

Bringing Engineering Opportunities to Title I Schools



AT-A-GLANCE

Background

Lawrence High School is part of a high-poverty Title 1 school district in Lawrence, Massachusetts, a struggling former mill town nicknamed the “Immigrant City.” Though resources are constrained, the district aims to provide students with high-quality enrichment opportunities comparable to those available to their suburban peers. *FIRST*® fits that bill.

Providing Opportunities

With the support of local team Sponsors and a group of dedicated Mentors, Lawrence started a *FIRST*® Robotics Competition team in 2004. Each year, the robotics team welcomes a diverse group of up to 60 students to gain confidence, leadership skills, and hands-on engineering experience. The team has helped reluctant students graduate, students who excel in math and science discover engineering, and many more promising students find scholarships, internships, and jobs.

Student Spotlight

Miguel De Jesus joined the team as a shy freshman, but with the encouragement of the Mentors, he came out of his shell to become a confident public speaker and the team’s president. Miguel plans to join the military after graduating Lawrence. “I don’t really know where I would be if it weren’t for what robotics has taught me when it comes to communications, sportsmanship, and technology,” he said.

When Cassie Hudson (Class of 2009) attended Math, Science and Technology High School in Lawrence, Massachusetts, she was in an Honors Program and taking AP classes, though her school didn’t have the resources to provide lab-based or hands-on learning—or even enough text books – in the classroom. Cassie had an aptitude for science and math, but she didn’t think she wanted to be an engineer—until she joined her school’s *FIRST*® Robotics Competition team, Team 1289 “Gearheadz.”

Lead Mentor Art Rousmaniere, an engineer at Farm Design who has been with the team since it was created in 2004, remembers being with Cassie and another female student the first time they used a drill press—a new tool for many of the students. The girls screamed as the drill made a hole in the metal, startling Art. But their reaction was pure excitement. “That moment was such a big deal,” Cassie recalled. “It was really empowering that I had a group of friends and Mentors who were patient with me, and willing to show me how to build. I think I had been really intimidated by engineering, up until that point.”

Later, when Cassie was in college and unhappy with her major, she thought back to moments like that one at the drill press, and how it felt to use her hands to build. She switched her major to robotics engineering, graduated, and was hired as an Applications Engineer at MagneMotion, Inc., A Rockwell Automation Company. A Strategic Partner of *FIRST*®, Rockwell Automation hires many *FIRST* Alumni like Cassie. “*FIRST* participants learn to collaborate, innovate, and work as a team to develop solutions with limited resources. Those are skills Rockwell Automation employees use every day,” Jay Flores, Rockwell Automation’s Global STEM Ambassador, said.

Among Alumni of the Gearheadz, Cassie isn’t alone in finding success. The high school robotics team attracts a diverse group of students from Lawrence, a struggling former mill town nicknamed the “Immigrant City.” One-hundred percent of Gearheadz students graduate high school, compared to 72 percent of Lawrence School District’s Class of 2015. Most Gearheadz graduates go on to college, and some pursue further STEM education and STEM careers. “There are also the kids who don’t go into engineering, but gain confidence while building with their hands,” Art said. “It’s not unique to Lawrence, but I think it’s the real story of what *FIRST* is about.”

The district has also invited the team to bring its robot to pep rallies, attend open houses, and visit the district's middle schools. The district aims to provide students with high-quality enrichment opportunities comparable to those available to their suburban peers, and *FIRST* fits that bill.



Co-Captain Cassie Hudson (back row, far right), Lead Mentor Art Rousmaniere (back row, fifth from right), and the Gearheadz pose for a team photo while attending the 2009 FIRST Championship in Atlanta, Georgia.

Providing Opportunities

Lawrence Public Schools, a high-poverty Title 1 school district in Massachusetts, serves 14,000 students. More than 90 percent of the students are Hispanic, 63 percent are economically disadvantaged, and 31 percent are English language learners (ELL).

In 2011, with Lawrence's graduation rate at 52 percent and test scores in the bottom 1 percent of the state, Massachusetts took over and has helped the district improve drop-out rates and math and language proficiency results. During the first year of the receivership, the Gearheadz began recruiting students across the entire Lawrence High School Campus, which had six separate high schools at the time but is now moving to one unified high school. The team grew—at one point attracting up to 60 students. The robotics program has sustained with support from the district and Sponsors such as Raytheon, Farm Design, and Comcast.

Due in large part to the influence of the Gearheadz, Lawrence High School will add a new robotics class in the 2017-2018 school year. The district has also invited the team to bring its robot to pep rallies, attend open houses, and visit the district's middle schools. The high school aims to provide students with high-quality enrichment opportunities comparable to those available to their suburban peers, and *FIRST* fits that bill. "The Gearheadz are an opportunity success story. We've given an opportunity, and our kids have succeeded," Assistant Headmaster Tim Finn said.

Though resources are tight at Lawrence, especially as the high school undergoes reorganization, the school helps the team when it can. When Gearheadz advisor Linette Heredia, a teacher at Lawrence, needed support to run the program, the school found a stipend for a second in-school advisor. When the students were struggling to get space on the late bus after Gearheadz meetings, the school provided dedicated buses for a couple of years to help them get home.

Inspired by the Gearheadz, the students have also learned how to make their own opportunities. Lawrence doesn't offer a programming course, so one Gearheadz student created a proposal for an after-school coding club and successfully lobbied for it with administrators. "If that student wasn't part of robotics, I don't think he would have come to us," Tim said.

STUDENT SPOTLIGHT



Miguel De Jesus, Gearheadz President, Class of 2017

Miguel joined the Gearheadz as a freshman and has held several leadership roles. He says the team gives him a sense of community and a chance to hone specific skills that he doesn't get in the classroom, and the six-week build season has helped with his overall motivation and efficiency. "Being in the program taught me how to come up with better quality in the work that I do, whether it's in school or the workshop," Miguel said.

One of Miguel's favorite memories from the Gearheadz happened during a competition his freshman year, when Miguel borrowed a saw from another team and accidentally broke it. At first, he panicked: "I wasn't good at saying, 'I'm sorry.'" Mentor Art helped him calm down and joined him as Miguel admitted the mistake and apologized to the other team. "That was an important moment for me. Art helped me realize that breaking something isn't the end of the world," he said.

Miguel plans to join the military after graduating Lawrence. "I don't really know where I would be if it weren't for what robotics has taught me when it comes to communications, sportsmanship, and technology," he said.

The Spirit of Success

With limited resources and space for vocational teaching available at the school, the Gearheadz offers a safe space for students to explore their interests and gain hands-on exposure to skills and careers. Several students have told the Mentors they joined because they'd never been a part of a team before—and that the team has become family. "The Gearheadz gives them a place where they are able to be themselves and take charge," Linette said. "They have a voice, and the students are very accepting of each other."

In 2016, the Gearheadz won the Spirit Award at a *FIRST* Robotics Competition Regional event in Boston. It was a fitting title for a team that perseveres in competitions with a positive attitude. "Sometimes, we finish 40th out of 45, and the students can't wait for the next meeting. They don't get discouraged," Art said.

Student Miguel De Jesus (*see sidebar, "Student Spotlight"*) said the team's spirit stems from an understanding that success takes a lot of patience. "We take in everything we've done, good or bad, and then we build off that. Every year, we get better," Miguel said. "Besides, it's just the experience of being able to go to a competition that most of us want."

The team's Mentors work side-by-side with the students to help them succeed on the team, in school, and in life. "It's not just helping them build that 120-pound robot," Linette said. For example, a Mentor helped a student secure a robotics camp scholarship from her company, Comcast. Mentors from Raytheon have helped students get internships and jobs at their company, which is headquartered in nearby Waltham, Massachusetts.

The Mentors meet regularly so the adults can better work together to help the students. The students recognize the effort. "The Mentors are always there for emotional support. You can talk to them. Sometimes, they just sit down with you to make sure everything's OK," Miguel said. "They are like parents. If you need help, they'll nudge you toward the right direction."



Inventor and FIRST Founder Dean Kamen speaks with Miguel De Jesus at the 2016 FIRST Robotics Competition Kickoff event.

Bringing Kids Out of Their Shells

When Miguel joined the Gearheadz, he was very shy. His Mentors pushed him to give presentations and scout other teams at competitions. "As I went through the Gearheadz, I learned how to open up my shell and feel more comfortable with the world around me."

Linette encouraged Miguel's growth. "He's become a real leader on the team. He overcame his fear of public speaking, and any time we have an event, he's the first person to speak," she said.

Linette says the robotics team offers a hands-on way to engage her reluctant students. Linette had a student in her class who was bright, but never did the work. Yet in robotics, he wanted to do all of it. "I'd ask him, 'Why are you so willing to do work here, but in class, you're not engaged?'" And he said, "This is fun, interesting." So I tweaked his work a little bit to apply it to the work in robotics, and he ended up graduating. He is now taking classes at community college while working and still pops in to help the team out. He's happy. This is a student who some teachers thought wasn't going to make it."

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— MIGUEL DE JESUS

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Gearheadz President Miguel De Jesus (kneeling, left) and teammates pose with their robot at a 2017 FIRST Robotics Competition event.

Giving Back

Over the years, many *FIRST* Alumni have returned to volunteer with the team. "When I see kids who have graduated over the past few years come back and want to be a part of it, I feel like that's the measure of success," Tim said.

As a team, the Gearheadz also strive to spread STEM excitement to their local educational community. They have helped start robotics teams for middle school students in Lawrence, and every year they host a *FIRST*® LEGO® League event in December and present at a spring science fair.

Miguel says he hopes to one day return to Lawrence to help out with the Gearheadz. "I want to see the community grow and prosper, especially the Gearheadz, so we are able to bring in more kids and teach them skills they can use, or even just to teach them how to be a better person."

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