

Chairman's Award - Team 3504

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2022 - Team 3504

Team Number

3504

Team Nickname

Girls of Steel

Team Location

Pittsburgh, Pennsylvania - 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.

Our members develop leadership, communication, a strong work ethic, and a well-rounded skill set by participating in both a business and technical subteam on GoS. We are mentored by STEM professionals from across the Pittsburgh area who help us refine our skills for a successful future, with 100% of our team members attending college and 85% of them majoring in STEM. Our alumnae have attended colleges like MIT, Harvard, Pitt, WPI, and CMU and work for companies like DEKA, Amazon, and Apple.

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

The GoS community is hosted at Carnegie Mellon University and made up of students from all across Pittsburgh. A unique circumstance of ours is that CMU hosts our workspace and outreach events, and restricted in-person meetings until Oct '21 (again in Jan '22) due to the pandemic. This made it difficult to engage new members and limited us to virtual outreach, but we haven't let this define the success of our team. We reached a total of 1300 individuals through virtual outreach since March 2020.

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?

Our K-8 virtual summer camps exemplify sustainability & innovation. In summer 2020 & 2021 we designed a one-week Scratch workshop to teach basics of the block coding platform, and transformed our FLL Workshop to an online format with a research project, coding, and hands-on engineering kits we give to students. Summer 2021 we created GoS Hacks Jr, a virtual hackathon where participants (K-8) design their own game in Scratch. We compiled all the materials necessary to recreate them in the future.

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

As directors of *FIRST* Ladies, GoS is a clear role model for teams who are promoting female inclusivity within *FIRST* and STEM. With 44 partner teams, we maintain a space for girls in *FIRST* to feel comfortable and supported, ensuring they stay engaged in both *FIRST* and STEM. We run annual *FIRST* Ladies events such as social movie/game nights and a Women in STEM panel event at the Greater Pittsburgh Regional. We also support our partner teams in running similar events around the globe.

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

Our Program Pyramid structure includes 8 FLL Explore teams, 4 FLL Challenge teams, 2 FTC teams, and 1 FRC team (129 members total). We directly mentor the FLL Challenge & Explore teams and build close connections to FTC members through joint outreach, a shared meeting space, and shadowing during build season. The pyramid emphasizes sustained connections to facilitate retention between programs. 16 FTC members came from FLL and 78% of our FTC members moved up to FRC.

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?

Our community outreach is designed to spark interest in STEM. Our virtual FLL Skills and Scratch camps inspired 24 participants to join our Program pyramid. Our "Rosie Talks" webinar series gives successful women in STEM a platform to share their story with the next generation. We're now utilizing our STEM skills to assist community members with Autism Spectrum Disorder through our BuzzBand and Autism Cushion projects, which are inspiring our members to apply their knowledge in meaningful ways.

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

Since 2018, we've partnered with an educational technology conference to present about *FIRST* & demo our robot to 250+ attendees. We partner with other *FIRST* teams in the National Advocacy Conference to lobby for afterschool STEM program funding, building relationships with 5 members of Congress. As part of the Steel City Robotics Alliance, we co-run the Steel City Showdown off-season event at CMU, hold a week-zero scrimmage at our practice field, and coordinate outreach & training activities.

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

Our DEI subteam is expanding which Pittsburgh communities are impacted by our team's outreach. We're currently planning new events with the Latino Community Center and Homewood Children's Village, to be executed this spring. Last year, our crowdfunding campaign raised \$3500 for subsidizing registration fees to make our team more accessible. Internally, we've improved inclusion through a Big/Little program that pairs FRC & FTC members together for monthly games and socialization.

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

Our Outreach Catalog compiles instructions and curriculum for all of our outreach events plus a list of additional event ideas, for future students to utilize in outreach planning. Its complementary Outreach Impact Document measures the inner-team engagement, community reach, and goal alignment of each of our past outreach events so we can optimize our efforts. We pass down organizational knowledge through frequent co-leadership positions between a senior student and an underclassman.

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

We leverage our current relation with our major sponsor, CMU, in innovative ways to make new connections. We are the face of the CMU STEM Outreach, are interviewed for Women in STEM events, help CMU in NSF grants, and represent CMU to tech companies in Pittsburgh. Our coupling with CMU convinces many potential sponsors to back us, as they see that we can stably fund (e.g. through crowdfunding) and sustain (via university resources/mentors) a *FIRST* program.

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

In recent years, partially due to our virtual meeting format, we've noticed decreasing enthusiasm about planning outreach among members. To combat this, we started thinking outside of the box and creating more engaging and innovative initiatives. This led to the creation of new subteams (BuzzBand, FLL, COVIDCast) and events (Rosie Talks, new summer camps). We also increased accessibility of planning outreach through our Outreach Catalog, which helps inspire members with ideas and resources.

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

We aid in *FIRST*'s mission by showing how to inspire and retain young women in *FIRST*'s pipeline. We do so through initiatives like *FIRST* Ladies and sending out a monthly newsletter to 967 people. Independently in the past and this year in partnership with FRC 1868, we make *FIRST* competitions accessible to women by providing sanitary products. We represent *FIRST* as positive role models by advocating with CMU on International Day of Women and Girls in Science and in 3 books featuring our team.

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.

While we do run initiatives that target female participation in STEM (Symposium, Rosie Talks, FTC teams), we also fulfill

our mission by being positive female role models for the co-ed events & teams that we run (summer camps, Hackathon, FLL Explore & Challenge). Not only do we provide a comfortable STEM space for girls, we dismantle gender norms for boys by cooperating with female mentors and teammates. We connect males who age out of our co-ed teams with other Pittsburgh FTC & FRC teams.

Essay

FRC 3504, Girls of Steel (GoS), is a community-based team that serves as a model for other teams to emulate by developing initiatives that effectively attract, engage, and retain minority and female interest in STEM, overcoming barriers to sustain an innovative and long-lasting program. We pursue this mission by being female role models and dismantling gender norms in STEM, displaying resilience in carrying out FIRST's mission in the face of challenges like the Covid-19 pandemic, and by emphasizing sustainability in our community initiatives to ensure STEM awareness continues to rise.

GoS was founded by Carnegie Mellon University (CMU) to allow young women in the Pittsburgh area to practice STEM with like-minded peers. We've extended this motivation to our outreach, where we overcome barriers women and other underrepresented communities in STEM face as female role models to our community and equitably spread STEM opportunities.

Our Program Pyramid is a pathway for students to stay engaged in STEM by progressing through FIRST programs in their K-12 education. Students could enter the pyramid on a FLL Explore team and work their way up to our FRC team, all under the GoS umbrella. The base of the pyramid is our 8 FLL Explore teams (2021: 50 students) that our FRC members start and mentor at their own school districts, followed by our 4 community-based FLL Challenge teams (2021: 25 students) mentored by our FLL subteam. These teams are co-ed to draw attention and excitement to the FIRST program for everyone. Our 50% reserved female membership gives girls a supportive place to explore a passion for STEM with like-minded peers, and exposes boys to diverse teams with female teammates and mentors. Our two all-girl FTC teams (2022: 9 students) introduce students in grades 8-9 to more advanced engineering skills, with the intention of them joining our FRC team the following year. Our FTC teams connect with us through build season shadowing, contributing to outreach, and participating in team-bonding events. This year, we had our first student join our FRC team who participated in every level of the pyramid! While our pyramid is built specifically to increase female retention in STEM and FIRST, we believe that a version of this solution could be used for any group of people needing a sustainable FIRST pipeline.

To attract students to the pyramid and spread the message of FIRST, events like our annual AI, Robotics, and STEM Symposium (grades 4-8) specifically target young women in the Pittsburgh area. In this event, we present about FIRST alongside STEM professionals from CMU. Our last in-person Symposium included 108 participants. With the success of the Symposium, we adapted it to the Virtual Expo, which drew 77 people over the 2020 & 2021 events.

For women who have joined FIRST, we create an encouraging environment by directing FIRST Ladies, an international organization promoting inclusion for female-identifying FIRST team members with 44 regional partners in 6 countries and 23 states. These partners, including our team, host inter-team social events and other outreach initiatives (we host an annual Women in STEM panel at one of our regionals) to provide an accepting place for women in FIRST to make friends and network.

We're now emphasizing the expansion of our model of female inclusion in FIRST to other historically overlooked groups in Pittsburgh. Understanding the importance of providing communities the resources and opportunity to gain exposure to STEM, we've hosted events with organizations like Boys and Girls Club and Assemble for years, and are now broadening our reach to the Latino Community Center and Homewood Children's Village, with whom we're organizing joint events for spring 2022. With the experience gained from these partnerships, we plan to keep extending this model to other communities in the future.

The Covid-19 pandemic challenged us to transition our outreach to an online format, but also gave us the opportunity to improve and expand our events by needing to think outside of the box to sustain our mission. As the rest of the world slowly reopened, we've remained unable to run any in person outreach and thus have spent the past two years becoming well-versed with a virtual format.

Our first major adaptation in the pandemic was transitioning to an entirely virtual Program Pyramid. We designed online curriculums for the past two FLL Explore & FLL Challenge seasons while maintaining a hands-on experience by sending activity kits to each student in 2021. Fall 2021 allowed our own members to meet in-person but not the FLL students, so we developed a hybrid meeting format where students designed & programmed their robots virtually, then could see the resulting robot actions on the field live over Zoom.

Similarly, we modified our annual in-person FLL Skills Camp to a virtual format and distributed hands-on materials to 81 total participants in 2020 & 2021. In one week, students learn the FIRST core values, program a simulated robot, and create a website to showcase their FLL Research Project. We also started the Intro to Scratch Workshop, a one- or two-week workshop that taught block-coding skills through Scratch to 74 students in 2020 & 2021. Between both camps, 24 joined our Program Pyramid. We've also had participants from states other than Pennsylvania due to the increased accessibility of virtual learning. In 2021 we ran the first ever GoS Hacks Jr., a virtual hackathon for K-8 students to encompass the problem-solving aspects of engineering. They created their own coding game using skills learned from the Scratch Workshop in 6 hours, with over 20 project submissions. The hackathon also included a workshop in Scratch, a Q&A session with GoS members and STEM professionals, and information about FIRST.

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To show the experiences and accomplishments of GoS students and female STEM professionals to members of our community, we created our Rosie Talks webinar series with 170 attendees in 8 sessions from 2020 - 2022. Speakers present to a young audience about their STEM journey and how they overcome obstacles they faced as women. One recent guest speaker was a GoS alumna and the current Lead Mechanical Engineer at DEKA, sharing how her experiences on GoS impacted her career and showing how others can emulate her success through FIRST.

These innovative virtual initiatives from the past two years exemplify our flexible approach to carrying out FIRST's mission through community interaction. While we're excited to soon resume in-person outreach, we are carrying with us lessons from our virtual programming that will continue to strengthen our program into the future.

A constant barrier of entry to STEM is general exposure. Through sustainable community initiatives, we continue to increase awareness of STEM, GoS, and FIRST. Historically, we have run a very successful and scalable interactive outreach event called the Chassis Project, which demonstrates the collaborative, hands-on experience of building robots. We guide attendees through building a robot with a kit that we designed, in ways that are scalable as either a walk-by event for larger venues and crowds or a 2 hour workshop for a smaller group. We transported our kit to over 31 locations in 2019 & 2020 (pre-Covid), reaching 214 people in 2019.

Since 2013 (until 2020) GoS has partnered with other Pittsburgh FRC teams to hold Robotics Feiyue, a two-week FRC-style "build season" each summer that introduces students from mainland China and Taiwan to FIRST and ends with their participation in an off-season event. This camp has led to the creation of multiple FRC Teams, but we still keep up with 6414, 6947, and 7635, and team 6947 from Taipei is even one of our FIRST Ladies partners! Running Feiyue has been one of the most impactful and excitement-garnering outreach events for our team, so we're committed to reinitiating the program as soon as possible given international safety guidelines.

We also give back to the community at the national scale during the pandemic through the COVIDcast project. Supporting CMU's Delphi group since summer 2020, we've helped to maintain the COVIDcast website, which displays various disease metrics across the United States. Our team members ensure accuracy of website data, enabling better user experience for the community members who depend on the website, like the 59.1k site visitors in January 2022 alone.

Since 2019, GoS has branched out from our traditional outreach methods by using our STEM expertise to design innovative devices designed to assist members of our community with Autism Spectrum Disorder. One such device is the BuzzBand, a wearable fitness device designed to remove the sensory, physical, and emotional challenges of exercise for youth with autism. This device was originally created as part of the 2021 FIRST Innovation Challenge, but continued after the season and became a 2022 Lemelson-MIT InvenTeam with a \$10,000 grant. With that funding, we've begun writing a research protocol and improving the product with a second prototype. This project goes along with our earlier Vibrating Cushion Project, in which we designed low-cost vibrating seat cushions to comfort students in a special needs class.

These projects are just the beginning of a sustained relationship with this community.

As we look toward the future of our outreach, we always reflect on past successes and failures through our Outreach Impact Document, which compiles data about our events to measure their effectiveness and provide reflective ideas for improvement. We have recently complemented this resource with our new Outreach Catalog, an in-depth set of resources, instructions, and curriculum for all our core events. Together these resources ensure the sustainability of our outreach and alignment toward our core mission: inspiring everyone, especially historically overlooked communities, to believe that they are capable of success in STEM.