Demarest students program two NAO robots as part of STEM class

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Seventh-grade students Charles Reverand, Eunice Chong, Cole Wasserman and Emily Oh watch one of the Demarest Middle School's NAO robots perform yoga poses. Sixth-grade students in a robotics class and seventh graders in the Raspberry Pi club at Demarest Middle School programmed the robots to follow their commands, from speaking to people to performing complex physical routines. Seventh-grade students Emily Oh and Charles Reverand fixing a communication problem with the robot. Reverand is the force behind programming the two robots.

DEMAREST — An unusual trick-or-treater visited classrooms at Demarest Middle School this Halloween – a two-foot tall NAO robot that was programmed to mimic costume-wearing children.

The robot was performing a routine programmed as an end-of-semester project by a sixth-grade student in the school's new robotics academic enrichment program, a quarterly class that has students learning and applying electronics, programming, and math to make the robots walk and talk.

Science teacher Carl Quillen; who runs the program along with Joanne Werner, Isabelle Cavalli and Paige Sydoruk; said it's a class in physical computing, where students first learn how electronic circuits work, then software and programming and finally apply those skills to the robot in the last weeks of the semester.

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"It's taking the highest-level applications of their skills," he said. "They're expensive, high-end, and complicated, so I have to train them up in hardware and software before they can understand how they work."

Built by Aldebaran Robotics, the two NAO robots have a range of functions and capabilities students can work with in the class.

"The robots are very capable," Quillen said. "They can walk, talk, do simple motions and dance routines the children can program in."

He added they have voice, object and face recognition software, as well as sensors on their feet and hands.

The robots are part of the school's science, technology, engineering and math, or STEM, focus, Codey said. The school has also brought in Raspberry Pi computers, 3D printers, and a Lego League team as part of this initiative.

"We're opening up these types of experience to students in all grades," she said.

The final project of the program is for students to program a unique routine for the robot to perform.

"It's science, technology, engineering and math. They have to have all those disciplines to get the robots to do anything, really," Quillen said. Even getting the robot to do a simple task such as walking 10 meters and making a 90 degree turn, he said, requires calculations on the student's part.

"It's coding in a tangible way," Codey said. Unlike with coding a website, she said, the students can see their programming translated in a physical way.

The school also has a group, dubbed the Raspberry Pi club, where students use the robots throughout the year, made up of seventh-grade students who do higher level activities. The club started with one student, Wally Chang, before it grew, with more students joining to work with the school's new technology.

In addition to the robotic trick-or-treating, other students programmed the robots to perform a yoga routine – based on that student's own experience in the school's yoga program. Another student is working on a routine to have the robot visit a social studies classroom to recite the Declaration of Independence. Cole Wasserman, a member of the Raspberry Pi club, suggested they have the robots deliver espresso to the principal.

Quillen said the class was inspired by those students after their work with the Raspberry Pi portable computers the school acquired last year.

Response has been positive.

Jahnavi Kirtane, a seventh grader, said she liked that operating the robots involves different subjects the students have learned.

"All of us can have a role to play," she said, adding her classmate, Charles Reverand, is the club's best programmer.

Eunice Chong added working with the robots teaches them a variety of skills and responsibility.

Sometimes, Quillen said, the students encounter obstacles they have to overcome, and he's proud when they're able to find a solution.

"That's really engineering and problem solving," he said as Reverand corrected an error preventing the NAO robot from receiving signals from the class's wifi network. "He just went out on the internet, went to the website, figured out the problem with the robot, and fixed the connection."

As the students work with the robots more, they try to do more complicated and nuanced tasks, such as communicating between the robots.

"It would be cool if we can get them to act like humans," seventh grader Leslie Kang said.The school purchased robots with funds from the Parent-Teacher Organization at a cost of about $25,000 including software and staff training, Principal Emily Codey said.

"They're extremely generous with our school," she said of the PTO. "They buy so many items for us to enhance the educational experience for our students."

Quillen said when he asked for the robots, he was unsure if he would receive them, but he knew the students would enjoy the new devices.

"I knew these kids would take this and run with it," he said. "They think this is the greatest thing they've done."

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