

# Building up STEAM and Changing Lives with Robotics

Written by: **Sara Mullins**  
Photography by: **Lance C. Bell**

## Starting SuGO free-for-all with five robots!



Math and science are two academic subjects that have struck fear into many a student not predisposed toward either discipline. Traditional classroom lectures and problems that can seem abstract, difficult and dull often alienate such students to the point that they become intimidated, lose hope of succeeding, and drop out of their math and science classes. International rankings have shown that American students lag behind many of their contemporaries overseas in math and science skills. Yet given the ongoing explosion of technology and its expanding effect on everyday life – think cell phones and self-driving

cars – the need for education in these fields has increased to fill growing demand for a technically skilled workforce.

To reverse this trend, the National Science Foundation (NSF) developed an educational initiative called STEM, an acronym for Science, Technology, Engineering and Math, designed to foster critical thinking and creative problem solving. By integrating and applying their math and science knowledge, students could learn to develop solutions to real-world problems through engineering and technology. STEM has recently morphed into STEAM with the addition

of Art, to promote a more holistic learning approach that recognizes the value of creativity and encourages participation from students who are less technically inclined.

So how can all of those lofty goals be realized in a way that fires kids up about STEAM learning and makes it fun? How can families and members of communities get involved?

Dean Kamen, inventor of the Segway personal transporter and holder of 441 patents, has some answers: “Kids need access to hands-on projects that result in a tangible product. Instead of telling them why abstract concepts like algebra or

trigonometry are important, science teachers should say, ‘Let’s build a LEGO robot!’ With a little assistance, the kids build one and it solves a problem. Suddenly, they realize that math and science are very powerful tools. Suddenly, math and science are relevant and fun.”

To establish a robotics program that would engage kids in STEAM, Kamen founded FIRST, “For Inspiration and Recognition of Science and Technology.” FIRST was created “to inspire young people to be science and technology leaders, by engaging them in exciting mentor-based programs that build science, engineering, and technology skills, that inspire innovation, and that foster well-rounded life capabilities including self-confidence, communication, and leadership.” Since its founding in 1989, FIRST now sponsors competitions involving 3,128 teams, with roughly 75,000 students and 19,000 mentors from 24 countries.

The FIRST robotics craze has infiltrated the bucolic landscape of Garrett County, Maryland, and found a home in Accident’s industrial park, where GEARS (Garrett Engineering and Robotics Society) serves as headquarters for the area’s robotics teams and projects. To fulfill its stated mission – “Creating a world where



**Juan Aleman (left) and Griff Speis compare construction.**

Science and Technology are celebrated” – GEARS serves as the community hub, running FIRST and 4-H robotics for grades K-12, plus STEAM-related activities. GEARS was formed in 2006 to provide a home for on-going robotics activities year-round, and to develop new programs that would attract more participants.

One of the most popular GEARS programs is SuGO™ Sunday, when young robotics fans gather on the first Sunday of the month to build Sumo Wrestling Robots, form teams, and compete. SuGO, a Sumo-wrestling robotics event based on the LEGO Mindstorms™ platform, was developed by Phil Malone, aka Mr. Phil, a native Australian and retired robotics software engineer who retired to Deep Creek Lake. Participants build

**First is the “build” with certain guidelines in preparation for the final event — building is enjoyed by all ages and skill levels. Then it’s off to battle in a double elimination tournament where two contestants try to knock each other off of the ring.**



**Kane Eanes (left) and Garret Scardina busy building.**



**Evan and Serena Lewis working together.**

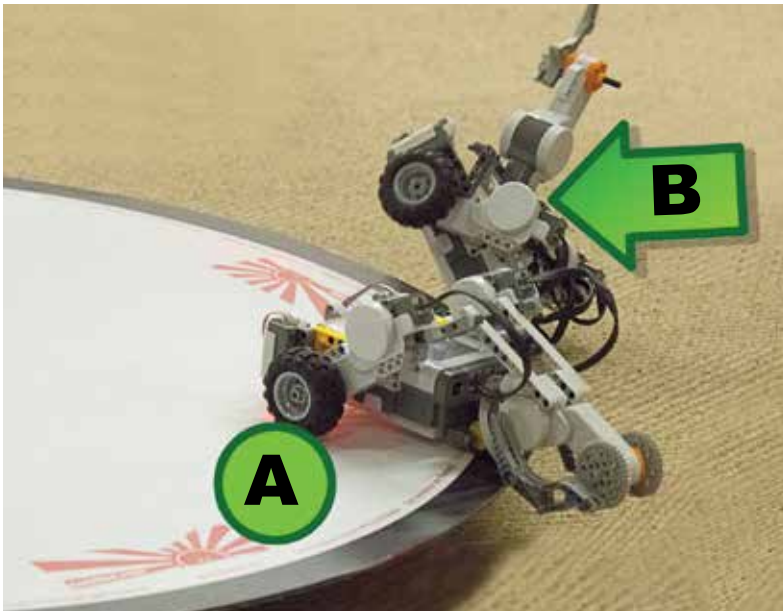
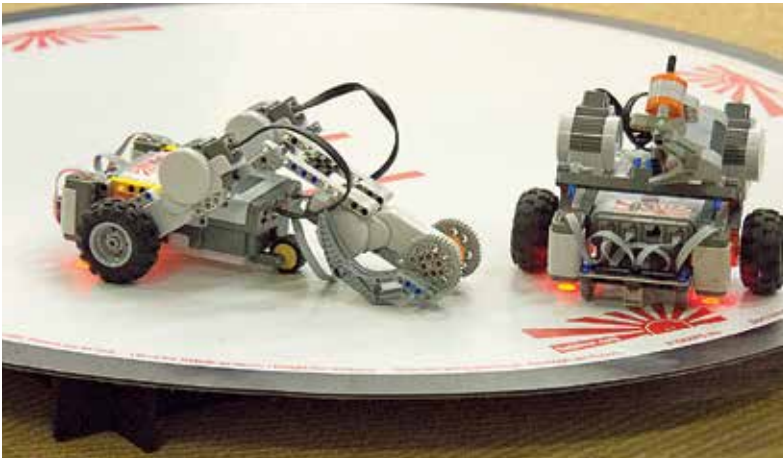
SuGO robots using Mindstorms™ kits that are pre-programmed with specially designed SuGO software. Then it’s off to battle in a double elimination tournament that takes place on a raised circular playing field. Two contestants place their robots

in the field, and the robots try to knock each other off the ring. Contestants earn points when they win or when their opponents fail to comply with the rules. The match continues until one of the contestants scores four SuGO points.

“Everyone loves fighting robots,” says Mr. Phil, “since LEGO blocks are a familiar play environment, SuGO is simple to learn but difficult to master. It’s adaptable to different ages and groups. It helps develop technical and strategic skills. It’s STEAM all over the place.”

In Garrett County, SuGO has served as a pipeline for students in grades 6 – 12 moving up to the “First Tech Challenge” (FTC), a more advanced competition that challenges participants to design, build, program, and operate robots that can play a floor game in an alliance (team) format. GEARS and 4-H have teamed up to create the G-FORCE FTC Team 2818. The team’s mission: “To promote 4-H and robotics while having fun and fostering gracious professionalism.”





This year, they competed with their G-FORCE Res-Q robot, which featured custom tracks, designed to scale a steep mountain. The tracks were constructed with custom fabricated nylon rods, covered with neoprene tubing and bolted to a pair of bicycle chains driven by 4" stealth wheels.

After the robot autonomously scores two Climbers in a perimeter basket, a team of two takes over to operate the ingenious device by remote control. While under driver control, the robot performs the following tasks: collects 2" plastic cubes into a container in the rear end of the robot; moves up the mountain to drop the collected cubes into low, medium and high "goals." Along the way, the robot uses a special Gyro Sensor to maintain stability and avoid roll-overs as it moves up and down the ramp.

Since 2005, a group of students from Northern and Southern High Schools have found a common mission as First Robotics Competition (FRC) Team 1629, the Garrett Coalition otherwise known as GaCo. For this year's FIRST STRONGHOLD competition, the team built a sizable robot resembling a large platform on wheels – but this one holds a large ball and zips around in multiple directions on a playing field. In competition, the robot heads toward goal posts, spins around and hurls the ball backwards, up and over the goal posts.

Community outreach and involvement are key elements of Garrett County's robotics program. Mr. Phil and Arlene Lantz, a Swan Meadow School Math & Technology Resource Teacher, serve as key mentors, with the assistance of other volunteers and family members. An active, year-round schedule includes competitions ranging from local to national levels, Navy Youth STEAM Camps, Summer Tech Camps and demonstrations at home and at public locations like libraries and hospitals.

"A reminder – the FIRST competition is more than robots," says John Abele, former board chairman of FIRST. "It's about people, it's about...working together on a shared goal...and it's about finding and using each individual's unique talent to make the project team greater than the sum of its parts. It's about applying skills that will lead to success in whatever you do in life."

**Top photo:** SuGO robots face off to begin the battle.

**Middle photo:** Robot "B" tumbles off the platform after getting a shove from robot "A," thereby losing the bout.

**Bottom photo:** 2818 G-FORCE FTC Res-Q robot picking up and dropping yellow cubes scattered among white wiffle balls.

To foster a spirit of teamwork among robotics participants, FIRST values emphasizes "Gracious Professionalism" that values people, the community and high-quality work, and "Coopertition," a spirit of "cooperation" and "competition" that encourages teams to help each other even as they compete.