Robots transform student lives

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In reflecting wryly on his northern California upbringing, Laboratory researcher Matt Williams says his small-town high school required just one STEM class to graduate: math/science. If you could add and subtract — and spell the word “science” — you passed.

Hearing this story for the first time is high school sophomore Shayna Gomez, who has been on his successful robotics competition team for nearly four years, and junior Carla Pacheco, who is on his research team. They met up with their mentor Williams outside at the campus of UNM-LA recently, where Gomez and Pacheco are taking college courses.

Getting stuck on robotics

Gomez has just finished explaining how a tiny army of fighting sumobots helped develop her interest in computer programming; how she is already taking online classes at the University of New Mexico-Los Alamos with her sights set on a bachelor’s in computer science; how she’s thriving as a sophomore at Española Valley High School while many students struggle to attend class (especially now during COVID-19) and graduate.

She remembers first meeting Williams in seventh grade when he popped into her computer science class to invite students to his club. She gave it a try, and “it just kind of stuck,” so much so that she signed up for a robotics elective in high school.

“I liked being able to explore programming more. I wasn’t the best at building stuff, but when it came down to the coding work it was pretty fun,” Gomez says.

Sumobot knockouts measure teamwork and resourcefulness

Gomez says she can’t wait to get back to competing once the COVID-19 pandemic eases. The aim at sumobot competitions is to outmaneuver your opponent’s robot, knocking it out of the circle, which requires a bit of engineering before the match.

A successful robotics team requires true teamwork and a good relationship with your coach “so that you can brainstorm together,” Shayna says.

She explains what she likes about Williams. “He’s very persistent and he has a lot of ideas,” she says.

Matt Williams says he has seen kids transform from not wanting to be in the classroom to excelling as robotics team leaders. Witnessing such turnarounds "makes it all worth it," he says.

Robotics opens the doors to science and math

Williams never thought much about robotics until he became a father.

Although he was a whiz with supercomputers, he began to fret that he didn't know anything about electronics, didn't want his kids to grow up not knowing about it. At the invitation of his daughter's teacher, he plunged into Lego robotics at Chamisa Elementary School in Los Alamos and soon became a classroom volunteer and helper at science nights and science fairs.

For 10 years, Matt was a regular at RoboRAVE events where teams from elementary to high school age build and prepare their robots to take part in challenges including navigating a maze, following a line and sumobot fighting.

Remembering his rural roots

Satisfied that Los Alamos was hopping with robots, Matt set out to find places where they were almost nonexistent. One day, he showed up unannounced in the office of Carlos F. Vigil Middle School in Española and said, "Would you want me to bring some robots in here and teach your students?"

He got a resounding yes, and became a registered substitute teacher so he could run a class by himself. He dropped by study halls to recruit students to robotics club.

Three years ago, when Matt started the program, he secured support from the Northern New Mexico chapter of the American Society of Mechanical Engineers (ASME). Now there are four participating schools, located in Española and Santa Clara Pueblo. The program so far has served more than 70 students and sent 14 teams to competitions, while gaining the status of North American Middle School Sumobot Champions.

Carla Pacheco, an aspiring neurosurgeon, is a high school junior (homeschooled in Española) who is also taking classes at UNM-LA. She's on a new team Matt is leading, which involves artificial intelligence robots.

Sponsored by NASA, RoboRAVE and others, the international research project is called Students & Teachers Assisting Real Research (STARR). Matt's team is composed of high-school students from Española, Santa Fe and California; ASME Northern New Mexico is supporting it.

Teams from around the world are programing AI robots to recognize objects. Pacheco says the robot for STARR took her about an hour to build from a kit, but the programming is a lot more involved. The robots are being trained with machine learning and a photo database to recognize objects and navigate obstacle courses like self-driving cars do.

"I like being able to make it do what I want," says Pacheco.

Williams repays his mentors by being a mentor

In Williams' rural hometown, he liked taking stuff apart and putting it back together. Nothing in school enraptured him the same way, and his grades showed it.

Matt says he was fortunate to have a string of supporters, about a dozen over time, who helped him on his journey from indifferent student to Ph.D., to career at Los Alamos National Laboratory.

"Now it's my turn to be the person who finds those special individuals who, with a little bit of help, are going to do incredible things," he says.

> Learn more about the Laboratory's support for education in Northern New Mexico