Chairman's Award - Team 4904

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2020 - Team 4904

Team Number

4904

Team Name, Corporate/University Sponsors

Google / BAE P&S / NVIDIA / Lamrock Fund and Silicon Valley Community Foundation / McCracken Family / Marc Tarpenning and Erika Shillinger / GrabCAD / Dassault Systems / Progforce / Altium / The Voorhis Family & Nueva School

Briefly describe the impact of the *FIRST* program on team participants within the last five years.

When students join our team, they become passionate and inspired to make change through the learning they do. With no entry test and team members representing over 25% of our school's student body, Bot-Provoking ensures that anyone can participate and grow. 100% of our alumni pursue higher education, and 96.3% major in STEM fields. 75% of our upperclassmen pursue STEM internships, gaining valuable experience that they bring back to the team.

Describe the impact of the *FIRST* program on your community within the last five years.

Our public programs impact 4,550+ students, parents, and mentors annually, and make an effort to engage students and show them how to get more involved in FIRST, rather than to just have them watch. We run demos at county fairs, public libraries, and FIRST events. We created robotics curricula in multiple underserved communities through partnerships with Peninsula Bridge, John Muir Elementary School, Habitot Children's Museum, and Parkside Middle School.

Describe the team's methods for spreading the *FIRST* message in ways that are effective, scalable, sustainable, and creative.

For the past three years, our team has run a drone competition which emulates the FIRST model, providing middle-schoolers with the opportunity to learn about the physics, mechanics, mathematics, and engineering that power an emerging field. We partner with Peninsula Bridge to teach Lego Robotics classes twice a week to high-achieving yet underserved middle-schoolers, and run a large interactive showcase of FIRST at CuriOdyssey, our local science museum, to introduce young students to FIRST.

Describe examples of how your team members act as role models and inspire other *FIRST* team members to emulate

Our team strives to provide mentorship and training to younger FIRST teams. We have worked directly with 15 FLL and FTC teams, often acting as the primary mentors for students eager to get involved with FIRST. We also work closely with teams on more niche issues, whether assisting FTC team 13905 with their organizational structure or providing our scheduling resources to other FRC teams, in order to help others better understand the mechanisms behind being a successful FIRST team.

Describe the team's initiatives to help start or form other FRC teams

Our team works diligently to start FRC teams. As part of our work with the board of KIPP Bay Area, which oversees a series of schools for underserved students, we started Team 7468 at their San Francisco school last year. In competition, 7468 was highly competitive as the 5th seed alliance captain. We mentored rookie Team 5940, helping them develop into a successful FRC team. In the future, we plan to expand our work with KIPP to create more FRC teams and set a precedent for KIPP engineering.

Describe the team's initiatives to help start or form other *FIRST* teams (including Jr.FLL, FLL, & FTC)

After inspiring a science teacher to add Lego robotics to the curriculum for all 4th and 5th graders at John Muir Elementary, we started and mentored two FLL teams at Parkside Middle School, where these students go next, and eventually plan on starting an FTC team at their high school. These students, whose parents did not attend college, are now expressing deep interest in STEM majors. We also provide resources for starting FIRST teams at demos we attend.

Describe the team's initiatives on assisting other *FIRST* teams (including Jr.FLL, FLL, FTC, & FRC) with progressing through the *FIRST* program

Our team is dedicated to assisting FIRST teams of all levels. We have assisted 13 local FLL teams and run an FLL qualifier which attracts 16 teams each year. For the past 5 years, we have taught over 125 students about Lego Mindstorms through our FLL camp. At the FTC level, we assisted team 13905 with team structure and organization, and ran a 16-team FTC tournament in collaboration with team 13050. We also assist FRC teams with our open-shop policy, practice field, and on-going Q&A support.

Describe how your team works with other *FIRST* teams to serve as mentors to younger or less experienced *FIRST* teams (includes Jr.FLL, FLL, FTC, & FRC teams)

For the past 4 years, we have collaborated with Team 5026, Team 253, Team 4990, and Team 840 to create a FRC practice field at the San Mateo Event Center that any FRC team can use. This year, after supporting the creation of our middle school's 30 person FTC team (13050), we co-hosted an FTC qualifier with them and reached 150 students. Bot-Provoking members, inspired by the tournament, volunteered at the Daly City FTC Qualifier and we are eager to continue to grow our partnership with FTC.

Describe your Corporate/University Sponsors

We are fortunate enough to receive a wide variety of support from our sponsors. We regularly receive grants from Google, BAE Systems, and others who wish to remain privately recognized. Additionally, Dassault Systemes, Maxx Metals, Altium Designer and Weller provide us invaluable donations of software or materials. Finally, the San Mateo Event Center graciously allows us to access their space to create a community field with local FRC Teams, a partnership we are looking to continue and expand.

Describe the strength of your partnership with your sponsors within the last five years.

We recognize the gracious support our sponsors provide through consistent communication. We involve sponsors by sending them periodic email newsletters, update videos and daily documentation detailing our progress. Additionally, we publicly thank them for their support by sending them a handwritten note and team picture and displaying them on our team gear, robots, pit space, and website. Through these programs we acknowledge our sponsors for their instrumental role in our success.

Describe how your team would explain what *FIRST* is to someone who has never heard of it

FIRST is an international organization that runs four levels of robotics competition programs for students of all ages, with the goal of allowing everyone to have the ability to pursue STEM. It aims to shape a generation of innovators, leaders, and changemakers. FIRST events may be based upon friendly competition, but collaboration defines all team interactions. FIRST creates a culture of learning based on helping others, innovating, and striving for greatness.

Briefly describe other matters of interest to the *FIRST* judges, if any

We focus our outreach efforts on programs that will have a sustained and lasting impact on the people they reach. We prioritize meaningful and direct interactions over quantity, allowing us to inspire the people we interact with beyond the event. As a large team, we are proud that all of our members are involved in both technical and non-technical work—from planning inclusion workshops to working on the business plan—and that we never have our mentors do our work.

For FRC teams older than 5 years, briefly describe your team's broader impact from its inception.

Since the founding of 4904 seven years ago, our team has grown from 15 freshmen to over 110 students—in those years, we've donated over $19,000 to our school's shop. Our goal as a student-run and student-led team starts within, but expands to empower students to make changes in the wider world through meaningful, collaborative experiences. This unique culture of innovators grounds Team 4904's mission and actions, allowing us to support our school, spread STEM, and make a difference.

Team Captain/Student Representative that has double-checked this submission.

Billy Pierce

Essay

This year, Bot-Provoking took a new look at our team, and realized that our mission statement—the core principles by which we wanted to work, guide ourselves, and make decisions—wasn't accurately representing the team. We analyzed our values and goals, and created a statement to define us.

OUR MISSION:

Bot-Provoking is a student-run and student-led team that strives to empower students through meaningful, collaborative experiences.

This is how we accomplish this mission.

"STUDENT-RUN AND STUDENT-LED"

Bot-Provoking was started in 2013 by 15 freshmen with hand tools, hallway space, and lots of enthusiasm. Since then, it has grown to 113 members, encompassing over 25% of our school, Nueva. Putting students at the core of the robotics experience is central to Bot-Provoking's mission. All Bot-Provokers are involved in both technical and non-technical subteams, allowing members to learn and contribute in a variety of ways.

Bot-Provoking embodies "student-run and student-led" to the fullest extent. Every level of technical and non-technical work within the team is led by Bot-Provoking students. From making parts and putting the robot together to planning out meetings and leading discussions, Bot-Provokers take ownership of their work on the team. Our mentors help guide us, but never make decisions or do work for us. Our core priority is learning, not winning, and we believe that the best way to learn is by doing, by trying and failing, and by collaborating.

Our unique approach is enabled by a team structure that prioritizes inclusion, teamwork, and learning. Our team has no barriers to entry, and our Inclusion subteam is specifically dedicated to fostering an open environment where any person feels comfortable regardless of their identity or experience level. As a result, 41% of our team is female-identifying, and our majority-minority team is 62.5% persons of color. Last year, Bot-Provoking set a goal of having our leadership gender ratio mirror that of our broader team, and we are proud to have accomplished this goal—both in technical and non-technical leadership.

Our leadership structure is designed to promote sustainable knowledge retention. None of our subteam-leadership positions are composed of only seniors, allowing our team to continue to learn across grades and experience levels.

Our quest to shape student leaders is demonstrated through our Peer Mentor Program, in which Bot-Provoking students serve as mentors within our school's maker space. Additionally, we have funded $9,000 of supplies and tools for our school's maker spaces, leading to the creation of new STEM classes and increasing school-wide participation.

4904's "student-run and student-led" framework impacts team members even after they graduate. 100% of our alumni are pursuing higher education with 96.3% of our alumni majoring in STEM fields. After graduating from the team, alumni continue to be involved by attending team events and providing design advice.

"EMPOWER STUDENTS THROUGH MEANINGFUL, COLLABORATIVE EXPERIENCES"

We want to empower students—both on and off our team—to be changemakers, engineers, leaders, and everything in-between, and we believe that meaningful, collaborative experiences allow everyone to reach that goal. With this in mind, we have created an outreach program that provides students of all ages with valuable hands-on experiences.

Our youngest students are 1-6 year olds at Habitot, a children's museum in Oakland. We work with them to build small sailboats, inspiring them via hands-on experiences. By directly involving both students and their parents, we promote collaborative engineering early on.

We work with John Muir Elementary School in San Bruno, inspiring a science teacher to incorporate a robotics unit for the 4th and 5th graders. We designed 8 weeks worth of Lego robotics and engineering lessons which have now been used, along with donated materials, for three years across multiple grades. This year, we partnered with the middle school that many of their students attend, Parkside, by starting and mentoring two FLL teams, creating continuity in their engineering exposure. We see the impact of our work—although many of their parents have not attended college, these students have expressed interest in pursuing engineering fields and post-secondary education.

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Our team provides a variety of other FLL opportunities to students, as the collaborative nature of FLL makes it an effective teaching tool. We run an FLL camp every summer that has reached 125 students since its inception 5 years ago, which introduces students to robotics through an FLL framework. We also run an FLL tournament each year, which reaches 100+ students. Except for judges, all of the volunteers at the event are 4904 members.

We have published an 80-page FLL book, detailing everything needed to participate in FLL—from understanding the game and designing a robot to thinking critically about the project and core values. The inspiration for this book came from observing that most FLL guides are written for teachers—so we wrote our FLL book to be oriented towards the students actually competing.

Our outreach programs also target middle schoolers outside of FLL. In 2018 we started Drones for Good (DFG), a program to teach middle schoolers about engineering and physics through drones. By giving students kits of drone parts and challenging them to complete a series of challenges by assembling, testing, and iterating on their drones, they learn the basics of prototyping and engineering through an engaging and inspiring medium. Since its establishment, DFG has reached 30 students across 6 engineering teams, and we intend to iterate on it this spring by focusing on a shorter event that impacts more students.

We are also in our second year of teaching STEM classes to students from around the Bay Area. We teach after school classes through Peninsula Bridge, a middle school through college completion organization that targets low-income, high-achieving students. We work closely with 20 students each year, providing robotics and math courses twice a week with curriculum designed and taught by 4904 members. In this process, they learn about mechanical design, programming, and robotics applications of the math they learn. Our classes also teach collaboration and cooperation through an open-ended class structure different from the lecture-format they receive in school.

This year, we've also expanded our outreach focus to include FTC teams. Eager to help facilitate the growth of FIRST programs, we co-ran the San Mateo Qualifier FTC tournament this year with our school's FTC team, a 16-team tournament with 150+ students participating. Inspired by this experience, a few of our members went on to volunteer at the Daly City Qualifier tournament. Finally, we assisted FTC Team 13905 from San Mateo High School, advising them through the intricacies of season planning and team dynamics.

Lastly, we empower students in FRC. We mentored Team 5940 during their rookie and sophomore seasons at a brand-new school—a challenge we related to. We work with team 253, allowing them to use our shop to manufacture parts they were unable to make at their school. We also run workshops, such as a design and prototyping workshop for Team 4765, to help share our knowledge. We worked with the board of KIPP Bay Area, starting Team 7468. KIPP reaches underserved students, we intend on inspiring and starting 4 more KIPP FRC teams in the coming years.

In order to help the broader community and share what we have learned over the past years, we publish FRC resources on our website. This past year, we published public daily updates for each day of build season, showing our technical progress for both internal and external usage. We also publish technical resources including CAN tools and guides to advanced programming concepts.

Alongside Teams 5026, 253, 4990, and 840, we run a practice field for FRC teams at the San Mateo Event Center. The field is open for anyone to use and has proven to be an invaluable resource for FRC teams throughout the Peninsula and larger Bay Area.

Past inspiring elementary, middle, and high-schoolers, we demo our robot with a focus on maximizing meaningful interactions. Our partnership with John Muir Elementary School, for example, started out of a demo for 100 students. We demo our robot at our Nueva's STEM Fair, Dream Machines in Half Moon Bay, the San Mateo County Fair, Maker Faire, and the San Mateo Public Library.

We also partner with Curiodyssey, our local science museum in San Mateo, annually to run a 2-day robotics demo of all levels of FIRST. As the primary organizers of this event, we focus not only on introducing students to FIRST, but also on providing ways to get involved—we connect students and parents with FLL and FLL Jr. opportunities, spread word about Drones for Good, and teach students about our robot.

Across our events, we have reached 4,550 people in the past year. While we do take pride in the number of people we reach, we don't let it define our outreach or our goals. Our team's mission is to empower students through meaningful collaboration, and so we dedicate ourselves to fostering more of those moments—whether working with an FLL team, or teaching a couple of eager drone-building middle schoolers, or helping a few FTC teams with organization, we take pride in having a meaningful impact on those who we do reach.

Bot-Provoking prides itself in shaping the leaders of tomorrow. Our members graduate the team with technical skills—writing code, working in a shop, etc.—and with the experience to apply these skills to create change. Bot-Provoking members are empowered to independently start outreach programs, to lead collaborative teams, to teach, and to enact positive change in their community. As a team, we spread FIRST; more importantly, we inspire changemakers to take the spirit of FIRST past the limits of a single team.