

Chairman's Award - Team 3324

Team Number

3324

Team Name, Corporate/University Sponsors

PAST Foundation/Honda R&D/Boeing/Metro PTSO/CORI/The Ohio State University&Metro Early College

Briefly describe the impact of the *FIRST* program on team participants with special emphasis on the 2016/2017 year and the preceding two to five years

In 8 years, we increased the total number of members on our team from 10 to 63 students and the percentage of female members from 10% to 54%. All of our alumni have gone on to major in a STEM field at a 4-year institution, including Harvey Mudd, Cornell, Rose-Hulman, and MIT. All former members have earned an internship in places such as OSU Medical Center, Rev1 Ventures, and Battelle. Also, 32% of our team members have stayed involved with FIRST after graduation.

Describe the impact of the *FIRST* program on your community with special emphasis on the 2016/2017 year and the preceding two to five years

The Metrobots have provided opportunities in STEM to a combined 3,600 at-risk youth in the last four years by partnering with the Columbus Metropolitan Libraries, Millennium Schools, and Healthy Asian Youth. We lead workshops on Women in Engineering, physics, and sustainable energy to a variety of audiences. These, along with robot demonstrations, each uniquely promote STEM and FIRST in the Columbus area. Over the last 4 years, our team has accumulated over 27,000 service hours in our community.

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

The Metrobots work to "inspire young people to be science and technology leaders" by holding robot demonstrations at Battelle Memorial Institute, The Ohio State University, TEDx, Columbus Crew Soccer games, the Ohio State Fair, and COSI (Center of Science and Industry). We reach audiences of all ages, varying from students in grades 1-9, to the Hooligan Army of the Columbus Crew. At these events, we are able to educate others about FIRST and the amazing opportunities that come with it.

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

Our students represent 27 different school districts, so our team members reach a broad range of communities, in which we began 18 FLL teams. As the veteran team of the Center of Robotics Innovation (CORI), we host scrimmages and strategy meetings in our build space for teams in central Ohio. In our shop, we also fabricate parts for other teams and provide pit space for them to work. We have hosted 2 prospective Chinese and Russian FRC teams, allowing them to see the benefits of joining FIRST.

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

3324 is a founding member of CORI, assisting in the formation of 6 new FRC teams. Currently, we are forming 3 teams in New Jersey through mentorship and shared resources. We share our workspace with 2 FRC teams and mentor a pre-rookie team to help them transition to FRC. We hosted 2 prospective Chinese and Russian teams as well, showing them what FIRST has to offer. 3324 is influential in the ongoing formation of WOW, a new FIRST district combining Western Pennsylvania, Ohio, and West Virginia.

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

Working with the PAST Foundation, we have introduced FIRST-based courses in Metro Early College High School, Metro Institute of Technology, and the Metro Middle School. Additionally, our team formed and mentored 18 FLL teams at these schools in the last 3 seasons. Furthermore, in their 2016 season, we hosted our 4th and 5th regional FLL tournaments. We started FTC team 10441 this past season as well, to whom we continue to provide mentorship and monetary support.

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

In addition to forming numerous FIRST teams, 3324 collaborates with other teams. We manufacture and design parts for teams within our community by use of our fabrication lab, which includes a metal brake, a milling machine, 3D printers, a CNC machine, and a laser cutter. We also share all of our team documents, including project plans, outreach iBooks, and handbooks with other teams. We collaborate through these initiatives to promote maximum individual and community growth of FIRST.

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)

Over the last five years, we have assisted over 18 FLL, 2 FTC, and 10 FRC teams to help them achieve their goals. Through CORI, we host 4 FRC teams in our build space, including 1014, with whom we work to mentor other CORI teams. Among these is a pre-rookie team that will start their FRC team next season. We also work with Team 4085 to collaborate on our outreach efforts including participating in their initiative to begin the Ohio Robotics Leadership Alliance.

Describe your Corporate/University Sponsors

PAST Foundation -Build Space and collaborative environment Honda of America -Financial Contribution Honda R&D Mentors -Financial Contribution The Ohio State University -College mentors -Internships & research experiences AEP - Financial Contribution -Energy Workshop materials provided Metro PTSO -Monetary Contribution Raising Cane's - Monetary Contribution -mentorship Boeing -Entry Fee Grant -Mentors during build season Battelle Memorial Institute -In-Kind donation of materials & equipment

Describe the strength of your partnership with your sponsors with special emphasis on the 2016/2017 year and the preceding two to five years

Honda R&D and Honda of America have consistently been our biggest sponsors, offering mechanical engineering mentors to work with our students in a collaborative environment. In partnership with them, our team participates in the Honda STEMfest each year. Our corporate sponsors combine to offer 19 mentors to our team - the largest number to date. The PAST Foundation graciously provides our build space, and aided in our renovation and development of our new build space in 2016.

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

"Life-changing." "Collaboration." "Respect." "Encouragement." "Teamwork." When asked what FIRST was to them, the students of 3324 responded with these words. When pressed, they explained that these ideas meant collaborating with other local teams to build the best ideas possible; gaining exposure to unique opportunities; learning hands-on life skills; and having fun doing it. To our team, FIRST is the platform that allows us to become future STEM innovators- we just happen to build robots.

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

The Metrobots are a student-led and student-run team. In January 2017, our team spoke at the State of STEM event in Columbus, Ohio about how the hands-on STEM curriculum at Metro is contributing to a generation of problem-solvers. This year, 56% of our team are students who are new to FIRST. Our team has been recognized by our community for our efforts; this season alone we have been featured on the local news 3 times in January 2017 alone and in the Columbus Dispatch.

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

Eilidh Cowan

Essay

OSU Football Coach Woody Hayes once said, "You can never pay back, so you should always try to pay forward." When one receives a generous act, they are often prompted to reciprocate the kindness, or "Pay It Forward." FIRST regularly grants FRC team 3324, The Metrobots, opportunities to experience STEAM, making it our desire to give others similar opportunities by "STEAMing it Forward."

Our Team

When a small group of students founded The Metrobots in 2010, we faced a lack of proper tools, mentors, funding, community support, and practice space. Additionally, as our team comprises students from Metro Early College High School, a STEM school composed of students from 27 different Central Ohio school districts, transportation became an issue. Despite such challenges, The Metrobots grew into a cohesive team full of ethnic and gender diversity. The residential variety among our members, while posing its own unique setbacks, increased our team's cultural and ethnic diversity. Our team boasts a membership of over 24% immigrants and first generation Americans. Furthermore, over the

past eight seasons, our team has aimed to inspire women to pursue STEM - an effort proved effective by an increase from 10% to 54% of female members of our team. In addition, 67% of our student leads are female. Whether through female participation or diversity on our team, our varied backgrounds allow us to grow through a shared appreciation for FIRST robotics and STEM.

The Metrobots' graduates retain an appreciation for STEM and FIRST robotics long after graduation. In fact, 100% of our team alumni have majored in and pursued a career in a STEM field, whereas only 28% of undergraduate students nationwide pursue STEM-related degrees (USDOE: NCES, 2014). These alumni have gone on to pursue degrees such as computer engineering and mathematics at Harvey Mudd College, Cornell University, Rose-Hulman Institute of Technology, Ohio State University, and MIT. Furthermore, 32% of our team members have stayed involved with the FIRST robotics program by mentoring FRC teams after graduation. Our dedication to FIRST robotics reflects the profound impact it has on our lives.

FIRST It Forward

The Metrobots aspire to share FIRST opportunities with students to whom they are not readily available, so we "FIRST It Forward."

The Metrobots promote FIRST and its mission to "inspire young people to be science and technology leaders..." by supporting other FIRST teams. Over the last four years, we initiated 18 FLL teams as well as FTC team 10441 - teams we continue to mentor and support monetarily. Furthermore, in encouragement of FIRST and the FLL community, we organized and hosted our 4th and 5th FLL regional tournaments in December. In addition, our team participates in FIRST outreach through FRC mentorship and involvement.

Our team is a member of the Center of Robotics Innovation (CORI), which facilitates gracious professionalism among Central Ohio's FIRST teams. As we are one of CORI's veteran teams, we assist in hosting the Ohio State University FRC Kickoff event, host annual strategy meetings, share our build space and full field practice space with other teams, and host mock competitions. Moreover, we co-host the annual off-season event, the CORI Invitational, to further our relationship with CORI teams.

Teach It Forward

The Metrobots "Teach It Forward" by encouraging the implementation of robotics and FIRST-based courses in middle and high schools. Our team has developed 8 STEAM-based courses, which are now part of the curriculum at Metro Early College High School, Metro Middle School, and the Metro Institute of Technology. Such courses include Mechatronics, Java Programming, Introduction to Engineering Design, Automation and Robotics, Design and Modeling, Introduction to Computer Science, and more. To further expand our educational influence, our team collaborated with The PAST Foundation to develop a virtual Mechatronics course for students in South Dakota, teaching engineering concepts through project-based learning. Given the success of our STEAM courses at The Metro Schools and in South Dakota, we aim to impact the education in all schools in Ohio. As such, representatives from our team presented to members of the Ohio State Education Committee to encourage legislation supporting the inclusion of FIRST and STEAM-based courses into Ohio school curriculum. We have also discussed the use of FIRST as a learning medium in the classroom at the Science Education Council of Ohio Conference and the Ohio Educational Technology Conference. This month, members of our team spoke at the State of STEM event in Columbus, Ohio about how the hands-on STEM curriculum at Metro is contributing to a generation of problem-solvers. "This should be a regular school," said former NASA astronaut Mae Jemison on Metro High School. "Education should not be cookie-cutter; it deserves to be hands-on." We introduced TEDx-Style Presenters from STEM fields to an audience of representatives from supporting organizations such as the SciTech at The Ohio State University, Wexner Medical Center, Battelle, JPMorgan Chase, and Worthington Energy Innovations, as well as Columbus Mayor Andrew Ginther.

The Metrobots also educate the general public about FIRST and STEAM through presentations, exhibitions of our robot, and interaction with the community. We have demonstrated our robot at Battelle Memorial Institute, The Ohio State University, TEDx, the Ohio State Fair, and the Center of Science and Industry (COSI). Our team members let kids drive our robot to instill in them the value of STEM. During these demonstrations, we educated audiences about opportunities in FIRST to expand knowledge and experience in engineering.

STEM It Forward

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The Metrobots "STEM It Forward" by working to provide local underprivileged students with opportunities in STEM. For example, we taught 14 Energy Workshops at the Columbus Metropolitan Libraries, teaching financially disadvantaged students about environmental science and physics. Our team also developed and maintained a nine-week engineering summer camp for underprivileged students at Millennium Community School. During the summer of 2016, we helped host a week-long summer program at Healthy Asian Youth to provide inner-city kids with STEM opportunities.

Approximately 200 students attended the camp every day where our team members taught them various STEM concepts ranging from sound and light waves and electrical circuits to simple kinematics by creating mini-catapults. We plan to continue spreading STEM to as many communities as we can reach; currently, we have planned FRC, FTC, FLL, and underwater robotics camps that will be run by Metrobots team members in conjunction with The PAST Foundation. Continuing in our mission to "STEM It Forward," The Metrobots have hosted 7 Maker Mania Days and 6 Spring Flings during which students participated in a series of fun, hands-on activities to increase their problem-solving skills and

encourage their interest in engineering. Additionally, our team educated over 2,500 students on the importance of recycling through our e-Cycle and Garbology programs. As women are underrepresented in STEM, we aim to inspire girls in the Metro school system to pursue the male-dominated field of engineering. Our efforts in reaching these underprivileged populations through our Women in Engineering and Women's Programming Workshops have been successful. Recently, The PAST Foundation's Girls Who Lead campaign featured our female members to recognize their outstanding leadership. By taking the initiative to provide STEM opportunities to communities around us, we communicate the value in the real-world application of STEM concepts.

Pay It Forward

Serving our community is an integral part of our core values and team mission, so the Metrobots strive to perform community service, or "Pay it Forward." Over the last five years, we have raised over \$125,000 for pediatric cancer research at Nationwide Children's Hospital through an annual Metrothon dance marathon in partnership with Metro High School. Additionally, our team's media subgroup creates a children's coloring book each year, which features images and activities that promote STEAM concepts and that year's FRC game. We plan to donate these coloring books to Nationwide Children's Hospital in order to provide patients with a creative, educational activity to improve their hospital stay. Our team also hosts annual blood drives, book drives, and food drives. Furthermore, we have held two rap battles in which we raised money for leukemia and lymphoma research. Due to our dedication to community service and outreach in the last three years, our team has collectively served over 27,000 hours. Our team is focused on improving the wellbeing of others by reaching out to those in need.

The Metrobots continue to give back to our community while empowering those around us. For example, we participate on a student-run chapter of Zonta, an international organization focused on human rights issues. Our contribution to this organization includes sending backpacks full of school supplies to Costa Rica to help underprivileged schools. We also donated over 100 tutus to girls at Nationwide Children's Hospital to raise their spirits and make their hospital stay enjoyable.

STEAM It Forward

The community supports and recognizes all we have done to "STEAM It Forward." This year alone we were featured on local news channels three times, highlighting the commendable work our team is doing. We were also featured in the Columbus Dispatch in recognition of our students' achievements in STEM education. With the help of our sponsors and mentors, The Metrobots continue to follow the wise words of Coach Woody Hayes to fulfill our mission to inspire personal and community development by creating innovative leaders and problem-solvers through collaborative outreach in STEM, community service, education, and FIRST robotics.