

## LEGO® MINDSTORMS® Education EV3 Programming App Introduction

LEGO® Education is pleased to bring you the tablet edition of the LEGO MINDSTORMS® Education EV3 Software—a fun, structured way of learning to program your LEGO MINDSTORMS Education EV3.

### Who Is It For?

The primary subject focus of the coursework created for the EV3 Programming App is Engineering, Technology, and Computer Science. However, taking advantage of all the challenges included in the coursework allows for cross-curricular activities that integrate both science and mathematics.

Regardless of prior programming or building experience, the engaging and motivating tablet software will have everyone constructing, programming, and experimenting in no time.

The provided Lesson Plan includes procedures for delivering step-by-step courses and also invites educators to use a more open-ended approach to ensure solution diversity.

### What Is It For?

The EV3 Programming App and Lesson Plan is a valuable tool for teaching students and teachers how to use LEGO MINDSTORMS Education EV3 within a classroom-based environment. Along with six tutorials, a step-by-step Lesson Plan (and integral Lesson Challenges), two Master Challenges, and four Design Brief Challenges, this is also a learning guide for the EV3 programming language and the hardware included with the set. By combining the easy-to-use programming environment with the supporting material, you will be off to a quick, smooth start using robotics in a STEM context. Experienced users will also find inspiration and support for furthering students' building and programming skills, as well as their overall engineering design and problem-solving abilities.



**What Is in the Pack?**

- EV3 Programming App
- Quick Start Video
- User Guide PDF
- Introduction PDF
- Six engaging, motivating Robot Educator tutorials that will get your students off to the best possible start. They include
  - model animations of the EV3 Robot;
  - animations that help make the connection between program and Robot behavior;
  - six modular building instructions;
  - a “Modify It” task that tests the students’ understanding of the tutorial and helps consolidate the learning outcome; and
  - links to relevant help text and user guide topics.
- Lesson Plan PDF, which includes
  - step-by-step help on using the six tutorials;
  - a range of ideas for lesson-specific challenges;
  - two Master Challenges that provide solid opportunities for students to use EV3 in a STEM context;
  - four open-ended Design Brief Challenges;
  - suggestions on how to assess student learning; and
  - references to relevant subject standards.

The EV3 Programming App, Lessons, and Challenges are designed for use with the 45544 LEGO® MINDSTORMS® Education EV3 Core Set.



## Classroom Management Tips

### How Much Time Do I Need?

The time taken to complete each of the tutorials as well as the suggested activities in the Lesson Plan depends on a number of factors, including the level of complexity, the age of the student, and the student's experience with LEGO® MINDSTORMS® and the concepts covered in the relevant Lesson. The following estimates are therefore based on the time it would take an average student, with no prior experience with LEGO MINDSTORMS, to complete a task in each of the following categories:

Category	Estimated completion time including building time (minutes)
Tutorial	45-90
Tutorial and Lesson Challenge	90-135
Master Challenge 1	90-180
Master Challenge 2	90-270
Design Brief Challenge	90-270

Based on the estimates listed above, it should be possible for your students to complete the first tutorial within a 45-minute class period.

### Additional Material

To complete the Lesson Plan, the following additional material will be needed: different-colored sticky tape or paper (at least black, blue, gray, and one other color), large sheets of paper, objects of different shapes and sizes, protractors, measuring tapes (minimum length 1 m), and markers.

### Challenge-Based Assessment

The EV3 Programming App concept includes several ways of assessing students' work. The hands-on challenge approach, which provides a simple method of observing a Robot's ability or failure to complete a task, is an effective way of challenging a student's problem-solving skills and integrating student and teacher assessment tools. When students have difficulty completing a challenge using their Robot, they are motivated to improve their design or program in order to see something that they have built themselves succeed; this is a self-reinforcing process.

In the "Test It" phase of the tutorials, students are asked to describe the behavior of their Robot in the Comment Box provided on the canvas. This process encourages students to reflect on the connection between the programming blocks and Robot behavior.

The "Modify It" tasks included in the tutorials help consolidate learning by asking students to make changes in the sample program to fulfill a given task.

Lesson Challenges provided for teachers in the Lesson Plan enable students to show that they can apply the skills gained via the tutorials. Each Lesson Plan includes an assessment section that gives guidance on what to look for or what kind of questions to ask students. In the Design Brief Challenges, you can choose an approach that, compared with the step-by-step tutorials, is more open-ended. This allows you to assess students' innovation and collaboration skills.

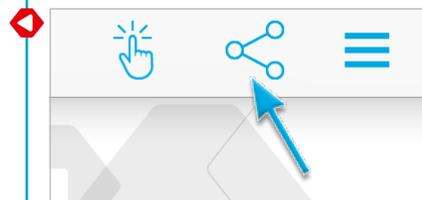
By using the Challenge-based assessment approach, students can apply their STEM learning in an authentic context and show what they have learned.

### Student Documentation

When documenting, students will reflect on and consolidate what they have just learned, as well as how to use appropriate language to communicate it. You can ask students to

- write full descriptions of their working processes;
- add images and videos of their Robot in action;
- take screenshots from the EV3 Programming App by pressing the "Home" and "Power" buttons simultaneously; and
- share their unique project with other students.

Guide the students in which app(s) to use when documenting what they learned after each Lesson—the EV3 Programming App does not include a documentation tool. If the students are using shared tablets, make sure they know how and where to save their programs.



## Before Starting the First Lesson

If you have never worked with LEGO® MINDSTORMS® Education EV3 before, you should ensure the following:

1. Each tablet has a preinstalled version of the LEGO MINDSTORMS Education EV3 Programming App.
2. Each EV3 Brick has the latest firmware and is fully charged. To install firmware, you need a desktop version of the EV3 Software. For more instructions, refer to the User Guide, which you can access from the Menu.
3. Before connecting tablets and EV3 Bricks via Bluetooth in the classroom, we recommend renaming each EV3 Brick. This can be done in two ways:
  - a. Update the name via the desktop EV3 Software using a USB cable.
  - b. Update to firmware V1.07E or later and change the name via the EV3 Brick Settings Area (see the User Guide for more help).
4. Check out the Quick Start Video from the Menu.

You may want the students to understand the names and functions of the different elements in the brick set. Discuss the naming and basic functionality of the key hardware components and establish a set of brick management rules. A copy of the 45544 LEGO MINDSTORMS Education EV3 Core Set Elements List is included in the User Guide. The User Guide is your source for everything relating to the LEGO MINDSTORMS EV3 Hardware.

### Firmware Update

