

Chairman's Award - Team 3792

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2022 - Team 3792

Team Number

3792

Team Nickname

Army Ants

Team Location

Columbia, Missouri - USA

Describe the impact of the *FIRST* program on team participants within the last 3 years. This can include but is not limited to percentages of those graduating high school, attending college, in STEM careers, and in *FIRST* programs as mentors/sponsors.

Army Ants students develop technical and leadership skills by collaborating with others from diverse backgrounds. They also gain an appreciation for community engagement and diversity through mentoring in our extensive outreach programs that target underrepresented groups. All participants have graduated high school and have pursued post-secondary education, with 98% pursuing a STEM career and 83% pursuing engineering. Of the graduates, 30% were women, 93% of which pursued STEM careers.

Describe your community along with how your team addresses its unique opportunities and circumstances.

Home to the University of Missouri, Columbia holds the College of Engineering, a resource that provides numerous opportunities: operation out of an MU space, mentoring by professors and FIRST alumni college students, as well as successful advocating for expanding FIRST scholarships. The Missouri Orthopedic Institute and Coulter biomedical incubator has also played a crucial role in the team's success at the FIRST Global Innovation Challenge Finals in 2021.

Describe the team's methods, with emphasis on the past 3 years, for spreading the FIRST message in ways that are effective, scalable, sustainable, and creative. How does your team measure results?

Robotics camps are held every winter break, with parents receiving the robot in advance to wrap and gift to their child. After the holidays, the kids attend a camp where we teach programming. They keep the robot and continue to learn using our online resources. Our first camps used mBots, and we have expanded them to include AirBlock drones and Codey Rocky robots. Since 2019, over 100 kids have attended these camps, with scholarships provided to underserved kids.

Please provide specific examples of how your team members act as role models within the FIRST community with emphasis on the past 3 years.

With members consistently leading our extensive outreach events, like GradeA+, member exposure allows youth to remain interested in STEM. Additionally, our local FIRST Alumni college student organization, mainly composed of Army Ants alumni, participates in building a robot in 3 days, creating videos of their solutions to inspire the FRC community. A presentation by the team to our new school district superintendent was followed by a new stipend program for teachers who mentor FIRST teams.

Describe your team's initiatives to Assist, Mentor, and/or Start other *FIRST* teams with emphasis on activities within the past 3 years.

FIRST activities in Columbia Public Schools fall below that of peer school districts, particularly following Army Ants' movement out of CPS to the Univ. of Missouri in 2016. The team is addressing this by building community support through engaging the College of Engineering and appealing to the new CPS superintendent. Through our engagement, we have encouraged the creation of an FTC team and two FLL teams and are working on creating the conditions for even more teams to be founded.

Beyond starting teams, what initiatives have you done to help inspire young people to be science and technology leaders and innovators? What results have you seen from your efforts in the past 3 years?

In 2015, the Army Ants established the Columbia Educational Robotics Foundation (CERF) as a 501(c)(3) non-profit, an initiative dedicated to connecting robotics and STEM enthusiasts from across the community. With the help of Army Ants members and mentors, this has resulted in the formation of new FLL teams in Columbia, from 6 in 2015 to 16 in 2018. Additionally, CERF provided funding to start, support, and sustain the first FTC team in Columbia in 2017.

Describe the partnerships you've created with other organizations (teams, sponsors, educational institutions, philanthropic entities, etc.) and what you have accomplished together with emphasis on the past 3 years

The University of Missouri has provided the team with \$13,000 to support scholarships to our mBot camps for underserved youth. We have received uninterrupted funding from Boeing and 3M since 2014 and 2017, respectively, with funding from 3M due to our diversity initiatives. Through our partnerships with Granny's House and GradeA+ programs for African refugees and low-income children, we have introduced FIRST and STEM to a new generation of young engineers.

Describe your team's efforts in the past 3 years to promote equity, diversity, and inclusion within your team, *FIRST*, and your communities.

Outreach efforts to promote EDI are a central focus of our team. Outreach and target recruitment have led to the team now being majority POC and 40% non-male. Our major community partner in these efforts is the GradeA+ enrichment program. 95% of the team is on a technical sub-team and also participates in marketing tasks. This prevents girls from being relegated to exclusively marketing roles. The aforementioned diversity of our leadership team also shows our commitment to inclusion.

Explain how you ensure your team and the initiatives you have created will continue to run effectively for the foreseeable future

In order to ensure the initiatives created by our team will continue to run effectively for the foreseeable future, it is crucial that we work to instill a sense of community within the budding members of our team. Partnering with local organizations (University of Missouri, GradeA+, Granny's House) makes our initiatives more resilient. Our unique organizational system also makes our camps and STEM-focused initiatives sustainable for the foreseeable future.

Describe your team's innovative strategies to recruit, retain, and engage your sponsors within the past 3 years

Strengthening ties with our sponsors is essential to our team's growth. We've pursued our critical partnership with the University of Missouri, allowing us to develop our brand of education robots called the AntBot. The development of this project has provided the team's students and university engineering students with invaluable STEM and entrepreneurial experience. Moreover, the AntBot will reduce our outreach costs while acting as a branding opportunity for the team and university.

Highlight one area in which your team needs to improve and describe the steps actively being taken to make those improvements.

A consistent issue we tend to find and address during a new year is the communication between our subgroups: CAD, programming, and mechanical. We have counteracted miscommunication by first holding discussions to address updates at the beginning of each meeting, thus helping us understand where each group is at and which projects we need to focus on for the night. Our mentors are notified of any conflicts or accomplishments and inform the rest of the team on multiple communication platforms.

Describe your team's goals to fulfill the mission of *FIRST* and the progress you have made towards those goals.

The Army Ants have been conducting outreach since our inception, and we prioritize financial sustainability. All profits from our camps are recycled into investments to continue our mission of spreading STEM education. We buy robot parts to maintain an inventory for our campers. Furthermore, we consistently innovate our curriculum—most recently incorporating a self-driving tutorial—to keep our camps engaging. We look to expand our camps to encompass broader aspects of STEM in the future.

Briefly describe other matters of interest to the *FIRST* Judges, including items that may not fit into the above topics. The judges are interested in learning about aspects of your team that may be unique or particularly noteworthy.

Our team's mission is to promote and instill the values of FIRST and STEM within our community. In the future, we would like to expand upon the partnerships we have made within our community to inspire youth in STEM further. Specifically,

we plan to increase our engagement with our local Boys and Girls Club and university student organizations like the National Society of Black Engineers and the Society of Women Engineers.

Essay

The room was dead silent. Suddenly, we heard a squeal.

"It's on fire! Ahhh!"

Coming over to the screen of the excited youth engaged in this Army Ants STEM camp, we found a recreation of Godzilla—but with a dragon. This camper showed us something we didn't even know the Scratch programming language could do.

Regardless of the student's background, their excitement to engage with robotics and STEM was universal. Just watching their creations instilled a sense of inspiration in all of us running the camp. We matched their excitement with in-depth explorations of programming, hardware, and robots, as their response never failed to impress us. As the only FRC team in the city of Columbia, MO, the Army Ants focus their outreach efforts on engaging underserved youth in our community through strategic partnerships with URM-serving organizations to promote FIRST and STEM careers. Through ingenuity and hard work, these efforts have not been thwarted by the COVID-19 pandemic. In fact, both the outreach and competitive efforts of the team have thrived during this challenging time.

The Army Ants team has always worked hard to welcome an increasing number of underrepresented minorities onto our team. Our earliest team records show that we used to be only 23% POC and 16% female and non-binary students, but we have worked to correct this imbalance over the years. Through targeted recruitment and outreach, the team is currently 40% female and non-binary, with 52% of our members being POC. This shift resulted from a sustained effort of our team, with 10% of this shift in POC membership and an 8% increase in female and nonbinary membership occurring over the past four years. Additionally, our leadership this year is very diverse, with about 45% being female and non-binary students. This increasing inclusion on our team has allowed us to gain new perspectives to serve our team and community better.

Our dedication to serving underrepresented minorities in our local community doesn't end at the team level. Team 3792 is dedicated to working with local organizations and hosting events for these groups to further spread our opportunities and love for STEM. Our outreach events number at around 20 per year pre-COVID. We have worked with programs such as Grade A+, a community-based organization that provides educational support and opportunities to underserved youth in Columbia. In cooperation with this program, we provide resources and mentoring that teach children how to code an mBot using Scratch. Our hands-on approach allows them to develop logical and design skills while getting a better understanding of block-based programming. Starting from a basic, accessible level, these students gain valuable expertise in coding and witness firsthand how they can make a physical robot move with just simple blocks of code. Knowing how meaningful this is to students, we sought to establish a sense of normalcy by providing such experiences in a safe, virtual environment during COVID. Because students had numerous difficulties attempting to use several platforms simultaneously, we developed the "Army Ants Camp Experience," an in-house learning management system that caters to the needs of campers and provides content in a seamless, organized manner. Developing a medium for efficient file transfer while maintaining a video chat, we combined our needs from Zoom and Google Drive into a streamlined application. These factors enabled 45 kids to learn Scratch programming in a virtual format. We have also worked to reduce the cost of supplies for outreach camps. Because of the virtual structure and our reduced costs, students can keep the mBot and continue to explore coding outside of the two-day camp experience.

In addition to our in-depth mBot camps, we excite kids about STEM careers through our interactive and inspiring outreach at local elementary, middle, and high schools, working closely with our school district to introduce FIRST to hundreds of youth. To achieve this, we work closely with the Columbia Educational Robotics Foundation (CERF), an organization dedicated to expanding robotics in our community that was founded by the Army Ants and other FIRST mentors in Columbia. Perhaps our most important contributions to the FIRST community over the last year have been new, productive engagements with the University of Missouri College of Engineering (COE) and the new Superintendent of Columbia Public Schools (CPS). Army Ants, led by team captain and Dean's List finalist Sophia Eaton, presented to the COE Dean. We successfully proposed a doubling of FIRST scholarships and the deployment of COE undergrads as technical mentors of FIRST teams. Dean Manring agreed to implement this plan and recognized FIRST as a priority for COE recruitment. Subsequently, Dean Manring joined the Army Ants in making a presentation to the new Superintendent of CPS, presenting a vision of a "PreK - profession" pipeline to STEM careers through FIRST programs at all levels. The specific request to CPS was to grant stipends to teachers who mentor FIRST teams and a FIRST "czar" to coordinate the expansion of FIRST in CPS. Due to our efforts, CPS is now, for the first time, offering stipends to teachers to run FIRST teams. These new initiatives with COE and CPS join ongoing efforts of the Army Ants to sustain FIRST in Columbia. Army Ants alumni are the principal technical mentors of Columbia's first FTC team, "Ant Colony," and also mentor two FLL teams at Jefferson middle school. These efforts are coordinated by the Mizzou FIRST alumni organization, a recognized student organization at the University of Missouri. The leadership of this alumni organization is currently Army Ants alumni.

The current pandemic has not derailed our efforts to positively impact our community. In the early days of the pandemic, food insecurity was a major issue in our area. We partnered with Lincoln University's agricultural department and CERF to reduce food shortage at the Columbia Red Roof Inn, where families with and without children sought day-to-day lodging. Without this system, many would have been sleeping in their cars until their next SSI, TANF, or paycheck. We met the food deficit with weekly care packages accommodating individual dietary restrictions. In total, we provided 13 families and 53 people with essential resources, and, to our knowledge, everyone who resided in the hotel is back on their feet and in their homes. Additional efforts in spring and summer 2020 include our contribution to the design of face shields issued by the University of Missouri. Previous face shield designs were too thin to securely hold the screw that kept the face shield intact. Through the efforts of the Army Ants CAD team, we were able to redesign and improve this part using a thicker material. Our design was subsequently used to fabricate hundreds of face shields issued to all university faculty. Team members also contributed to the COVID ICU unit at our local hospital. The unit's nurses and doctors regularly used PAPR respirator masks to avoid infection but could not get replacement "disposable lens cuffs" (DLCs) to use in the respirators. An Army Ants alum reverse-engineered the DLCs, allowing COE technicians to fabricate replacement parts that were used by the university hospital in Columbia and Blessing hospital in Quincy, IL. In addition, new clips were designed by Army Ants alumni to support the re-use of DLCs, which became an important tool to keep the ICU running safely and smoothly.

Through the raging COVID-19 pandemic, our team remained highly active and accomplished. We took particular interest in the 2021 FRC Innovation Challenge. Our team designed a sensor platform to monitor the patient rehabilitation process after knee surgery. We embedded a simple leg stocking with sensors for pressure and muscle activation, calibrating the electrical signals to represent the activation and movement of the knee accurately. By interviewing university experts and collaborating with the Coulter Biomedical Accelerator, we learned everything from Medicare CPT codes to FDA approval, which was instrumental in developing the business model for SPOCKS. As a result of our efforts, we advanced to the international finals and won the Design Award. We were one of 6 awardees in the world. What started as a programming project evolved into an insightful experience on biomedical product development for the team as well as a new biomedical product that could help thousands of lives in our community.

Our robotics efforts were not limited to SPOCKS; we also excelled in the Infinite Recharge @ Home Challenges. We developed a vision targeting system that enabled us to operate autonomously based on OpenCV and camera input. We finished our season as the winner of the aluminum division and won the Industrial Design Award. Our team was also successful in the Game Design Challenge, where we won the Creativity Award with our game FIRST Robolympics. This sport/Olympic-themed game used objectives inspired by the events of marksmanship, curling, hurdles, track, and biathlon. Our efforts in this challenge helped members gain Computer-Aided Design (CAD) and collaboration skills, a valuable asset to the design of our competition robots.

The Army Ants remains a frontrunner of the movement for inspiring STEM education throughout mid-Missouri. We provide high school students with technical and leadership skills crucial for future success. Even with the new challenges that arose during the pandemic, our commitment to garnering interest in STEM among youth did not falter. We continue to host in-person robotics events, work with local organizations, and provide new virtual learning opportunities. Our commitment to spreading STEM education to diverse audiences has brought many children happiness and curiosity to pursue their interests. We hope this sentiment can live on with future generations of dedicated STEM enthusiasts.