



FRC #4468

**LINKING
IDEAS AND
NETWORKING
KIDS WITH
SCIENCE**

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THE MISSION

The mission of Fernbank LINKS is to inspire a passion for Science, Technology, Engineering, and Mathematics (STEM) in our community, with a focus on introducing children and young adults to the possibilities and rewards of the STEM fields. We strive to ensure that our members develop, through education and hands-on experience, the leadership skills and technical knowledge necessary to succeed in a global community.

ABOUT FERNBANK LINKS

In 2002, five students sought ways to apply the STEM concepts that they were learning in a fun and engaging way. They formed a Team America Rocketry Competition team to explore STEM outside the classroom. To sustain this endeavor, they founded Science Night Out (SNO), a program where elementary and middle school students participate in hands-on, science-related activities.

Fernbank LINKS (Linking Ideas and Networking Kids with Science) started new DeKalb FLL teams and hosted trainings and tournaments for teams and students who wanted to learn about *FIRST*® LEGO League. Therefore, the LINKS motto, “Building Robots, Developing Minds, Changing Lives,” was born.

From 2004 through 2014, they competed in BEST, a free robotics competition for middle and high schoolers. Through BEST, they learned important skills which prepared them to compete in *FIRST*® Robotics. In 2011, they helped the North Atlanta Warbotz, a rookie team, build their mini bot for the *FIRST*® Robotics competition, and after two years they became FRC team 4468, the first in DeKalb County. In 2014, they joined the Johnson Research & Development robotics alliance, which supports Georgia *FIRST*® with DE Atlanta.

STUDENT RUN STUDENT LED

STUDENTS LEAD, MENTORS FACILITATE

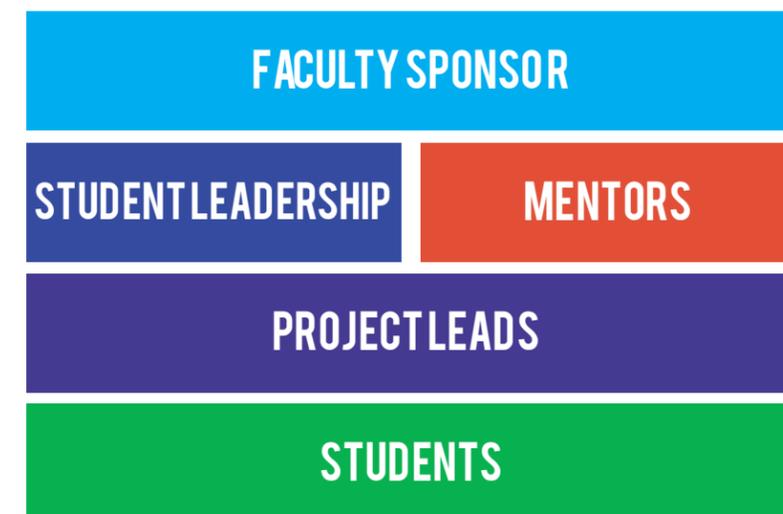
Ever since its founding in 2002, Fernbank LINKS has always been a team run by students for students. The team remains sustainable through the healthy relationships that the senior and leadership members have with newer rookies. Veteran members teach new members about important, specialized skills that they learned during their time on the team, such as CAD, programming, robot manufacturing, presentation, and gracious professionalism. The student leadership is comprised of several students who govern over the main branches of the team: Programming, Marketing, Robot Building, and Financing. LINKS students also coordinate many of their outreach events and keep the team in working order while communicating important announcements

to the students and parents. Members have a mutual relationship to lift each other up in order to progress as a team.

The student leadership team and mentors participate in a weekly conference call, during which they discuss the state of the team, where it is going, and plan for the future. Every call is documented with a meeting agenda, including the topics discussed and decisions made.

An effective mentor demonstrates the value of success he or she has encountered during his/her career path and uses these skills and successes to share knowledge and values with team members. At Fernbank LINKS, the role of mentors is to facilitate, not to instruct or manage. LINKS mentors provide students with opportunities to make choices, both good and bad.

LEADERSHIP STRUCTURE



GEORGIA BEST ROBOTICS



LINKS HOSTS THE GEORGIA BEST ROBOTICS COMPETITION FOR 23 MIDDLE AND HIGH SCHOOL TEAMS

Georgia BEST is a robotics competition provided for free to middle and high school students, originated in 1993 by two Texas Instruments engineers who saw a video of freshmen building a robot in Woodie Flowers' class at MIT. Each year, hundreds of students use drill presses, hand tools, CNCs, CAD, programming languages, teamwork, creative thinking, and other invaluable skills to creatively build successful competition robots.

Students just don't build robots in BEST, they market them as solutions to a real-world problem. As a result, the students must create presentations, booths, brochures, design notebooks and a corporate identity to convince judges that their robot is the best product on the market. BEST functions under the philosophy that such experiences in STEM and business should be free for

As a result of participating in BEST, students...

- Understand the practical use of math concepts and applied physics
- Solve real-world science and engineering problems, training that is transferable to all academic disciplines and career pursuits
- Gain an increased interest in engineering, math, and science
- Understand what engineers do — the engineering profession is “demystified”
- Experience “design-to-market”

students; therefore, the competitions have no entry fee, and the kits are provided at no cost.

In 2015, Georgia BEST had lost its Hub sponsor. LINKS decided to remove themselves from competing in order to host the competition for 12 other teams in Georgia. Since then, Georgia BEST has grown 67%. Through the BEST competition, LINKS is making entry level robotics available to all of Georgia. Because the competition is free, schools that could not afford robotics through FIRST can compete in BEST and gain the valuable skills and experiences of robotics. LINKS is looking to expand Georgia BEST in the near future by establishing additional hubs in rural and south Georgia, so that teams who cannot afford to travel to Atlanta can compete as well.

product development

- Receive recognition and acclaim typically reserved for their peers in sports

Students become competent and confident in:

- Abstract Thinking
- Self-Directed Learning
- Teamwork
- Project Management
- Decision-Making
- Problem-Solving
- Leadership

TRAININGS

Since 2011, LINKS has been contracting with the DeKalb County School District (DCSD) to provide **6 annual free FIRST® LEGO League (FLL) trainings to over 70 DeKalb County teams**, each training with up to 350 students. The goal is to give DCSD FLL teams the support, education, and inspiration needed to be competitive FLL teams. **Many of the schools they serve are Title 1**, so their support is important when it comes to providing resources related to STEM.

The three hour trainings are led by LINKS students with assistance from official Georgia FLL judges. LINKS trains these teams by discussing the judging rubrics of Robot Design, Core Values, and Project, providing the students with a deep understanding of what the criteria are for their robot and project, and how to analyze their work as a judge will at a tournament. Teams are taught how to implement sensors. Two trainings are scrimmages, where they have practice matches and mock judging sessions. LINKS also trains judges for FLL tournaments around the state of Georgia, so every FLL team can receive a quality judging session at their tournament. Many of the FLL teams trained by LINKS advance to the Super Regional and State tournaments.

TOURNAMENTS

To accommodate this growth of teams in DCSD, **LINKS hosts two FLL Tournaments every year**. In December, they host the DeKalb Regional Qualifier. They also volunteer at the Chamblee Regional Tournament. LINKS then hosts the Atlanta Super Regional in January. Along with the students, the parents, mentors and alumni of the team volunteer at the tournament. Competition is the final step in the FLL season. LINKS supports DCSD teams in every step, from starting teams and mentoring to competition.



FLL SCORE ANDROID APP

In 2016, LINKS created the **FLL Score app for Android devices** so that FLL teams could score their practice matches for the Animal Allies game. The app helps teams define their potential on the field objectively and prepare effectively for tournaments. LINKS has committed to support each new FLL game, and has updated the app for Hydrodynamics. With over 300 downloads in over ten countries, the app has made a positive impact on the quality of these teams' practice matches.



The success of FLL teams in DeKalb inspired LINKS to create their LEGO Robotics Camp. Their goal is to introduce FLL to students who have never been on a robotics team and inspire them to join FLL teams at their schools. For 5 days, LINKS works with rising 4th through 8th grade students and teaches them about the fundamentals of FLL: game strategy, robot design, and programming. The students are challenged to use these skills to build a robot for the tournament on the final day, when they compete using the current FLL game. Teams of two to three students achieve scores similar to real FLL teams.

LINKS' goal is to give DCSD FLL teams the support, education, and inspiration needed to be competitive FLL teams

COMMUNITY OUTREACH

In the past 3 years, Fernbank LINKS has introduced *FIRST* robotics to over **100,000 individuals** in Atlanta and around the world through *FIRST* LEGO League and many community outreach events. That is 100,000 people who are now aware of and inspired by *FIRST*. Many of them are involved through FLL. Students who have attended LINKS outreach events such as Science Night Out have joined FRC teams and graduated to go into STEM fields.

**FERNBANK LINKS HAS
INTRODUCED *FIRST* TO
OVER 100,000
INDIVIDUALS WORLDWIDE**

Science Night Out, (SNO), the signature outreach program of Fernbank LINKS, is hosted at Fernbank Science Center every spring. Each SNO is an evening packed with hands-on STEM related activities for students, led by Fernbank scientists, LINKS members and alumni.

Science Night Out was the first outreach program the team hosted, created in 2002 and designed to attract young students to STEM and to raise needed funds for competition expenses. Each session is built around a theme such as flight, space, engineering, electronics, LEGO Mindstorm robotics, animal science, chemistry,

and much more. Each year, in celebration of National Engineering Week, the theme is based on structural engineering. Local bridge engineers from MARTA and other companies come and share activities and examples of their work with the participants. SNO is one of the main fundraisers which has helped keep LINKS sustainable since 2002. Not only does the program support the team financially, but many participants have joined or started *FIRST* LEGO League teams, and even joined Fernbank LINKS. Alumni proudly report being in rewarding STEM college majors and eventually internships and careers.



FERNBANK SCIENCE CENTER OPEN HOUSE

The Fernbank Science Center Open House is an opportunity for DCSD students to discover the STEM programs offered at Fernbank. LINKS presented their outreach robots as well as their Science Night Out program to DeKalb County students and parents.

GE ROBOTICS OPEN HOUSE

LINKS showed off their newest FRC robot for the Steamworks game to employees from GE at their company robotics open house. LINKS, as well as other FRC teams in attendance, is sponsored by GE with mentors.

SCHOOL VISITS AND CAREER DAYS

LINKS participates in many school STEM events and career days throughout the year. At the Kittredge Science Night and Henderson Mill STEM Night they encouraged students to join robotics by showing what LINKS does as a team. LINKS allows the students to drive FRC robots and explains the process of building them.

The team brought FIRST® robotics to the STEM Career Day at St. Philip AME Church. A variety of university STEM clubs, companies including AT&T and Lockheed Martin, 3D printing companies, and battlebots exhibited STEM for over 100 students alongside Fernbank LINKS.

FESTIVALS

LINKS has attended the Atlanta Maker Faire since it began at Georgia Tech. With over 20,000 attendees, they have reached out to many future FIRST® students and mentors. Fernbank LINKS was a featured exhibit in the official STEM Education Tour at the Maker Faire. LINKS attended the event to exhibit FIRST® robotics.

The team also showed off robotics at the Emory Streets Festival. Kids drove the team's outreach robot as team members discussed FIRST® with the parents and handed out information. These are two of many public events LINKS uses to share STEM.

WEST POINT MILITARY ACADEMY STEM EXPO

LINKS partnered with West Point Military Academy and HUD (United States Department of Housing and Urban Development) to host a STEM expo for inner-city students. At the expo, they taught 50 students about programming and showcased and let the students drive FRC robots. LINKS also held a panel for the parents so they could learn more about the importance of STEM in their students' education as well as the local FIRST® programs that they provide.

DE ATLANTA



JR&D AND THE DE ATLANTA FIELD

LINKS works closely with 5 other FRC teams as a part of the Johnson Research & Development (JR&D) Robotics Alliance to share ideas and create several successful outreach programs like FLL workshops, FRC scrimmages, and competitions to inspire more students to be involved with *FIRST*. They developed two new scoring apps to be used alongside the DE fields that are held at JR&D. FIRST teams can practice on the full-sized FRC and FLL fields and score their practice matches to prepare for competition.

GEORGIA TECH TE JAVA SESSION

The lead programmer of LINKS gave a presentation on the basics of Java programming in FRC to over 40 Georgia FRC attendees. The session was part of a series of Technology Enrichment sessions provided by leading Georgia FRC teams and hosted by the Georgia Tech RoboJackets. After the session, they also provided teams access to their online Github repositories, so that teams would be able to study LINKS' code and improve their programming.

SOLIDWORKS DEMONSTRATION

Members of Fernbank LINKS who are involved in the CAD design of robots partnered with SolidWorks Education to take part in a SolidWorks Demonstration, explaining to industry users how they use CAD in FIRST® and its utility in engineering. The demonstration was held at the offices of InReality, a marketing agency in North Atlanta. The meeting covered several areas of SolidWorks such as the new features offered in SolidWorks 2017, details on future updates and how to contribute to them, and a tutorial on the SolidWorks sheet metal tool.

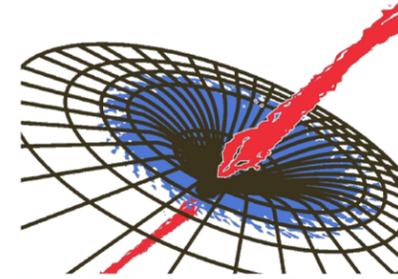
FRC SCORE ANDROID APP

Similar to the FLL Score app, LINKS programmers have developed the FRC Score app for Android devices so that FRC teams can score their practice matches and record their progress to establish their strategy and ultimately have a better performance in competitions. The *FIRST* Power Up update was built with the help of Toaster Tech FRC5332. Currently, the app has over 900 installs not only from the US, but from teams in Canada, Chile, Australia, Colombia and Poland. Teams use FRC Score paired with the JR&D DE Atlanta field during practice and scrimmages.

SPONSORS

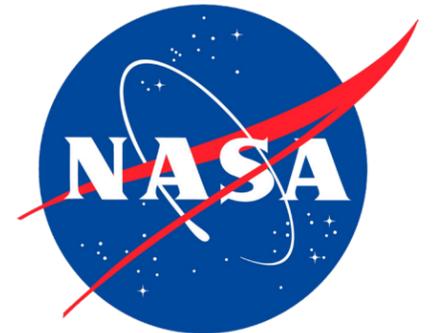
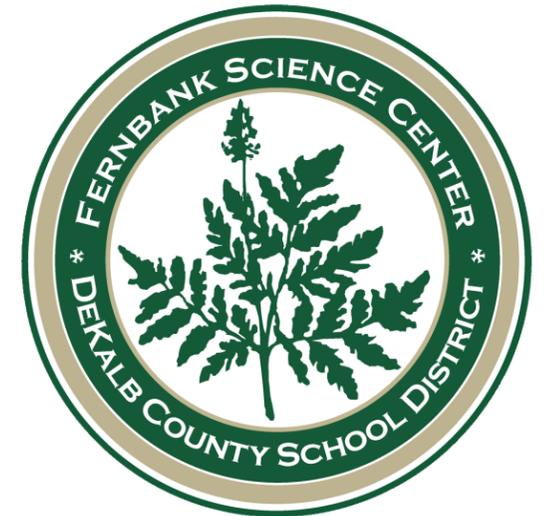


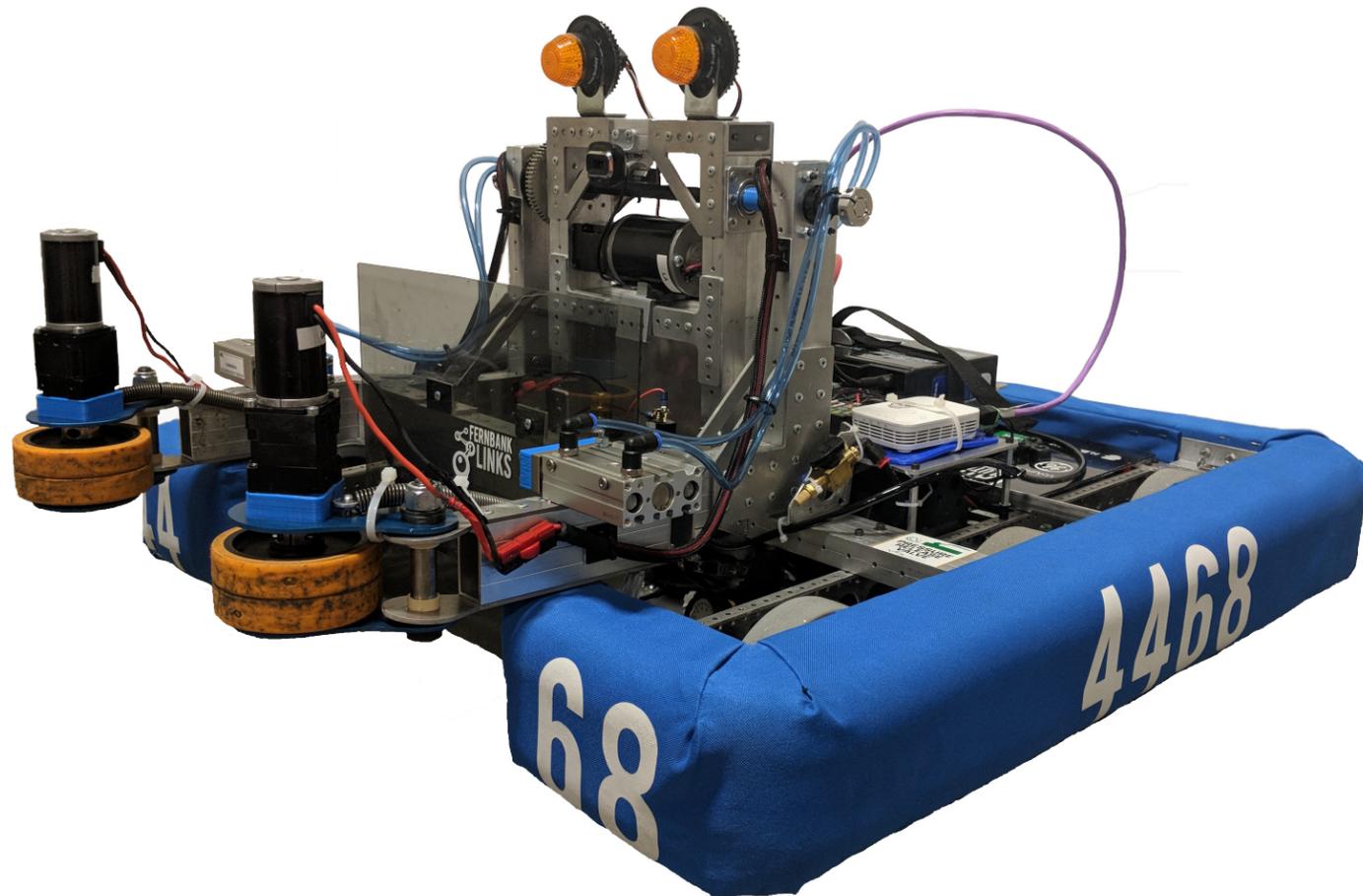
Novelis



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GE Volunteers





ARMIDA

“Armida” is Latin for the small armed one. She is specialized for ground-play in FIRST Power Up. Armida can load the vault, protect the home switch, attack the opposing switch, or anything in between. At 100 pounds with battery and bumpers, Armida is faster and more maneuverable than most scale bots. She trains for competition by maintaining a healthy diet of Power Cubes every day.

Frame Perimeter: 28.5in x 26.5in
Weight: 78 lbs - battery - bumpers
Mechanisms: Intake, Rotating Lift

All included = 100 lbs

Drivetrain: 2 Speed 6 MiniCIM tank drive with 6 center dropped 6 in Colson wheels

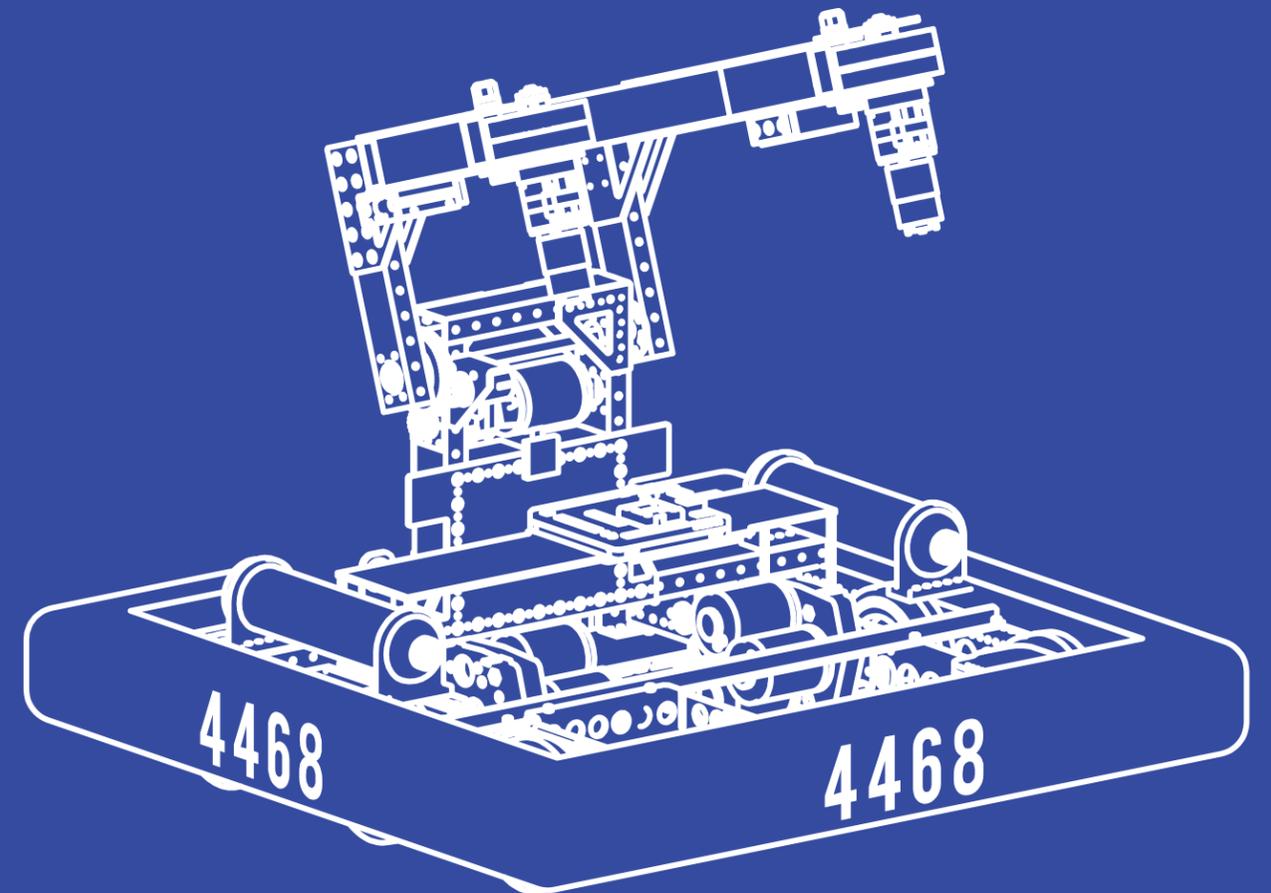
Intake: Single bag driving 2 BaneBots 40 A wheels per side, with linear actuator piston clamping

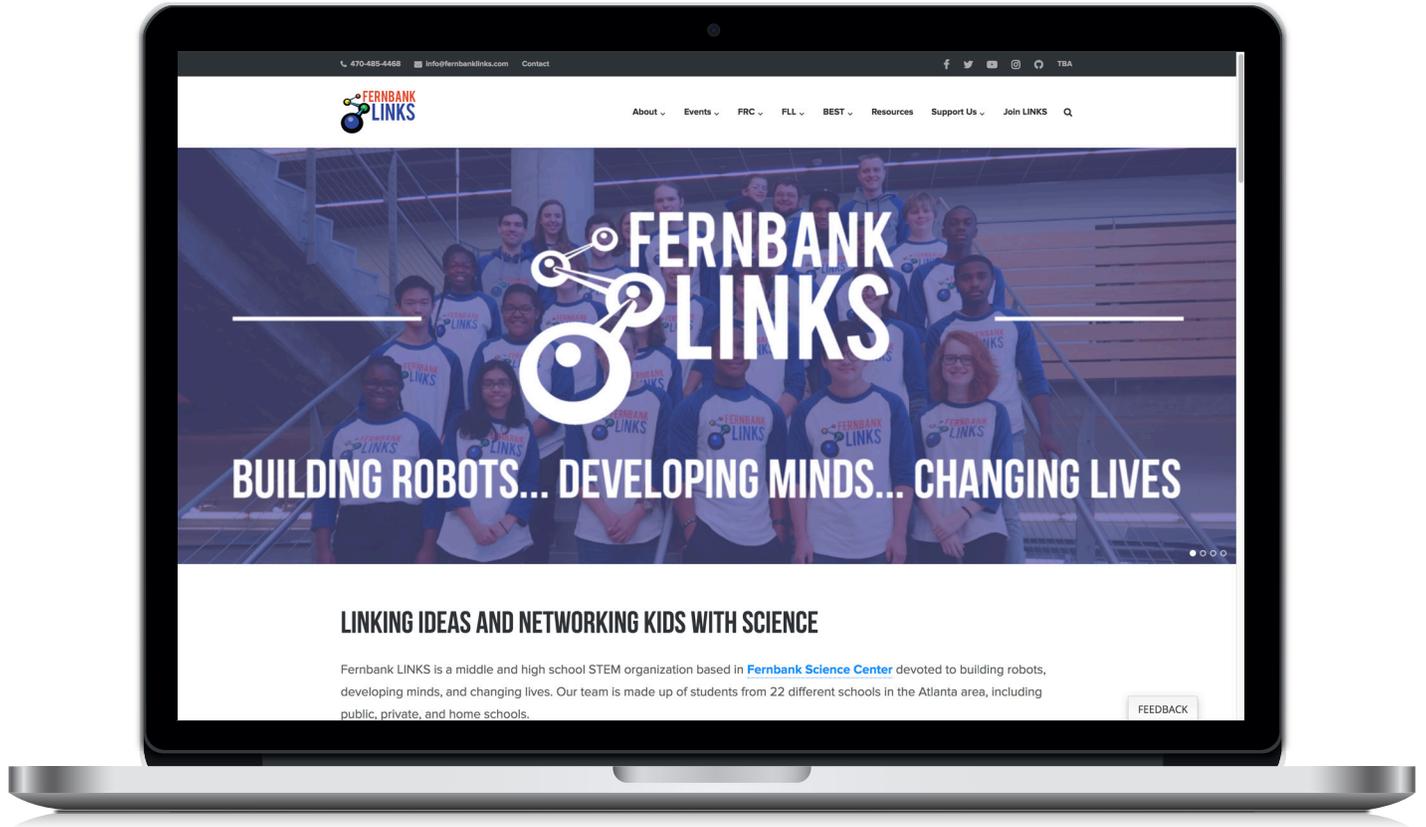
Speed: 13.66 ft/s high gear, 5.16 ft/s low gear

Functionality: Outputs to EXCHANGE or SWITCH as well as opponent SWITCH

Rotating Lift: Single MiniCIM (VP 45:1, External 3.4:1, Total 153:1) driven rotator orients the intake at any angle between 0 and 180 degrees, detected by single rotation precision potentiometer

Available Strategy Coverage: Claim switch, load the vault, load enemy switch, park or buddy climb





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