

## Chairman's Award - Team 604

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2016 - Team 604

### Team Number

604

### Team Name, Corporate/University Sponsors

Brin Wojcicki Foundation / IBM / Google.org / Qualcomm / Apple / Team Grandma / BAE Systems / Western Digital / WAGIC / Lockheed Martin / TE connectivity / Leland Bridge / Intuitive Surgical / San Jose City Councilman J. Khamis / eBay / Cisco / Dell / Benevity / MDR Precision / SOLIDWORKS / Sierra Radio Systems / HSC Electronic Supply / Hurricane Electric / Dropbox / GitHub / STL Shipping by FRC3256 & Leland High

### Briefly describe the impact of the *FIRST* program on team participants with special emphasis on the 2015/2016 year and the preceding two to five years

100% of alumni went to college. Since 2010: 80% in STEM majors; 3 FIRST scholarships + other merit; 1-NSF grad fellowship; FIRST SpaceX internship; sponsors hire interns. Community Service-10K hrs; 42% growth in 5yrs: 2016 team is 30% female & 36% with JrFLL/FLL/other robotics experience. FIRST builds a tight community of alumni & introduces students to new skills & friends; gives confidence to stay on task & succeed under deadlines & pressure; value of teamwork & respect for the individual.

### Describe the impact of the *FIRST* program on your community with special emphasis on the 2015/2016 year and the preceding two to five years

LelandHS named SJUSD "Communication&Technology" school in '13. 4 Project Lead the Way Classes - taken by 750+ Leland students in 5yrs; Gateway-to-Technology & Robotics classes at 2 middle schools & 4 other HS. In 2014- 2 Intro CS & APCS classes at Leland & 2015 CS class at other HS's; CS classes will be in all SJUSD HS in 3 yrs; 7 FLL Quixilver Qualifiers in past 8yrs; Local demos- Art&Wine, Starbucks, Toys4Tots, County Fairs; elementary school science fairs; Mentored 13 FLL teams in 5 yrs.

### Team's innovative or creative method to spread the *FIRST* message

Presentations to SJUSD board followed by meetings in our build room; SJ City Council recognition, commendations & attendance at SVR. Engineering alphabet cards/Posters to elem. schools/CAD coloring pages to local schools&restaurants; STEM materials to local schools; Robot Driver Licenses; SVR Tickets; Maker Faire; AT&T Science Festival; Computer classes for senior citizens; Demos & FIRST handouts at Stanford BioX, County Fair, SJ Family Shelter, Take Flight 4 Kids, Hot SJ Nights/STEAM festival.

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

Our dedication, enthusiasm, and robots draw 1 million people/year in at 40+ community events. We volunteer at both STEM & non-STEM events. We collect & distribute AP&SAT books to underserved schools in SJ. We distribute the KOP (9yrs) reducing time from hrs to 12min for 67 teams. Share mentors and supplies with other teams. Refurbished computers & taught CAD to SpEd. We helped 5 other teams with WFA essays. Sustainability savings through cafeteria work/ewaste/garage sales/Christmas tree sales.

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

Started FRC 2135,2643,2854,3022,3256,5027, still maintaining close relationships. FIRST handouts at every demo event, CTA & math conferences & national PTA; Presented benefits of FIRST to SJ school board with FRC668. In 2014 sent emails & literature to 1100 HS's in US without FIRST teams. In 2015 started "Project InSite" database to identify missing FRC teams, gave spreadsheets to FIRST HQ & all regional directors. Mentors talk directly to HS administrators/potential mentors about FRC benefits.

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

Free yearly Build a Robot Day classes-90+ kids&parents-leads to new JrFLL&FLL teams. Partnering with elem.school principals to start JrFLL&FLL teams. Demos/Q&A at local schools' ice cream socials, open houses, back to school night, science fairs; FIRST literature at all demos. Summer visits to India, Peru&Honduras, members&alumni give FLL talks/demos to schools. Started&mentored FTC team 8404 in 2014 w/ students from middle school robotics class&Leland; FLL/FTC/FRC events advertised to community

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

## through the *FIRST* program

Local FLL teams visit during build season; Talk to FLL teams @ tournaments we volunteer at & give our contact info; FRC robot displays at FLL events & K-6 science fairs. Encourage FLL members to join FTC/FRC team in MS/HS. Helping start FLL tournament in Carmel in 2016. Mentoring *FIRST* teams at all levels by team members & alumni. Invite area FRC/FTC/FLL teams to join us at community demos. 604 Mentors/Students give workshops at WRRF. Open House during build. Share team training materials.

## 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)

Worked with FRC 256,2643&3256 to help 5027 on weekends with safety, design, team organization&building. We share mentors, safety manual&team workshops with other teams (FRC 2135, 3256, 5027). 604 Alumni mentoring their own FLL, FTC, FRC teams. Alumni volunteer at *FIRST* events around the US; Organized&gave workshops on CAD, team management, chairman's, & programming @Santa Clara University for younger teams; Project InSite uses the Blue Alliance to identify FRC teams who left via geographic area.

## Describe your Corporate/University Sponsors

Our sponsors come from *FIRST*, parents' workplaces & new grant applications we identify via online searches, like BEST BUY. Long-term financial sponsors: IBM, BAE, BRIN/GOOGLE, WD, QUALCOMM. In-kind sponsors: QMD, MDR, SIERRA RADIO, HSC, HE, SOLIDWORKS & DROPBOX. New this year: APPLE. Sponsors provide mentors, internships, material & workspace. SCHOOL: provides dedicated room for robotics to use, allowing work on weekends & hosting other FRC teams at sessions. Machining at universities by alumni.

## Describe the strength of your partnership with your sponsors with special emphasis on the 2015/2016 year and the preceding two to five years

We work for our sponsors! IBM: 9yrs visibility, funding; sharing expertise; our lesson plans used for employees' outreach; we run 4TYCTWD + 2 summer camps; alum get internships. BAE: 9yrs girl engr. events. BRIN/GOOGLE: 6yrs demos at Googleween & HQ. WD: 8yrs & led to sponsoring other teams. MDR: 7yrs created website in exchange for machining. INTUITIVE SURGICAL: 5yrs Robonanza+OpenHouse, plans for using Engineering Activities book at TYCTWD. SCHOOL-work in cafeteria (\$3-5K/yr) for 7yrs.

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

*FIRST* is a robotics program that's about more than just building robots; it's about opening new opportunities. Students work with professionals to learn practical skills about STEM, having fun and forming friendships along the way. But it doesn't stop there; students pay it forward and pass on what they've learned to others in their school, community, and abroad. In a world focused on celebrities & selfies, *FIRST* teaches collaboration and working against deadlines in order to improve our future.

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

Collect BoxTops for Education for MS science programs - \$3000+ over 5 years. Commendation from SJ Mayor's office in 2008, 2013, & 2015 for exceptional outreach. Engr. Activities at the San Jose Family Shelter. Organized and recruited FRC team volunteers for Toys4Tots for past 3 years, volunteered for 9yrs. One of 19 schools selected by PG&E to build SolarSuitcases for Kenya. 604's Robot & presentation at Apple HQ for official worldwide *FIRST* announcement, helping *FIRST*'s business plan.

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

Rayna Mehta

## Essay

*FIRST* Team 604 Quixilver, from Leland High School, San José CA, was formed in 2001 by math teacher Helen Arrington, who is still our long-time dedicated mentor. This year marks the 15th anniversary of our team and through the years we've developed a collection of core activities to spread STEM and *FIRST* and continue exploring new ideas to expand and improve upon our successes. We build more than just robots, we build character, STEM education, partnerships, and a community.

Originally, our school district recognized Leland as only a Communications school. Our members saw the need for more hands-on STEM classes, so in 2008, our mentors went through training to bring Project Lead the Way engineering classes to Leland. In the past six years, the popularity of the classes has led to more sections-from one Intro to Engineering Design to five sections of different courses including Digital Electronics and Aerospace Engineering. The percentage of girls enrolled has also increased from 6% to 50% and it's now common to find athletes CADing. Seeing the impact on students at our school, we helped bring PLTW to two middle schools and four other high schools, reaching over 1200 students each year. There are now three sections of the Gateway to Technology PLTW class at our feeder middle school, where 43% of our members became more involved in STEM. To further STEM

education at Leland, we partnered with the Computer Science Club in 2013 and petitioned the school board to add CS classes. Intro to CS and APCS classes were offered in 2014. The board was so impressed with the high demand that they are adding them to all high schools in the district over the next three years; two have already made that addition. Due to 604's effort, Leland is now a Communications and Technology School.

Because of the changing academic environment, we created and compiled math Common Core Lesson Plans and Resources for all grade levels. Some of the lesson plans take a unique approach by using Legos to visually represent elementary level math. Last year, we uploaded them to education websites, reaching over 1700 teachers at 45 different schools. This year, to expand our lesson plans we've begun adding more middle and high school geometry concepts using Legos and K'NEX.

In 2011, we created a Science and Engineering Activities Book, full of science experiments that use everyday materials along with questions to spark critical thinking. To make these books more accessible, team members who know a second language have translated them into five languages with two more in progress. These translated books have been used in foreign language classes in at least four schools and will be distributed to Honduras, Cambodia and China this summer. To help science teachers with adopting the new Next Generation Science Standards in CA, we added them to our books for them to use in their classes. Last year, we started taking these books to the San José Family Shelter, opening new doors for underserved families. This motivated us to reach an even broader audience and kids with different learning styles, so we're filming YouTube videos to demonstrate the activities and ask "what-if" questions to further their learning experience.

This past winter, 29 high school and college educators from Hunan, China visited the San Francisco Bay Area, including the head of the Hunan education department. Along with touring several tech companies, they learned about STEM education at Leland-the only school they chose to visit. We discussed our PLTW program and they drove our robots. We also gave them the Chinese version of our Science and Engineering Activity Books to use at their schools. They were impressed with the books and asked for more to distribute which we'll mail soon. Representatives from Congressman Mike Honda's office also visited Leland for our "outstanding STEM program". After learning about our outreach and seeing our robots, they asked Mrs. Arrington to be on a CA state committee to evaluate educational applications for the congressman's office.

In addition to introducing academic courses and attending 40+ community events each year, we've built a pipeline to continuously engage students of all ages and help them transition between FIRST programs. The first stage is encouraging the growth of FLL teams by showing how much fun STEM can be. We do that by running an FLL Qualifier, holding Build a Robot classes, and presenting at demos. Our qualifiers are so well-loved that we were approached to help start a qualifier in Carmel this upcoming season. We've also partnered with elementary school principals and veteran FLL teams in the area to hold introductory meetings about FIRST at local schools. Many FLL students we mentor are inspired to join FRC and become FLL mentors themselves. We're now at our third generation of students becoming mentors, and hope to be at a fourth next year. Due to the large number of rookie teams in need of mentoring, we are setting up group mentoring at Leland to teach them the skills they need for FLL. To present another option besides FLL for middle school students in our area, we formed and mentored FTC Team 8404 as a partnership with Leland and our feeder middle school. In two years, they've won four awards, further inspiring the students to continue with FIRST. We will continue mentoring this FTC team and gather resources for creating other sustainable teams in the upcoming years. As a result, students have multiple robotics programs to choose from in middle and high school.

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FRC is the final phase of the pipeline and we continue to make sure the number of teams grows. Over the years we've started six FRC teams and mentored nine more. Similar to our FTC mentoring, we work closely with our rookie teams, inviting them to our workspace and sharing resources. We make sure they understand that FIRST is more than building robots-it's about changing our culture and inspiring students. We're especially proud of a team we started in 2010, FRC 3256, who took this to heart and are now a Chairman's Award team themselves. With this pipeline, students are able to continue their involvement in STEM through FIRST and are prepared for future STEM careers. Just as FLL students are inspired to mentor FLL teams after they join FRC, current FRC members are also inspired to become mentors after they graduate. But our alumni don't just mentor teams, they become teachers and start their own FIRST teams, volunteer at STEM events, run off-season FIRST events, and become role models to their mentees.

In early 2014, in order to launch new FTC and FRC teams nationally, we sent letters to the top 20 and bottom 10 performing schools in each state, informing them about FIRST and offering to help start teams, but the results we received were not as expected. We stepped back and figured out our next steps; while contacting the schools, we noticed that many of them had inactive FRC teams, leading us to start Project InSite in late 2014. We used data from 1997 to 2016 on TheBlueAlliance.com to identify all inactive FRC teams, calculate retention rates, and determine the probability of teams returning after being inactive for several years. We shared this information with all FRC Regional Directors and FIRST HQ in 2015, of which CA Senior Regional Director Jim Beck said, "604's database has probably had a strong influence on the high retention rate of teams this year." While working to reestablish three teams over the past two years, we've realized the importance of having personal guidance from a veteran team. Using the information we collected from Project InSite, we're now matching veteran teams with inactive teams' schools to assist the schools with the restarting process. Upon sharing our plan, NorCal Regional Director Janet McKinley commented, "604 has come up with a very innovative way of rekindling dormant CA teams by having sustaining teams reach out locally to help them back into the program; they are the embodiment of Gracious Professionalism."

A large part of our success can be attributed to the close partnerships we maintain with our sponsors. Our Take Your Child To Work Day workshops, engineering week presentations, seasonal activities, and demos are always in demand.

We are especially proud of our nine year partnership with IBM, which has allowed us to start several engaging educational programs. We started by giving an interactive presentation about FIRST at their Girls and Boys Technology Camps to middle school students. Two years later, IBM invited us to their TYCTWD where we taught employees' children how to build Lego NXT robots and introduced FIRST to the parents. These are still ongoing events that we do. We also updated the corresponding lesson plans for these workshops to improve the children's experience of building robots. Seeing the popularity of these events, IBM has provided NXT kits for our annual free Build a Lego Robot Day at Leland for the past four years. These classes have reached 200+ children and parents and led to at least one new JrFLL or FLL team being formed every year. This year, to inspire more girls to pursue careers in engineering, we planned a discussion panel with women in engineering at IBM. 30 girls attended the initial event from several Leland clubs, including Girls Who Code, Future Business Leaders of America, and Robotics. Through our partnerships with other FIRST teams in the area, we plan to include girls from other schools and clubs. For fifteen years, our core activities-running demos, teaching children, and helping other teams-have never changed, but we continue to adapt and enhance our ways of inspiring others. Using the diverse interests and backgrounds on the team, we have become a driving force for STEM and FIRST locally, nationally, and globally. To influence and spark an interest in STEM in more people, we are committed to continuing our efforts and making sure that everyone has the opportunity to come in FIRST!

2016 - Team 604

Picture 1



2016 - Team 604

Picture 2



2016 - Team 604

Picture 3



2016 - Team 604

Picture 4

