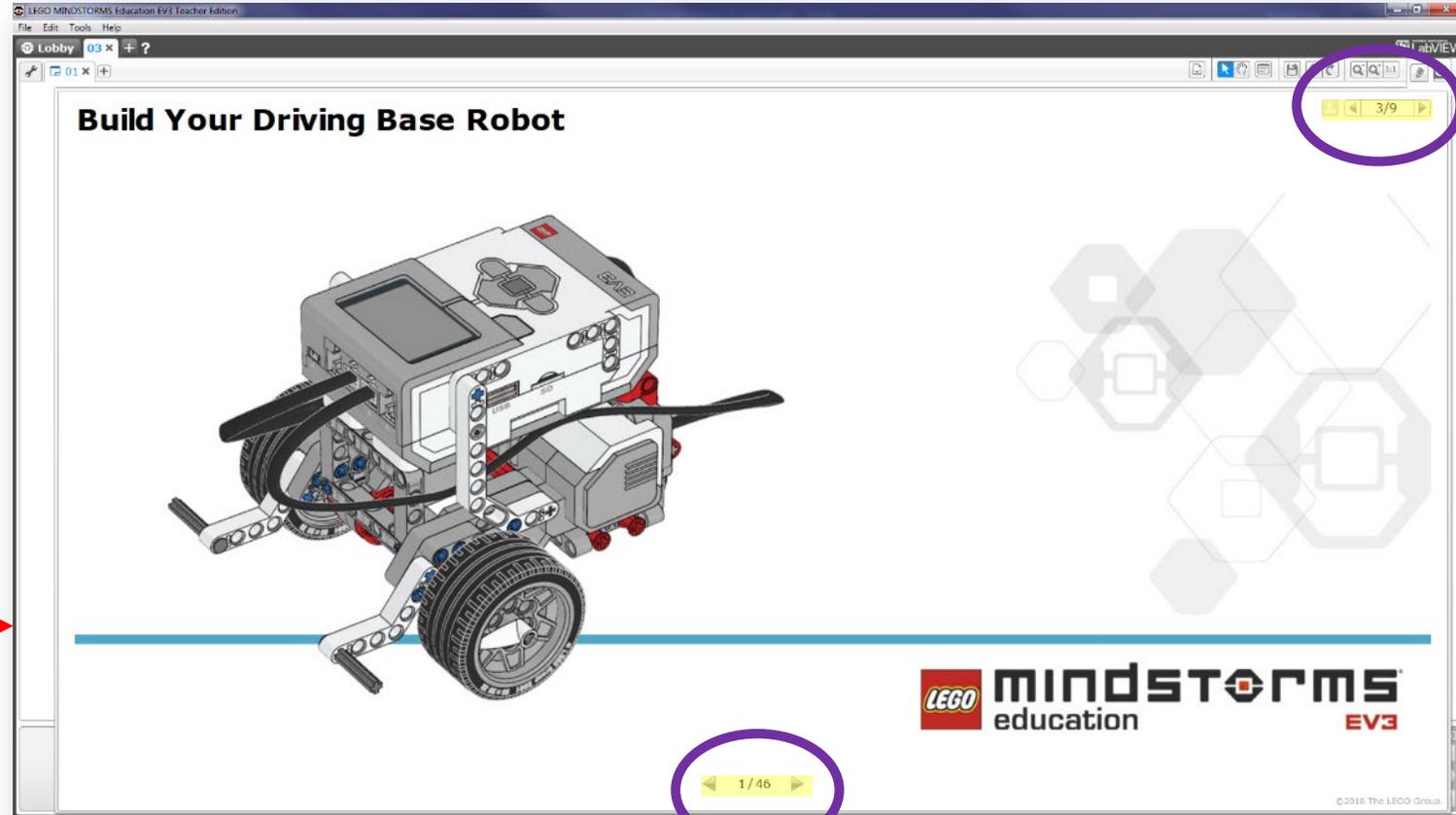
Disassemble after  
completing Lesson 1

*When you have completed **Robot Lesson 1**, take the driving base apart so the other group can build it next time.*

# Using the *FIRST* LEGO League Robot Lessons Poster

## Lesson 2

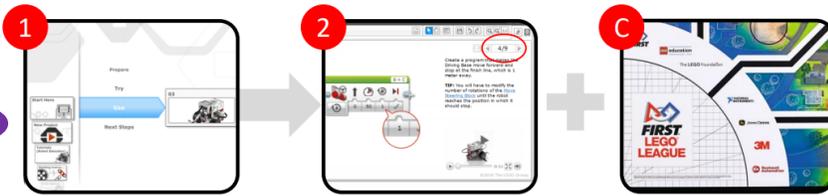
The directions for **Robot Lesson 2** on the Robot Lessons Poster are copied below. In Robot Lesson 2, a different group on your *FIRST* LEGO League team should be working with the EV3 robot. This groups will follow the same steps (**Start Here** → **Use** → **Page 3**) as the first group in order to complete the Driving Base robot.



### Robot Lesson 2

Program your robot to move in different ways.

1. Start Here -> Use, page 3
2. Start Here -> Use, page 4-8
- C. Use what you've learned to drive your robot across the Game Field. Use the cube as a stopping point.



Remember: Make sure you have a robot game field set up on the floor or table for the end of this session.

Remember to advance the building instructions by using the arrows at the bottom of the instructions.

# Using the *FIRST* LEGO League Robot Lessons Poster

## Lesson 2

**Make It Move** 4/9

Create a program that makes the Driving Base move forward and stop at the finish line, which is 1 meter away.

**TIP:** You will have to modify the number of rotations of the [Move Steering Block](#) until the robot reaches the position in which it should stop.

**Make It Turn** 5/9

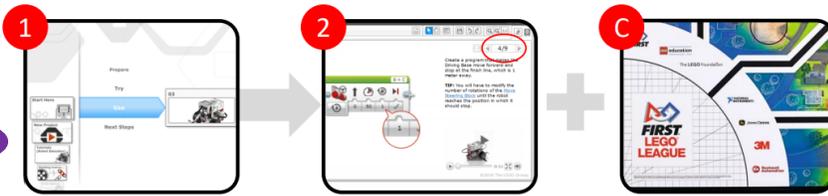
Create a new program that turns the Driving Base 180 degrees.

**TIP:** You will have to modify the number of rotations of the [Move Tank Block](#) until the robot reaches the desired angle.

Once you have completed construction of the Driving Base, work the lessons on **pages 4-8** of the EV3 software.

**Robot Lesson 2**  
Program your robot to move in different ways.

1. Start Here -> Use, page 3  
2. Start Here -> Use, page 4-8  
C. Use what you've learned to drive your robot across the Game Field. Use the cube as a stopping point.

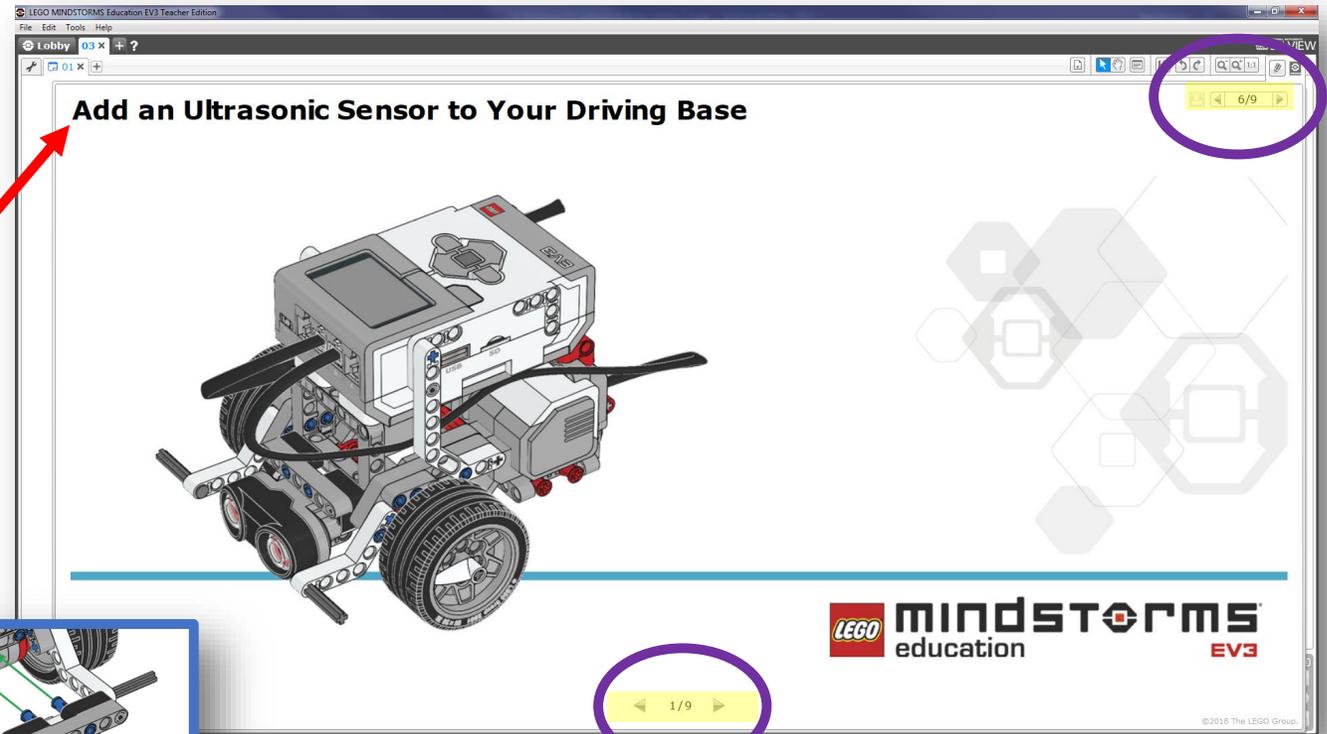
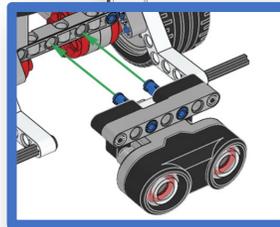


**Remember:** Make sure you have a robot game field set up on the floor or table for the end of this session.

# Using the *FIRST* LEGO League Robot Lessons Poster

## Lesson 2

When you get to **page 6**, new building instructions will open up to and show you how to add an Ultrasonic Sensor to your Driving Base.



**Robot Lesson 2**  
Program your robot to move in different ways.

- 1. Start Here -> Use, page 3
- 2. Start Here -> Use, page 4-8
- 3. Use what you've learned to drive your robot across the Game Field. Use the cube as a stopping point.

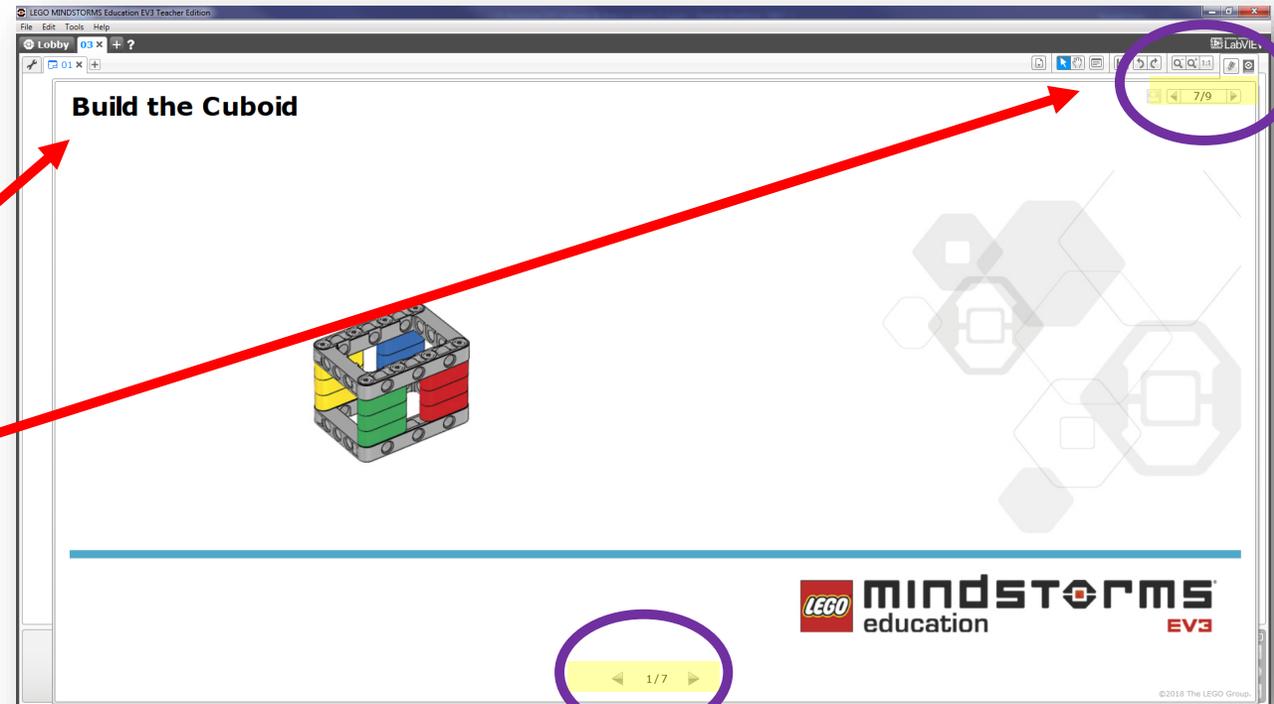


**Remember:** Make sure you have a robot game field set up on the floor or table for the end of this session.

Remember to advance the building instructions by using the arrows at the bottom of the instructions. Follow the nine (9) steps of these building instructions before moving to **page 7** of the lesson.

# Using the *FIRST* LEGO League Robot Lessons Poster

## Lesson 2

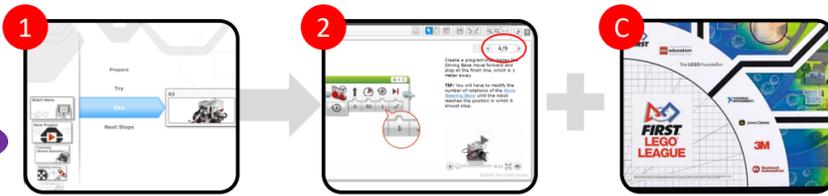


When you get to **page 7**, new building instructions will open up to help you build the “Cuboid,” a cube you will use for object detection.

Remember to advance the building instructions by using the arrows at the bottom of the instructions. Follow the seven (7) steps of these building instructions before moving to **page 8** of the lesson.

**Robot Lesson 2**  
Program your robot to move in different ways.

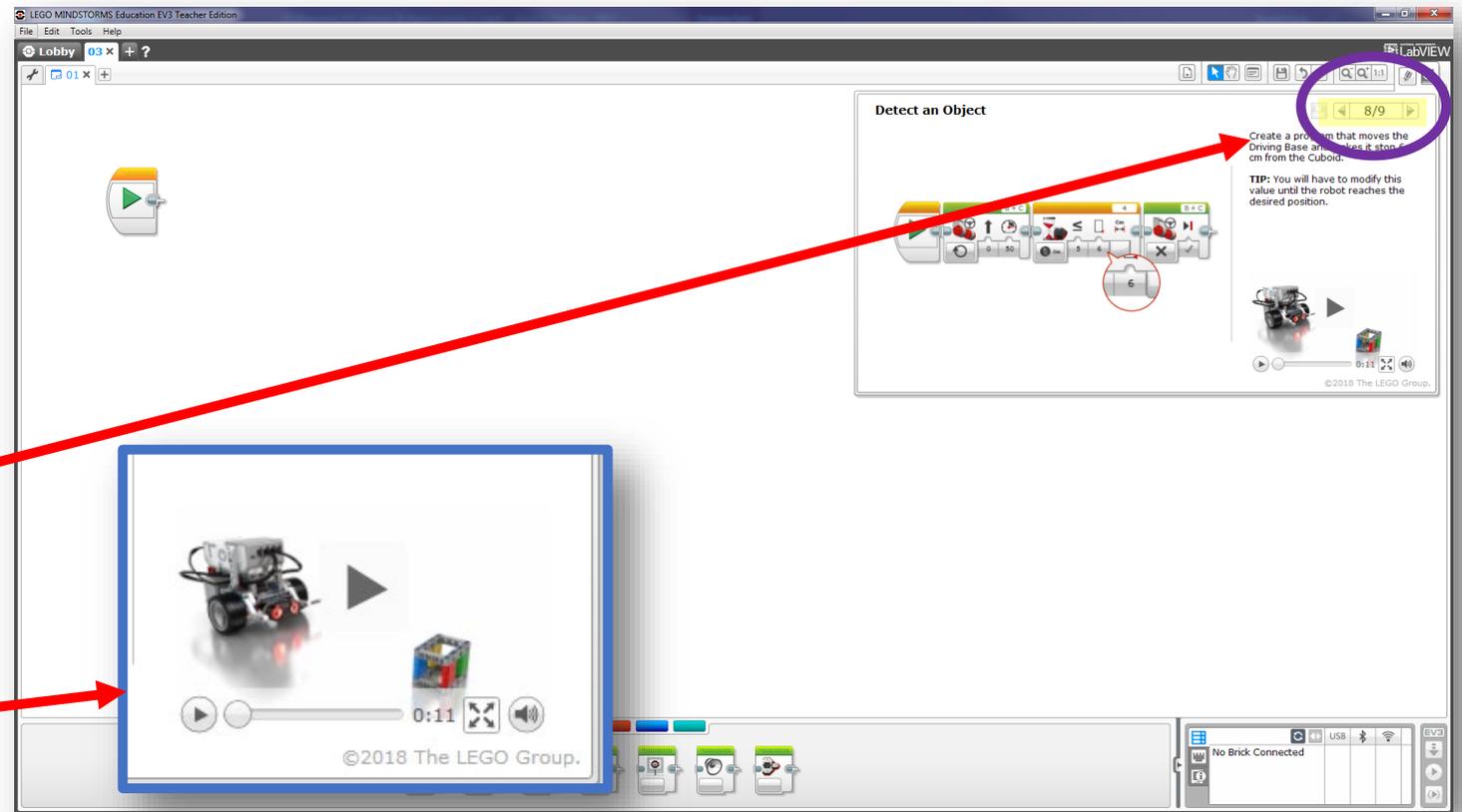
1. Start Here -> Use, page 3
2. Start Here -> Use, page 4-8
3. Use what you've learned to drive your robot across the Game Field. Use the cube as a stopping point.



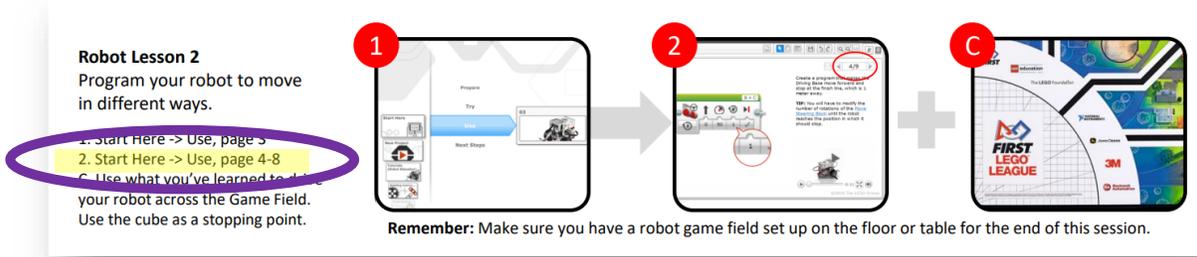
**Remember:** Make sure you have a robot game field set up on the floor or table for the end of this session.

# Using the *FIRST* LEGO League Robot Lessons Poster

## Lesson 2



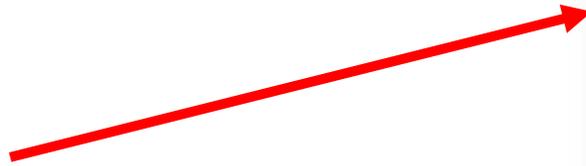
When you get to **page 8**, you will create a program that moves the Driving Base and makes it stop 6 cm from the Cuboid.



Remember to advance the building instructions by using the arrows at the bottom of the instructions. Follow the seven (7) steps of these building instructions before moving to **page 8** of the lesson.

# Using the *FIRST* LEGO League Robot Lessons Poster

## Lesson 2



*If you have time after completing the activity on page 8, try using what you have learned to drive around the CITY SHAPER robot game field.*

**FIRST LEGO LEAGUE** | **TABLE OVERVIEW** | When placing your Field on an Official Table, gently slide the Mat until it meets up against the South and East Border Walls. To hold the Mat in place, you may use a thin strip of black tape on the West edge as needed. Where the tape sticks to the Mat, it may cover the Mat's black border only.

**FIRST** **LEGO education**

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**Robot Lesson 2**  
Program your robot to move in different ways.

1. Start Here -> Use, page 3
2. Start Here -> Use, page 4-8
- C. Use what you've learned to drive your robot across the Game Field. Use the cube as a stopping point.



**Remember:** Make sure you have a robot game field set up on the floor or table for the end of this session.

**Remember, in a competition, your robot should always start in the Launch Area, and return to Home before you pick it. Please see the [Game Guide](#) for more information on Robot Game Missions and Rules.**

**Hint:** If you would like to save some time at the next meeting, leave the Driving Base assembled after Lesson 2.

### Robot Lesson 3

Program your robot to move and stop in different ways.

1. Tutorials -> Basics -> Straight Move
2. Tutorials -> Basics -> Stop at Object
- C. Tutorials -> Basics -> Tank Move



**Remember:** Moving around the robot game field in different ways will help you score more points.

### Robot Lesson 4

Program your robot to interact with game objects.

1. Tutorials -> Basics -> Curved Move
2. Tutorials -> Basics -> Move Object
- C. Use what you've learned to modify the program and attachment to deliver the Building Units to the Game Field.

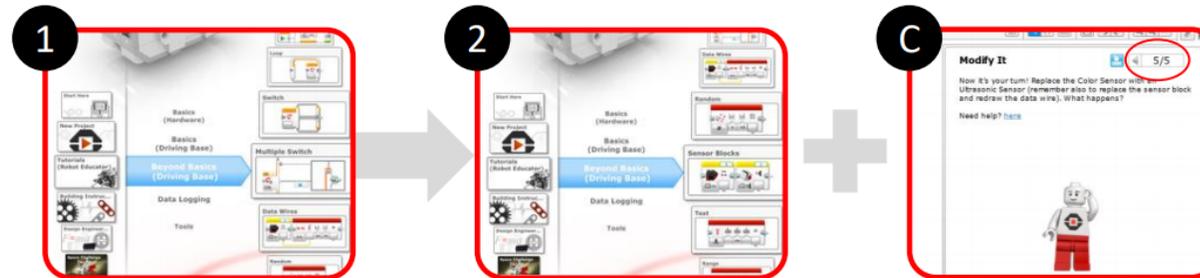


**Remember:** Interacting with, and moving, objects on the robot game field is how you score points.

### Robot Lesson 5

Learn to use sensors in more advanced ways.

1. Tutorials -> Beyond Basics -> Multiple Switch
2. Tutorials -> Beyond Basics -> Sensor Blocks
- C. Tutorials -> Beyond Basics -> Sensor Blocks, page 5



**Remember:** Using different sensors during the game will help your robot be more efficient and effective.

### Robot Lesson 6

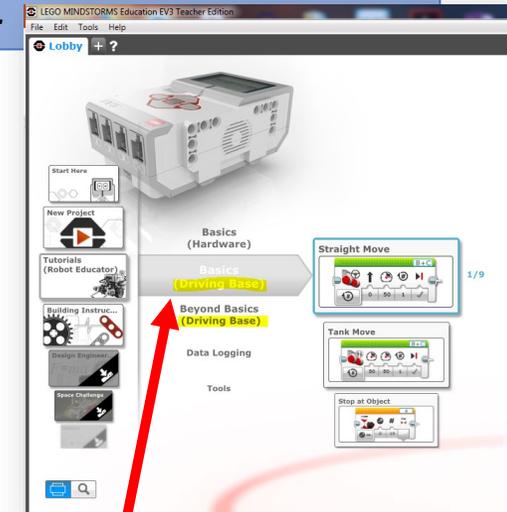
Learn to stop at and follow lines.

1. Tutorials -> Basics -> Stop at Line
2. Tutorials -> Beyond Basics -> Switch
- C. Tutorials -> Beyond Basics -> Color Sensor - Calibrate



**Remember:** Following and stopping at lines on the robot game field is a great way to navigate.

The remaining introductory lessons on the Robot Lessons Poster are completed the same way as Lessons 1 & 2. We'll discuss the Crane Mission lesson in a separate tutorial.



Hint: Be sure you are in the Driving Base section when working Robot Lessons 3-6. (You should see the words "Driving Base" below "Basics" and "Beyond Basics.")