

Family Ties

Legos build foundation for learning robotics

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Parent volunteer Ed Boyd disassembles a Lego robot with the help of student Brinn Dwyer.

The Edmonds Homeschool Resource Center serves 460 students. The alternative school in the Edmonds School District offers classes to supplement a homeschool education, ranging from Spanish and biology to acting, ballet and beginning animation.

Parent Ed Boyd has two teenagers who spend about 60 percent of their school day at the center. Boyd is there a lot too. He admits building with Lego bricks is "addicting."

Boyd volunteers in the Lego lab, which is technically known as the Integrated Projects Cooperative laboratory. He's also using Lego systems to make models of agricultural machines he'd like to invent.

"Ideas on paper are one thing, but being able to physically test whether something works or doesn't work has a lot more value," he said. "That's something the kids here get to do every day, and they have fun too."

The robot's brain is a Lego RCX 16 bit brick that houses programmable features. Students use computer software to program the brick, which then executes the command. Simple robots move forward and backward. More advanced Lego-bots move in multiple directions and have attachments that pick up or move other objects.

Student Lucas Messenger, 13, has constructed several robots. His most recent creation took two hours to build. He plans to program it to follow a black line on a table and turn around.

What most kids call a "flat Lego," students in the Edmonds Homeschool Resource Center robotics lab refer to as a "2 x 6 plate."

Instead of digging through buckets of blocks, children at the alternative school select double concave slopes or cross axles from an organized collection of more than 100,000 plastic pieces.

And while it might look like students are playing with toys, they're actually creating robots and programming them to perform simple tasks.

Teacher Cathy Webb uses Lego blocks to teach math and science. That's not all. Students learn about sequencing, structural design, gear ratios, fulcrums and gravity.

"My philosophy is that we learn to be successful by applying our knowledge," explained Webb, the K-12 technology coach. "Most of us didn't get to where we are in our lives because we've memorized a bunch of facts."

Lego robotics programs are offered at other area schools, but Webb's class is unique because it's available to students as young as five years old. It's also one of the few robotics courses geared toward homeschooled kids.

"It's fun to be able to imagine something and then engineer it," said Messenger. "Robots are cool."

Although Messenger thinks he'll be an actor someday - his friends describe him as "dramatic" - others who've been through the class said they might study robotics or engineering in college.

Both the University of Washington and Washington State University use advanced Lego robotics to teach computer programming.

Recently, students from the Edmonds Homeschool Resource Center participated in a First Lego League competition called "Ocean Odyssey." Teams earned points for each task a robot completed. Missions included fixing an oil pipeline, gathering items that spilled from a cargo container and releasing a trapped dolphin.

"Kids need to have authentic environments to showcase their learning," said Webb. "They're creating products that demonstrate knowledge. That's education."

Student learning goes beyond math and science. According to Webb, students who've been through the program have more confidence.

"It's building their self esteem," she explained. "Building Lego robots can be difficult and things don't always turn out the way students want. But they work through their frustration and end up with something they're immensely proud of."

Ed Boyd has noticed changes in his son Christian's confidence.

"He's far more inquisitive and sure of himself now," Boyd said. "It's really evident in his math classes. One day Chris came out of algebra class and proclaimed, 'I'm a genius' because he understands math. He gets it."

Sarah Blaine, a 10th grader, said her early interest in robotics has evolved into a passion for building. Among other things, she constructed a case for her handheld video game out of Lego bricks.

"If I had enough Lego pieces I think I could build anything," she said. "I want to be an architect when I grow up."

Despite having 100,000+ Lego pieces in the lab, Webb says the collection will "never be big enough." More bricks of all shapes and sizes would enable students to build more complex and intricate designs.

She is also eager to get her hands on Lego's new NXT brick which will be available in August. The \$250 Lego piece has a 32-bit programmable microprocessor, allowing robots to perform more complex tasks.

And Webb is already planning a new class for next year to inspire creative thinking. Students will program virtual pets. The artificial pets are distinct from robots in that they have no physical form other than the hardware they run on.

"The possibilities are unlimited," Webb said, "and I'm rewarded by seeing students succeed every day."