20th ANNIVERSARY
OREGON ROBOTICS
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CELEBRATION

OREGON ROBOTICS TOURNAMENT & OUTREACH PROGRAM

Evaluation 2019

dia*
rethinking the development of people

Acknowledgements

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Oregon Robotics Tournament & Outreach Program

Evaluation 2019

Organization Overview

The Oregon Robotics Tournament & Outreach Program (ORTOP) is the Oregon Program Delivery Partner of *FIRST,* an internationally recognized P-20 STEM (Science, Technology, Engineering, Mathematics) and Career and Technical Education (CTE) program. ORTOP was founded in 2001 as a university program and became an independent non-profit in 2014. Its mission is to open doors to the worlds of science, technology, engineering, and mathematics for Oregon's youth by providing educational opportunities featuring robotics with special emphasis on maximizing the diversity of those participating.

ORTOP works to decrease the opportunity gap for underserved and underrepresented youth, including providing funding and technical support to reduce barriers to participation. ORTOP builds partnerships with culturally and regionally specific organizations to increase participation by youth and adults from these communities. *FIRST* gives children the opportunity to envision their success in a STEM career while learning real-world skills needed in tomorrow's workforce.

ORTOP 's dedicated staff supports over 7,230 children participating across Oregon, with over 4,720 trained volunteers participating as team Coaches and Mentors and implementing over 90 events statewide. Events include Expos and competitive Tournaments where teams demonstrate and celebrate their accomplishments.

FIRST is a robotics community that prepares young people for the future. The annual theme-based challenges use hands-on Project Based Learning (PBL) to capture young people's inherent creativity and curiosity. Challenges connect to real-world themes such as space exploration or urban planning, demonstrating career pathways and the ways scientists and engineers help their communities thrive. A continuum of *FIRST* programs spans grades K-12: *FIRST* Lego League Junior (K-3th grades), *FIRST* Lego League (4th-8th), *FIRST* Tech Challenge (7th-12th), and *FIRST* Robotics Competition (9th-12th). *FIRST* provides direct access to college and career pathways while students participate, and afterwards as part of a global Alumni network. Students build connections with adult mentors from local employers and have exclusive access to more than $80 million in scholarships to top engineering colleges and universities. Longitudinal studies have demonstrated a significant increase in participants' STEM skills, knowledge and identity, leading to an increased enrollment in STEM majors and courses after graduation. The cornerstone is the Core Values, which emphasize the contributions of others, celebrating discovery, teamwork, and Gracious Professionalism®. Participants' report *FIRST* helps them develop holistic skills enabling them to plan and present ideas, solve unexpected problems, and collaborate with others.

Intended Impact

In addition to increased STEM Knowledge, Skills, and Identity, ORTOP seeks to make an impact in the lives of participants in the following areas:

Gracious professionalism

- Teamwork (ability to work with others)
- Sharing with competitors (inter-team collegiality)
- Principled action (behaving virtuously, even under stress)
- Habits of civility (appropriate interpersonal interaction)
- Collaboration (ability to make progress with others toward a common goal)
- Sportsmanship (attitudes and mindset befitting respect and appreciation for others regardless of winning or losing)
- Inclusivity (actively reaching out to others, especially those who are different)
- Belonging (the ability to be relationally secure not because of affiliation but because of professionalism)

Project management

- Planning (ability to anticipate critical steps, identify key benchmarks, and break a task into its parts)
- Implementing (take action on plans and follow-through)
- Accountability (responsiveness to expectations, respect of rules)
- Multi-tasking (ability to perform multiple tasks and advance multiple objectives simultaneously)
- Managing deadlines (ability to set and meet goals on time)
- Delivering (ability to complete tasks)
- Budgeting (ability to manage finances through a project)

Problem solving

- Tenacity (strength to keep going)
- Curiosity (eagerness to push into the unknown)
- Grit (able to push through difficulty and challenges)
- Experimentation (ability to hypothesize, imagine, and design)
- Try new things (explore, test, courage to attempt)
- Critical thinking (analyze, test assumptions, able to reflect and examine)

Leadership presence

- Communication (ability to speak publicly, express thoughts, have poise in front of others)
- Initiative (start, step forward, advance on tasks and projects)
- Responsibility (able to shoulder the weight of a process, not drop things, not neglect)
- Empowerment (sense of agency and ability to make a difference)
- Confidence (belief in one's abilities)
- Self-esteem (proper awareness of worth of self)
- Listening (effectively receiving the ideas of others)

Purpose orientation

- Vision for life (sense of purpose and meaning)
- Aspirations for the future (elevated ideas of what might be possible in the future)
- Orientation toward STEM careers (opening of new categories and possibility for STEM)
- Informed trajectory of life (improved direction)
- Transferring skills to other parts of life (ability to translate the skills learned to other parts of life)
- Meaningful behaviors (engagement in productive and positively formative behaviors)

Evaluation Methodology

The purpose of this evaluation was to see what kind and quality of impact *FIRST* programs are having on the young people who participate. To understand this, we explored two broad evaluation questions:

1. What kind and quality of impact are we having on young people?
2. What aspects of our program are causing this impact?

Over the course of the project, we (a) developed and refined ideas of intended impact and indicators, (b) designed and implemented a mixed-methods outcome evaluation using both qualitative and quantitative means to collect and analyze data, (c) identified themes and findings, and (d) considered the implications to those findings for program improvement and innovation.

This project began by identifying and clarifying the intended impact of ORTOP. Once the ideas of impact had been developed, we used the Heart Triangle™ model to identify qualitative and quantitative indicators of impact on the mental, behavioral, and emotional changes in our participants. These indicators were used to design a qualitative interview protocol and a quantitative questionnaire to evaluate progress toward achieving our intended impact.

Qualitative Data Collection and Analysis

For the qualitative portion of the evaluation, we designed an in-depth interview protocol to gain data about the structural, qualitative changes resulting from our program. This project focused on the two High School Level programs, *FIRST* Tech Challenge (7th-12th), and *FIRST* Robotics Competition (9th-12th). We used a purposeful stratified sampling technique to select a representative sample from the population we serve, limited to those students who attended at least one competition to ensure an appropriate level of dosage. The number of youth participants in these programs was estimated at 3,300 during the 2019-20 Season. Our sample size was 49.

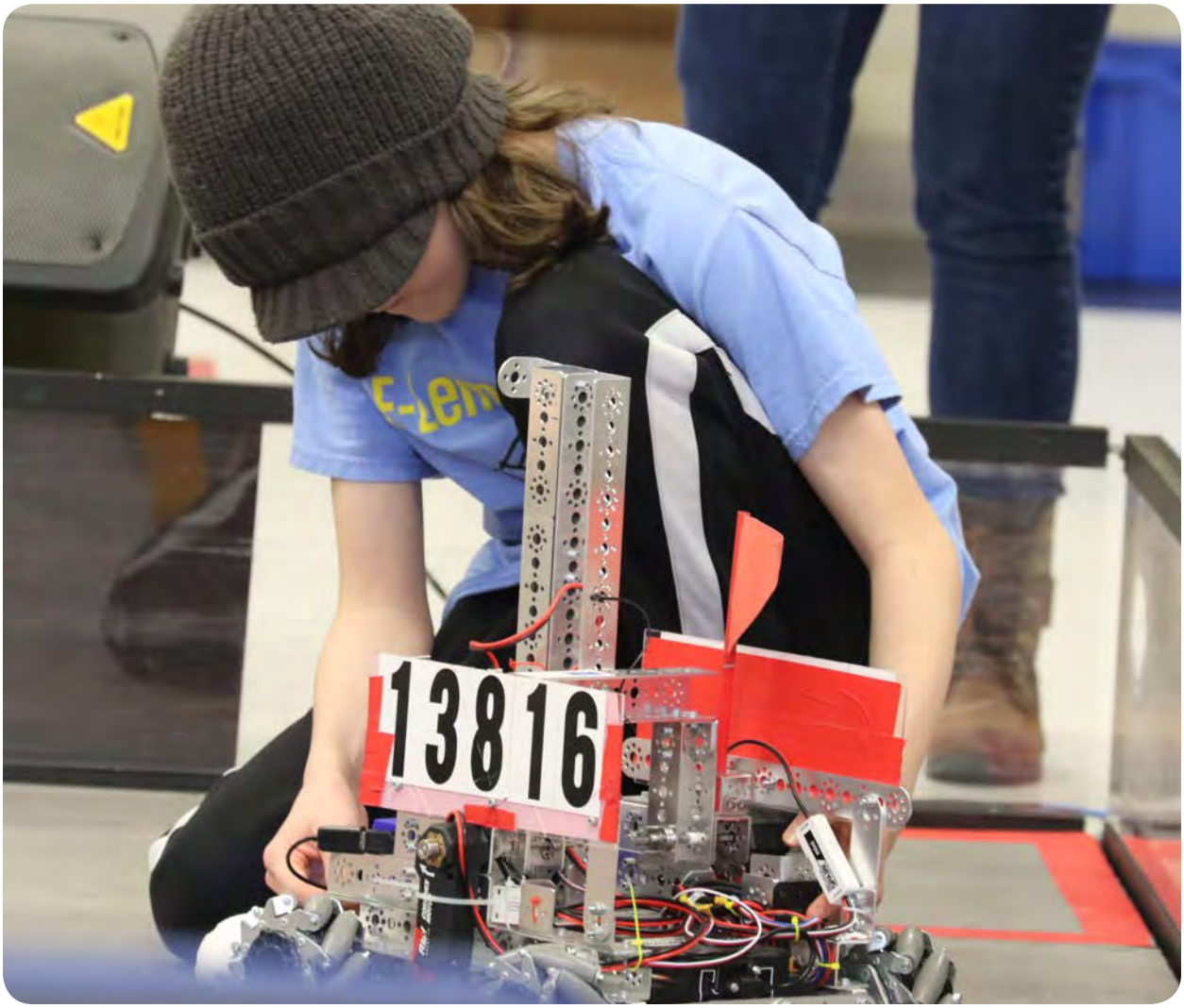
Our interview team consisted of 11 volunteers from across Oregon, representing multiple *FIRST* teams. The team convened one-on-one interviews lasting from between 45 minutes and one hour in length and collected interview data. Data from the interviews were collected primarily using Otter.AI and augmented with concurrent note-taking.

Team members analyzed the data inductively using a modified version of thematic analysis. Each interviewer implemented the first three phases of thematic analysis (becoming familiar with the data, generating initial codes, and identifying themes) for each interview. Together, they developed common themes from the entire data corpus identifying the overarching and inter-interview themes that emerged from the full scope of our data analysis to illuminate the collective insights and discoveries.

Together, interviewers identified findings, causes and catalysts of the themes, new and surprising insights related to the themes, and relationships between the themes that were revealed in the data. We then determined the most significant and meaningful discoveries and brought them forward as findings to be described in the final phase of thematic analysis, this report.

Quantitative Data and Analysis

For the quantitative portion of the evaluation, we designed a questionnaire to collect data on quantitative indicators of impact. The instrument was administered to participants and had a response of 252 students. The data were analyzed primarily using measures of central tendency. From the data were identified key insights, patterns, and gaps within the data. These were incorporated into the discoveries of related qualitative findings. The most significant insights from the quantitative data are described in the following narrative.



Impact 1

Gracious Professionalism

Findings of Impact

1.1. Gaining sense of belonging and acceptance

Interviewees repeatedly talked about the sense of belonging within individual teams as well as in the competitive arena. Through *FIRST*, young people are developing friendships that extend across teams, often referring to the team as family. One participant said, "Robotics has helped me to be more social, I have more friends now, and I am happier." Another said, "It has brought me together with other people and allowed me to make friends." Yet another spoke to the family feel of the community:

> I think that my *FIRST* team is my family. Half the time, they don't acknowledge it. But honestly, whatever team I'm on, they're still going to be my family. You spend so much time to get to know each other so well.

This sense of belonging can have an immense impact on the lives of participants, well outside of robotics. One participant shared how the support from his team gave him courage when he communicated publicly about his gender identity. He said,

> [Robotics] was the first group that I asked to start calling me [by my current name] and the positive response that I had there was what gave me the courage to actually tell my parents that I was trans and tell my teachers that I was trans and start asking people to use the right pronouns.

Another participant talked about her fears of being inhibited by stereotypes of women in engineering and how, over time, she realized those stereotypes were not present in her team environment. She said,

> I think being a girl, there's always this stereotype in mind of the girl that does engineering. [That she] has to be this one type of person. So at *FIRST,* I was having trouble because I didn't want to be categorized as that one type of person because I knew myself as just different from that stereotype...The more involved I've gotten in robotics and the more lessons that I've learned from just how supportive the *FIRST* community is, I realized it doesn't matter so much, and I can just be proud of that part that gets really excited about robots.

FIRST teammates developed attitudes of acceptance, tolerance, and care toward one another through the influence of the program. A sense of belonging and community was fostered by

the development of habits of acceptance fostered throughout the experience. One interviewee said, "The main motivator for me is the people who are on the same boat as me. Having a community of people who appreciate what I do, and I appreciate what they do, and we just support each other."

Significance

One of the striking effects of *FIRST* is in the esprit de corps developed among participants. The data reveal this sense of closeness, acceptance, and belonging was not necessarily a result of natural attraction, as one might expect among adolescents everywhere, but of a unique bond forged through working together toward a common aim. What we saw in the data was not simply the grouping of young people in typical social subgroups, but the development of warm and familial relationships and the strengthening of bonds of acceptance as a result of being committed to accomplishing a task together. This differentiates the kind of familial attachment achieved through *FIRST* from the cliques and clubs associated with this stage of life. *FIRST* offers a more professional cause for belonging, no less powerful than typical teenage friendship, and potentially more transferrable and more efficacious to impact participants for the rest of their lives.

1.2. Growing confidence and self-worth

The experience of being in *FIRST* provided participants with a sense of confidence and self-esteem. The experience helped participants build their self-esteem and feel a sense of security in themselves and in being themselves with others. One said, "I can just be myself around these people because they understand. They have the same interests as me." Another said, "I used to be uncertain about how others would perceive me. Now I am not as worried about what others are thinking about me, and I can focus on the tasks and helping others." Yet another spoke about the impact on their relationship with their parents, saying, "[*FIRST*] has helped my parents understand me better. Because I didn't want to play sports, we weren't connecting until robotics."

Interviewees expressed increased confidence through *FIRST* about finding the courage to express themselves and a place to exercise their voice. One interviewee said, "Now, because of robotics I have the confidence to speak up, I am more confident around people, I am more positive, and now I am a part of a group." Another said, "It is a little hard for me to speak up still, but I am trying more and getting more comfortable, especially when things are important. I am still a little quiet, but I know I can speak up if I need to."

In *FIRST*, participants feel their ideas are valued. They experience how they can make a contribution to the team. Over time, observing the impact they can have on others, the

influence they can exert toward completing projects, and the value they bring to the team instills and strengthens a sense of self-worth among the youth. One said, "I have also learned that in every project, big or small, I matter. I can make a difference in the success of our team." One interviewee reflected, "I know that I am a good leader. I am kind, hardworking, helpful, and try to help others succeed. Robotics has helped me believe in myself and in my self-worth."

Significance

Finding a sense of worth and contribution is essential to the developmental tasks of adolescence. Every young person needs to know they can make a difference. Each individual needs to find value in making something important happen. The data reveal a substantial change in the degree to which participants know and value who they are and what they can positively bring to the challenges of the *FIRST* season. Gaining a sense of confidence in themselves and their abilities is a critical task at this stage of life. The data clearly show that the experience of *FIRST* is catalytic in securing progress in that area of development.

1.3. Developing capabilities for teamwork

The data reveal that participants feel a strong sense of camaraderie and teamwork in the *FIRST* program. Interviewees described the impact of working together as a team to achieve their goals. Given the nature of robotics projects, teamwork is essential to success. All members of the team need to fill their specific role, or the project fails. One interviewee said, "[I have come to] understand that if you get others to help you, the complex project doesn't seem so big and overwhelming." Another said, "I think what I've learned is that it expedites the brainstorming process. Gracious Professionalism makes competition more efficient and more enjoyable." Yet another said,

> It's changed the way I look at group projects, like making sure that I'm not putting in too much or too little contribution to the project. I would say that being in [*FIRST* Tech Challenge] and [*FIRST* LEGO League] has improved my ability to work with other people, and that is due, in part, to the gracious professionalism philosophy that's valued by the *FIRST* program.

The data show that *FIRST* provides opportunities to develop strong teamwork and collaboration skills. Participants discover their own strengths and areas for improvement and learn how to work with the strengths and areas for improvement. This promotes character development needed for teamwork. For example, one participant said,

> I have learned that patience and kindness is the key to enjoying your team members and your work environment. If you are impatient and unkind, you make everyone miserable,

> and you cannot enjoy working on projects together. You also need to get to know each other's strengths and weaknesses so that you can help your team members be successful and reach common goals.

Another said:

> I realized that it can't always be how I want it exactly. I have to take everyone's perspective and, even if I disagree with it, just look at the pros and cons and then be accepting of other ideas and treat everyone with respect.

Participants also had opportunities to discover and develop their own strengths and how they could contribute to the larger picture. One of the highest scored items on the survey was the statement, "As a result of *FIRST*, I am more aware of my strengths and weaknesses." For many, this led to feeling empowered and valued by their peers, further boosting confidence and self-esteem.

Significance

In a unique way, the experience of *FIRST* is giving young people the opportunity to develop and practice skills of teamwork. Time and again, through the interviews, participants expressed the progress they made in being able to work together with others as a team. This is an important capacity to learn for growing in professionalism. Participants developed their ability to contribute, negotiate, communicate, take part in a project, and interact productively with others. Their ability to be a productive part of a team was significantly increased through the experience of *FIRST*.

1.4. Working productively with competitors

The focus on community and collaboration extended beyond individual teams and into the competitive arena. Interviewees shared that when teams went to a competition, their goal, understandably and appropriately, was to win. Many participants truly enjoy and thrive in the competitive aspects of the program. However, participants consistently revealed through the interviews a professional willingness, even eagerness, to assist their competitors. If they could help another team or another team could help them, for example, by providing a replacement part for one that broke or providing design ideas, they were willing to engage with their competitors without hesitation. There was a clear sense that everyone was expected to support others.

Interacting professionally with competitors, the data show, is one of the most clear and compelling qualities engendered through the program. One participant said, "We're all in this together. Professionalism, and the kindness that goes with that professionalism, really makes the entire thing come together pretty well." Another said, "Many teams are friends. They help

each other, and you're not afraid to go up to a team and ask for help, which is always what should be the goal of a community."

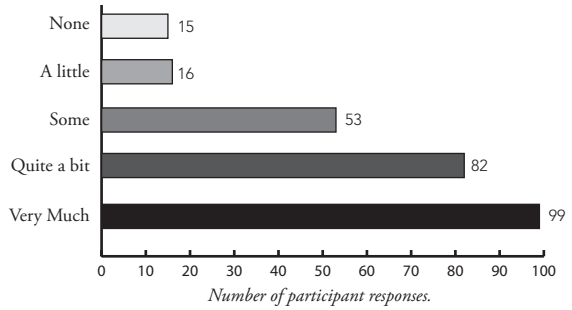
The collaborative aspects of Gracious Professionalism, particularly collaborating and sharing with competitors, emerged time and again as key catalysts for what makes *FIRST* unique in the world of competitive programs. In the participant survey, 68% of respondents reported making substantial progress in the area of the statement, "As a result of *FIRST*, I work harder to treat opponents with dignity during competition (see Figure 1)," and 66% reported that they are now substantially more committed to the success of others. One said,

> Whenever I talk about robotics to other people, they always bring up BattleBots. It's the first thing that comes to their mind. I'll say it's a little different because of gracious professionalism. We're able to share our resources together, which has been really useful for me. Because as someone who came into robotics not even knowing what a rivet was, having those resources available from other teams and just having a community that is willing to teach you, even if you're across the country or on a competing team within your own district, it's really useful. I think without gracious professionalism, *FIRST* would not be so successful in expanding its reach.

Another said,

> [Gracious Professionalism is] very pervasive throughout the *FIRST* community. There are several instances of people going out of their way to help other teams. The way the tournament's set up is really conducive to teamwork and cooperation, even between teams, between competitors.

Figure 1. As a result of my involvement in FIRST I work harder to treat opponents with dignity during competition. (n=265)



Significance

The ability to work with competitors in a gracious way is one of the hallmarks of the impact of *FIRST*. The capacity to be in both a competitive and cooperative mindset simultaneously is a unique result of the experience of *FIRST*. This suggests the development of maturity in outlook, emotion, and volition among the participants, for it is neither simple nor easy to be

highly competitive and highly compassionate simultaneously. As a result of *FIRST*, participants are maturing in these very critical areas.

1.5. Applying self-regulation during high-intensity, stressful situations

Interviewees spoke about the opportunity to develop stress management skills, such as patience, under high-pressure situations. One said, "Now, with *FIRST*, my teamwork and skills grow stronger under pressure. I can perform effectively under difficult and challenging times." Another said,

> When I felt under pressure in the past, I used to shut down, which led to me not speaking up and ended in me getting hurt emotionally or physically. Stress is always hard, but I have the experience and the skills to handle it better.

There is a recognition that everyone undergoes tremendous stress through this process of *FIRST* competition. Evidence from the data suggests that participants are making efforts to avoid projecting their stress on others or mistreating others during times of stress. One interviewee said, "How I used to act was I used to get snappy towards people. Now I identify problems before getting upset." Another said,

> Before I started with robotics when I was under pressure, I would get anxious and would hide away. Now when I am stressed out, I remain calm because people are counting on me and looking up to me. It is important to set a good example.

Still another said,

> I'm learning to be more chill. [This] is a thing I'm working on. I'm better at it. I can rely on other people. I know that I can tell people, "Hey, I'm going a bit stir crazy right now. Can I step outside?" and tell people, "Can I talk with you, because I need a little rant?"

By fostering a mentality focused on growth mindset and the importance of enjoying the experience over winning the competition, *FIRST* helps participants see anxiety and stress as learning opportunities. They are growing in their ability to take the stress of mistakes and failures as opportunities for growth. One participant said, "It's not about blowing off mistakes but forgiving mistakes and making up for them. [It's about] really pushing yourself. What you get out of it is working for the greater good."

Interviewees viewed Gracious Professionalism as a model on how to behave and how to interact with each other. This translated into how they interact in other environments. One interviewee described applying the *FIRST* principles of Gracious Professionalism to a social studies project in another academic setting they were in, explaining how they interacted differently with that

team than they would have previously. Another talked about how Gracious Professionalism is not just a buzzword for her and explained how it had changed the way she was interacting with others in classes at school. Another talked about discovering how "you really cannot get anything done" unless you are all working in civility with each other. Other interviewees noted that these skills would benefit them down the road in future employment opportunities.

Significance

Developing skills of self-regulation and self-possession during the experience of trial and stress is an extremely important capacity for young people to develop. The data reveal participants are becoming cognizant of the importance of being gracious and professional during times of strain. The data also reveal participants are making progress in their capacity to have a productive mindset toward stress and exercise self-possession in the face of difficulty and challenge.

Findings for Improvement

1.6. Stress management is a challenging skill to develop

The data reveal many participants still have room for growth in stress management. Interviewees talked about their struggle to express their best self under the stress of competition, particularly when challenges arise and plans go awry. One said, "I get stressed out, snappy. I don't know. I mean, I think that maybe I've calmed down a little bit under pressure. I'm still not great. It's why I'm not on drive team." Another shared, "I still struggle with performing well while driving under pressure. It has allowed me to see areas to improve upon in my character." The survey data confirm this challenge for participants. One of the lowest scored items in the survey was the statement, "As a result of *FIRST*, I am better able to respond graciously when I'm disappointed."

Significance

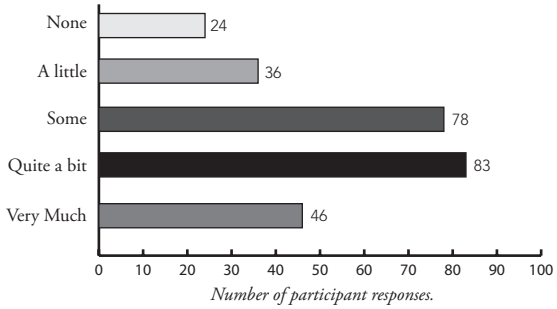
Young people care about their performance. The competitive environment engenders the kind of stress that is an essential component for practicing self-possession and self-management. It would be reasonable to expect the skills of stress management would be challenging to develop and variable in the attainment. Building the skills for managing that stress, and helping participants deal with the internal challenges of proper response, is an essential, if difficult, component of the program.

1.7. Emotional self-regulation and resilience is a worthy focus for the future

Survey data also reveal the challenge young people face in monitoring and managing their emotions. One of the aims of *FIRST* is to develop in participants resilience in the face of

disappointment. Whereas there are data to support the claim that participants are making significant strides forward as a result of *FIRST*, there is work yet to do. One of the lowest scored items was the statement, "As a result of *FIRST*, I feel less upset when my ideas are rejected by others (see Figure 2)." This warrants attention for the future in the design of the strategy and administration of the program.

Figure 2. As a result of my involvement in FIRST I feel less upset when my ideas are rejected by others. (n=267)



Significance

Survey data suggest the area of developing emotional self-regulation and resilience among participants is in need of further attention and strategy from the leaders. Perhaps providing more instruction, support, debriefing, coaching, or sense-making in this area is warranted for the future.

1.8. There is still progress to be made to ensure an inclusive environment

While interviewees spoke at length about the welcoming, family feel to the program, the data revealed that there are still some gaps in fostering a consistently inclusive community. Interviewees noted progress they have seen over the course of their participation but recognized there was still room for improvement in this area. Several interviewees participating on an all-girl team shared challenges about how they are perceived based on their gender. They talked about being frustrated when their kindness was mistaken for flirtation and when other teams assumed they were unable to complete their tasks without help because of their gender. One said,

> I've learned that gracious professionalism can be seen as other things. Especially since we're an all-girl team, and a majority of the teams don't have that many girls but more guys, it can seem like flirting. So it's just that aspect of, "Okay, how do I turn this back so it's still gracious professionalism, but not coming on as we're just sticking with one team or other teams."

Another girl spoke about experiencing difficult gender dynamics on her team but went on to share what kept her going despite those challenges:

> I'm one of five girls on the team, and there are 20 guys. So, honestly, half the time, just the culture, in general, makes me want to quit every single day, and I am sure that the other girls on our team are the same way. But these giant projects that make us feel so proud, so passionate about our work, honestly give us the grit to keep going. Because if we're constantly working on something, if we're learning new things, why would we want to quit something we've already started?

One interviewee spoke about working through non-traditional gender identity in the context of the team:

> All of our mentors are older white men, and so there are a few that weren't sure about how to feel about me. They were a little bit less nice to me, and I think it was because I was a different kind of queer than they were used to. But then I noticed that I grew on them, and they would see me out actually doing things that other kids were doing. I could do all of the things that the other boys on the team to do. But you know, the very skinny, feminine hands were a lot more helpful, and I could do some of the things the boys couldn't do. And I think that was when they started to see me as a boy with everyone else, which was really cool.

Significance

Creating a safe, inclusive environment in a state-wide program with thousands of participants is no easy feat. The data suggest that significant progress has been made in making *FIRST* a welcoming place for many who have often felt a lack of belonging. It also shows that for many young people, participating on a *FIRST* team can be one of the first times they feel comfortable being themselves. Yet, there is always more work to be done regarding equity and inclusion. Continued training for coaches and mentors and more open dialogues regarding the issue within and across teams in the program would likely further the progress already being made in this area.

Gracious Professionalism by the Numbers

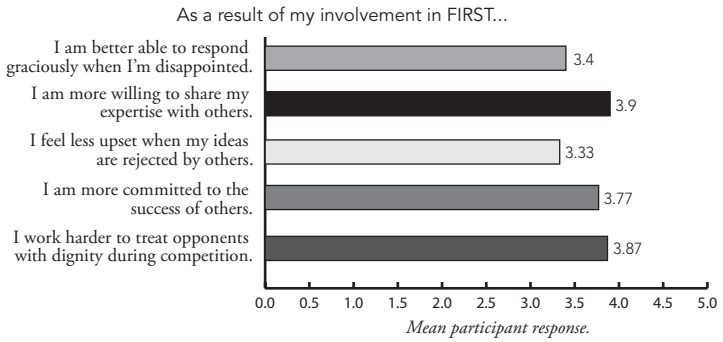


Figure 3. Gracious Professionalism (n=252)

Impact 2

Project Management

Findings of Impact

2.1. Learning to effectively plan ahead and manage time

At the core, project management requires managing the self in the face of deadlines, tasks, expectations, project sequencing, prioritization, and time limitations, among many other challenging dynamics of task achievement. Interviewees reported that participating on a robotics team involves a significant time commitment. A great deal needs to be accomplished in a limited amount of time. Participants need to develop strong self-management, time management, and planning skills in order for the team to succeed. Interviewees repeatedly said that they had improved their skills of time management and their ability to manage themselves in the midst of time pressures as a result of their involvement in *FIRST*. Some talked about learning new systems for time management. For example, one said,

> [I learned about] planning things out and documentation. So keeping a notebook of things that you're going to do, or things that you are doing, or things that you haven't done, and making sure you stick to that plan. Also, being able to adjust the plan when you can see it's not going to work.

Survey data reveal a positive impact of *FIRST* on areas related to project planning, planning, persistence, and follow-through. Sixty-four percent of respondents reported making substantial progress on the area of the statement, "As a result of *FIRST*, I understand better how to manage a project from start to finish."

These skills extend outside of involvement in the program. Participants learn to manage their lives along with robotics. Their commitment has provided both the need and opportunity to organize their lives and determine what approaches and strategies work best for them. In interviews, several participants reflected on their process of creating a sense of balance and managing workload, often through making and learning from mistakes.

Significance

Learning to manage time, pace oneself, stick to deadlines, respond to feedback loops, and organize oneself to accomplish a complex task is a substantial skill set. Participants describe making progress in their ability to manage themselves and the time they have. These skills will serve them effectively in years to come.

2.2. Developing communication skills

Throughout the interviews, subjects talked about the development of their communication skills as a primary area of growth for achieving effective project management. One said, "Robotics has strengthened my voice. I communicate better. I am able to plan for reasonable tasks to delegate to other students and to be a positive leader."

Good communication among the members of a team is seen through the interviewees as a strong indicator of overall team success leading to a positive experience for participants. Interviewees described that when there was a breakdown in communication, it had a significant deleterious effect on team progress. Even though a team may be highly skilled in the technical aspects of robotics, participants described the difficulties they faced developing the ability to communicate through challenges.

Significance

Strong communication skills are required throughout all elements of *FIRST*. Interviewees talked about getting everyone talking to each other and creating an understanding of interdependencies across the team. For a team to experience success, it is essential that everyone understand how their individual role and piece of the project fits into the greater whole. This can only be achieved by developing healthy practices of effective interaction and dialogue. *FIRST* is developing these important communication skills in participants.

2.3. Creating team-driven solutions

The data show that through robotics, participants are improving their ability to work with others. One interviewee described how being involved in the robotics team had helped him with his patience and dealing with people working at various speeds.

Interviewees spoke about their growing realization that project designs are always stronger when everyone works together. Many subjects described ongoing efforts to learn about the individual strengths of their teammates and ensure everyone has a role and an opportunity to provide input. Participants are strengthening their ability to listen to those around them. In the survey, 61% of respondents reported substantial progress in the area of the statement, "As a result of *FIRST*, I listen better." One interviewee said, "I think it is important to take time to listen to others before making a decision." Another shared:

> Before I joined *FIRST*, I was really full of myself, and I didn't really care for other people's ideas because I thought mine were always the best. In doing *FIRST* for six years, I realized that there are a lot of smart people who have a lot of smart ideas in mind. Taking those into consideration, making compromises, and doing all those things really helps the design process and everybody in general.

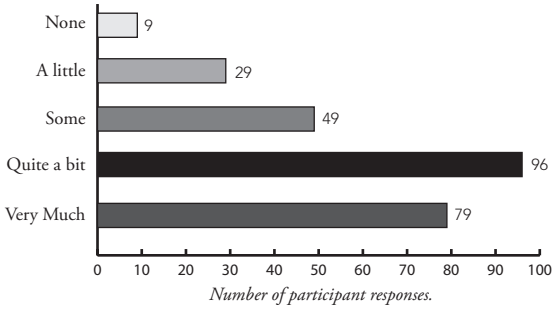
Significance

A key feature of the robotics process is fostering a collective approach to the work. Participants are coming to realize the critical role played by each member of the team. They are seeing the importance of developing the skills necessary to work positively and productively with others. These are highly valuable and sought-after skill sets and will serve students well in both their professional and personal paths moving forward.

2.4. Building capacity to take the initiative

The data reveal that participation in *FIRST* not only provides opportunities for developing project management and collaboration skills, but also the ability to take initiative. Working collaboratively on a project as complicated as robotics requires every team member to contribute readily and meaningfully. The data show that participants are regularly stepping up to identify and meet the needs of the team. Interviewees described taking on roles and addressing challenges of their own accord. They are learning to find and fill the holes in the work, and their confidence in their own abilities is increasing as a result. In the survey, 67% of respondents reported making substantial progress in the area of the statement, "As a result of *FIRST*, I feel more confident in my ability to follow through on difficult tasks (see Figure 4)."

Figure 4. As a result of my involvement in FIRST I feel more confident in my ability to follow through on a difficult task. (n=262)



Interview data show participants being drawn to take on roles beyond what they imagined they were capable of. They realized that if they did not step into roles of responsibility, critical tasks would not be done. They talked about the benefits of learning to be proactive to fill in the gaps and help others. For example, one said, "The main motivator for me was that my team was counting on me."

Significance

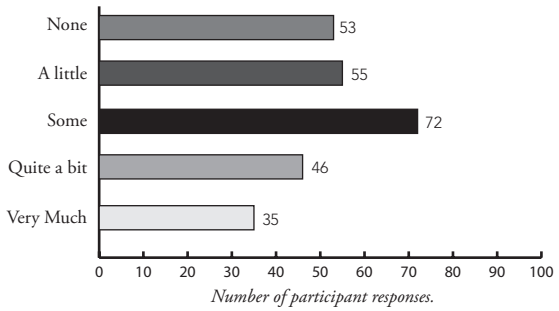
Interviewees repeatedly shared experiences of being drawn out of their comfort zone to manage the tasks required of them. The stretch of these experiences had a positive impact on the growth of their confidence and skill development. By not just handing out roles to the students that initially appear best suited to fill them, *FIRST* is creating real and practical opportunities for participants to discover and develop their strengths of project management in a supportive environment and share these strengths with their team.

Findings for Improvement

2.5. needing to develop a more explicit and effective approach to developing Project Management Skills

While many interviewees talked about their growth in planning and time management skills through participating in *FIRST*, not everyone saw progress. Some reported struggling with this competency. Survey data also indicate a need to give more attention to the development of project management skills in the future. Only 48% of respondents reported substantial progress on the area of the statement, "As a result of *FIRST*, I can follow timelines more closely." Data related to budget management was even less positive. Only 31% of survey respondents reporting substantial progress on the area of the statement, "As a result of *FIRST*, I am better able to manage budgets (see Figure 5)."

Figure 5. As a result of my involvement in FIRST
I am better able to manage budgets. (n=261)



Significance

It is clear that *FIRST* offers a wealth of opportunities for students to develop their skill set in project management, but the data indicate a need for staff and coaches to frame these skills better. By helping participants develop better and more explicit strategies and highlighting the opportunities participants have to build project management skills, young people will be better able to make and recognize their progress.

Project Management by the Numbers

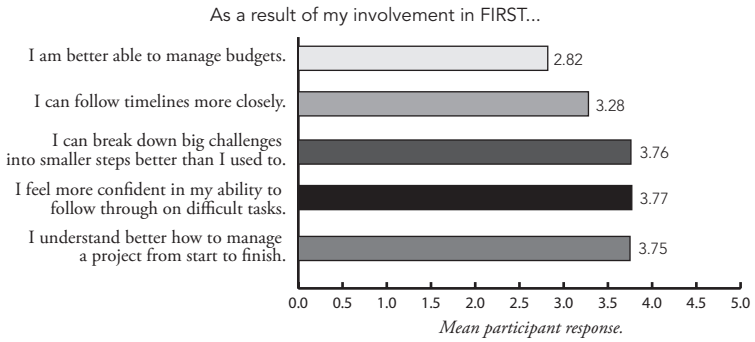


Figure 6. Project Management (n=252)

Impact 3

Problem Solving

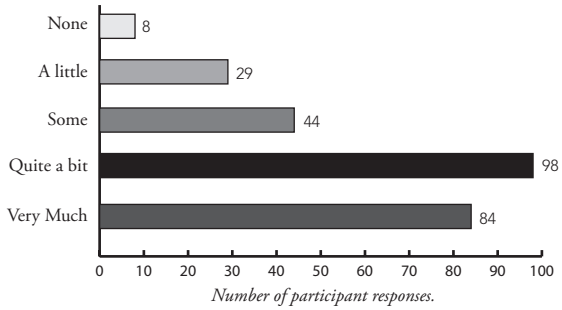
Findings of Impact

3.1. Developing strategies for problem-solving

Successfully navigating any design and implementation process requires the ability to problem-solve challenges that arise along the way. One of the highest scored items in the survey was the statement, "As a result of *FIRST*, I am better able to think through difficult problems (see Figure 7)." Throughout the interviews, subjects talked about learning strategies key to the design and build process, such as problem decomposition. Sixty-four percent of survey respondents reported making substantial progress in the area of this statement "As a result of *FIRST*, I can break down big challenges into smaller steps better than I used to." One interviewee said,

> I now solve problems in chunks. I take apart individual tasks and have learned how to delegate them. I have also learned that by taking apart big complex problems, you make the problem less daunting. All of this has given me more confidence.

Figure 7. As a result of my involvement in FIRST I am better able to work through difficult problems. (n=263)



Participants are learning to plan ahead and anticipate potential challenges. They are also realizing the benefits of considering the big picture when approaching a project, and not just making decisions based on immediate circumstances and needs. One interviewee said,

> I've learned a lot about trying to come up with methods and systems where you don't have to rewrite large portions of things. In other words, from a leadership perspective, I've learned to think about big picture before you just jump straight into a project.

Another said, "[Problem-solving in robotics has] taught me patience to look at all aspects, to make sure more problems don't arise."

In interviews, many participants talked about the need to problem solve in teams and with others. Some reported growing the ability to ask for help from others. A few commented on

how this reduces stress and allows them to be in a frame of mind to better problem-solve. For example, one interviewee said,

> Before I started with robotics, I didn't know how to deal with anxiety or stress when dealing with people, so I would isolate myself. Now I ask for help and firmly believe that problem solving is the most basic human behavior.

Interviewees noted that many of these skills are benefiting them in other areas of their lives. One said, "Robotics has helped me in other aspects of my life as well. I am able to deal with stress and anxiety and problem-solve easier."

Significance

Through *FIRST*, young people are developing the skills they will need to solve problems and work through challenges throughout their life. The data show that participants are not just addressing problems as they arise, but are learning to plan ahead, anticipate issues that may come up, and reach out for assistance when needed. These skills give participants increased confidence in their abilities and helped them better manage stress and anxiety levels.

3.2. Imagining the possible in the face of Challenge

FIRST participants are discovering that nothing is really impossible if they keep trying. The data show participants are learning to meet setbacks with creativity and curiosity. In the survey, 69% of respondents reported making quite a bit or very much progress in the area, "I am more curious about things I don't understand." Interview subjects spoke about their growing recognition that if one idea fails in a project, they are more certain than they were previously that they can find another way to solve the challenge. They see that even small improvements can make a big difference. For example, one said,

> If something does go wrong, it's not the end of the world. If something breaks [or] our robot ends up not moving for one game, we can still have time to not stress out; time to work at it for the next match.

Another said:

> [Participating in robotics] made me realize that when you get stuck, it doesn't mean that it's over or that you can't do it. You just have to find another way or to try to look at it from another perspective to try to accomplish the task at hand.

Through their experiences in *FIRST*, participants are developing increased confidence that, with persistence, they will eventually meet their goals. They see that challenges and mistakes

along the way are important learning opportunities. Sixty-four percent of survey respondents agreed substantially with the statements, "As a result of *FIRST*, I am better able to stick with a problem until it is figured out" and "I am more comfortable than I used to be working on a problem I can't solve." One interviewee said,

> [Being on the *FIRST* team has shown] that there's usually a light at the end of the tunnel. And that even if we don't do very well, it's a very rewarding season. We didn't do great this season, but it was one of the best learning seasons I think we've ever had. I had the most fun.

Another interviewee reflected, "There wouldn't be light without darkness, right? And there wouldn't be learning without mistakes."

The data reveal that participants are also displaying this perseverance in their lives outside of robotics. One interviewee spoke about how his participation in robotics helped him to develop the confidence and courage to pursue AP classes in school. He said:

> I used to give up on stuff easily, and now I believe that I can do anything I put my mind to. For example, I used to think that I couldn't take AP classes, but robotics and my ability to problem-solve better has given me the courage to take more AP classes, and I am doing well.

Significance

FIRST participants are experiencing a mindset shift toward perseverance and tenacity in problem-solving. They are embracing mistakes and failures as a part of the larger learning process and developing a willingness to consider the value of experience gained over simply the end result. These characteristics are highly valued in an educational and professional world increasingly focused on the development of growth mindset in young people.

3.3. Finding collaboration in the competitive arena

Robotics competitions, as in most competitive activities, can be high-pressure, high-stakes environments. The data suggest, however, that the competitive arena creates opportunities for participants to seek external supports and collaborate across teams to find innovative solutions to the challenges that arise, drawing out the problem-solving strengths of their teammates.

A few interviewees described the difference in their response to problem-solving during competition versus during the design phase. In competition, they reflected, teams have others to reach out to and a broader support network. In designing and building, the experience can be more isolating. One said, "Something about [*FIRST* Tech Challenge] I enjoy is when you are in a competition and can easily talk with others about scouting, strategy, and your robot."

Another interviewee spoke about opportunities to learn from the ideas of his peers. He said,

> The highlight is probably seeing other people's designs and seeing how creative they can be with stuff. I was amazed the first time I saw a robot backing up blocks with this cool dual reel intake system. I was amazed at how advanced the thinking of people my age is already.

In addition to receiving support and learning from others, many participants enjoy the opportunity to share their own knowledge and ideas. One of the highest scored survey items was the statement, "As a result of *FIRST*, I am more willing to share my expertise with others," with 69% of respondents reporting either "quite a bit" or "very much."

Some teams are working on expanding these opportunities in between competitions by reaching out across geographic locations to seek external supports and to connect with other teams for ideas and solutions.

Significance

Through the tournament aspects of the program, *FIRST* is providing participants with an opportunity to connect and learn from not only their own team but with others throughout the state and nation. Interviewees spoke of this as a valued strength of the program. This also adds a layer of collaboration and networking that is helping young people develop the capacity to seek out inspiration and insight beyond their immediate circle and to value the ideas of those around them, both teammates and competitors.

Findings for Improvement

3.4. Limiting experimentation and innovation

In some cases, the data show that *FIRST* project timeframes caused constraints of opportunities for experimentation and innovation (trying new things). These two dimensions have been defined by ORTOP staff as components of the intended impact of problem-solving. Interviewees talked about their stress level during the project build phase, noting that deadlines often limited flexibility and opportunities to experiment until the best possible solution is reached. There is time for teams to discuss the project initially, but then participants are running with implementation, they feel the restriction of time as an inhibiting factor to their ability to stretch themselves into innovation and ingenuity.

Significance

It may be that there is sufficient experimentation and innovation embedded in the design of the robotics challenges. There may also be an appropriate level of challenge that is being modeled

to participants – the idea that experimentation and innovation are typically needed despite time limitations and the stresses of deadlines. However, there still might be an opportunity to develop strategic pauses for focused experimentation and innovation during and throughout the course of the programming.

3.5. Limiting disparity of resourcing teams

In addition to the challenges related to time, there is a noted disparity between teams in terms of resources available, often related to geographic, cultural, and economic demographics. Many teams, particularly in rural areas, are financially limited and are, in some cases operating under bare-bones circumstances. This can have a significant impact on the team's ability to experiment and try out various approaches to design without the worry of expending the materials available to them.

Significance

One of the most striking areas of impact of *FIRST* is its ability to involve young people from any community throughout Oregon. However, for true equity to be experienced, there will need to be more attention given to enhancing the provision of resources to teams that may be underfunded or in communities where there are fewer resources than others.

Problem Solving by the Numbers

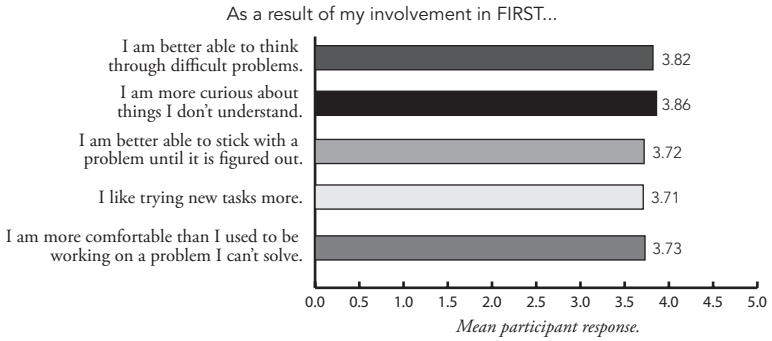


Figure 8. Problem Solving (n=252)

Impact 4
Leadership

Findings of Impact

4.1. Learning and practicing Leadership

The data show that participation in *FIRST* provides an opportunity for students to practice leadership skills in a supportive environment and allows those who have not previously seen themselves as leaders build confidence in their skills. The program inspires participants to take initiative and try leadership roles that are out of their comfort zone. One interviewee said, "Robotics has strengthened my voice. I communicate better. I am able to plan for reasonable tasks to delegate to other students and to be a positive leader." Another said,

> Robotics was the first place where I feel like I really took on a leadership role in a significant way - maybe not the first place, but the first place where I ever did it well. There's a reason I'm doing leadership in robotics. There's a reason I can teach new members. I have skills, and I know how to use them, but that gives me a lot of confidence, and I've been able to take that confidence into places where I might not actually know what I'm doing.

Some participants reported through interviews that they already considered themselves strong leaders before their participation in the *FIRST* program. What participating on a robotics team offered them was a place to practice and cultivate their leadership skills. One interviewee said, "I already knew that I make a good leader from school projects. But I learned more so about [it] from robotics."

Significance

Stepping into a leadership role for the first time can be a daunting and stressful experience. Even those with a seeming natural inclination for leadership require time and space to hone and practice their skills. The data show that by providing a safe and supportive environment for participants to try out leadership roles and practice various skills, *FIRST* is helping them to grow their confidence in their leadership abilities and develop their identity as a leader.

4.2. Developing empowerment and agency through contribution

Leadership can take many forms. Interviewees who did not have experience taking on more traditional leadership roles were still able to acknowledge the empowerment and skill development they were gaining through their participation in *FIRST*. One said, "I [have discovered] how to lead by participation; to lead while engaged in work others are doing." Another said, "I am grateful I can contribute in meaningful ways."

Interviewees described a sense of pride in the new skills and knowledge they are developing. One said, "I have been very proud of how much I have taken on programming our robot. The complexity of programming has given me confidence that I can accomplish big projects in the future.

This sense of agency is transferring over to other aspects of participants' lives and giving them the confidence to try new things. One shared:

> [*FIRST*] got me interested in dancing in a dance line [at a *FIRST* Robotics Competition] event] and in the middle school jazz band. It also got me interested in soloing, which has way too scared to do before. So [it] just got me into my element and [I am] just a lot less scared to share my opinions and share my personality with everybody.

Another said:

> This year I have had to take a more vocal role [in basketball] because I am the only returning player who has been on the varsity team for two years. Our basketball team has been very successful over the past couple of years, so for us to maintain that they need a leader, somebody who's had experience. I've never really been vocal on the basketball court. So [my participation in robotics] definitely has helped me there.

Significance

FIRST is providing an opportunity for participants to feel valued and confident that their input and contribution is important to the overall makeup of the team. For young people who are often struggling to find a sense of identity and empowerment, this can be a major defining moment in developing their self-assurance and willingness to try new things and take risks.

4.3. Modeling and Helping others grow

Throughout the interviews, many subjects talked about learning leadership skills from their teammates. They described looking up to peers two or three years older, who were in leadership positions when they started. Interviewees talked about the difference between learning from peer leaders versus following the leadership of a teacher or another adult role model, noting that it is particularly impactful to follow in the footsteps of someone who is where you are going to be in two or three years. One interviewee said,

> When you see something being led by somebody like a teacher or something, it's okay. But if you see someone just a year older than you, or three years older at most, then you know you can do that too. They have that confidence and the leadership skills that's like, "Oh, I can do that."

Several interviewees spoke of learning to love their ability to help people grow through the robotics program. One said, "I am still not sure that I am a good leader, but I know now that

I am good at helping people." Yet another shared, "There are plenty of opportunities to be involved in programs that enrich life, either through participating or mentoring."

Some *FIRST* teams extend the idea of helping others out into the community. Interviewees on one team spoke about a hospital outreach program the team participated in, describing it as a highlight of their participation in robotics that year. One said:

> The children's hospital project is the time that I felt the best, and when I felt that we accomplished the most. It was amazing that we gave kids in the hospital the same STEM opportunities that we have, and we showed them that someone cared about them. That is what being an engineer is about, making a difference in the lives of others and your community.

Another said, "Just seeing the smiles and hearing about how great our team is doing in helping others is good to hear and helps your heart. It is amazing to learn that such a big and difficult project can make such a big difference in other peoples' lives."

Significance

Through *FIRST*, young people are learning and guiding each other, rather than relying solely on adult coaches and teachers. This peer to peer learning will benefit participants as they move into the professional field, where there is not always a willing mentor available. Participants are experiencing opportunities to help not just peers on their team but those in the greater community, laying the groundwork for a life-long dedication serving others and working toward equitable opportunity for all.

4.4. Embracing leadership as a shared activity

Many interviewees shared that through *FIRST*, they had learned that effective project design and implementation is a team effort. They realized one leader could not do it all. One interviewee said, "I have learned that leadership isn't something you should "hold over" people. You are working together to accomplish goals; it isn't just about what you want."

Another interviewee used an analogy, likening her leadership role to a chariot. In this view, she lets those she is leading hold the reins to steer as well, so she knows she is going in the right direction rather than doing it all herself. Other interviewees talked about gaining an understanding that there is more than one right answer most of the time. Still another said,

> With a lot of school projects, my leadership ends up being "[I'm] on the team so [I do] everything." In robotics, I know what people are good at, and so I can manage who's doing what at what times [and] organize the team to achieve the best success rather than just being the person who can do everything.

Significance

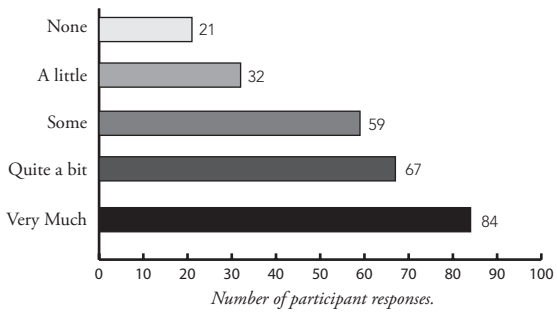
In leadership, it is as essential to have the wisdom to join with others as it is to find the courage to step forward. Through *FIRST*, young people are learning to recognize the important role each member of the team plays and to value everyone involved. This mindset leads to stronger across-team collaboration with everyone feeling valued for their participation, regardless of their role.

Findings for Improvement

4.5. Becoming an accidental leader

For some participants, becoming a leader was not a desired role. They did not aspire to leadership. As leadership needs surfaced for the team, these participants appeared to be motivated to step up and do their best to fill that need and learn the necessary leadership skills as they went. However, they did not see themselves as leaders.

Figure 9. As a result of my involvement in FIRST I am more of a leader. (n=263)



Significance

Apart from any further reflection and guided consideration, there is a risk that the confidence and self-image of participants as leaders will be under-developed. This may not be a critical error of strategy at this point in their lives. However, their perception of not being a leader may be an inhibitor for further leadership development and the taking on of leadership roles.

Leadership by the Numbers

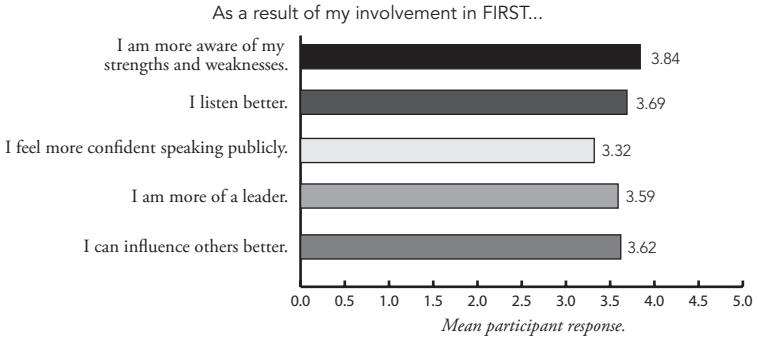


Figure 10. Leadership (n=252)

4.6. Being intentional about the development of young leaders

Survey data reveal the need for a continued focus on developing the leadership skill sets of young people in *FIRST* programs. While interviewees noted some positive impact related to leadership through their participation in *FIRST*, even though it was accidental at times, scores for items on the survey under leadership were notably lower than those in other impact areas, indicating there is work still to be done. Only 57% of respondents reported substantial progress on the notion of the statement, "As a result of *FIRST*, I am more of a leader (see Figure 9)," and only 62% reported that they were substantially better able to influence others. This finding warrants future attention and further investigation.

Significance

Given the need for leadership in the STEM fields, pursuing a more robust strategy for developing leadership could serve to amplify the impact of *FIRST* not only in the lives of participants but through the lives of participants to their peers and to others.

Impact 5

Purpose Orientation

Findings of Impact

5.1. Building a sense of tomorrow

While not all participants plan to go into the robotics or engineering field, the data indicate that *FIRST* has opened doors of possibility for many. Interviewees described opportunities to explore career possibilities they had not previously considered. One said, "I can see myself having a career in electrical or mechanical engineering. *FIRST* opened my eyes to engineering. Before robotics, I didn't think of a career in engineering, but now I do."

For many participants, the *FIRST* program lowered the barriers to STEM-related opportunities and increased their interest in the field. Having opportunities to be involved and feel successful took away the mystique and fostered a mentality of "I can do that."

In some cases, the program offered clarification for those who had already chosen a career path. One participant said, "I have always wanted to be in computer science. Robotics makes me want to be in programming." Another said:

> I've always known that I wanted to do science and technology stuff. I joined robotics because I've had that goal since elementary school. I just knew it would be fun, whether or not I was actually going to be an engineer. But then the more I did it, the more I realized I'm just doing this because I love it, and I have a ton of fun. And I love the constant learning that you're doing.

Throughout the interviews, subjects confirmed their participation in *FIRST* helped them build skills that would benefit them professionally, regardless of their career path. One participant said, "I want to be in robotics as a career. *FIRST* set me on that mechanical engineering path in the first place, and so I actually want to apply it to a career setting after college." Another interviewee said that they did not intend to pursue robotics or engineering, but noted, "*FIRST* has been an enjoyable experience, but I am going to use my skills gained through this experience for another career direction." Yet another said, "I have learned [that] a lot of the skills I've learned in [*FIRST* Tech Challenge] are very transferable to STEM fields."

Significance

FIRST participants are given the opportunity to explore multiple skillsets and career paths, opening doors to possibilities. Many did not previously see themselves as capable or interested in a STEM field but have discovered new strengths and passions of which they were previously

unaware. Regardless of whether a participant intends to pursue robotics, they are gaining insights into who they are and the confidence that they can accomplish their career goals.

5.2. Building a better world

The data show that many interviewees are particularly drawn to the innovative and life-long learning elements of the technology industry. One interviewee shared:

> I like the idea of being a game-changer. There's this one team in Texas, 148, [that] says "fail harder" as their motto, and I really like that because it highlights the idea that engineering is always an iterative process. I like how engineering makes it so that you can literally build your own future design world.

Another said:

> In STEM, you have to be a lifelong learner. [In] some other careers, you can learn what you need to learn out of college and be done. I don't like that. I like learning. If I could get paid to just learn stuff, I totally would. I like that in STEM, especially computer science, everything's changing so fast, you've got to be constantly on top of it, or you fall behind. I think that's what I'm most excited about. Part of what you get paid for is being a lifelong learner.

Many participants are inspired not only to go into engineering or another STEM-focused field but to use their skills to help people and create positive change in the world. When asked about future career plans, one interviewee said, "I want to bring STEM education to unincorporated areas like poor countries, things like that. Generally, educating ladies across the world wherever I am because I want to have an international impact." Another said, "I want to work at a company in my dream job and inspire other people as well." Yet another, when asked about their career goals, shared, "I think just making a positive impact, wherever that takes me."

Significance

Many young people who plan to go into engineering and other technology-centered professions are doing so not just because of their strengths and interests in a STEM skillset but because of the deeper characteristics of the field. The data show that innovation, creativity, life-long learning, and the opportunity to create technology that will benefit their community are primary draws for many of the young people we interviewed. Participation in *FIRST* offers opportunities to experience these characteristics of the work and inspires young people to take the skills and ideas they are developing into the next stage of their career.

Recommendations

The following represent a few of the most salient recommendations from the findings of this evaluation:

1. **Provide coaching for socio-emotional outcomes**. The findings reveal that the significant impact of *FIRST* on the science and technology outcomes among participants is matched by the social and emotional outcomes it achieves. The benefits of the program are obvious not only in the development of acumen for robotics but also in the development of personal and interpersonal maturity. The idea of Gracious Professionalism is a hallmark of the program's impact. These socio-emotional outcomes may be advanced even further through the coaching and facilitation that is directed toward developing these outcomes.
2. **Develop curricula for sense-making and student reflection**. The experience of *FIRST* is powerful for participants. To amplify the impact of the program, a means and method for facilitating self-reflection along the way will increase the meta-cognition of participants. When young people have the opportunity to reflect on their own learning, it makes the impact more significant and durable. They become aware of the progress they are making in part through self-reflection and articulation.
3. **Pursue resources for greater equity and parity among teams**. Whereas the impact of *FIRST* appears to be independent of the number of resources available for each team, members of teams with fewer resources are cognizant of the inequity. To the extent that the experience is limited by the limitations of resources, that access is limited by the limitations of resources, and the attractiveness of participation is limited by the limitation of resources, strategies to remedy the inequities should be made.

4. **Create a strategy for increasing competency in specific aspects of project management.** Data from both the survey and the qualitative interviews reveal that the elements of project management that are intended to be realized as outcomes are lagging the other dimensions of intention. In particular, the skills of budgeting are revealed to be under-developed in comparison to the rest of the outcome data. More attention will be needed for this area of impact to be improved.
5. **Develop and apply more intentional leadership components to the strategy.** Even though the data reveal that leadership is being developed as a result of *FIRST*, participants are often unaware and unintentional about their growth in this area of competence. Providing clearer, more explicit guidance in the area of leadership development will maximize the impact in the lives of students and empower them to advance in the intended leadership skills.
6. **Develop strategies for communicating the expansive impact of *FIRST* beyond robotics.** The findings from this evaluation show that the impact of *FIRST* is meaningful, significant, and expansive. Any perception that this is a program designed narrowly and only for young people with a particular predilection for robots should be exposed to the message of the impact of *FIRST* on the full development in the lives of participants.

Appendix

Interview Questions

Gracious Professionalism

What have you learned about gracious professionalism through your time in *(this program)*? How has that changed how you think about teamwork (or, cooperation, sportsmanship)?

When you feel under pressure, how do you act differently toward people now than you used to? What is still hard for you to do well when you are under stress? How has that made a difference in who you are as a person?

How has being a part of *(this program)* helped you feel more comfortable about being yourself around people? How has that given you a sense of belonging?

Project Management

What have been the biggest lessons you've learned through *(this program)* about how to manage projects? How has that changed how you plan for the big challenges you face in your life?

What are all the skills you've learned through *(this program)* about how to approach big, complex, challenging projects? What project management skills have been difficult for you to do? How has that helped you be more disciplined and responsible in your life? In what ways do you still want to grow to be better at taking on challenges?

What makes you most proud about what you've taken on through *(this program)?* How has this given you the grit to stick with projects over the long haul?

Problem Solving

What have you learned about how to think about solving problems through *(this program)?* How has that helped you believe in your ability to solve problems in the future?

What can you do now to solve problems that you couldn't do before *(this program)*? How has that made a difference in your ability to keep working on problems even when there is no easy answer?

What have been some of the highlights of your projects, when you have felt the best about what you've accomplished? When were some of the low points when you felt like you couldn't figure things out? How has *(this program)* affected your ability to press through times that felt the most difficult?

Leadership

What have you discovered through *(this program)* about your ability to lead people? How has that changed your view of yourself?

Since being in *(this program)*, how can you lead better now than you used to? What have you seen through *(this program)* about what you need to work on to be a better leader? **How has that made you show up better as a leader in other areas of your life?**

What used to make you feel uncertain or nervous about motivating and guiding people? How has that changed through *(this program)*? **How has *(this program)* given you greater confidence in your leadership?**

Future Orientation

What have you learned through (this program) about what might be possible for you in your future involvement with robotics and STEM? **How has that changed how you see your future?**

What are you doing now to prepare for a future in robotics and STEM? **How do you think your future career choices will be different as a result of (this program)?**

What are you most excited about when you think about your future in robotics or STEM? How will you keep committed to this in the future? If your future could go just as well as you could imagine, what will it look like?