



ROBOTICS

# TEACHER for Children with Autism

RoboKind's Milo robot has an expressive face and infinite patience.

STORY BY MICHAEL ABRAMS • ILLUSTRATION BY ZINA SAUNDERS

The challenges associated with autism—specifically those involving communication and social skills—throw up barriers to both students and teachers. It is hard to learn about social interaction when human interaction itself is problematic. It's no surprise, then, that multiple studies have shown the great potential that robots hold for teaching children with autism.

Unfortunately, most of those studies tested robots too exorbitantly expensive for general use.

Richard Margolin knew of the cost of those robots, as well as the progress children with autism make when working with them, thanks to his time as engineering director at a humanoid robotics company. “The robots, at that time, were multimillion dollar platforms,” he said. “I wanted a product that could go in a school, that would be cost effective, and work with lots of kids—that was the goal.”

So Margolin started RoboKind to develop an affordable robot for the children that needed one.

The result is Milo, a robot with all the patience in the world. Milo has an expressive face, a screen on his chest, and is programmed with an extensive curriculum

for teaching calming techniques, conversational skills, emotional understanding, and other behavioral necessities. The robot can also teach in ways people cannot: He can repeat things infinitely and he can slow down his speech as much as necessary for children that learn better that way.

To teach how one goes about greeting a friend, for example, Milo first explains the process: First you look, then you smile, then you say hi. There are flash cards—that appear on his chest screen—that further illustrate each element. They're followed by a video of two students at school walking up to each other in front of their lockers and saying hello. The video is followed by a quiz.

For Milo to reach as many students as possible, he had to be affordable—which was the biggest challenge



Margolin and his colleagues faced.

The robots he had worked on before had 42 motors for the face.

The lips alone had eight dedicated motors, allowing them to smile, sneer, smirk, purse their lips and make just about any expression in the human canon.

“To get the feel of seven degrees of freedom out of the seven motors we had to cram into this relatively small box that is the head, we had to

use one motor to do multiple things through clever gear boxes or cams,” Margolin said. The result is that Milo's expressions are currently all symmetrical. “I can't do a smirk, for instance. It's a little limiting but it gets us the grand majority of the way there.”

Another hurdle to affordability was the robot's skin. Using the material Margolin had worked with in the past, the skin of the face would have cost more than the entire robot. With a team dedicated to the robot's epidermis, Margolin created a new affordable material that could be mass produced.

Milo is now deployed in more than 400 schools working with thousands of students. And the success he's had is nothing short of astounding. With a flesh-and-blood therapist, children with autism typically engage for about 3 percent of any session. With Milo, the kids were engaging 85 percent of the time. And, after a lesson like the one about how to greet a friend, students are eager to try out their new knowledge, making huge social breakthroughs with friends and family.

“This wasn't a little bit different,” Margolin said. “It unquestionably worked better than I could ever have hoped for.” **ME**

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### An Expressive Robot Teacher

**INNOVATOR:** RoboKind. Richard Margolin, Founder.

**INNOVATION:** A less expensive robot built to teach children with autism how to interact with other people.

**IMPACT:** Children are more engaged with their lessons and more eager to test out their newly learned skills.



RICHARD MARGOLIN