



The Highlanders Chairman's Essay

We are team 4499, The Highlanders: a unique model born from 11 kilt-loving engineers, future professionals, STEM ambassadors and young leaders. Our ideas are innovative; our passion is tenacious; our drive is immense. Our journey is best told in 5 parts: mission, leadership, community, triumph and future. We may be small, but we are mighty!

Mission

In 2013, The Highlanders were born from two FTC teams, a shop with a few tools and a mission to provide youth with the opportunity to explore STEM. After returning from Iraq as a decorated veteran, an integral mentor utilized his resources to create a space for 4499. Unbeknownst to us, this would become a place of dreams, forever friendships and an almost sacred robotics sanctuary.

To accomplish this mission, The Highlanders prioritized learning through hands-on experience in the FIRST robotics program. From machining to video-making, programming to marketing, we fascinate and inspire kids by teaching and investing in their growth.

Most schools do not have hands-on learning programs. 4499, however, provides the opportunity to use academic knowledge to build real-world skills. As Highlanders, each of our students has a wide range of knowledge including running manual mills, CAD, creating carbon fiber parts, designing PCB boards and using industry software such as Adobe Suite and JIRA for project management. Using these skills, we expand our knowledge with the support and tutorage of our alumni and mentors.

Our dedication to STEM education is never-ending and constantly expanding. Our community-based team meets year-round with 11 students from 5 schools and 3 cities but 1 uniting purpose: to learn the art of robotics and impact our community. 94% of our graduates have gone on to pursue STEM degrees since our inception. To expand our mission 4499 created the 501(c)3 nonprofit company, Neaera Robotics which has grown to help create and fund 10 FIRST teams across the state of Colorado; in doing so, we bring today's opportunities to tomorrow's engineers.

Leadership

In 2020, 4499 realized that our growth as a team and as a program was capped by a need for strong leadership, so we created the TARTAN leadership initiative (Training And Readiness: Teach, Appoint, iNteract). Under the Tartan leadership initiative, students, not mentors, are responsible for teaching and expanding the team's knowledge base and identity. This includes training new leadership, teaching difficult skills, and innovating community engagement. TARTAN encourages personal accountability and looks to magnify students' skills through steady growth; this allows each new group of students to stand on the shoulders of their peers. We reach new heights and impact the community

in ways that no single student could have achieved alone. Because of this, the Highlanders often remain exceptionally involved in both FIRST and STEM as Alumni.

Community

In our local area we share our passion with those near us. Each year, we use our robots' elements to create unique designs like a pool noodle spider, bobbing snake, pneumatic powered dragon and a LED lit ghost. We connect with kids by passing out candy with our costumed robots. This tradition has transformed into volunteering at HP's haunted house event and our community center. Reaching over 23,000 people, 4499 has also presented our robots at Shepardson Elementary and other outreach events such as Energy Day Colorado, Apolopalooza and Wings over the Rockies to introduce STEM to kids.

We connect with local FIRST teams by starting 5 and mentoring 10 FLL explore teams. In the past 3 years, 4499 has mentored several teams, but with FTC team 5899 from Liberty Common High School, we created a special partnership as their mentors. We teach them how to machine their own parts, help them start and mentor teams for themselves and critique their design process, suggesting helpful solutions. For the past decade, 4499 has runs the FLL Challenge Liberty qualifier. Students, alumni and coaches act as referees, MCs, Judges, scorekeepers and head refs while parents run the concessions stand, judge the competition and participate in FIRST tournament planning committees. We do not limit ourselves merely to local outreach. We provided a student tournament director and referees to the North Denver qualifier (FLL Challenge, 2yr), and assisted the Weld County qualifier (FLL Challenge, 1yr), Kendrick Lakes (FLL Explore, 1yr) and Northern Colorado Expos (FLL Explore, 5yr). 4499 volunteered at the Boulder qualifier and State Championships as referees, MCs and judges. For the 2021 virtual tournaments, we recorded 2 videos for CO FIRST and provided backgrounds for FIRST volunteers.

Our students and mentors are always open to assisting other FRC teams: embordering bumpers (1339), machining parts (1410/4388), transporting supplies (4550) and providing meals (11308). Recently, the team has recorded presentations to create webinars for vision code, upside-down electronics boards, Twitch and Adobe Creative Cloud. Shop tours are available for teams who can come in person (FTC teams 5899, 15403, 11308). For those who are unable, we have created a shop tour video that describes our machines and workshop on our website and YouTube channel. We are sharing our space with both FRC veteran (2240, 4388) and rookie (8250) teams to film FIRST At Home Challenges and machine/house robots. Via the official Colorado FIRST discord, we have notified teams that our shop is open to all. At tournaments, 4499 passes out rookie survival kits, SPORRAN kits (Safety Preparation Observation Report Respond Awareness Negotiation) and tools.

We reach people around the world inspiring them using STEM through our series of both collaborative and reusable science experiments designed around FIRST core values KILTS (Kits that Inspire Leadership and Teamwork in STEM). In the past 3 years we have visited Hawthorn Hill elementary school in Kansas, USA; a school in Lima, Peru; and an orphanage in Shishu Mandir, India to teach and hand out KILTS. To connect with young students, 4499 authors Rocky the Robot, a four-part, Amazon published a book series. The books present FIRST Core Values through Rocky's various adventures. To reach a diverse audience, we have translated our books into Spanish. This series is a team supported project; our members write the stories and translations; our alumni help illustrate. KILTS and Rocky the Robot are publicly available on our website and YouTube channel as pdf documents and videos.

Triumph

A sustainable model maintains a successful team despite adversity. Many can obtain sponsors and resources to build robots. However, our model seeks to improve our impact on the world by investing in future leaders and FIRST ambassadors through encouraging continued volunteering and mentoring. At the beginning of 2019, the team had only 4 students! Within a year, we grew by 200%, allowing us to teach waves of future engineers. With the new additions to our team that year, 4499 was able to assist 15 FIRST events, 8 demos and reached 23,000 people. Through our unique and innovative programs, team members positively affect our near and far-reaching communities. Our individual acts of immense impact include an on-site bottle rocket demo in India and donations of KILTS kits to Operation Christmas Child and Peruvian schools.

In 2020, 4499 was heartbroken after the novel Covid-19 virus stole the second half of the 2020 season from us. The virus ravaged our members' sense of normalcy, disconnecting us from friends, school and community. 4499 became a beacon for our team members to hold fast to a semblance of safety and light in a devastated world. Through this light 4499 became more determined, more creative and more productive. Despite this unexpected turn, our team strives for excellence when working together online. By using JIRA to organize, plan and communicate, we continue to develop skills like CAD, video-editing and computer programming. In this remote work environment, we found new opportunities to engage with the FIRST community, such as creating new promotional videos for CO FLL and running a series of skill building webinars for other teams. We have enhanced our impact by starting a Rocky the Robot Book 5, digitized our book series, created online walkthroughs of our KILTS science kits and made our coloring and activity books available on our website. Because of our size and flexibility, our small community team has recently resumed meeting safely under state restrictions allowing us to continue impacting the world through our mission.

Future

Through bittersweet change, we have grown together as a team to overcome these trying times. Our passion has bonded us together, so that we have successfully immersed youth from around the world in STEM. We started our journey partnering with several school districts (Jeffco/Weld) and plan to reach out to more by organizing future FIRST events. We are looking forward to a time when we can do onsite demos, create a new Halloween costume for our robot, and see our community face to face. Until then, we look forward to our next Rocky adventure, KILT kits, webinars and opportunities to volunteer at FIRST virtual tournaments. Within our own team, we are leveraging our leadership structure to gain new skills and engage in new community programs. We have a passion to inspire more youth and potential students through systems we have developed and new ideas that are yet to come.

The Highlanders' journey started within FIRST, but it does not end there. We measure our progress in our members, our community and our stories. Transferring our knowledge has allowed us to grow, creating an opportunity for all Highlanders to become future engineers. Over the years, we have grown from local to international outreach. Our students are innovators, volunteers and leaders that reach communities through our outsized impact. After all: we may be small, but we are mighty!