FIRST Impact Award - Team 1072

2023 - Team 1072

Team Number

1072

Team Nickname

Harker Robotics

Team Location

San Jose, CA - 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.

Team 1072 has 100% high school graduation and college attendance rates. 100% of our alumni pursue STEM careers, many participating in STEM teams and prestigious programs such as Caltech's DARPA Team, UMich's Mars Rover Team, Columbia's Egleston Scholars, and UT Austin's Turing Scholars. A 2021 alum expressed a sentiment many on the team share: "1072 has become a second home over the years, and I could not be more grateful for the experiences, skills, and friendships I've gained from this team."

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

Located in Silicon Valley and surrounded by STEM innovation, we form relationships with the companies around us and take advantage of the opportunities they offer, such as J&J's FIRST Teams Day, to further our team's education. However, we recognize our privilege as a funded private school team and will host Robocamp—an introductory course for underserved kids in East San Jose middle schools—to spread the FIRST message to an area that lacks access to proper resources for STEM education.

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 spread the FIRST message through our educational robotics outreach programs to increase excitement for FRC in our community. For example, we host Wonderbots, a free introductory robotics course for middle school girls, where students learn to create different LEGO robot designs with creative, practical applications. Many students love the course so much that they go on to join FIRST in high school. We measure our results through the amount of people we spread FIRST to and the impact we make.

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

Our software director published an open-source sysID customization on GitHub for other teams to use to characterize motors and subsystems. We included an additional feature that allowed motors on custom CANbuses to also be characterized. We also update and maintain an open-source library on GitHub named HarkerRoboLib to enhance and complement WPILib and Phoenix APIs. This year, we created a TalonFX motor builder and a conversions file to convert from native units on a TalonFX motor to metric.

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

Team 1072 has introduced 50 middle school and 130 elementary school students from Harker to FLL in the past 3 years, forming 16 new teams and hosting 3 intramurals open to students of all experience levels. Our student mentors teach a curriculum covering introductory EV3 topics and foster a welcoming environment promoting creativity and experimentation. Furthermore, with our three registered FLL teams, we encourage passionate students to showcase their skills at local FLL competitions.

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?

1072 runs a VEX robotics program to introduce Harker middle school students to robotics. Participants learn to build and code their own robots from scratch while gaining valuable teamwork and communication skills. Members from our team work closely with the students to teach them the principles of good design and guide them through the building process. Many of these middle school students have gone on to join 1072 and have become valuable members of the team.

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

Team 1072 partners with the Harker School, Santana Row, and the Bay Area Science Festival Discovery Day to spread the message of FIRST through our public robot demonstration days. We teach children to drive our robot, often providing a DDR pad to make the activity more appealing and accessible for energetic young kids. Additionally, we provide their parents resources for involving their children in FIRST. Since 2020, we have introduced hundreds of families to FIRST robotics.

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

1072 strives to cultivate diversity and encourage the involvement of women in STEM. 2 out of 3 of our co-presidents and 6 out of 10 of our directors are female. They serve as role models for our entire team and work towards creating an equitable environment. Furthermore, we ensure that we include all younger members of our team by prioritizing training and involving them in larger projects. Additionally, we promote diversity beyond our team with Wonderbots, which introduces young girls to STEM.

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

We prioritize team longevity by maintaining comprehensive documentation for future years' use: leadership members write guides about their positions' responsibilities and create extensive online training materials. We hold a summer camp dedicated to training incoming freshmen and use the off-season to prepare newcomers for build season. Finally, 1072 maintains open channels of communication

between team members, leadership, and alumni, who are available to answer questions and provide advice.

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

1072 maintains strong partnerships with Alan Steel, Automation Direct, GitHub, The Cook Family, Google, Johnson & Johnson, Carpeteria, and the Harker School. We continually reach out to prospective sponsors, advertising our team. To engage with and retain our sponsors, we send them team merchandise in gratitude; display their logos on our robot, website, and merchandise; and advertise them on social media. We also hold many demo days at Harker events to help them attract potential families.

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

We want to increase the involvement of our technical subteam members in outreach initiatives, so we have imposed a minimum outreach hour requirement for members to be allowed to attend competitions. We also require our technical directors to volunteer for our outreach programs and demo days. As a result, our outreach efforts are far better staffed this year than in previous years, and we will continue improving member engagement with outreach, scaling our current programs and creating new ones.

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

1072 places a strong emphasis on spreading STEM to the next generation of innovators. We host Wonderbots, mentor 16 FLL teams, and guide four advanced middle school robotics teams. Our Wonderbots and FLL curriculums focus on teaching basic coding concepts, while our VEX middle school robotics program aims to teach students how to assemble a robot from scratch. In order to give participants competition experience, we host intramurals for our FLL teams and intermediate teams.

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.

In the spirit of Coopertition, our team is currently building an app called The Purple Warehouse that will serve as a platform for teams to share resources in an organized and engaging manner. One feature launching at our first 2023 competition is our scouting app and analyzer. Teams that contribute their scouting data to our shared database will reap the benefits of our sophisticated data analysis and match prediction software. We plan to make the app available globally within the next year.

Essay

Team 1072 was founded in 2003 at The Harker School by our head administrative mentor, Dr. Eric R. Nelson, and aims to provide hands-on experience with robots and machines for our club members. We learn the organizational and teamwork skills required to successfully design and build robots for the FIRST competition. We perform with joy, professionalism, and excellence, while sharing our knowledge and experience with our larger community. Regarding our team structure, Team 1072 is divided into 2 groups of subteams, technical and operational, with each subteam having 1-2 directors. Technical subteams work directly on the robot and consist of design, machining, mechanical, electrical, and software. Operational subteams cover all other aspects of the team, including media/PR, app development, scouting/strategy, and outreach. Team 1072 has over 60 active members, and most of them work across multiple subteams. We also have three co-presidents that ensure the team is functioning well and also oversee the budgeting and high-level decision-making of the team; they consist of an Executive President, a Technical President, and an Operational President. Our two mentors, Dr. Nelson and Mr. Baynes, help us with administrative work, and parent volunteers assist with field construction. However, our team is extremely student-run, and our mentors rarely work directly on technical aspects of the robot. HELPING OTHER FIRST TEAMS - COOPERTITION Harker Helpers is a prime example of the FIRST core values and philosophies of teamwork and Coopertition. During SVR in 2022, 1072 started Harker Helpers, in which a group of technical members would go to our alliance partners and inspect their robots before matches. As a result, none of our alliance partners had major robot issues during qualifying matches. We hope to expand Harker Helpers' influence in future years by continuing to help alliance partners as well as other teams. After the success of Harker Helpers, we wanted to take our mission of collaborating with other teams to the next level. As strong believers in the FIRST philosophies of Gracious Professionalism and Coopertition, we seek to facilitate collaboration across teams in an environment where all contributions are respected, valued, and encouraged, even in competitive settings. To that end, we are developing The Purple Warehouse, an app for teams to share resources in an organized and engaging manner. The app features a gamified social feed where teams can post resources (including software documentation, CAD tutorials, outreach program guides, and more) to help other teams, especially those newer to FIRST robotics. The materials posted are automatically organized into an intuitive navigable repository and sorted by their impact on teams, making it easy for others to discover high-quality resources in future years. Among other upcoming features that embody FIRST philosophies and core values, we also hope to make the process of scouting more collaborative through The Purple Warehouse. Last year, our scouting subteam created an advanced scouting analyzer, which included not only visual representations of data through a plethora of graphs and charts but also displayed accurate match prediction and internal ranking algorithms. We recognize that newer teams may not have the adequate team size or experience to scout all robots at every match or analyze large quantities of data. Therefore, as part of The Purple Warehouse, we are creating a free, open-source scouting interface and analyzer for teams at FRC competitions to easily input data about robot performance and contribute to a shared pool of scouting data. Users can view statistics and trends for teams as well as predictions and analyses, creating a foundation for scouting among FRC teams. Since this initiative is launching this season, we are focusing on rookies and small teams at the same competitions as us so that we can be on standby for issues or questions. With more revisions, we will be able to improve user experience and share our team's love for scouting. Furthering our goal to share resources with other FRC teams, our software director created an open-source sysID customization for other teams to use to characterize motors and subsystems, with features to allow motors on custom CANbuses to be characterized. We also update and maintain an open-source library (HarkerRoboLib) to enhance and complement WPILib and Phoenix APIs. This year, we added a TalonFX motor builder and a conversions file (converts from native units on a TalonFX motor to metric) to our library. Our robot code, library, and sysID customization have all been published on GitHub for other

teams to reference. FOSTERING AND INSPIRING THE FUTURE OF FIRST Team 1072 strives to inspire a new generation of innovators through our outreach initiatives: Wonderbots, FLL, and VEX. In the spring of 2019, we started Wonderbots, a free introductory robotics program for middle school girls, in order to encourage girls in STEAM. Our program provides students with LEGO Spike Prime kits and teaches them a variety of coding topics. We continue to improve our curriculum each year, and we modified it this year to focus more on teaching students how to build and program robots from scratch. Our FLL program for middle school students began shortly after, in the fall of the same year. Since then, we have shifted the focus of our FLL program to elementary school students, introducing FIRST robotics to students at an earlier age. This shift also caused the number of participants to skyrocket from 10 in previous years to 80 this year. The FLL mentors foster a welcoming environment, promoting creativity and experimentation. Throughout the program, students work with LEGO EV3 Mindstorms robots and learn how to utilize programming, innovation, and mechanical skills to accomplish each year's FLL game missions. Last but not least, we hold a VEX robotics program for middle schoolers to brief them on FRC principles before they reach high school. 1072 volunteers meet with students weekly to guide and support them as they build robots, teaching them good design, assembly, and coding practices. Many alumni of our middle school VEX program go on to become valuable members of our team in high school, and this year, our software director and Dean's List nominee was a former student of the VEX program. Within our school, volunteers from our team set up annual demonstrations for the school's biggest events: Harker Day, Research Symposium, and Open House. These events are open to families and alumni from all campuses, and 1072 plays a huge role in providing engaging activities through robot demos. These events encourage families and alumni to ask questions and learn more about the structure of our team and FRC. Our involvement in school-wide events has inspired many elementary and middle school students to join our robotics outreach programs and attracted new students and families to the school. We also host demos for our community at AT&T Discovery Day and local malls, and we pass out flyers with information about FRC and our team. In order to creatively engage younger audiences, we also built a DDR pad that demo participants can step on to control our robot. Team 1072 prides itself on being able to give back to our school and local community, especially when we see younger students become inspired to also pursue robotics through our initiatives. Within the FIRST community, for the first time since the pandemic, 1072 attended and served a full breakfast to 200+ attendees at the Pioneer High School Kickoff, continuing a decade-long tradition. We brought an assortment of breakfast food and beverages and had 18 volunteers from our team prepare it for all attendees at the event. We also showcased our PancakeBot (a robot that 3D prints pancakes onto a griddle) as a fun outreach initiative that we plan to use at future demonstrations and events to inspire an interest in robotics and a love for engineering. IMPLEMENTING FIRST VALUES INTO OUR PLANS FOR THE FUTURE We also seek to impact our community by "applying what we learn to improve our world." 1072 has partnered with Harker's environmental club, Harker Green Team, to create a Smoothie Bike, which consists of a blender powered by a stationary bike. We led our new members to create a CAD model for the bike stand and blender attachment, and we will build the Smoothie Bike this April to have it ready for Green Team's Earth Week activities. To ensure that our building and sourcing process was sustainable and eco-friendly, we thrifted a second-hand bike from Good Karma Bikes (a local small business) and repurposed an old broken blender. The purpose of this collaboration is to promote upcycling, renewable energy, and waste reduction. We utilize our unique access to resources and tools to help Green Team educate our school about important issues and initiate change within our community. We are very proud of the progress our outreach programs have made, but we have even more goals cresting the horizon. For example, we will launch Robocamp, a free introductory robotics course, to underprivileged students in the Bay Area. The five-class course will be held at a public middle school in East San Jose, an underserved community, and will cover basic engineering skills by teaching students

to assemble, program, and drive LEGO Spike Prime robots. Through this program, 1072 hopes to make STEM education more accessible, especially for underprivileged communities. THE IMPACT OF OUR TEAM Harker Robotics measures success in terms of the impact we make, both inside and outside the team. From what FIRST has given us, we strive to open doors of opportunity within our community and beyond. As much as we enjoy winning matches at competitions, our priorities are to foster a collaborative learning environment, empower our members to become capable leaders, and spread the message of FIRST to the communities around us.;