



## Designing the EV3 Education Core set

*Interview with Lee Magpili, lead designer of the set*

*By HispaBrick Magazine®*

*Pictures by Lee Magpili*

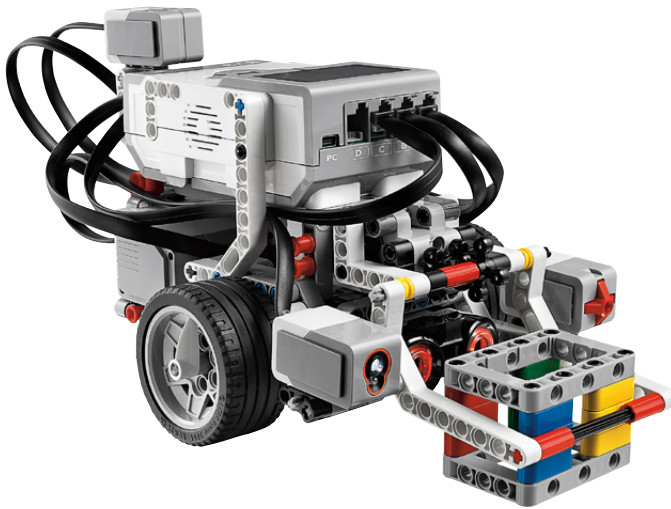
August 1st is the official release date of the 45544 LEGO® MINDSTORMS Education EV3 Core set. To celebrate this fact and to show you a bit more about what you will find in this set and how it was put together, HBM talked to the lead designer for this set. In case you haven't heard of him before, let me introduce you to Lee Magpili. You may have seen some of his other creations, like VALENTINE, the red dragon that was shown at LEGOWorld Copenhagen and EVAN the EV3 android that has been travelling along with the EV3 Education presentations to different events.

**HBM:** Before becoming a LEGO Designer you were AFOL. What was the transition like?

**Lee Magpili:** There's no real short answer to this, I did a whole talk about being an AFOL and Designer, 20 minutes and I could probably go for an hour or maybe more.

For me, I'm still an AFOL that just happens to work for LEGO

as a designer. It just so happens that I get to work and make money doing something I absolutely love to do. LEGO bricks have been a way for me to express myself as an individual through the craft and creativity, and everything I have done in my lifetime has led me to this career. Learning the basics of design process and mechanical functions through university as an Engineer, selling LEGO as a retail associate and eventually creating and teaching robotics programs has all but made me a better LEGO Builder. Being an AFOL has made me humble to all the great work that is being done out there by fans and enthusiasts and building the right network of fans and internal employees got me to where I am today. And now, I can say that I have my life's work up until now packaged up and ready to go to the masses, that everyone who will touch a LMS Education EV3 set will get a part of me, and will get one of my MOCs sitting in their classrooms. I also hope that I'll spark one genius kid into becoming something greater than I'll ever be. That's what it's like to go from an AFOL to a Designer.



**HBM:** What were the main values that new educational EV3 models intend to convey to students? How are they different from those of the NXT Edu set?

**LM:** Firstly, we wanted to make a robot that was easy to build and learn the programming language with, there the EV3 and the NXT are similar. We also wanted to give some additional experiences after the initial learning of how to robot as well, hence the additional models.

There were also significant hardware upgrades that had our users in mind. Surely there were the upgrades in technology such as more memory and faster processing speed, and we also developed a new smaller motor and reshaped the NXT motors to make a better building and robotics experience.

(I put a lot of learning from my personal experiences into the EV3 core set and models. I felt that the model should also be good for competition and have a good look that kids would really appeal to. Decreasing build time without sacrificing stability was also something we wanted to go for in our models.)

Ultimately we wanted to make it a better experience overall, from building to programming and start to 'finish'. I made models to try and give the students something to strive for, building and programming techniques that were clever and useful as the student got better at making robots.

**HBM:** Did the models influence the choice of sensors to be included in the set, or was it the other way around? What were the considerations behind a sensor assortment so different from the retail EV3 set?

**LM:** We really had to go with what made sense in a classroom or educational setting here, even competitions were taken into account. Every brick, and HW piece have been chosen with that in mind. Of course the models needed to have a clever way to use them to make sense. The addition of the second touch sensor, for example, came late in the process, so it wasn't easy or possible to include a model that had two touch sensors. Including the ultrasonic sensor instead of the IR sensor was a matter of precision. Schools, educators, robotic competitors wanted the precision of the US sensor so that made more sense to have in there. The gyro sensor was a big question in that we had to come up with a way to make it simple enough for younger students to use and understand. I

think we came up with a great assortment that will add some great new functionalities to new robots students make.

**HBM:** Is the design process (philosophy, budget, building techniques, and other requirements) very different when designing models for the Education Division and for the "mainstream" line?

**LM:** I believe so, as it includes the input of an Educational specialist at the very least. We need to work together to make a model that is understandable for teachers as well as students and it needs to have the content and tutorials to match their needs. There needs to be a good dynamic between the designer and educational specialist in order to make a great content and model. Our sets typically contain many models out of the same volume sample, for example, the Core set was designed with almost 30 models in mind, including the expansion set models, the core set models, and the Design and engineering pack models. We had to maximize the use of the collection of elements in the box.

In my experience, for an LE model, everything matters so much more. Each step takes a lot of care as it needs to make sense in a classroom. The building experience has a lot of other things to consider, such as build time, building space and element sorting or finding. Not that those things don't matter in a 'mainstream' model, but we need to consider a couple of different audiences and spaces as well.

**HBM:** A lot of open frame pieces (e.g. 64179) are used in the base set and the expansion set. How has the availability of this kind of piece influenced the design process?

**LM:** I personally really love the frames as building elements and use them in so many of my own models. This element has been found to make building so much easier and sturdier so we really wanted it to be a feature in our sets. Even the motor design had these elements in mind so that we could use them more efficiently.

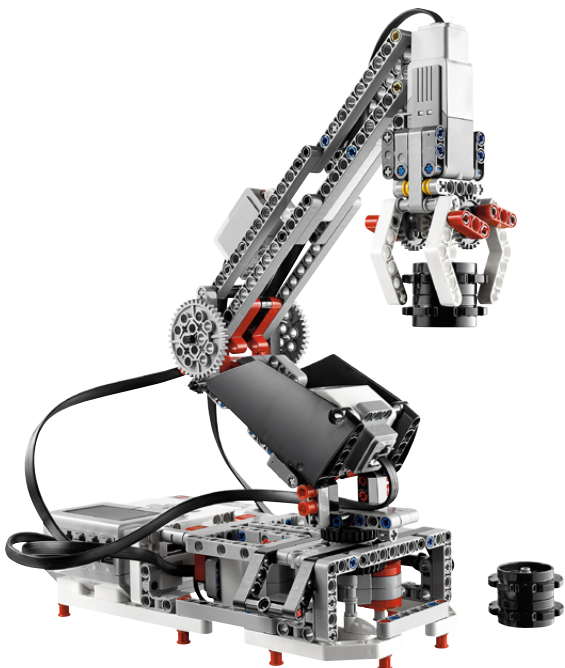
**HBM:** What does the EV3 offer to motivate female students in classes? Were female LEGO® Designers involved in the development of the EV3?

**LM:** Unfortunately there were no 'official' female designers in our EV3 team, but we did have a host of female marketing managers as well as another female designer in the LE team. I would say it's pretty difficult to create a base model robot that appealed to girls only for example, although I believe we have chosen robot models and programming activities that appeal to both boys and girls. We did not have a female designer on our theme, but one of our educational specialists who has developed Design & Engineering is Cathy Helgoe. As a whole, we wanted to make our models more 'cute' and 'accessible' as well as add a few decorative and colored elements that we hope could draw in some other females. Models such as the Puppy and the Elephant really appealed to everyone and even Znap, Tankbot and Gyroboy had a lot of character that girls might like and identify with.

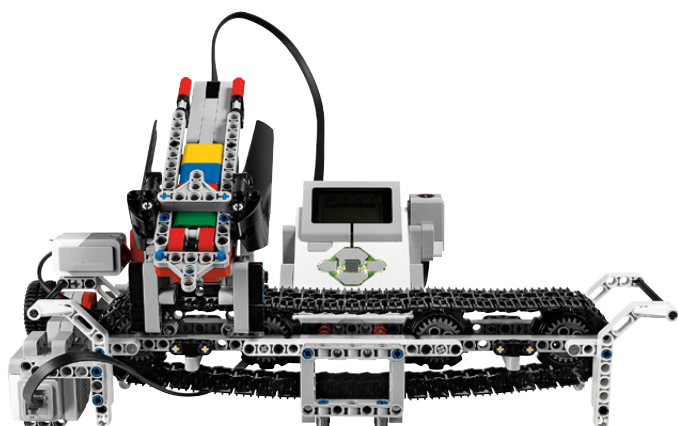
**HBM:** Do you have any favourite model? Why?

**LM:** I'm the most proud of the robot educator base model since so much of my experiences have gone into it. I'm just proud to be able to design what could be someone's first experience with a robot and hope that person really comes out enjoying and wanting to learn more about robotics.

**Robot arm** - this was designed by Hans Madsen, and for his 25th year working at LEGO® we named it Robot Arm H25. My original sketches had a turning wrist, but it turned out much more complicated and did not have quite the right look that we wanted. Hans was able to give the robot arm a more modern look and simpler functionality. I hope that students can do a lot with it, especially when there is more than one Robot arm.



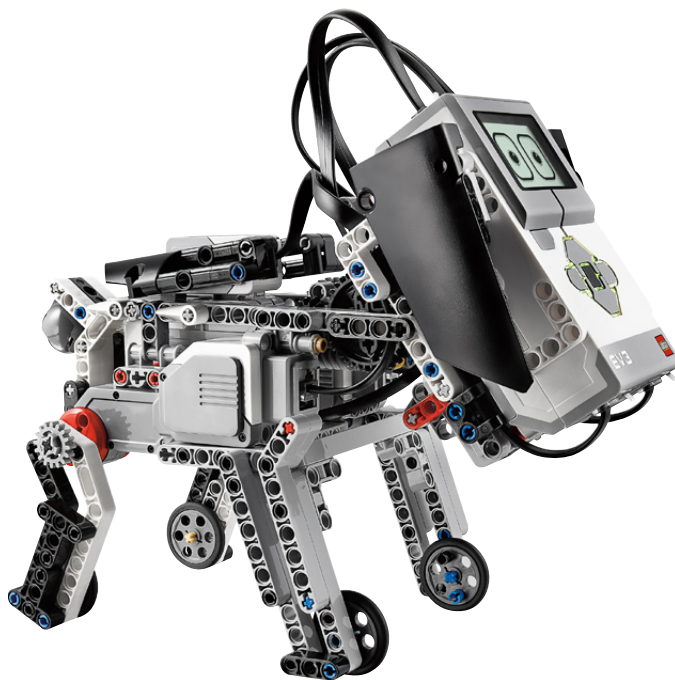
**Color sorter** - I wanted a more hands on experience with this model as well as something a bit more radical in how we used our parts, officially anyway. We also wanted a way to show how arrays were used, so information should be stored and played back. Scanning and sorting meant the builder had that much more contact with the robot and having the conveyor belt gave much more reason to have the tracks in the set.



**Puppy** - the most advanced and interesting program went into this one. As a physical robot, it doesn't do that much, just sit, stand and move its head. There's a game you play with the puppy, if you pet and feed it the right amount of times, it will have hearts in his eyes and bark lovingly. If you pet him too much, he gets angry and if you feed him too much you get a surprise. And some other behaviors as you let the pet and feed count go to zero over time.

Here we also take advantage of the screen and the speaker by using eyes and sounds to give the puppy emotion. The puppy

really looks great and is cute and approachable, its simplicity is really contrasted by a major programming feat! Regards to DB for this one.



**Gyroboy** - The front cover model. Segway and balancing robots have been done before, so there had to be something special about this one. I already had the puppy and a bit of the color sorter as a start for inspiration, this model had to have character. I wanted to make a fun model that could do more than just balance, he had to be able to stand there and look great, and do cool stuff as well. I originally wanted a game to play with the robot, such as tag or the like, but i did have some limitations in the programming. Balancing had to be first, and then I could throw in a bit of control by color and expression with the eyes. At the end of it all, it came out being super iconic, using all of the sensors (save for one extra touch sensor) in the set and in a clever way. So much went into the design of the arms, the stand, the programming, it was a real labor of love, and it came out great.

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