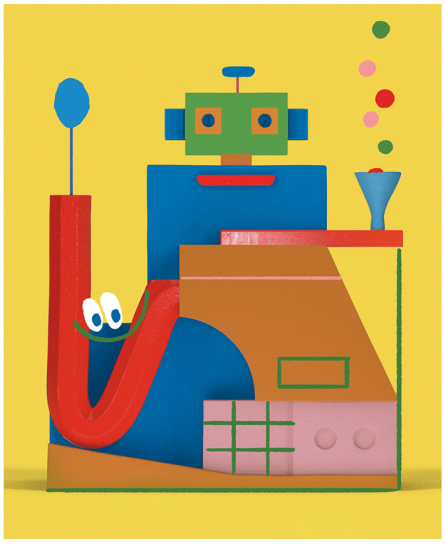
GEAR & GADGETS

The Best Robot Toys for Building Kids' STEM Skills

These robot toys and kits help teach children problem-solving skills—ones they'll need as they grow into adults in a world run by machines



MR. ROBOTO You might think kids take such wizardry for granted these days, but you'd be wrong.

ILLUSTRATION: DAVID LUEPSCHEN

By Aaron Stern

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TODAY'S KIDS will think it weird that robots were ever considered some space-age novelty. Children are already surrounded by voices (see Siri, Alexa) that respond to their every whim, and pet-like Roombas that relentlessly clean up after them. Why would they blink at a universe full of self-driving cars and A.I.-augmented everything else?

Nevertheless, there are still reasons to buy robot kits for these worldly kids. Building a friendly bot-toy helps children adapt even more readily to a changing world and develop STEM skills—in science, technology, engineering and math. It also pushes them to think creatively and hone life skills.

"Coding by itself teaches you how to break the problem into steps and how to approach it

in Pleasanton, Calif. "That kind of skill is going to help you in anything you do in life."

'You can see the kids' excitement in their whole bodies, in their eyes.'

Mr. Raina breaks the overwhelming number of robot toys on the market into three tiers. The first consists of off-the-shelf robots that vary wildly in their educational value. Typically geared toward younger kids, they don't demand that children do much programming or commanding. Fisher-Price's Think and Learn Code-a-Pillar Twist *($34, fisher-price.com)*, for instance, teaches kids age 3-to-6 the very basics of sequencing. For preteens, Elenco's Teach Tech Mech-5 *($36, elenco.com)* and Makeblock's mBot Ranger kit *($126, makeblock.com)* call for critical-thinking skills but don't overwhelm budding builders.

The second tier includes store-bought kits that provide kids all the necessary components, but let the maker assemble them as he or she sees fit. Lego's Mindstorm EV3 kit offers detailed instructions for five core designs, but also equips young tinkerers with enough pieces and programming flexibility to set them free once they've earned their engineering stripes (*$345, lego.com*). Vex Robotics is another player in this category, with crafty kits ranging in grade level, complexity and price for prekindergarten children through college-age engineering students *(vexrobotics.com)*.

After learning to create and code their own bots from kits, experienced builders as young as age 8 can set their sights on the third and most advanced tier, custom machines that are often crafted with pieces pilfered from kits or found at hobby stores. These homespun bots might not look pretty, but by assembling the components from scratch with the help of coding programs, builders learn along the way. Kids who jump at the chance to build and code robots often enter competitions like RoboRave, a set of contests that call on student teams to design robots that accomplish specific tasks like navigating a maze or extinguishing a fire *(roborave.org)*.

Competitions teach students collaboration and conflict-resolution, on top of STEM skills. That said, Marina Umaschi Bers, chair of the department of child study and human development at Tufts University, who has developed her own robot toy system for kids called Kibo, argues that the value of building and coding bots comes from the creative process of iteration, and that outcomes-based activities like competitions can overlook that value.

She divides the glut of robot toys into more black-and-white categories: There are "playpen" robots that are fun, but teach few skills and require little input from the user, like the WowWee Miposaur, a futuristic dino that lets kids play fetch. But she prefers "playground" robots that require creativity and enable collaboration, such as the Robolink Roki Smart Starter, which helps kids grasp the Arduino programming language as they command their toy to navigate mazes.

Bret Greenstein, senior vice president for A.I. and analytics at the tech firm Cognizant, similarly extols open-ended robo engineering: "The fact that you can copy instructions and make something work is really cool. But it's the extrapolation and the creativity that comes after that: 'Oh, if I can make it do this, how do I learn to make it do that?"

He and his 3-year-old son have started building command-driven contraptions using the Smart Circuits Games and Gadgets Electronics lab *($50, mindware.com)*. He said he's already seen the wheels turning in his son's head: "It's how I felt when I saw those same things as a kid, and how I got into technology."

Whatever the end goal, the process of creating becomes the reward, said Mr. Raina. When kids find "a solution to something they have never worked on, the level of excitement that you can see in their whole body, in their eyes, their expression...it's an incredible feeling just to watch them," he said. "That is the high you are going to give them."

That high, and the skills they develop, will serve them throughout their strange, futuristic lives. They'll know they're capable of overcoming obstacles of all shapes and sizes—even if robots will be on hand to do much of the work anyway.

RO, RO, RO YOUR BOT / FIVE COMPLEX TOYS THAT TEACH KIDS AS THEY PLAY

Clockwise from top left: Matatalab Coding Robot, Lego Mindstorms EV3 31313 Robot (middle), Sphero SPRK+ , Robolink Rokit Smart Starter, Ozobot Evo Coding Robot.

PHOTO: NO CREDIT

Matatalab Coding Robot

With this screen-free coding set, kids age 4-and-up use color-coded blocks to make the robot

Sphero SPRK+

This rolling bot has programmable sensors including LED lights and an accelerometer. Kids can use the Sphero+ app to steer their ball around. *$130, sphero.com*

Ozobot Evo Coding Robot

Kids 5-and-up can code this cute palm-sized sphere to do tricks or trace colored routes drawn with special markers that it recognizes and processes. *From $99, ozobot.com*

Robolink Rokit Smart Starter

This kit introduces children 9-and-up to the Arduino programming language, and its robots can be coded to navigate paths and escape mazes. *$120, robokit.com*

Lego Mindstorms EV3 31313 Robot

This 601-piece kit for kids 10-and-up has instructions for multiple designs which can be programmed to walk, talk and dance, all controlled via the EV3 smartphone app. *$345, lego.com*

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