

Chairman's Award - Team 4904

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2021 - Team 4904

Team Number

4904

Team Nickname

Bot-Provoking

Team Location

San Mateo, California - 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.

When students join 4904, they are surrounded by a supportive and collaborative environment that inspires them to make change using what they learn. In 2019, 75% of our upperclassmen pursued STEM internships, gaining valuable experience that they bring back to the team. 100% of our alumni are pursuing higher education with 97.5% majoring in STEM fields. After graduating, our alumni continue to give back to the team by attending events such as design reviews or kickoff and by providing advice.

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

Team 4904 encompasses 22% of our school's student body. Members have a wide array of interests/strengths which we utilize by encouraging collaboration and both technical and nontechnical involvement. Our local community is densely populated with FRC teams which has helped us easily assist other teams. Alongside 5026, 253, 4990, and 840, we run an annual FRC practice field and our open-shop policy enables teams to use our tools to manufacture parts that they are unable to make on their own.

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?

We prioritize sustainability by partnering with annual multi-day event organizers to demo our robot at the San Mateo County Fair, Nueva STEM fair, and the Maker Faire. While we typically reach around 4,500 people annually, our outreach emphasizes forming meaningful connections with the community such as through talking to students of all ages about how they can get involved with *FIRST*. Ultimately, our focus on establishing relationships enables us to more effectively advance *FIRST*'s message.

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

4904 runs annual FLL and FTC qualifiers where we support participating teams, volunteer, and engage younger students through demoing our robot. Our students are eager to assist teams at competitions, helping with debugging code to mechanical fixes. While assisting or mentoring, we focus on helping other teams learn through engaging them in problem-solving rather than just fixing it for them. Our members act as role models by spreading collaboration and patience to the *FIRST* community.

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

We started FRC Team 7468 and two FLL teams at Parkside Middle School which we continue to mentor. We have also continued to update our publicly available FLL book which helps new teams understand the basics of competing. We assisted FTC team 13905 with their organizational structure and routinely assist local FRC teams, giving them access to our shop and collaborating to run a practice field. At competitions, we continue this supportive mentality by assisting other less-experienced teams.

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?

We run an annual summer camp that uses FLL to get students excited about STEM. We started Drones for Good (DFG), an annual drone competition that introduces middle schoolers to STEM, teamwork, and creative problem solving. 30+ students across 6 teams have been involved with DFG. We also partner with Peninsula Bridge to design and run a year-long math/robotics class for 20 low-income, high-achieving students annually. This program's open-ended format stresses experimentation and resilience.

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

We funded \$9000 worth of tools and acted as peer mentors in our school's maker space which helped create new engineering classes and increase school-wide STEM participation. We've also partnered with 2 schools in San Bruno; after helping a science teacher develop a robotics unit, we started 2 FLL teams at the middle school. The donated materials and curriculum we designed have inspired four years of 4th and 5th graders and the FLL teams have expanded these opportunities to 3 more grades.

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

Anyone can join Team 4904 regardless of experience or identity. 46% of our team is non-male identifying and 67% identifies as non-white. After recognizing it as an area of growth three years ago, our leadership now mimics the gender ratio of our full team at 45% non-male identifying. This year, our dedicated Inclusion subteam ran workshops educating members using *FIRST*'s youth training modules which we plan on continuing and growing to include other teams in future years.

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

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. We have also made it a goal to prioritize long term partnerships with outreach organizations and multi-year sponsors. Additionally, this year we worked on a contingency plan that outlines how our team would run if our funding was unexpectedly cut off for two years.

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

We utilize social media platforms, merchandise, and professional relationships with other teams/non-profits to recruit new sponsors. Sponsors are sent periodic newsletters, update videos and daily documentation detailing our progress. We also handwrite a thank-you note, send a team picture, and include their logo on our team gear, robots, pit space, and website to show our appreciation. Multi-year sponsors include Google, BAE Systems, Dassault Systemes, Maxx Metals, Altium Designer and Weller.

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

With ~100 members, ensuring that everyone is aware of what is happening on all parts of the team, particularly while we are remote, is difficult. Last year, we made it a goal to improve our communication and so far we have implemented daily documentation updates on our website for members who miss meetings or are interested in knowing what other subteams are working on and have increased the depth of articles on our wiki. We are also constantly brainstorming/testing out new solutions.

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

"Bot-Provoking is a student-run and student-led team that strives to empower students through meaningful, collaborative experiences." Our mission statement, which aligns with *FIRST*'s, drives our goals. We inspire students to act as leaders and learn from each other while growing their skills in STEM and effective teamwork. Furthermore, we equip students with the tools to succeed as changemakers by giving students opportunities to innovate and implement their own creative ideas on the 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.

All Bot-Provoking members are involved in both technical and nontechnical work. We value giving members opportunities to explore cross-subteam interests and discover new topics that they may not initially have been interested in. With all students contributing to both nontechnical and technical subteams, we are able to have diverse ideas and greater collaboration. We believe that both aspects are equally important to upholding our mission and thus, we aim to expose all team members to both.

Essay

Walking down the hallway you begin to notice it: the chatter of voices from the room on the left and the mechanical whir of machines. You take a left and enter 112. The room is full of students chatting excitedly eager for the meeting to start. This is Team 4904: Bot-Provoking.

Bot-Provoking has no barriers for entry and as a result, our 95 members encompass 22% of our school's student body. 46% of the team is non-male identifying and 67% identifies as non-white. Furthermore, 45% of our leadership is non-male identifying, matching the full team gender ratio. Over the last few years, increasing our diversity—especially in leadership positions—has been a primary area of growth. We are proud to have improved from the 2017-18 season's 32% non-male identifying students team wide and 22% in leadership positions with the help of our dedicated Inclusion subteam.

The meeting begins: the room falls silent as two students walk to the front to share the daily announcements. Looking around, you might notice that there are very few adults in the room, and those who are there are primarily there for supervision. This is because 4904 is a student-run and student-led team, empowering students to take charge of everything from management and business to machining parts for the robot. The announcements come to an end and the students begin to disperse into four technical subteams: Design, Fabrication, Electronics, and Programming.

During the first meeting of the year, new members rotate through all of the technical subteams—listening to presentations and participating in activities—allowing each member to make an informed choice about which subteam best suits their interests. As with joining the team, anyone is welcome on any subteam regardless of prior knowledge or grade level.

Walking into the adjacent room, you see one of the design subteam leaders teaching new members the basics of CAD, while the other works on intake prototyping. We believe strongly in student-driven sustainable knowledge retention. Every subteam is led by two subteam leaders—which are never both seniors—in order to pass down knowledge between years.

Across the courtyard, you walk into the electronics lab where members work collaboratively to assemble PCBs: one student stabilizes the surface mount pieces with tiny tweezers while the other student carefully holds the soldering iron. These soldering irons are just one example of some of the tools that we have donated to our school's makerspace. In total, we have funded over \$9,000 worth of tools and have partnered with our school to split the cost of more expensive machines which has helped expand our school's STEM class offerings and increase our technical capabilities.

Heading back inside into the shop, an older fabrication member teaches a younger member about the router, ensuring that once the older member graduates, the gears of the team will continue to turn. 4904 extends this mentality of teaching to the whole school through the Peer Mentor Program. Experienced members of the team can sign up to become Peer Mentors, supporting all students that enter the shop to bring their creativity to fruition. This initiative has increased STEM participation, excitement, and confidence in our school's community.

On other days, you may even see members from different schools working in the shop. This is because of Team 4904's open shop policy, giving local FRC teams the tools to continue the creation of their robot. If members of these teams are unsure of how to operate the tools in the shop, we make sure to give their members the skills they need to fashion parts with their own hands. Furthermore, we bring a similar open policy to competitions, sharing tools, spare parts, and expertise with FRC teams who need them.

Our quest to grow the FRC community extends beyond our willingness to assist teams in our shop. In 2019, we started FRC Team 7468: Firebolts in partnership with the board of KIPP Bay Area. After giving them tours of our shop and inviting some of their students to an offseason event, we supported the team through the following season where they were highly successful as the captain of the 5th seeded alliance. We hope to expand our work with KIPP Bay Area to start more teams in order to provide other students with the opportunities to have hands-on engineering experience.

In order to see the last subteam, you'll need to take a quick five minute walk through a parking lot to the San Mateo Event Center where a practice field is set up. Here, the programming subteam works to test a variety of code. We run this practice field—which is open to any FRC team in the Bay Area—in collaboration with teams 253, 840, 4990, and 5026. Teams have the opportunity to test their robots, exchange ideas with each other, and collaborate with other students. Off of the field, other programming members work to write articles for the website. Through our online wiki, we are able to preserve technical expertise for future years and share resources with the broader FRC community.

After an hour and a half of technical time, the subteams return to the main room to hear about the team's current nontechnical projects from our outreach, inclusion, and business subteams. All Bot-Provoking members are involved in both technical and nontechnical work. This enables members to have the opportunity to experiment with their interests and develop passions that span across different aspects of the team.

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Both our outreach and business subteams focus on establishing meaningful relationships, increasing the sustainability and effectiveness of our initiatives. Our approach to outreach is rooted in providing students of all backgrounds with hands-on experiences.

We partner with John Muir Elementary school and Parkside Middle School in San Bruno. After inspiring a science teacher to incorporate robotics into the 4th and 5th grade curriculum, we designed an 8 week Lego robotics and engineering curriculum. This curriculum has now been used for three years across multiple grades with the support of our donated supplies. Following the excitement and success of the lessons, we started 2 FLL teams at the middle school, continuing the students' engineering exposure. For many of the students, our programs are their first exposure to hands-on STEM learning.

Since our founding, we have been committed to providing mentorship and guidance to younger FIRST teams. We run both an FLL and FTC tournament annually where 4904 members volunteer and support participating teams. For the last 6 years, we have run an FLL summer camp where students are introduced to robotics in a fun and collaborative way. Additionally, we have continued to update our publicly available FLL book which walks new teams through all aspects of FLL and running a team. Outside of these methods, our members have assisted both FTC and FLL teams. We helped FTC team 13905 with their organizational structure and have worked directly with 14 other FLL and FTC teams.

Additionally, we collaborate with Peninsula Bridge, a tutoring organization that targets low-income, high achieving students, to run a yearlong after school robotics and math class. 4904 members designed curriculum and acted as teaching assistants, teaching students about experimentation and resilience.

Even in our robot demos, we emphasize the importance of meaningful interactions. Each year 4904 participates in the Maker Faire, Nueva STEM Fair, and San Mateo County Fair, three multi day events that bring in visitors from around the Bay Area. We have also shared our robot at Dream Machines, the San Mateo Public Library, and Curiodyssey. At each event, we let event attendees drive our robot as well as share with people of all ages about our team and ways that they can get involved with FIRST. While we are able to reach around 4500 people during these events, we believe that the meaningful conversations we are able to have at these events are the most important.

The focus of today's meeting is on preparing for the upcoming DFG (Drones for Good) competition. Some members work to assemble PVC pipe obstacles while others learn about the drones to provide technical support. DFG is designed to teach middle schoolers about STEM, teamwork, problem solving, and real world applications of emerging technology using drones. Since it was started in 2018, the program has impacted over 30 students across 6 teams. While DFG is now an annual event, it began as an idea from some of our members who were passionate about starting a drone competition. 4904 supported these members to bring this idea to fruition, highlighting our goal to not only expose members to robotics, but also to allow them to become leaders, making change on and off of the team using what they have learned.

Non-technical time comes to an end and when returning to Room 112, you notice some older students in 4904 t-shirts with slightly different designs. These are our alumni, who make frequent visits back to the team, helping at kickoff and design reviews, and teaching current members for complex topics that they can bring with them. FIRST has had a strong impact on our alumni, with 100% of them pursuing higher education and 97.5% majoring in STEM related fields.

As the meeting ends, machines are powered off and totes are stacked back in closets. While this is just a snapshot of Team 4904, throughout every activity, our members are engaged in meaningful and collaborative work.

This past year, our meetings have shifted online. Instead of team gatherings in room 112, rows of small boxes fill the Zoom screen. While transitioning online has brought challenges, it has also given us an opportunity to find creative ways to advance the team's mission and spread the values of FIRST. Whether it be planning a virtual DFG competition or implementing team bonding activities, Bot-Provoking continues to empower team members and those in our community to pursue their interests in STEM.