Understanding the Differences of

Lego EV3 Education Version (45544 & 45560)

&

Lego EV3 Home Version (31313)
LEGO MINDSTORMS EV3 Home Edition (#31313) and LEGO MINDSTORMS Education EV3 (#45544)

Published on November 25, 2013  by Laurens Valks

This article covers the difference between the LEGO MINDSTORMS EV3 Home Edition and LEGO MINDSTORMS Education EV3 products.

One robotics platform, two targets

The LEGO MINDSTORMS EV3 robotics platform has been developed for two different target audiences: home users (children and hobbyists) and educational users (students and teachers). LEGO has designed a base set for each group, as well as several add on sets.

There isn’t a clear line between home users and educational users, though. It’s fine to use the Education set at home, and it’s fine to use the Home Edition set at school. This article aims to clarify the differences between the two product lines so you can decide which product works best for you.

LEGO MINDSTORMS EV3 Home Edition

The LEGO MINDSTORMS EV3 set (LEGO #31313) is the one you’ll find in toy stores and many online stores, as shown in Figure 1. It is often referred to as the Home Edition or Retail Edition. Right out of the box you can build 5 robots including EV3RSTORM, GRIPP3R, TRACK3R, R3PTAR and SPIK3R and 12 bonus models.

You can program the robot with software that you can download from the LEGO MINDSTORMS website for free. http://www.lego.com/en-us/mindstorms/?domainredir=lego.com
You can also control your robot with your smart phone, or with the infrared remote control that comes with the set.

The set contains 1 EV3 programmable brick, 2 Large Motors, 1 Medium motor, 1 Touch Sensor, 1 Color Sensor, 1 Infrared Sensor and an infrared remote, as shown in Figure 2. The set also includes 7 connector cables and a USB cable for programming.

You’ll need 6 AA batteries for the EV3 brick, and 2 AAA batteries for the remote. Instead of using 6 AA batteries, you can purchase the LEGO EV3 Rechargeable Battery and charger. (See “The EV3 Rechargeable Battery” below.)

Figure 2: LEGO MINDSTORMS EV3 Home Edition Hardware

The 31313 set contains nearly 600 building elements, including beams, axles, gears and connectors, as shown in Figure 3. The inside of the cardboard packaging contains a mission pad. See next page.
Figure 3: LEGO MINDSTORMS EV3 Home Edition Parts list.
The LEGO MINDSTORMS Education EV3 Core Set (LEGO #45544, see Figure 4) is available from LEGO Education (Duck Learning in Singapore) and various education resellers worldwide. The set includes building instructions for one vehicle with various sensor attachments. More building instructions are available here online provided by various educators or hobbyists. Software tutorials are available as part of the LEGO MINDSTORMS Education EV3 programming software, which is sold separately (#2000045).

Figure 4: LEGO MINDSTORMS Education EV3 Core Set (LEGO Catalogue #45544) – Image credit: LEGO Education

The set contains 1 EV3 programmable brick, 2 Large Motors, 1 Medium motor, 2 Touch Sensors, 1 Color Sensor, 1 Ultrasonic Sensor and 1 Gyro sensor, as shown in Figure 4. The set also includes 7 connector cables and a USB cable for programming. The set includes a rechargeable battery for the EV3 brick. The charger is sold separately (#8887).

Figure 5: LEGO MINDSTORMS Education EV3 Core Set Hardware. The set also includes a rechargeable battery for the EV3 brick (not shown here).
The set contains nearly 540 building elements, including beams, axles, gears and connectors, as shown in Figure 6. The sturdy plastic box further contains storage bins for your Technic elements.

![LEGO MINDSTORMS Education EV3 Parts list](image)

Figure 6: LEGO MINDSTORMS Education EV3 Parts list. – Image credit: LEGO Education.

‘Upgrading’ Elements from Education Edition to Home Edition

If you have the Education Core Set (#45544), you may still want to build the robots of the Home Edition set (#31313), the 12 bonus robots can comes with the retail version (31313), or robots from books about the Home Edition set. To do so, you’ll need to purchase separately the Infrared Sensor and the Infrared Beacon, as well as certain Technic building elements.

You can find a list that compares the elements in both sets. Thomas Rosendahl has compiled a list of elements required to upgrade from the Education Core Set to the Home Edition here at . You can order most elements from LEGO or Bricklink.

Alternatively, you could get a large LEGO Technic set or a MINDSTORMS EV3 expansion set (45560) (See ‘LEGO MINDSTORMS Education EV3 Expansion Set’ below). You’ll get more value for money this way, but you may still need to buy certain pieces separately.
‘Upgrading’ Elements from Home Edition to Education Edition

Similarly, if you have the Home Edition set (#31313), you may still want to build the robots of the Education Core Set (#45544). To do so, you’ll need to purchase separately the Ultrasonic and the Gyroscopic sensors, as well as certain Technic building elements. You can find a list that compares the elements in both sets here at Internet websites. Note that the Infrared Sensor has exactly the same shape as the Ultrasonic Sensor. Both sensors can sense distance, but the Ultrasonic Sensor is more accurate for distance sensing. On the other hand, the Infrared Sensor serves as the receiver for the Infrared Remote. It’s up to you to decide whether you need both sensors. If you have an NXT Ultrasonic sensor, it can be used with EV3.

EV3 Programming Software Versions

LEGO MINDSTORMS EV3 robots must be programmed from a computer. National Instruments and LEGO have created a graphical programming language environment to make it easy for everyone to get started programming. This software comes in two versions: The Home Edition and the Education Edition (for teachers and students). In addition, hobbyists are currently developing alternative programming languages for EV3 such as C/C++ and Java.

Home Edition Software

The LEGO MINDSTORMS EV3 Home Edition set (#31313) does not include a software CD in the box. Instead, you will need to download the Home Edition software for free from the LEGO MINDSTORMS website

http://www.lego.com/en-us/mindstorms/?domainredir=lego.com. The software includes a programming environment, and building and programming instructions for the robots you can build with the Home Edition set. The software does not require a license key, so you can download the software early to see if you like the programming language, and to avoid waiting for a big download when you want to get started building and programming.

The installation file is about 700 MB in size. The system requirements can be found in the installation folder. Download and run the free software to see if it works before you buy the set!

Prerequisites:

* Silverlight 5.0 or newer (Installer is included – no need to download separately)
* Microsoft Dot Net 4.0 or newer (Installer is included – no need to download separately
**Operating systems:**

* Windows: Windows XP, Vista, Windows 7, and Windows 8 (32/64 bit) with the latest service packs. *(Note that it may not work on Windows 8.0 RT or 8.1 RT)*

* Macintosh: Mac 10.6, 10.7, and 10.8 with the latest service packs

**System requirements:**

* 2 GB of RAM or more

* 2.5 GHz processor or faster (This is the minimum for a dual core processor. For example, a laptop with **quad core processor is just 1.7 GHz** works fine.)

* Minimal supported screen resolution of 1024*768

* LEGO® MINDSTORMS® EV3 does not support tablets or certain netbooks with hardware that does not meet the above requirements.

**Education Edition for Teachers and Students**

The LEGO MINDSTORMS Education EV3 Core Set (#45544) does not include a software CD in the box. You can purchase a digital license for the Education Edition software from LEGO Education. You will then be given a personalized download link for a software installation file. The installation file is about 700 MB in size. The system requirements are the same as given above.

The software includes a programming environment, and building and programming instructions for the robots you can build with the Education Core Set (#45544) and the Education Expansion set (#45560). In addition, it contains a data logging environment for science experiments. For example, you can plot a graph of the light level in a room, and see it change over time.

**Using the Home Edition Software with the Education set**

The EV3 brick in the Home Edition set is the same as the EV3 brick in the Education Core Set, so you can use either version of the programming software to control your robot. In fact, you can install both versions of the software on the same computer, if you like.

It is therefore possible to use the Home Edition software with the Education Core Set. When you do, you’ll need to add a few programming blocks to the software to be able to control the Gyroscope and the Ultrasonic Sensor.
LEGO MINDSTORMS Education EV3 Expansion Set

You can upgrade the LEGO MINDSTORMS Education EV3 Core Set (#45544) with the LEGO MINDSTORMS Education EV3 Expansion Set (#45560, link). This allows you to build bigger robots such as an elephant and a stair climber. The set includes over 850 building elements including beams, axles, and gears, as shown in Figure 7. It does not contain any electronic elements.

Figure 7: LEGO MINDSTORMS Education EV3 Expansion Set #45560. – Image credit: LEGO Education.

While this add on pack was made for the Education Core Set, it’s also an excellent parts resource for use with the EV3 Home Edition (#31313). You won’t be able to build all of the models from this add on pack because you may be missing some elements from the Education Core Set, but the pieces are very useful to create your own robots. In particular, the set contains 9x O-frames, 6xH frames, 13x 15M beams, and numerous gears including a differential and a turntable.
The EV3 Rechargeable Battery

The LEGO MINDSTORMS EV3 Home Edition set does not include a rechargeable battery. You can simply use 6x AA batteries. You may want to invest in 6 high performance rechargeable batteries with a dedicated charger. If you do, you’ll probably want to get at least 12 batteries so you can use one set while you charge the others.

You can also purchase the LEGO MINDSTORMS EV3 rechargeable battery (#45501) and the charger (#8887, link). This allows you to charge your robot while it’s on. No need to take your robot apart when the batteries run dry. The battery does make your EV3 a bit bigger (precisely one LEGO unit), as shown in Figure 8.

Figure 8: The LEGO MINDSTORMS EV3 rechargeable battery (#45501) and the charger (#8887)

Apps for Smartphones and Tablets

You can control your EV3 from your iOS or Android smartphone or tablet. You can search the available apps at Apple and Google play stores. The official Commander app is targeted at Home Edition users, with specific controls for the Home Edition robots, but it also works with the Education Core Set. In particular, if you have the Education Core Set, you can use the TRACK3R controls software to drive the Educator Vehicle. In addition, you can create their own customized remote to control each motor connected to the EV3 brick.
Purchasing Bluetooth and WiFi dongles

When you’ve created a program in the LEGO MINDSTORMS EV3 software, you transfer it to the EV3 brick using the USB cable included in the set. Once transferred to the brick, the robot can run the program on its own. In addition, you can program your robot wirelessly using Bluetooth or Wifi (use **NETGEAR N150 Wi-Fi USB Adapter (WNA1100)** WiFi dongle). This way, there’s no need to connect the USB cable each time you change the program.

While this works great for small setups at home, it can be frustrating to set up in classrooms, because classroom computers may not have administrator rights (for Bluetooth drivers) or they might not have access to configure wireless network settings (for WiFi). If you plan to use wireless capabilities in the classroom, consider buying just one dongle so you can try it out before you buy one for each set.

### 2014 Price List

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<th>Item Name</th>
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<td>31313</td>
<td>580 to 630.00</td>
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<tr>
<td>Lego EV3 Education Core Set</td>
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<td>Lego EV3 Education Expansion Set</td>
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<tr>
<td>Lego EV3 Education Software Licence (Single)</td>
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<tr>
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<td>Battery Charger, Transformer</td>
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<td>Rechargeable Battery</td>
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<td>IR Sensor (Seeker)</td>
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**Note:**

The above information is provided in good faith and accurate in time of printing. For feedback kindly send it to admin@robotics.com.sg.

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