

2017 Essay:

The Past Ten Years

When the original members of Mountaineer Area Robotics began their rookie year, they had just finished competing in a state-wide FLL program of only 17 teams. They entered into FRC alongside just three other West Virginia competitors. They believed that the lack of a sizable FIRST program in our state was symptomatic of a need for opportunities for WV youth to pursue their intellectual and creative passions.

FIRST robotics provided these 11 MARS students with the chance to participate in an emerging cultural revolution aimed at overcoming socio-economic barriers and adapting to our quickly modernizing society. They created a plan to take the opportunities they had been given and expand them to a population of future scientists and engineers who could bring West Virginia into the 21st century. This five-step STEM education development plan for rural communities is what we call The MARS Plan.

Step One: Advocacy and Inspiration

A strong community presence is how we attract sponsors and other supporters of our mission. Over the past five years, we have talked to thousands of people at hundreds of events, including festivals, STEM nights at schools, parades, summer camps, tech conferences, sporting events, and so much more. Our audiences range from pioneers of the tech industry to attendees of a local pet adoption event.

One of our biggest milestones in introducing FIRST to our community was the creation of an off-season event unlike any other, West Virginia Robotics eXtreme. WVRoX was not just the first FRC endurance event, 26 hours and 14 minutes of nonstop action, but in 2014 it was also the first FRC competition ever held in WV. We ran this event for a second time in the summer of 2016, and WVU again offered three renewable \$4,000 scholarships for participants.

Recent outreach efforts have been focused on gaining the support of statewide political leaders. Last year, MARS was honored with two legislative citations on the floor of the WV House of Delegates. Our rapport with state leaders has led to support for our mission by the Governor's STEM Initiative and individual legislators.

Joining together with supporters requires ongoing and strong communication with all of our partners. We maintain relationships through in-person meetings, regular presentations and letters, social media, and our annual open house. We pride ourselves on giving back to our sponsors. We run, host, and assist events throughout the state with the United Way, the Children's Museum of WV, and NASA's IV&V Facility.

Step Two: Starting Teams

One of our main priorities is continuing the steady growth of the WV FLL and FLL Jr. programs. This year, we supported 20 FLL and FLL Jr. teams with direct funding and

actively mentored 28. MARS also runs an annual FLL summer training camp. There are now over 114 FLL teams in WV. We placed special emphasis on developing teams in isolated, rural communities. For example, after repeated visits and advocacy by MARS, leaders at West Preston Elementary saw the impact that FIRST could have on the students in this impoverished community. 20 FLL and 20 FLL Jr. teams have been created to support every student in the school.

Recently, MARS began reaching out to often overlooked demographics, such as the physically disabled and incarcerated youth of WV who rarely have the chance to experience the benefits of STEM programs. Our work with the WV Schools for the Deaf and Blind has revealed the need for a change in the way visually impaired youth are accommodated within FLL. We have been working with NASA's IV&V Facility and the leaders of FIRST to establish a routine policy for FLL teams with visually impaired students. Additionally, in 2016 MARS alumni worked with NASA to hold VEX-IQ competitions for students in each of the 21 juvenile detention centers and rehab facilities in WV. In partnership with the Governor's office, students who complete their sentence and want to start a robotics team upon returning to their schools will receive direct financial support.

As a result of our demonstrations of the impact of FIRST programs to our local BoE, this fall, the Governor's office targeted three middle schools in our county for a new retention program which integrates FLL into classrooms. This program will develop an FLL team for every six sixth-graders in all three schools, totaling 70 new FLL teams to be formed in early 2017. Working with FIRST leadership, MARS is advocating for changes to the FLL registration process that will enable large-scale FLL program development in schools without prohibitive registration fees.

In 2016, MARS and our NASA partner took over FTC in WV and hosted our first FTC state championship in the fall. This extends MARS' portfolio beyond our current leadership role in the WV FLL and FLL Jr. programs, for which we continue to run our own FLL scrimmage, FLL qualifier, and FLL Jr. Expo. We supported six other WV FLL events in 2016 and again supplied judges, referees, and logistical support for the state FLL championship and FLL Jr. Expo.

Step Three: Sustainability

MARS dedicates the fall months to mentoring and supporting FLL. Beyond running bi-weekly mentoring sessions, our students are assigned as points of contact for state FLL teams so that they have a direct connection to MARS. We also provide travel funds to WV FLL and FTC teams that qualify for the World Championship.

To forge a strong relationship with our surrounding FRC teams, we share our practice facilities, host kick-off brainstorming sessions, and offer mentoring support throughout the build season to teams in WV and southwestern PA such as 3511, 3955, and 4467. We developed a biennial FRC-modeled, off-season game called FIRST Base that we

use to help teams learn to fabricate drive trains. Additionally, we've provided \$10,000 for area FRC teams in the last three years.

When we travel for competition, we take this philosophy of Gracious Professionalism on the road through the Tiger Team system. Tiger Teams visit each pit at our competitions and make sure every team has what they need to be as successful as possible. In memory of their founder, Phil Tucker, these teams have been renamed the Tucker Teams. It is clear from the outpouring of support from the FIRST community after Phil's passing that Tucker Teams have had an extensive impact and have inspired a true sense of Gracious Professionalism.

Last year we began to expand Phil's legacy beyond the events we attended. At FRC regionals, we trained two other teams in our Tucker Team process and are developing a broader strategy to train others around the country to assist struggling teams at events in an organized and purposeful fashion. By providing teams with the layout of how Tucker Teams work as well as support and advice, we hope to ensure the success and enjoyment of every student in FRC. We do this to give teams a reason to keep coming back year after year, thereby promoting sustainability in FRC.

Step Four: Progression of Programs

Now that MARS and NASA's IV&V Facility are responsible for all FIRST programs in WV, as well as VEX, VEX-IQ, and Zero programs, we can match schools and other groups with the most appropriate STEM program. By combining events, MARS also helps guide teams through a progression of programs. For example, in 2016 the WV FLL and FTC state championship events were hosted back-to-back at Fairmont State University (FSU) so FLL participants could see FTC up close. This year also brought opportunities for MARS to encourage the creation of teams at the college level through VEX University. MARS students, mentors, and alumni are overseeing the creation of a new team at FSU.

Step Five: Creating Leaders and Innovators

Much of the immeasurable MARS impact is born from the ripple effect created by our students and alumni who take the message of FIRST into their own hands and create an interworking STEM network by coaching and supporting other programs. Many of our alumni stay with MARS, forming a mentor-in-training program, while some have even been employed by FIRST or the NASA IV&V Facility. In 2016, two MARS alumni even led the winning NASA Centennial Challenge robotics team at WVU.

We are also engaged in outreach efforts designed to reach struggling rural areas around the world. In 2015, Pragya spent a year in India creating FLL teams for students in her family's home village with financial and logistical support from MARS. She followed the example of Ben, another alumnus who ran a similar program also in India, the year prior. In 2016, Daphne spent her vacation working in a primary school in the

Philippines with a LEGO EV3 kit provided by MARS. With her continued support, that school is building up an FLL program.

Impact

The implementation of The MARS Plan has led to the creation of a passion for the inspiration and recognition of science and technology throughout West Virginia. Dozens of partners throughout the state have realized the power of FIRST and STEM to change a community for the better. Through MARS' efforts there are now hundreds of robotics teams in the state of WV. Surprisingly for such a rural state, WV is now a national leader in youth robotics program growth.

Our next big step in raising awareness of STEM programs in WV will be running the Mountain State Invitational FLL Tournament in the summer of 2017 in conjunction with NASA's IV&V Facility. This event will draw teams from across the world. Before we began our efforts, this kind of whole-hearted investment in STEM programs would not have been part of West Virginia's educational agenda.

Over the last ten years, MARS has become a driving force for STEM education in West Virginia. The MARS Plan is working. The state of West Virginia is changing, and we will never let it stop. We are part of a revolution. We are MARS.

2017 Executive Summary:

QUESTION 1: Describe the impact of the FIRST program on team participants with special emphasis on the current season and the preceding two to five years.

Our students have a 100% postsecondary education attendance rate, many with the help of FIRST scholarships. MARS has inspired them to bring FLL to India, Zimbabwe and the Philippines. Our mentor-in-training program keeps students engaged in robotics after high school and has led some to employment by NASA & FIRST. Two alumni led the 2016 NASA Centennial Challenge robotics team at WVU. Their robot was the only one in the world to complete the tasks, bringing home over \$850,000 in prize money.

QUESTION 2: Describe the impact of the FIRST program on your community with special emphasis on the current season and the preceding two to five years.

In partnership with our BoE and the Governor's STEM Initiative, we inspired the first retention program of its kind, starting an FLL team for every 6 sixth graders in 3 schools in our county by incorporating LEGO robotics and Core Values into the curriculum. The support we have gained for STEM throughout the state has made it so that more middle school students in our county compete in FIRST than football, demonstrating a culture change in how our community prioritizes STEM education.

QUESTION 3: Describe the team's innovative or creative methods to spread the FIRST message.

The MARS Plan is a strategy for FIRST & STEM education development in rural communities. Step 1: advocacy through dozens of outreach events (34 this year alone) to gain partners & other supporters of our mission. Step 2: working with these partners to start robotics teams and programs. Step 3: using a variety of methods to sustain these teams. Step 4: encouraging and supporting a transition through the progression of programs. Step 5: creating leaders and innovators. (More info in business plan)

QUESTION 4: Describe examples of how your team members act as role models and inspire other FIRST team members to emulate.

To increase sustainability and outreach capacity, we redesigned our team structure this year. This established a higher degree of student leadership and increased efficiency of outreach organization through task forces, giving each student ownership of specific initiatives. This, alongside our team's focus on maintaining a professional image and core values, demonstrates how FIRST is about more than just robots. We show this through projects such as Chairman's Exchanges and Tucker Teams.

QUESTION 5: Describe the team's initiatives to help start or form other FRC teams.

MARS and our NASA partner have recently taken over the WV FTC program and assumed responsibility for program expansion and running the state tournament alongside our current involvement in FLL. By doing this, we are building a strong foundation of these programs with the goal of making sustainable FRC teams possible within rural communities in the future. We have been successful in starting team #3492 PARTs and expect a current FTC team from Union WV to be transitioning to FRC in 2017.

QUESTION 6: Describe the team's initiatives to help start or form other FIRST teams (including jrFLL, FLL, & FTC).

Our advocacy and name recognition throughout the state have helped us form strong partnerships that have led to the exponential growth of WV FIRST teams since MARS' founding, from 20 to 182 teams (810% growth). In 2016, we directly funded 2 FLL teams and 18 FLL Jr. teams. Another 50-75 FLL teams were organized in 2016 with our NASA partner. As we continue to run FLL and FTC events back to back, the potential for FTC growth increases as we encourage teams through the progression of programs.

QUESTION 7: Describe the team's initiatives on assisting other FIRST teams (including Jr FLL, FLL, FTC & FRC) with progressing through the FIRST program.

MARS students are contacts for local FLL teams to offer support and provide a direct connection to individual members of our large FLL program. This expands upon our

open mentoring sessions throughout the FLL season. In 2016, we provided over \$25,000 in financial support to our robotics programs in WV. Our new student leadership structure has created task forces devoted to expanding each FIRST program individually. The entire team is divided among these task forces to maximize efficiency.

QUESTION 8: 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).

We are promoting a higher level of GP® across FIRST by demonstrating how to help other teams in an organized and purposeful fashion through our Tucker Teams. This year we promoted the idea at regionals and applied to give a championship conference on the concept. We also developed an FRC robot game for competition among local teams. FIRST Base teaches construction basics. This, alongside our joint kickoff and open practice facility, helps us forge strong relationships to support teams.

QUESTION 9: Describe your corporate or university sponsors.

In the interest of sustainability, we focus on having a wide range of sponsors to ensure that unforeseen circumstances causing loss of sponsorship do not limit our ability to keep working. Our university sponsors are West Virginia University and Fairmont State University. WVU provides workspaces, tooling, and a strong base of mentors. FSU is a partner in FLL, FLL JR, and FTC event hosting. We have 22 corporate sponsors including Mylan, Aurora Flight Sciences, Key Logic, EQT, and Wilson Works.

QUESTION 10: 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 are the NASA house team for WV. We encouraged the NASA IV&V Facility to put their full force behind expanding FIRST in 2012. Since then, we've worked side by side to support each other's initiatives (juvenile detention VEX, FLL events, teams for the deaf & blind, etc.) that have led to the substantial growth of robotics programs in WV. The United Way is another two-way partnership as we help them with their goal of providing educational opportunities for students in rural Preston County, WV.

Question 10.5: For FRC teams older than 5 years, briefly describe your team's broader impact from its inception.

To diminish travel strain on teams due to geographic barriers, we have helped make WV a state with one of the highest densities of FLL qualifiers. MARS has been vital in pushing WV toward promoting robotics programs. The Governor's STEM initiative is now integrating FIRST directly into curricula at several public schools. Programs are also being implemented at the Schools for the Deaf and the Blind and 21 juvenile detention centers. Our state government now directly funds teams across the state.

QUESTION 11: Describe how your team would explain what FIRST is to someone who has never heard of it.

FIRST is a program dedicated to inspiring youth to learn about and experience the excitement of science and technology through high intensity competition. Whether it is through designing and building their own robot, giving a presentation to judges or sponsors, or giving back to the community, FIRST works to extend opportunities for youth to pursue their intellectual and creative passions. Students learn the importance of helping others while striving for success.

QUESTION 12: Briefly describe other matters of interest to the FIRST judges, if any.

MARS is part of a larger cultural revolution that is moving WV toward a modernized, STEM-focused society. We are ensuring that everyone in WV has access to beneficial robotics programs, even commonly overlooked groups such as those in juvenile detention centers and the deaf & blind. With NASA, we are now running a major FIRST event in WV every year, alternating between our FRC event, WVRoX, and the Mountain State FLL International Invitational, to raise public visibility of STEM education in WV.

2017 Presentation Link:

<https://www.youtube.com/watch?v=hV6FbFnJOTE>

2017 Video Link:

<https://www.youtube.com/watch?v=8EeHoscHnKI>