

Part 1: Our Roots

“New branches are formed every second of every day... Each twig has traveled only one journey. But there are still other twigs... This is a tree of life,” according to Matt Haig’s *The Midnight Library*. Our team is a family tree with twigs and branches grown from the same roots, yet developing in different directions. Mechanical Advantage was formed in 2016 with 11 students who left a memorable impact on the Littleton, MA community, and has continued to grow in numbers and experience. FRC6328 currently has 30 students from 7 school districts in grades 7-12, with people of color comprising 33% and female students comprising nearly 25%. Our 23 mentors come from a variety of backgrounds including college students, parents, and adults with abundant FIRST experience.

As our tree grew from a sapling into full blossom, we worked in multiple workspaces such as a vacant high school classroom, a home garage, and our current 6,269SF space. Generously provided by Patriot Beverages, our biggest sponsor, this space has given our team a unique opportunity to work safely in-person amidst COVID-19. A former R&D building, our workspace has a shop, assembly room, and several other rooms, allowing for social distancing. Following state guidelines, we rotate in small groups of students and mentors and make improvements on the 2020 robot. Since the start of lockdown, most of our subteams have been entirely remote, holding weekly meetings online for updates and troubleshooting.

To prepare for each season, we evaluate the current team structure and make necessary changes to give more students leadership and learning opportunities. For 2021, we divided FRC6328 into a mechanical team and a business team that are further subdivided into CAD/design, electrical, scouting/strategy, manufacturing, software, awards, marketing, and outreach. We strongly reinforce student leadership by encouraging every student to apply for a leadership position, and we create new positions as needed to give more students a lead role. By requiring minimum outreach hours for student team membership and giving all students opportunities to work on the robot, we emphasize the importance of balancing technical and business aspects. Training programs that cater to both facets have been a major focus and opportunity for team growth in the past year. Formerly, some new students had trouble finding footing on the team. To tackle this issue, a handful of mentors and students designed and held extensive offseason training programs consisting of scouting/strategy, software, CAD, manufacturing, sponsor outreach & fundraising, leadership & communication, and project management training from the summer to fall of 2020 (most of which are available to all on our website). Through these programs, students tried their hand at different areas of the team to find what best suited them. The training helped equip students with technical, leadership, and life skills they use every day inside and outside of FIRST. To further increase involvement of new students we introduced a 1-to-1 learning model, in which we pair new and experienced students to give students more exposure in their subteams. This helps us create experienced young leaders who are ready to fill the roles of older, graduating students. Passing on knowledge creates long-term sustainability by strengthening our tree, allowing us to build more branches in the future.

We express gratitude and thanks to our sponsors with newsletters during the build season, an annual fall update, and an End of Build Open House. Communication with sponsors to stay updated on our build, competition, and off-season activities is a critical part of our roots. The story of how we acquired our workspace underscores the key role outreach and community connections have in maintaining team function and sustainability. In response to our efforts to spread the FIRST message through different forms of outreach, sponsors have invited us to visit their operations and taught us about various industries, worked with us to place interns, and we are currently working with two Senior Mentors to develop a more comprehensive relationship between NE FIRST and one of our sponsors.

Part 2: Growing Branches

Ahead of the 2020 season, we reached out to all 8 New England rookies to provide support. Our mentors and students spent several weekends driving around New England to meet them, assisting with technical issues, making parts, programming, and gifting care packages. These “Welcome to the Family” bins included FRC6328 resource guides and mini quiet room setup among other items. We are continuing our rookie team support into 2021, reaching out and working with some current rookies. Through 2019, we were delighted to work with two all-female FIRST Global teams in Liberia and Afghanistan. For 2021, one of our founding mentors started FRC8604 at Minuteman High School as our sister team to further support FIRST and provide STEM opportunities for students. Since kickoff, our mentors and students have been regularly attending FRC8604 meetings and social events to share ideas, advice, equipment and experiences with our rookie sister team.

Mental health has always been a primary branch for FRC6328. We posted weekly on our team social media in the summer of 2020 with #MentalHealthMondays. Each week, we created encouraging reminders on social media to spread positivity. Over that summer, our team members also ran a Social Justice Book Club to support the Black Lives Matter movement. We held weekly meetings with people inside and outside of FIRST to discuss *So You Want to Talk About Race* by Ijeoma Oluo, and sold t-shirts to raise money for BLM groups. In June, we held a Pride Month fundraiser by selling FRC6328 pride socks and t-shirts. Profits proceeded to Time Out Youth mission, an organization that supports LGBTQ+ youth in Charlotte, NC.

We are a founding member of the Open Alliance. It quickly became one of our primary branches and participating teams became an extension of the FRC6328 family tree. We collaborated with FRC teams across the globe to share our build season progress on Chief Delphi. We published all aspects of our work from 2020 including our design process, CAD, outreach/awards resources, and scouting data. We have continued this effort into 2021, striving to be a source of inspiration for teams that have struggled due to the pandemic. For our build thread this year, we continue to upload CAD and videos of our robot, updates of our progress for different challenges and awards submissions, and training programs. Overall, we have 22.8k views on our YouTube channel, and 39.1k views and 265 replies on our CD thread as of mid-February.

Part 3: Strengthening Our Trunk

Team sustainability is the most important way to build and strengthen our family tree. We integrate FLL graduates onto the FRC team with our FLL-to-FRC transition program, encouraging them to try out pit crew and drive team roles at offseason competitions and giving them hands-on technical experience. FRC6328 mentors and students coached 6 FLL Explore and 4 FLL Challenge teams last year. These teams draw from multiple communities to promote involvement in STEM to more audiences. Close relationships between coaches and students extend the feeling of family to FLL, making their transition onto 6328 smoother so they aren't intimidated by the intensity of FRC. We also engage 8th graders as full FRC members to maintain their momentum from FLL to FRC.

To spread the word of FRC6328's approach to maintaining a long-term stable structure, our team members recently gave an hour-long presentation on team sustainability for 24 Hours of STEM. Through a Zoom meeting broadcast on YouTube, we gave our know-how and advice on how to tackle issues that can come with the different life stages of an FRC team. In addition, our team supports sustaining girls in STEM. We expanded our traditional Girl Scouts badge events held in 2018, 2019, and 2021 by developing an event for Girl Scouts Daisies to acquire 3 robotics badges.

With COVID-19, we converted many of our outreach activities to a virtual format. The team designed new curricula consisting of at-home challenges for FLL teams and put together a packet, partnering with MA FLL to send it to every state FLL team as well as regional partners in New England and NY. Our annual in-house FLL summer camp adapted a similar structure, where we provided kids with weekly robot, project, and core values challenges to complete at home. We ensured all FLL students either had access to an EV3 kit or a virtual robotics toolkit, which allowed them to build and program their own FLL robot in a virtual environment. Participants could share their work and ask questions during weekly online meetings. We are proud to have 4 competing FLL teams this COVID season that function while meeting all safety regulations, keeping students from missing out on yet another fun activity this year. In response to COVID-19, our team has also participated in PPE work. A mentor on our team collaborated with FRC5254 in NY to make PPE, printing over 500 face shields and 100 ear savers. We are proud that our outreach hours grew from 854 in 2018 to 2027 before the 2020 season, and we are on track to reach more than 1700 outreach hours even during the pandemic, keeping our trunk strong.

Conclusion: Our Family Tree

Each of us brings a fresh perspective to our team, allowing our family tree to weather even the fiercest of storms. When a storm hits and a branch is broken, it leaves behind a scar-like knot that can make the tree stronger. COVID-19 has created a knot and pushed us to improve our communication and cooperation skills. We continued our outreach efforts while developing new ways to hold meetings, share progress, and resume technical work. Every subteam contributes to nourishing different parts of the tree. Each season, our roots grow deeper into the soil and our branches grow higher into the sky!