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## EDUCATION

# Journeys of empowerment

By E.C. SALIBIAN | March 21, 2019



The X-Cats share a special bond forged by students working and playing together supported by devoted adults: Wilson High faculty, X-Cats parents and volunteer mentors. (Photos in this article courtesy of X-Cats)

Their families came to Rochester from as far as Vietnam, Kenya, Turkey—or they've been here for generations.

Their parents are software engineers, schoolteachers—or never had the opportunity to study past grade school.

They don't always get along, they don't always agree. Sometimes they face problems they don't know how they'll overcome.

Then they figure it out. They are a team. They are the X-Cats (<http://www.x-cats.org/2019/index.html>), the robotics team of Joseph C. Wilson Magnet High School.

Since the team formed in 1992, the X-Cat experience has touched the lives of hundreds of Wilson High students. For some, it clarifies career goals and paves the way to prestigious jobs. For others, it makes the difference between graduating from high school or dropping out. For all, it's a life-changing six weeks of discovery.

The X-Cats graduation rate is near 100 percent, compared with 54 percent for the Rochester City School District as a whole. In the team's 27-year history, only a single X-Cat has dropped out of high school, and that was for personal reasons.

"I know all the negative news we hear about Rochester city schools," says DaTwan Dixon, an X-Cat mentor. "I'd tell people to please just find out about FIRST Robotics."

The X-Cats, Team 191 is one of three RCSD teams to compete annually in the FIRST Robotics worldwide challenge. At the FIRST Finger Lakes Robotics Competition at Rochester Institute of Technology March 14-16, the X-Cats came out in force, competed valiantly and made it to the semifinals.

"I don't think it really matters if you win the competition," says X-Cat Twanda Dixon, DaTwan Dixon's daughter. "Sure, it's a great feeling to win. But it's even better to be together and root for each other."

This year some 35 students participated in the X-Cats. Each has a unique story.

Twanda Dixon started going to team meetings with her father when she was 2 years old. When she was in fifth grade, he taught her HTML and she helped create the X-Cats website. This year, she contributed on the app development and leadership sub-teams. On game days, her voice rises through the stands to lead the X-Cats cheers.

Hassan Abdi worked on the X-Cats innovation team, evaluating next-generation technologies. Born in Kenya, he came to Rochester with his mother and sister after the father he never got to know passed away. Two older brothers had to stay behind for lack of family resources. Good in English as well as math and sciences, Abdi plans, after high school, to study criminal justice or law.

Nicholas McMillan helped out with the X-Cats web design. He joined the team at the urging of his friend Hassan. McMillan wants to be a firefighter, and his life plans for getting there start with saving up enough money to buy a car.

Asked what the X-Cats means to him, McMillan leans in to whisper something I heard team members say one after another:

"It's like a family."

He means the special bond forged by students working and playing together supported by devoted adults: Wilson faculty, X-Cats parents and volunteer mentors—as diverse a group as the X-Cats themselves.

### **Promoting STEM education**

The FIRST Robotics Challenge is the brainchild of engineer and inventor Dean Kamen. He wanted to give students a challenge of the mind that replicated the excitement—and teamwork—of a sports tournament. In 1989, Kamen founded the New Hampshire nonprofit For Inspiration and Recognition of Science and Technology, or FIRST (<http://www.firstinspires.org>). Its purpose is to engage youth in science, engineering, technology and math—STEM education.

Over the years, FIRST has expanded globally. This season it expects to reach 615,000 students in more than 100 countries. The organization runs four programs for different age levels: FIRST LEGO League Jr. for grades K-4; FIRST LEGO League for grades 4-8; FIRST

Tech Challenge for grades 7-12; and FIRST Robotics Competition for grades 9-12.

The annual high school robotics competition challenges students, working in teams with professional mentors, to design and build robots meeting performance requirements that change every year. The initial FIRST Robotics Competition took place in 1992 with 28 teams in a New Hampshire high school gym. Xerox Corp. was a founding sponsor and Wilson High's X-Cats won the championship.

In 2019, FIRST Robotics is seeing its largest season ever: 3,790 teams, with some 95,000 participants from more than 30 countries. The X-Cats remains one of the few FIRST Robotics founding teams still in competition. Twice winner of the FIRST Chairman's Award, it is a Hall of Fame team entitled to participate in the national championship finals every year.

"To have a city team nationally recognized is pretty significant," says Julie VanDerwater, principal of Wilson High. "It's just amazing, the doors that are going to open for them."

### **An inner-city success story**

The Wilson High student population is 80 percent "low socioeconomic status" as defined by New York State, VanDerwater says. Seventy percent of Wilson students are black or African-American; 12.5 percent Hispanic or Latino; 10 percent Caucasian; and 7 percent Asian.

They are children growing up amid Rochester's failures to eradicate poverty, violence and racism.

"It's pretty bad. Sometimes I can't walk down the street without being disrespected because of my skin color," says Trinity Prince, a Wilson senior who is African-American.

Prince has been called the "n" word, she says. Shopkeepers have assumed she was trying to steal when she was merely reaching into her pocket for money to pay for something.

The X-Cats contradicts that ugliness. Members and mentors who have attended the finalist games for years say the X-Cats is one of the most ethnically diverse teams in the nation. In addition, this year approximately half of the X-Cats are girls.

"It's my team," Prince says. "It's not about our race. It's about what we can do together with our minds. It's our contribution to generations to come."

Prince's contributions to the X-Cats include computer-aided design, website development, robot mechanics and team-building leadership. After graduating high school, Prince plans to attend Monroe Community College for two years, then transfer to RIT to study graphic or interior design. She'll join her parents, aunts and uncles as a Wilson alum; her father in the 1990s was one of the early X-Cats, and Prince wants to mentor teams herself someday.

"I've met people I never would have met—from the Bahamas, from India," she says. "We all have special abilities. It all comes together to make a robot."

What it takes to make a robot, it turns out, is what it takes to empower a human being. X-Cats get hands-on experience with modern engineering equipment and technologies, but they also take on public speaking, leadership, problem-solving and collaboration challenges that build core skills and confidence. To earn an X-Cats varsity letter, students devote extra time to community service and fundraising.

"It's not just a mechanics program for robotics; students are required to log their goals and personal growth. They have to stand in front of their peers, be vulnerable, and learn to be a public speaker," VanDerwater says. "I was blown away by the dimension of the program."

VanDerwater's own son participated in the X-Cats when he was in fourth grade. The team accepts younger children and students from other school districts if their parents are mentors or Wilson faculty. Dixon's daughter Twanda attends high school in Henrietta but chose to stay with the X-Cats because she's been close to the team for so long.

VanDerwater says the team experience pushes students beyond their comfort zones, builds confidence and provides role models many students are missing in their lives.

“Our dedicated mentors include black and brown men,” she says. “A lot of the men in (our students’) lives don’t stick around, but some of these mentors have been here for 20-plus years.”

### **Mentors bridge community divides**



X-Cat mentors and Xerox engineers DaTwan Dixon, far left, Daniel Rabess and Carlos Terrero.

Lead mentor Carlos Terrero, a Xerox mechanical engineer, has worked with the X-Cats since 2001. Terrero was born in Puerto Rico, the son of a single mother who didn’t earn much money. Thanks to a basketball scholarship, he attended a private high school where he had access to high quality math and science courses. Terrero went on to study mechanical engineering at the University of Puerto Rico, started at Xerox in 1999, and also earned a graduate degree.

Growing up, Terrero says, all the people around him were blue-collar workers. He didn’t know any engineers, architects or lawyers who could model career options for him. Terrero wants things to be different for Rochester children.

“I particularly wanted to work with city schools, to give exposure to students that people like them can be engineers,” he says.

That sentiment is echoed by DaTwan Dixon, a Xerox software engineer who has been mentoring the X-Cats for 16 years. An African-American, Dixon, 43, grew up on Woodlawn Street in Rochester. By the time he was 10 years old, he’d seen his uncle slammed against a squad car and his grandmother shoved by police.

“It was a time of racial tension,” he says. “I always knew I wanted something more.”

Encouraged to think big by his mother, Dixon transferred to Wilson High in 1991. There, he encountered a different type of problem: gangs. Charging the school day with menace were white skinheads, and African-American gangs with names like Black Mob and G-Boys. Dixon says he never felt pressured to join a gang, but for self-preservation you had to know people’s affiliations.

Despite the dangers of those days, Wilson also had teachers who encouraged him and a pre-engineering program that took him to the RIT campus to learn about engineering careers. Dixon graduated from Wilson in 1993, then earned a degree in computer engineering from RIT. He started working at Xerox, and earned a master's degree in software development and management. He and his wife, Winona, have two daughters, Aaliyah, 7, and X-Cat Twanda, 17.

Things have changed in Rochester since he grew up in the 1980s, DaTwan Dixon says. The police are more aware, the gangs less prevalent. But inner-city children still grow up in an atmosphere of violence. An X-Cat once was beaten up at the bus stop on his way home from a meeting.

Dixon is warm, with a quick smile. But he runs a tight ship. When students are late for meetings, he might have them drop down and do some pushups. One day a late-arriving student did his pushups without protest, then went to work on his robotics project. At the end of the evening, Dixon asked him how his day had gone.

It's good now, the student told him, but it started out bad: His uncle had been shot dead in front of the house that morning.

"They see things children shouldn't see," Dixon says.

The year he started as an X-Cats mentor, Dixon says, he noticed the team did not reflect the diversity of Wilson High. So, he became involved with recruiting. Dixon makes presentations at career-day events and during Black History Month, so that minority students can see someone who looks like them succeeding in a technology career.

"When you say 'robotics,' many people think 'Caucasian male.' We're trying to get rid of that idea," Dixon says. "When you see someone similar to you, it makes you think it's achievable."

Mentor Jan Enderle is head of product quality assurance for the Xerox office products group. She mentored X-Cats for several years starting in 1994, then took a hiatus. When she returned recently, things had changed: Girls had come into their own.

"The girls used to be so timid," Enderle recalls. "They'd come into the shop very nervous. I had to show them how to use a drill. Now they're taking leadership roles."

Enderle's own daughter, Maggie, is team captain this year. She plans to become a mechanical engineer or an ocean engineer, developing technologies for ocean research.

### **'We build people, not just robots'**

FIRST is about STEM education, and many X-Cats are interested in science and technology careers.

Yunus Kelas, born in Ankara, Turkey, moved to Rochester when his parents came for jobs with Hickey Freeman, the Rochester maker of high-end suits.

"I want to be a robotics engineer like Elon Musk," he says, referring to the founder of SpaceX.

Omari Bryan, from New Jersey, at first missed his old friends and kept to himself. Then he realized he could talk to his Wilson High teachers, and he joined the X-Cats. It was fun, students helping one another, he says. Bryan looks like the football player he is on Tuesdays and Thursdays. But for a career, he wants to become a mechanical engineer or a computer engineer.

Not every X-Cat is committed to math and science. Students can participate as designers, builders, fundraisers, marketers—in whatever capacity they have something to contribute. Dixon recalls one student who just liked to draw; he painted the robot's crate—and that year the whole X-Cats team stepped up to accept an award for best crate.

“It’s not just engineering,” says Mike Kehoe, an X-Cat mentor and retired Xerox engineer. “It emulates all the roles of running a small business, including how decisions are made.

“Everyone comes in a little shy. At first, they don’t know what they’re doing, and they grow into the positions,” Kehoe adds. “The X-Cats motto is, ‘We build people, not just robots’ and it really is that way.”

Jason Cao, a Wilson High junior, has been on the X-Cats team for three years. When he compares himself to his freshman year, the biggest differences he sees are in self-knowledge and ease with public speaking.

Cao is the first member of his family born in the United States. His parents are from Vietnam, and never had the opportunity to complete their educations. Cao says he joined the X-Cats because he wants to be a well-rounded person. He has visited Vietnam three times and learned the language. Cao plays violin in the school orchestra and paints with acrylics.

Interested in neuroscience and developmental psychology, Cao wants to become a psychiatrist. He is interning at the Social Cognitive Development Lab at the University of Rochester, studying how children interact with other children of different socioeconomic backgrounds. Differences in social status can be a barrier to friendships, especially for younger children, Cao has found. With the X-Cats, however, to accomplish anything everyone has to work together.

This year, Cao is the X-Cats scout master. The role is all about scoping out other teams’ strengths and weaknesses, both to guide alliance-building and to strategize competitive play.

“Next year, I want to go for a leadership role—maybe team captain,” Cao says.

### **Game day: gracious professionalism**

The particular game of each year is a closely guarded secret until the day it is revealed. Then, each team receives the same kit of materials and a 100-page specifications manual—but no instructions. They have six weeks to design, build and test their robots.

This year’s game is “Destination: Deep Space.” Three-team alliances compete against each other to get the most cargo off Planet Primus before the next sandstorm. Each match lasts 2.5 minutes. Teams progress from district to regional events and championships—and hopefully to national finals.

Forty-eight teams participated at the Finger Lakes Regional FIRST Robotics Competition at RIT this month. Most were from Upstate New York—including Webster, Fairport, Pittsford, Penfield and Victor—but there also were teams from Ohio, Pennsylvania, Michigan and Mexico, and two teams from China.

Teams with names like Iron Lancers, Electric Fire, Mechanical Marauders and Rolling Thunder sat in the bleachers wearing T-shirts of blue, red, pink, lime green and forest green. A loudspeaker broadcasted game lineups, match plays and perky music.

The playing field was laid out with mocked-up rockets and a cargo ship, with robot habitats off to the side. The X-Cats wore their black-and-red tie-dyed T-shirts and went about their designated jobs. The driver team operated their robot in the field. Scouts in the bleachers scoped out the other teams. Spirit Leader Twanda Dixon led booming cheers.

Everyone heeded the mentors' prime directive: "Don't do anything that would embarrass your grandmother."



This has been a tough year for the X-Cats. They had wanted to build some nifty lift capabilities into their robot, but then lost one third of their meeting time to snowstorms. Up until the last minute, Robot 191—a 3-foot-high contraption of metal, wires and software programming—remained a work in progress.

"It kept breaking," says X-Cat Alissa Rivers, who worked on the driver base and lift hardware. "I learned that if going from A to C doesn't work, you go from A to B to C—you look at your problem from a different point of view and find another way to solve it."

Now all that problem-solving was put to the test. Rivers' scarlet ponytail shone on the competition floor alongside other members of her sub-team: the robot driver, operator and repair technician.

The first match ran into trouble fast. While competing robots zipped around slam-dunking cargo into rocket ships, Robot 191 stood off to the side looking forlorn.

"The hatch is stuck!" mentor Kehoe said to me in the bleachers. "And the camera doesn't seem to be working. They're playing blind."

After two and a half minutes the end-of-match buzzer sounded. The X-Cats driver team pushed their creation off the field like a fallen gladiator.

They carted it to the pit zone and fixed stuff. Things got better. The X-Cats started to win. Enormous amounts of pizza were eaten. The X-Cats and its Blue Alliance collaborators made it to the semifinals, then were bested by the Red Alliance—which X-Cats noted really did do a great job.



“It’s an atmosphere of gracious professionalism,” Kehoe says. “A competing team will give you their spare radio if you need it. They’re in it to win but also to share.”

Next step, as a Hall of Fame team the X-Cats will compete at the Detroit final championship April 24-27.

### **Paving the way to educational and career success**

DaTwan Dixon says he forgets the technical particulars of each year’s games, but he never forgets the individual students. He remembers Anna who, a few years ago, cried when she couldn’t muster the courage to stand up and state her name and grade in front of her own team members; by the end of the program she was the X-Cats ambassador at the national championship.

“It was a totally amazing transformation,” he says. “She’s in the Air Force now.”

An evaluation conducted by the FIRST organization found that 91 percent of FIRST Robotics participants expressed an interest in going to college; 92 percent gained self-confidence; 99 percent increased teamwork skills; 95 percent increased leadership skills; and 99 percent felt better able to solve unexpected problems.

What’s more, high school student participants in First Robotics and/or FIRST Tech Challenge programs are eligible to apply for more than \$80 million in scholarship opportunities through FIRST to continue STEM education.

Of FIRST program alumni, 34 percent achieve bachelor’s degrees, 41 percent master’s degrees and 19 percent earn doctorates. Forty-three percent remain involved with FIRST as mentors and coaches or in other volunteer roles.

X-Cat Aidan Sciortino, heading off to college, already has a job at the UR Laboratory for Laser Energetics.

Twanda Dixon has been accepted to RIT, but she’s still considering options including UR, Massachusetts Institute of Technology and State University of New York at Buffalo. She wants to combine computer programming with her love of art—perhaps in new-media interactive development or design, artificial intelligence or virtual reality.



Rivers, the robot-hardware troubleshooter, wants to become a case worker for at-risk children. Her own mother had been adopted and had a hard time in the foster system, she says. Rivers sees similar hardships playing out in her classmates' lives.

"Some of the kids here, their life is rough and they're not having a great time at home," she says. "I want to take some of that stress off of kids, and help them if I can."

### **Funding always precarious**

Despite proven results spanning decades, the X-Cats struggles every year to raise financing. Approximately 25 percent of the program's annual cost is covered by Xerox. Other community and corporate [sponsors \(http://www.x-cats.org/2019/Sponsors&Donors.html\)](http://www.x-cats.org/2019/Sponsors&Donors.html) include Sikorsky, a Lockheed Martin company; the aerospace firm United Technologies; and the Rochester Schools Modernization Program. The X-Cat students themselves raise funds. They collect deposit-return bottles, send Valentine's Day candy grams, serve pancake breakfasts and deliver presentations to potential corporate donors. The team very much wants to find another key sponsor.

"The funding is always at risk," Wilson principal VanDerwater says.

Transportation is another huge challenge. The X-Cats meet at Edison Career and Technology High School, which houses facilities and equipment for their robotics projects. Meetings are Wednesdays after school and on Saturdays during the six weeks of the program. Some students, like Twanda, can get rides to and from meetings from their parents. Many inner-city students cannot; their parents don't have cars or they have one car that is in use. If another parent or a mentor can't give them a ride home, sometimes these X-Cats have to leave meetings early to catch a bus home. Often, they spend hours waiting for or riding buses.

"Students who need the program the most have the most trouble getting back and forth to the meetings," DaTwan Dixon says.

RCSD has three FIRST Robotics teams. The others are Roc City Robotics, a multi-school team that meets at Edison Tech, and XQ Robotics, from Benjamin Franklin High School. Given the huge difference FIRST Robotics makes in students' lives, DaTwan Dixon and his X-Cats colleagues would like to see more city teams and more-secure financing.

"Funding is the hardest piece," Dixon says. "It should never have to pop into my head to wonder if we'll be able to afford to travel next year."

Xerox used to carry a greater part of the financing burden than it does now, he adds, and what support it provides is divided among suburban schools too. Now it's up to other community members to support an endeavor that not only empowers children but also builds the workforce of tomorrow.

"Joe Wilson and Chester Carlson, the founders of Xerox, were all about community building," mentor Kehoe says. "So was George Eastman. Sponsorship was part of their mission to give back to community and build your resources at the same time."

"It takes a village, DaTwan Dixon adds. "This is bigger than robots. This is life."

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