

**Evaluation of
FIRST LEGO[®] LEAGUE**

Prepared by:

**Alan Melchior, Tracy Cutter, Faye Cohen
Center for Youth and Communities
Heller School for Social Policy and Management
Brandeis University
Waltham, MA**

Prepared for:

**U.S. FIRST
Manchester, NH**

July 2004

Chapter One

Introduction

FIRST LEGO[®] League (FLL) is a national robotics program in which teams of young people aged 9 through 14 assemble and compete robots (based on the LEGO[®] MINDSTORMS™ kit) designed to accomplish tasks involved in a ‘real world’ scenario. With the help of a coach (a local teacher, parent or other adult), children are organized into teams of up to 10 students who work through the fall to build robots that can perform a specified set of tasks related to a real world issue in the annual Challenge. Teams also conduct a research project related to the tasks in that year’s competition. The Challenge culminates in local, qualifying and state/provincial tournaments in which teams present their research projects and compete their robots for a variety of awards. Begun in 1996, the FIRST LEGO[®] League has grown to over 3,400 teams in the United States and Canada, with additional teams internationally.

The overall goal of the FLL program is to inspire interest in and increased understanding of science and technology among young people through hands-on, project-based experiences. Through the FLL season, team members have an opportunity to learn how to design, build, program and operate their robots to meet a set of defined challenges. Through the research project, they have opportunities to research a Challenge-related issue and to present their research as part of the tournament process. The FLL values of teamwork, creative problem-solving and ‘gracious professionalism’ are emphasized throughout the season with the goal of reinforcing students’ social skills as well as their interest in science and technology. The topic of the Challenge changes each year, but the missions are designed to encourage real-world applications of science and technology. Finally, while the primary goals are increased interest and understanding of science and technology, the intent of the program is to accomplish those goals by creating a fun and engaging experience in which children have the opportunity to learn and grow in an atmosphere of friends, teamwork and friendly competition.

Evaluation Background

In October 2003, FLL contracted with the Center for Youth and Communities at Brandeis University’s Heller Graduate School to conduct an evaluation of the FIRST LEGO[®] League program. The primary focus of the study was to assess the degree to which participation in FLL was having the expected impact on participating youth. However, the study was also designed to examine the implementation of the program from the perspective of coaches (i.e. perceived strengths and weaknesses) and its effectiveness in building and retaining adult engagement and support. Three major questions guided the evaluation process:

1. **What is the impact of the FIRST LEGO[®] League program on participating young people?** To what degree is the program meeting its goals of introducing young people to science and technology concepts and building key life, workplace and academic skills such as teamwork, project planning, conflict resolution or time management? To what extent are participants motivated by their program experience and/or report increased interest in science or technology studies and/or future careers? To what extent is the program successful in creating a fun and satisfying experience for young people, such that they want to continue their involvement in the program?

2. **What is the impact of the FIRST LEGO® League on participating adults and institutions?** To what extent is FLL successful in engaging and motivating or satisfying coaches and parents as the key volunteers involved in the program? Are parents and coaches sufficiently engaged and recognized? Are they motivated to continue their involvement over a longer term, and if not, what can the program do to support a longer-term commitment? Has participation in the program had an impact on coaches or parents in terms of their own interest in or knowledge of science and technology or, in the case of teachers, on the way in which they work with students in their classrooms? Overall, how satisfied are team coaches and parents with the program, and are they likely to continue their involvement over time?
3. **What are the strengths and weakness of the FLL program from the perspective of participating adults and youth and what steps, if any, could FIRST take to improve the program?** To what extent are teams completing the major elements of the FLL model? Are the program materials and challenges appropriate and effective given the age and skills of the young people involved? Are young people given the opportunity to play an active, leadership role on their teams? Are the tournaments well-organized and do they provide the kinds of positive experiences anticipated by FIRST? What kinds of barriers and challenges do coaches need to address to organize and run a successful FLL team and what suggestions do coaches and participants have for ways of improving the FLL experience?

Methodology

To address these questions, the evaluation drew on several major sources of data, including surveys, site visits, and telephone interviews. These include:

- Surveys of coaches, students, and the parents of participating students from teams involved in a sample of state/provincial FLL tournaments;
- Field visits to five FLL teams and several tournaments
- Telephone interviews with over 30 coaches from around the country

The primary data source for the evaluation is a set of coach, participant and parent surveys collected from a sample of FLL teams around the U.S. and Canada. Packages of surveys that included a coach survey, 10 student and 10 parent surveys were distributed to approximately 394 FLL teams who participated in a sample of seven of the U.S. state tournaments and one Canadian tournament. The tournaments in the sample were: Alberta, Canada; Northern California; Florida; Indiana; Michigan; Rhode Island; South Carolina; and Wisconsin. The tournaments were selected through a stratified random sampling process that was designed to ensure that tournaments from around the country (northern, southern, eastern and western regions) were included.

In some instances, survey packets were sent directly to teams; in most cases packets were handed out at the tournaments. In all cases, coaches were asked to have their team members complete their surveys and to have one parent per team member complete a survey as well. Coaches were also sent reminder emails and postcards, as well as reminder calls during the survey period. A

total of 185 teams (47%) returned packages, providing a total of 162 coach surveys (some coaches had multiple teams), 919 student surveys, and 699 parent surveys.

The surveys themselves were designed in conjunction with FLL and FIRST staff at the national office and were designed to provide multiple perspectives on the program. Because of the timing of the evaluation (which began after the 2003-2004 Challenge was underway), it was not possible to use a pre/post program survey design. Instead, the decision was made to use a single set of post-program surveys, but to gather and triangulate data from multiple sources: participants, parents and coaches. The use of multiple perspectives provides a check and balance on the survey results, providing greater reliability than if the study were to depend on a single source of data. Moreover, the relatively large number of teams involved helps to ensure that the results are not biased by a single team or region. As such, the surveys can be seen as providing a solid initial assessment of the program's operations and outcomes.

The FLL surveys were supplemented by field visits to a small number of programs and by telephone interviews with a sample of FLL coaches. The goal of the site visits was to gain a first-hand understanding of the program and to see a small number of programs in operation. Five schools were visited, and because more than one team was interviewed in a couple of the locations, we were able to meet with more than five teams altogether. Sites for field visits were chosen to represent the variety of settings and environments in which FLL teams operate. For example, we included a mix of urban, suburban, and rural schools. Two of the teams were single-gender teams (i.e., one all-girl, one all-boy). Four of the schools were in New England (schools in Boston, Holden, and Newton, Massachusetts and Manchester, NH) and one school was located in Houston, TX.¹ Each site visit included group interviews with students and individual interviews with coaches and mentors. In most cases, visits also included observations of students working on their robots.

Finally, after the survey process was completed, the evaluation team also conducted follow-up telephone interviews with a sample of 32 of the FLL coaches who completed the coach survey. These interviews were designed to explore some of the key issues that came up during the analysis of the survey and discussions with FLL staff. Topics included the helpfulness of materials used in preparing for the competition; strengths and weaknesses of the research assignment; mentor and parent support; and the tournament experience. Additional questions about recruiting and maintaining team members were posed for those teams that had substantial numbers of girls and/or older children. The sample includes coaches from each of the eight tournaments that were surveyed. We also sought to include a mix of rookie (i.e. first year) and veteran coaches, ending up with half in each group (i.e., 16 veterans and 16 rookies). As such, the coaches interviews provided an important opportunity to gain a better understanding of the programs and to address a number of operational issues in greater detail.

¹ The Houston school had been identified by FIRST staff as a particularly active FLL site and was visited in conjunction with site visits in Houston on another project.

Summary of Key Findings

Taken together, the data from these multiple sources provide a rich picture of both the operation of the FLL program at the local level and the impacts of the program on participating students, coaches and parents. The picture they present is of a program that has largely succeeded in its goals of providing an engaging and effective learning experience for older elementary and middle school-aged young people. Based on the survey data, as well as the site visits and telephone interviews, the large majority of FLL teams have implemented the major elements of the program and are providing participants with opportunities for the kinds of hands-on learning that the program is designed to promote. Students, parents, and coaches all agree that the program has increased student interest in science and technology and has helped students strengthen a wide variety of academic and social skills. Students, coaches and parents also voice a high degree of satisfaction with the program experience, and the large majority indicate an interest in continuing their involvement in the program next year.

At the same time, the study does help to identify a number of areas where FLL can look to further strengthen program operations. While the program hopes to increase the involvement of female and minority students, more than three-quarters of program participants are male and White. In terms of program outcomes, the program is less successful in introducing students to science and technology careers than most other areas of the program, and there appear to be relatively few links to more traditional academic skills and subjects, such as math and writing. It may be that these are areas that are not high priorities for the program; alternatively, program staff need to look at ways to strengthen the connections between the program experience and these academic skills.

In operational terms, the surveys and coach interviews suggest several opportunities for improved support for coaches and parents. As suggested above, recruitment of girls and minorities remains a concern, with some suggestions and strategies emerging from the telephone interviews. Coaches also had a number of suggestions for ways to improve or supplement the FLL materials to make it easier for teams to ‘get up to speed’ on the program and tournament rules. The surveys and interviews also suggest ways of improving the research assignments and tournaments, primarily by providing better structure and guidance for teams and tournament officials. Finally, the surveys and coaches also pointed to some opportunities for increasing parent involvement, primarily by better defining clear roles for parents and making it clear that parents do not need to be technologically savvy to be active in the FLL process.

The major message of the surveys, however, was that FLL was remarkably successful in providing a positive and rewarding experience for participating students, team coaches, and the parents involved in the program. As the first major study of the FLL program, the evaluation should provide a solid foundation for further development and growth of the program.

Some of the specific findings from the evaluation are as follows:

- **FLL programs take place in a variety of settings, however, the large majority of programs take place in school-based after-school settings (72%) and in suburban communities (60%).** Substantially smaller proportions of the programs (less than 10% each) take place in community-based, neighborhood, or home-school settings, and

approximately one-fifth each of the programs are in rural and urban communities. Approximately one-third of the teams report serving low-income students, though only 11% indicate that half or more of their students are from low-income families.

- **Despite a goal of establishing a diverse pool of participants, FLL participants and coaches are still predominantly male and White.** Seventy percent (70%) of the program participants are boys, and 78% reported their race/ethnicity as White. The demographic data for coaches provides a similar picture: 69% of the coaches are male and 86% are White. Roughly half of the coaches are teachers, and two-thirds (67%) bring a background in engineering, science or technology. Nearly 60% have a child on the FLL team.
- **Based on coach and student surveys, FLL teams provide students with the kind of active, hands-on experiences envisioned by the national program.** Over 96% of the coaches characterized their teams as “child-directed” or “adult-guided”, with less than 4% reporting that they were “adult-directed,” and over 90% of the students reported that they “made important decisions” and “had real responsibilities” on their teams. The large majority of students reported participating in a wide range of FLL tasks, including designing, building, programming and testing the robots. Almost all (98%) reported attending a tournament, and 97% also reported participating in the research assignment. Overall, 87% of participants reported that they “had a chance to do lots of different jobs on my team,” and 91% indicated that “I got all the help I needed.” It is important to note that, within this high overall level of participation, there are differences in the patterns of participation among girls and boys, with boys significantly more frequently involved in the design and construction of the robots, and girls more active in team support activities (i.e., fundraising, logos and materials) and the research assignment.
- **FLL coaches, participants and parents agreed that the program had a positive impact on participating students, increasing their interest in and understanding of science and technology and strengthening a range of problem-solving and teamwork skills.** Over 90% of the coaches reported that FLL had increased team members’ interest in or awareness of how math and science is used in the real world and their interest in computers and technology; 80% cited an increased interest in science and technology careers. Coaches also reported increased programming skills (98%), and increased understanding of how science and technology can solve real world problems (94%), as well as increased problem-solving skills (97%), teamwork skills (94%) and leadership skills (94%), among others.
- **FLL participants also reported increased awareness and understanding of science and technology** and gains in teamwork and problem-solving skills. Participants reported an increased understanding that science and technology could be used to solve real-world problems (97%), that science and technology are important to everyday life (95%), and that school subjects like math or science can be used to solve real-world problems (93%). Students also reported learning a variety of personal skills. Over 90% reported learning at least “a little” about working with other team members to solve a problem; brainstorming ideas; making decisions about roles on a project; accepting others’

suggestions and ideas; making suggestions to others; identifying the steps needed in a project; managing time; using trial and error to test an idea; and identifying ways in which science (like computers and robots) can be used to solve real-world problems. More than 80% also reported learning how to solve disagreements among team members; how to work well with both boys and girls; how to develop a research question; how to find information to answer a research question; how to use math in solving real-world problems; how to make a presentation using charts and graphs; and how to explain the scientific ideas that the team used in creating their robots.

- **Finally, parents also reported student gains, though at somewhat lower rates than reported by the coaches and participants.** More than 80% of the parents surveyed reported that FLL had increased their child's interest in computers and technology; in how science and technology are used to solve problems in the real world; and in the science related to the Mission Mars. Seventy percent (70) or more reported an increase in their children's teamwork and problem-solving skills, including their ability to work in a group; their sense of belonging; their ability to think through the steps involved in solving a problem; their use of trial and error; their confidence in speaking in front of a group; and their sense that they can succeed if they try hard. Slightly smaller numbers of parents (60% or more) also reported an increased ability to compromise or settle disagreements peacefully; take the lead on a group project; and use the library or internet to find information. Sixty-three percent (63%) also reported an increase in self-confidence concerning school and school work.
- **Overall, students, coaches and parents reported a high degree of satisfaction with the program experience.** Ninety-four percent (94%) of students rated their experience as "good" or "excellent," and over 80% plan to return the following year. Eighty-seven percent (87%) of the coaches reported that they were "satisfied" or "very satisfied" with their experience and 88% planned to return. Parents also indicated their overall satisfaction, with 97% reporting that they wanted to maintain or increase their level of involvement in the program.
- **Finally, both the surveys and telephone interviews highlighted several areas of potential improvement.** For students, the least favorite part of the program was the research assignment, suggesting that continued efforts to make that component clearer and more engaging are needed. Coaches highlighted a number of needs, including suggestions for improved training and materials (particularly videos) for use by the coaches; added opportunities for exchange among coaches; increased marketing; better quality control over tournaments and judging; and increased training and support for volunteers.

Chapter Two

Program Context and Participants

FLL programs take place in a variety of communities and settings. However, the “typical” FLL program (involving the large majority of sites) takes place in a suburban community as a school-based after-school program. Despite a strong interest in expanding the program to involve more girls, low-income, and minority students, the large majority of program participants are boys and most report that they are White. Similarly, only 11% of the coaches report serving predominantly low-income students.

The adults leading the program (team coaches) are also predominantly White males, though most of the parent survey respondents are women. At the same time, both coaches and parents bring valuable knowledge and experience to the program. Most coaches (and many parents) bring several years of experience with the program and a background in science and technology, and more than half of the coaches and a third of the parents have experience in teaching. As such, they represent an important resource for the students and the program.

Setting

Over 80% of teams are based in schools, with most of those operating as after-school programs (Table 1). Roughly 8% of the teams operate as an in-school class. Much smaller percentages of programs operate in a community setting, with the most common form (9%) being neighborhood-based teams: generally teams that are run by a parent for a group of children who are already friends. Smaller proportions of the teams are home-school teams, or are based in community organizations such as the YMCA or Scouts. Another 9% of coaches responded that their team did not fit into any of these categories.

The large majority of teams (60%) are located in suburban settings; about one fifth of the teams operate in urban areas and another fifth are located in rural areas. About one third of the coaches reported serving low-income students. However, a much smaller percentage of teams (11%) report that half or more of their students are from low-income families. Slightly more than half of the coaches (52%) report making special efforts to recruit girls into the program, and less than 20% report special efforts to recruit minority students, students with disabilities, or middle-achieving students onto their team.

Team Members

Despite reported efforts by many teams to recruit girls, teams continue to be made up predominantly of boys, with boys representing 70% of program participants (Table 2). Minority students are also under-represented among program participants. The large majority of students reported their race as White (78%), while 8% reported as Asian/Pacific Islander, 5% as Hispanic, and 4% as African-American.²

² According to the U.S. Census (2003), 76% of school-aged children aged 5-13 were white, 15.7% were African-American, and 3.8% were Asian. Overall, 18.5% were reported as Hispanic or Latino of any race.

Table 1: FLL Context

	N	Percent
Program Type		
<i>School-based (part of after-school program)</i>	117	72.2%
<i>School-based (part of a school class)</i>	14	8.6%
<i>Home-school based</i>	8	4.9%
<i>Community-based organization (YMCA, Scouts, etc.)</i>	2	1.2%
<i>Neighborhood-based</i>	14	8.6%
<i>Other</i>	14	8.6%
Community		
<i>Urban</i>	34	21.4%
<i>Suburban</i>	96	60.4%
<i>Rural</i>	29	18.2%
Students from Low-income Families on Team	35	35.3%
Teams Predominantly of Students from Low-Income Families	11	10.6%
Special Efforts to Recruit		
<i>Girls</i>	84	51.9%
<i>Children of color/racial or ethnic minorities</i>	26	16%
<i>Children with 'B' or 'C' averages in school</i>	31	19.1%
<i>Children with disabilities</i>	16	9.9%

Table 2: FLL Participant Characteristics

Student Characteristics	N	Mean
Years Spent on Team	891	1.5
Age	918	11.4
Student Characteristics	N	Percent
Grade		
<i>2nd</i>	2	0.2%
<i>3rd</i>	18	2%
<i>4th</i>	126	13.7%
<i>5th</i>	233	25.4%
<i>6th</i>	197	21.5%
<i>7th</i>	172	18.8%
<i>8th</i>	138	15%
<i>9th</i>	30	3.3%
<i>10th</i>	1	0.1%
Gender		
<i>Male</i>	636	70%
<i>Female</i>	273	30%
Race		
<i>African-American</i>	35	3.8%
<i>Asian</i>	73	7.9%
<i>Caucasian/White</i>	715	77.8%
<i>Hispanic/Latino</i>	49	5.3%
<i>Native American/Alaskan</i>	10	1.1%
<i>Other</i>	70	7.6%

In general, students fit the program profile of serving young people aged 9 through 14. The average age of participants was 11 years old, and the majority of students (66%) were in the 5th grade, 6th grade, or 7th grade. Students reported having been on their FLL team for an average of one and one-half years.

Coaches

As with the participants, FLL coaches were also predominantly male and White (Table 3). Roughly 70% of the coaches were male, and 86% were White. Less than 4% of the coaches reported that they were Hispanic, and less than 2% were African-American. The majority of coaches (78%) either currently have or have had a child of their own in FLL. While it was not prominently mentioned in any of the telephone interviews, one strategy for increasing the diversity of students in the FLL program may be to increase the diversity of the coaches who are involved.

FLL coaches do bring substantial background and expertise to the program. On average, coaches were mature adults (average age of 43) and had just over two years coaching experience (Table 3). Half of the coaches (51%) reported that they had a background in teaching and two-thirds (68%) reported that they had been employed at one time in a field related to science and/or technology.

Coaches were also generally familiar with the high school-based FIRST Robotics Competition (FRC) program (suggesting an opportunity to better link the FLL and FRC programs). Just over three-quarters (76%) of the coaches were familiar with the FIRST Robotics Competition (FRC). In practice, however, relatively few coaches were involved in both programs. Only 17% reported that they had ever been involved with FRC, and less than 4% reported involvement as a team leader in the high school program. The most common involvement (still only 4% of the coaches) was as a corporate volunteer. Only 2.5% had been involved in FRC as a parent volunteer.

Parent Respondents

Of the parents who responded to the survey, 74% were women, suggesting that substantial numbers of women may be involved in FLL teams, though not as the official team leader. One-fifth of the parents had other children who had participated in FLL. About one-third of the parents had a teaching background themselves, and slightly more than one-third (37%) reported that they had been employed in a field related to science and/or technology. More than half (60%) had heard about FRC (again suggesting an opportunity for better linking the two programs), but only 2% had other children who had participated in it.

Taken together, the data on program setting and student and adult demographics help to highlight both critical strengths and challenges for the FLL program. In terms of strengths, the program clearly draws on an experienced and knowledgeable group of team coaches and parents, with a high proportion bringing both teaching and science/technology experience to the program. That experience represents an invaluable resource for FLL in its efforts to inspire an interest in science and technology among its participants. At the same time, the lack of racial and gender diversity in the program continues to represent an important challenge as the program attempts to

reach more girls, students who are members of low-income families, and minority students as a part of its mission.

Table 3: Coach Characteristics

Coach Characteristics	N	Percent
Gender		
<i>Male</i>	111	68.5%
<i>Female</i>	51	31.5%
Race		
<i>African-American</i>	3	1.9%
<i>Asian</i>	7	4.3%
<i>Caucasian/White</i>	139	85.8%
<i>Hispanic/Latino</i>	6	3.7%
<i>Native American/Alaskan</i>	1	0.6%
<i>Other</i>	5	3.1%
Teaching Experience	162	50.6%
Ever Employed in Engineering, Science or Technology Field	109	67.6%
Child on FLL Team Currently	95	59%
Other Children w/Past Involvement in FLL	30	18.6%
Familiar w/FRC	122	76.3%
Involved with FRC as a:		
<i>Team leader</i>	6	3.7%
<i>Corporate volunteer</i>	7	4.3%
<i>University faculty/Staff volunteer</i>	0	0%
<i>Parent volunteer</i>	4	2.5%
<i>College student volunteer</i>	0	0%
<i>Robotics team member (high school student)</i>	0	0%
<i>Other</i>	3	1.9%
Coach Characteristics	N	Mean
Years Spent Coaching Team	162	2.1
Age	158	43.1

Table 4: Parent Characteristics

Parent Characteristics	N	Percent
Gender		
<i>Male</i>	184	26.4%
<i>Female</i>	512	73.6%
Familiarity with FRC		
<i>Have heard about FRC</i>	412	58.9%
<i>Had other children who participated in FRC</i>	17	2.4%
Background		
<i>Teaching</i>	219	32%
<i>Science and/or technology</i>	259	37.2%

Chapter Three

The FLL Experience

One of the key goals for the evaluation was to develop a better understanding of the FLL experience for participants at the local level and to assess the degree to which teams were implementing key aspects of the FLL model. How were FLL teams organized? What kinds of time did teams spend on FLL activities? To what extent were teams providing students with opportunities to take on active, leadership roles in designing and building the robots, and to what extent were students able to be involved in a range of activities?

The data from the coach and student surveys indicate that, in fact, the large majority of FLL teams were providing the kinds of active, hands-on experiences envisioned by the national program. Teams met on a regular basis, generally with the involvement of parents as well as the team coach. Most coaches characterized their team process as either “child-directed” or “adult-guided,” and the large majority of students indicated that they felt that they had a chance to make important decisions and had real responsibilities. Most students also indicated that they participated in a wide range of FLL activities involved in designing and building their robot. Almost all also participated in the research component and were able to attend a tournament.

Within a generally high level of involvement, it is important to note that there were some differences in the FLL experience for girls and boys on the FLL teams. While both participated at high rates, boys were significantly more likely than girls to report involvement in designing and building the team’s robot and deciding which mission to do for the Challenge, while girls were more likely to report involvement in fundraising, creating team materials, and almost all aspects of the research assignment. Again, the differences were not large, but they suggest that some effort may need to be made to encourage more hands-on involvement by girls on the teams and more active involvement by boys in the research task.

Lastly, the priorities that coaches established for their teams, in terms of the time reported spent on different types of activities, reflected the program’s dual emphasis on an introduction to science and technology and the development of social skills related to working successfully as a team. The result appears to be a typical program experience that reflects the fundamental goals of the program and a relatively high degree of ‘fidelity’ to the FLL model.

Team Structure and Operation

Based on the results from the coach survey, the typical FLL team had an average of eight students (versus the maximum allowed 10), with roughly twice as many boys as girls on each team.³ Teams generally met at least twice a week, with 16% of the teams meeting three times a week or more. On average, teams met for about 4.5 hours a week, providing substantial time for them to work on their projects over the course of the Challenge period (Table 5).

³ It is worth noting that these proportions differ slightly from those based on the demographic data from the student survey, reflecting both different sources and the fact that the figures here represent averages among teams, rather than individuals. In both cases, however, it is clear that girls were generally under-represented on FLL teams.

In most cases, it appears that teams had several adults on hand to help with the process. Coaches reported an average of slightly more than two parent mentors and one other adult volunteer working with their team. In addition, they had an average of just over 1 high school student mentor and just under one-half of a college student mentor. Altogether, 86% of the coaches reported the involvement of at least one mentor or volunteer; less than 14% of coaches reported no other adults working with the team.

From the student perspective, family members were also regularly involved. Almost two thirds of students had a parent, step-parent or guardian that helped the team. Of those students who said that they had parental support, half (50%) reported that their parent helped out most or all of the time, whereas 42% helped out a few times, and 9% helped out on only one occasion. Parents themselves reported that most did attend tournaments (80%) and that two thirds attended team meetings. Parents spent an average of 3.7 hours per week on FLL-related activities during the season (including driving their child to meetings and events). Half of the parents surveyed donated money or materials to their child’s team. However, parents also contributed in a variety of other ways. The most frequently reported were providing transportation for children other than their own (46%) and assisting the team with their research assignment (30%).

Table 5: Team Characteristics

Team Characteristics	N	Mean
<i>Boys</i>	142	6.2
<i>Girls</i>	138	2.7
<i>Total Students</i>	147	8.3
Hours per week that team meets	157	4.5
	N	Percent
Team Meetings		
<i>Once a week</i>	36	22.5%
<i>Twice a week</i>	87	54.4%
<i>Three times a week</i>	26	16.3%
<i>More than three times a week</i>	11	6.9%
Mentors Working with Team		
<i>High school students</i>	48	1.2%
<i>College students</i>	18	0.4%
<i>Parents</i>	100	2.3%
<i>Other adults</i>	59	1.4%
<i>No other adults working w/team</i>	22	13.6%
Parent Involvement with Team (Student Survey)		
<i>Parent involved with the team</i>	588	64.8%
<i>Helped most or all of the time</i>	295	49.5%
<i>Helped out a few times</i>	249	41.8%
<i>Helped out once</i>	52	8.7%

Team Formation

Coaches formed their teams in a variety of ways. A majority of coaches (64%) used announcements, posters and flyers at school to attract students to the program. About one-

quarter (26%) asked teachers or guidance counselors to refer students that they thought would be good additions to the team. Twenty percent (20%) of coaches sent notices directly to parents, informing them about the FLL team. Smaller proportions of coaches recruited team members through gifted programs (9%) and through emails, websites, and listserv postings (3%). About one quarter of coaches (27%) reported using some other method to recruit their team members.

As noted in the previous chapter, just over half of the coaches reported making special efforts to recruit girls onto their team, while smaller proportions reported making efforts to recruit middle-achieving students, children of color, and children with disabilities onto their team. As discussed in a later chapter, methods of recruiting girls, for example, included direct recruitment, recruitment through friends, and efforts to bring girls into FLL at an earlier age.

Table 6: Recruitment Practices

Recruitment Methods	N	Percent
<i>Announcements/posters/flyers at school</i>	103	63.6%
<i>Internet/email/list-serve/website postings</i>	5	3.1%
<i>Referrals by teachers or guidance counselors</i>	42	25.9%
<i>Recruit from gifted programs</i>	14	8.6%
<i>Flyers/notices to parents</i>	32	19.8%
<i>Flyers/notices at community centers/other community locations</i>	3	1.9%
<i>Other</i>	43	26.5%
Special Efforts to Recruit	N	Percent
<i>Girls</i>	84	51.9%
<i>Children of color/racial or ethnic minorities</i>	26	16%
<i>Children with 'B' or 'C' averages in school</i>	31	19.1%
<i>Children with disabilities</i>	16	9.9%

Youth Leadership

One of the major goals for FLL is to actively involve children in team leadership roles and decision-making. The survey results showed that teams generally met this goal (Table 7). When asked to characterize the work style of their teams, about two-thirds of coaches (65%) considered their teams to be “adult-guided” and another one-third (31%) thought of their team as “child-directed.” Only a very small percentage characterized their activities as being “adult-directed” (4%).

Coaches also reported an emphasis on youth leadership in the research component of FLL. Here, too, only a very small percentage of coaches (3%) reported that projects were “adult-directed.” Instead, 42% reported that their teams approached the research assignment in a “child-directed” way (a somewhat higher percentage than for general operations), and 55% reported working on the research assignment in an “adult-guided” manner.

Young people generally agreed with this characterization. An overwhelming majority of students (93%) agreed with the statement that the kids on their teams were the ones who made the important decisions, as opposed to the adults, and an equally high percentage agreed that they had real responsibilities on their team (94%).

Table 7: Youth Leadership

Overall Team Work – Coach Survey	N			Percent
<i>Child-directed</i>	50			31.4%
<i>Adult-guided</i>	103			64.8%
<i>Adult-directed</i>	6			3.8%
Research assignment – Coach Survey	N			Percent
<i>Child-directed</i>	65			42.2%
<i>Adult-guided</i>	85			55.2%
<i>Adult-directed</i>	4			2.6%
Student Survey Perceptions	N	Percent 'Agree'	Percent 'Strongly Agree'	Percent 'Strongly Agree' or 'Agree'
<i>Kids made the important decisions</i>	840	44.4%	48.4%	92.8%
<i>I had real responsibilities on my team</i>	848	37.2%	56.6%	93.8%

High Levels of Involvement in FLL Activities

The data from student and coach surveys also show that most FLL participants had opportunities to participate in key components of the FLL program, and that most were actively involved in a wide range of activities associated with the design and construction of the robot and the research assignment. More than 90% of the coaches responding to the survey reported that their teams participated in a state/provincial tournament, 64% attended a qualifying event, and 41% went to a local event (Table 8). As a result, 98% of students reported that they attended at least one FLL tournament this year. Coaches and students reported similar figures for participation in the research assignment, with almost all students and coaches (97%) reporting that they had worked on that component of FLL.

Table 8: Tournament and Research Assignment Participation

Tournament Participation	Student Survey		Coach Survey	
	N	Percent	N	Percent
<i>Local event</i>			67	41.4%
<i>Qualifying event</i>			103	63.6%
<i>State or provincial tournament</i>			146	90.1%
Working on Research assignment	810	96.8%	154	96.9%
Attending at least one FLL tournament	879	97.9%		

Most students reported at least some involvement in many different aspects of their team's FLL project (Table 9). For example, more than 80% of students reported that they were involved either "a lot" or "a little" in deciding which missions to do in the Challenge, designing their team's robot or designing a specific part of the robot, building the robot, testing the robot, and explaining how the robot works to the judges at the tournament. Similarly high percentages of children reported that they were at least a little involved in programming the robot (77%) and setting up or fixing the robot at the tournament (78%). The least common activity for students was involvement in raising money for the team. Only 27% reported activity in that area.

Most students also worked on tasks related to the research assignment (Table 9). For example, 84% of students presented the team's research assignment at the tournament, 79% of students

reported that they were either a lot or a little involved in deciding on the question for the research assignment and 77% spent time researching at the library or on the Internet for the research assignment. Fewer students (37%) interviewed or gathered information from scientists or other experts for the research assignment. Overall, students seem to be exposed to a variety of the different tasks involved in preparing for the competition, with 87% of kids agreeing that they had a chance to do lots of different jobs on their team and 91% indicating that they had received all the help they needed at those jobs.

Students also reported a variety of experiences at the state and provincial tournaments. Most students had the opportunity to talk to students from other teams (87%) over the course of the event, and roughly a quarter to a third of the students gave help to or received it from students on other teams (Table 10). It seems that those who did ask for help from other teams (25%), received it (25%), suggesting that there were multiple examples of the kinds of ‘gracious professionalism’ endorsed by the program.

Table 9: Student Involvement in FLL Activities

How much were you involved in the following activities?	N	Percent ‘A Little’	Percent ‘A Lot’	Percent ‘A Lot’ or ‘A Little’
<i>Deciding which missions to do in the Challenge</i>	831	42.1%	49.7%	91.8%
<i>Designing your team’s robot or designing a specific part of the robot</i>	804	40.5%	48.0%	88.5%
<i>Building the robot</i>	748	41.3%	41.5%	82.8%
<i>Programming your team’s robot</i>	697	36.0%	41.2%	77.2%
<i>Testing the robot</i>	828	32.7%	59.1%	91.8%
<i>Setting up or fixing the robot at the tournament</i>	703	36.1%	41.5%	77.6%
<i>Explaining how the robot works to the judges at the tournament</i>	759	44.4%	39.6%	84%
<i>Raising money for the team</i>	241	16.9%	10.0%	26.9%
<i>Creating team materials (i.e., logo, t-shirt, buttons, team names, etc.)</i>	654	38.9%	33.0%	71.9%
How much were you involved in the following activities?				
<i>Deciding on the question for your research assignment</i>	696	37.4%	41.7%	79.1%
<i>Doing research at the library or on the Internet for your research assignment</i>	675	31.5%	45.2%	76.7%
<i>Getting information from a scientist or other expert for the research assignment</i>	321	22.2%	14.5%	36.7%
<i>Designing the expedition for your team</i>	614	39.8%	31.3%	71.1%
<i>Presenting the team’s research assignment at the FLL tournament</i>	736	28.4%	55.2%	83.6%
Do you agree with the following statements:	N	Percent ‘Agree’	Percent ‘Strongly Agree’	Percent ‘Strongly Agree’ or ‘Agree’
<i>I had a chance to do lots of different jobs on my team</i>	788	42.7%	44.1%	86.8%
<i>I got all the help I needed to do my jobs on the team</i>	818	43.3%	47.5%	90.8%

Table 10: Tournament Experience

How much did you do any of the following at the tournament?	N	Percent 'A Little'	Percent 'A Lot'	Percent 'A Lot' or 'A Little'
<i>Talk to kids on other teams</i>	780	56.7%	30.7%	87.4%
<i>Help kids on other teams solve a problem</i>	317	29.4%	6.3%	35.7%
<i>Ask for help from kids on other teams</i>	219	20.8%	4.0%	24.8%
<i>Get help from kids on other teams</i>	229	22.0%	3.8%	25.8%

Differences in FLL Experiences for Boys and Girls

Within the generally high level of involvement, it is important to note that there were some differences in the FLL experience for girls and boys on the FLL teams (Table 11). While both participated at high rates across most activities, boys were significantly more likely than girls to report involvement in designing and building the team's robot and deciding which mission to do for the challenge, while girls were more likely to report involvement in fundraising, creating team materials, and almost all aspects of the research assignment. Again, the differences were not large, but they suggest that some effort may need to be made to encourage more hands-on involvement by girls on the teams and more active involvement by boys in the research task.

Table 11: Differences in FLL Activities for Boys and Girls

How much were you involved in these activities:	N	Boys			N	Girls		
		Pct. 'A Little'	Pct. 'A Lot'	Pct. 'A Little' or 'A Lot'		Pct. 'A Little'	Pct. 'A Lot'	Pct. 'A Little' or 'A Lot'
Deciding which missions to do in the challenge*	628	43.5%	49.7%	93.2%	268	38.1%	50%	88.1%
Designing your team's robot or designing a specific part of the robot*	627	37.6%	53.4%	91.1%	271	46.5%	35.8%	82.3%
Building the robot*	627	40.7%	44.5%	85.2%	267	41.9%	34.8%	76.7%
Programming your team's robot	623	35.6%	42.2%	77.8%	271	35.8%	39.9%	75.7%
Testing the robot	623	33.2%	59.4%	92.6%	269	30.5%	59.5%	90%
Setting up or fixing the robot at the FLL tournament	628	36.9%	42%	78.9%	267	34.1%	40.4%	74.5%
Explaining how the robot works to the judges at the tournament	625	43.7%	40.3%	84%	269	45.7%	37.9%	83.6%
Raising money for the team*	622	14.8%	9.8%	24.6%	265	21.5%	10.2%	31.7%
Creating team materials (creating a logo, t-shirt, buttons, team names, etc.)*	628	39%	28.3%	67.3%	271	39.1%	43.5%	82.6%

Note: An asterisk (*) indicates significant differences in responses between girls and boys at the .05 level of significance or above.

Table 11: Differences in FLL Activities for Boys and Girls, continued

Research Project Activities	Boys				Girls			
	N	Pct. 'A Little'	Pct. 'A Lot'	Pct. 'A Little' or 'A Lot'	N	Pct. 'A Little'	Pct. 'A Lot'	Pct. 'A Little' or 'A Lot'
Deciding on the question for your research assignment*	610	40.8%	36.2%	77%	260	29.2%	54.6%	83.8%
Doing research at the library or on the Internet for your research assignment*	611	34.5%	39.8%	74.3%	260	25.4%	57.3%	82.7%
Getting information from a scientist or other expert for the research assignment*	609	21%	13.5%	34.5%	257	24.9%	16.7%	41.6%
Designing the expedition for your team*	605	40.5%	26%	66.5%	250	38.4%	44%	82.4%
Presenting the team's research assignment at the FLL tournament	611	32.4%	50.4%	82.8%	260	18.1%	67.3%	85.4%

Note: An asterisk (*) indicates significant differences in responses between girls and boys at the .05 level of significance or above.

Priorities for Team Coaches

Finally, it is important to recognize that the FLL experience on most teams was also shaped by the kinds of outcomes that team coaches considered important. In this instance, the priorities that coaches established for their teams, in terms of the time reported spent on different types of activities, reflected the program's strong emphasis on the development of social skills related to working successfully as a team. The four highest priority outcomes for the coaches, based on the percentage who reported spending "a lot" of time working on those areas, were the development of teamwork skills (76.4% of coaches), problem-solving strategies (73.9%), building a sense of belonging (66.3%), and the importance of helping others (55.3%). At the same time, coaches clearly maintained the focus on science and technology. More than 90% of the coaches reported spending at least a little time working with their teams on basic programming skills; the role of science and technology in solving real-world problems; and building an understanding of basic science principles (Table 12).

It is notable that the areas that coaches were least likely to emphasize included an understanding of potential careers in science and technology (only 10% spent "a lot" of time on this), basic math skills (9.5%), and writing skills (13%). Thirty-eight percent (38%) spent "a lot" of time on the importance of doing well in school. Clearly, many coaches did not see their role (or that of FLL) as directly or explicitly supporting academic learning. On the other hand, it is important to note that that even in these areas, approximately two-thirds of coaches or more report that their team spent at least a little time working on these issues. As a whole, the data suggest that, coaches are exposing team members to a wide variety of skills and knowledge, with the strongest focus on teamwork and problem-solving.

Finally, it is also worth noting that, in many cases, coaches were largely on their own in their efforts to teach basic concepts in science and robotics. Slightly more than half of the coaches (55%) reported using instructional guides or curriculum from the FLL website or elsewhere to

teach students these basic concepts. FLL may want to look at ways of making more resources available for coaches, or for making coaches more aware of the resources that are available to help with their teams.

Table 12: Time Spent Working on Activities

How much time do you spend working on:	N	Percent ‘A Little’	Percent ‘A Lot’	Percent ‘A Lot’ or ‘A Little’
<i>Teamwork skills</i>	158	21.7%	76.4%	98.1%
<i>Problem-solving strategies</i>	159	24.8%	73.9%	98.7%
<i>A sense of team identity or belonging to a group</i>	155	30.6%	66.3%	96.9%
<i>The importance of helping others</i>	150	37.9%	55.3%	93.2%
<i>Basic computer programming skills</i>	155	42.2%	54.0%	96.2%
<i>Leadership skills</i>	150	43.1%	50.6%	93.7%
<i>Using science and technology to solve real-world problems</i>	152	53.4%	41.0%	94.4%
<i>Research skills</i>	146	50.3%	40.4%	90.7%
<i>Presentation skills</i>	149	52.8%	39.8%	92.6%
<i>Time management</i>	150	54.4%	39.4%	93.8%
<i>The importance of doing well in school</i>	122	38.1%	38.1%	76.2%
<i>Planning skills</i>	148	55.9%	36.0%	91.9%
<i>An understanding of basic science principles</i>	145	60.9%	29.2%	90.1%
<i>Writing skills</i>	100	49.1%	13.0%	62.1%
<i>An understanding of potential careers in science and technology</i>	99	51.9%	10.0%	61.9%
<i>Basic math skills</i>	104	56.3%	9.5%	65.8%

Chapter Four

Participant Impacts

Did FLL have an impact on participating students? **Survey responses from the FLL coaches, students and parents all agree that the program has had a positive impact on participating students, increasing their interest in and understanding of science and technology and strengthening a range of teamwork and problem-solving skills.** Across the board, coaches, students and parents report an increased interest in the uses of science and technology to solve real-world problems, and in computers and technology generally. All three groups also point to increases on a wide range of teamwork and problem-solving skills, including planning skills, time management, and the ability to work on a team: negotiating roles, giving and receiving feedback, and exercising appropriate leadership. All also agree that the least common impacts were on traditional academic skills: for example, improved math or writing skills. Both parents and students agreed that FLL had impacts that were as great or greater than those of other after-school in which they had been involved.

While all three groups report positive impacts from the program for a high proportion of participating youth, the student surveys do indicate some differences in impacts between boys and girls, generally in ways that are consistent with the differences in program experience reported in the previous chapter. On the whole, boys were more likely than girls to report an increased interest in computers and robotics and in careers in science and technology as a result of the program, while girls were more likely to report increased interest in doing well in school, an increased confidence in their own abilities, and increased research and teamwork skills. As noted earlier, the differences need to be seen in the context of the program's generally positive results, but they suggest that the program may want to pay further attention to the issue of gender and explore ways of ensuring that the needs of both boys and girls are met.

Finally, students also reported a high degree of satisfaction with the program overall, with the large majority of students rating the program as "good" or "excellent", and with most students indicating an interest in returning the following year. In this instance, the differences between boys and girls disappeared: both groups rated the program highly and were equally likely to want to return the following year.

Increased Interest and Skills: The Coach Perspective

Interest in Math and Science. Most coaches saw student improvement in several important areas as a result of FLL (Table 13). Almost all of the coaches reported an increased interest in or awareness of how math or science is used in the real world (93%); an interest in computers and technology (93%); and an increased interest in jobs or careers in science and technology (81%). Fewer coaches saw an increased interest in math or science classes at school (65%); succeeding in school (63%); or in going to college (60%), but even these outcomes were reported by more than half of coaches.

Understanding of Science and Computers. High proportions of coaches thought that their team members increased their understanding of basic science principles (91%), basic computer programming skills (99%), and an understanding of how science and technology can be used to

solve real-world problems (94%).

Teamwork, Problem-Solving, and Planning Skills. Most coaches also reported gains in a variety of teamwork and problem-solving skills, including teamwork skills (94%); leadership skills (92%); a sense of team identity or belonging to a group (94%); problem-solving skills (97%), and presentation skills (91%) and their belief in the importance of helping others (87%). Similarly, high percentages of coaches reported that their students had improved research skills (84%), time-management skills (81%) and planning skills (79%).

Less Impact on Career Awareness, Academic Skills. While most coaches saw increases in social skills and interest in science, smaller percentages (though still substantial) believed that the program had an impact on interest in science and technology careers and core academic skills. While 78%-80% indicated some increase in interest or understanding of science and technology careers (two separate questions), less than 25% thought that interest in those careers had increased “a lot” and only 18% believed that understanding of those careers had increased more than a little. Similarly, just under half of the coaches thought that FLL had an impact on their team members’ writing skills (48%), just over half saw an impact on their math skills (59%), and roughly 60% saw some increased interest in succeeding in school. However, here too, the proportion that thought these had increased “a lot” was very small: 22% reported major gains in the students’ interest in school, 11% saw major gains in math, and 10% reported major gains in writing skills.

When asked about other impacts FLL had on students, coaches most frequently mentioned that the children developed a sense of pride in their accomplishments; gained experience working in a team; increased their self-confidence and ability to communicate with adults; and developed an enthusiasm for science, technology and space exploration. (See the Appendix for sample quotes from the coach surveys.)

Table 13: Coach Perspective on Student Impacts

To what extent has FLL had an impact on: (Coach Survey)	N	Percent 'A Little'	Percent 'A Lot'	Percent 'A Lot' or 'A Little'
Interests				
<i>Team members' interest in or awareness of how math or science is used in the real world</i>	148	57.9%	35.2%	93.1%
<i>Team members' interest in computers and technology</i>	148	53.5%	39.6%	93.1%
<i>Team members' interest in jobs or careers in science and technology</i>	129	55.6%	25.0%	80.6%
<i>Team members' interest in their math or science classes at school</i>	101	51.0%	14.2%	65.2%
<i>Team members' interest in succeeding in school</i>	98	41.3%	21.9%	63.2%
<i>Team members' interest in going to college</i>	93	39.4%	20.6%	60.0%
Knowledge, Skills and Attitudes				
<i>Basic computer programming skills</i>	158	50.0%	48.8%	98.8%
<i>Problem-solving strategies (for example, steps to use in thinking through a problem)</i>	155	43.8%	53.1%	96.9%
<i>An understanding of how science and technology can be used to solve real-world problems</i>	151	50.0%	44.4%	94.4%
<i>Teamwork skills (negotiating roles, compromise, giving feedback, etc.)</i>	151	41.9%	52.5%	94.4%
<i>A sense of team identity or belonging to a group</i>	149	36.6%	56.9%	93.5%
<i>Leadership skills (working with a group, running a meeting, assigning tasks, solving conflicts)</i>	147	51.3%	40.6%	91.9%
<i>An understanding of basic science principles (e.g., force, momentum, etc.)</i>	146	69.4%	21.9%	91.3%
<i>Presentation skills (talking to groups, presenting information to others)</i>	146	50.6%	40.6%	91.2%
<i>Belief in the importance of helping others</i>	136	46.5%	40.1%	86.6%
<i>Research skills (using the library, Internet, interviewing skills)</i>	134	52.5%	31.3%	83.8%
<i>Time management (planning so that the work gets done on time)</i>	129	60.0%	20.6%	80.6%
<i>Planning skills (developing action plans, budgeting, etc.)</i>	126	60.4%	18.9%	79.3%
<i>An understanding of potential careers in science and technology</i>	125	60.0%	18.1%	78.1%
<i>Basic math skills (computation)</i>	93	47.2%	11.3%	58.5%
<i>Writing skills (example: writing brochures or letters)</i>	78	38.8%	10.0%	48.8%

Program Impacts: Students Perspective

We also asked students about what they had learned through FLL (Table 14), with results that were consistent with those reported by their coaches. The large majority of students, for example, reported that they wanted to learn more about computers and robotics (93%) and science and technology (88%) as a result of the program and similar proportions wanted to learn more about projects like the Mission Mars (87%) and how science and technology can solve real-world problems (85%). Seventy-seven percent (77%) indicated that they were more interested in jobs that use science or technology, though substantially smaller numbers (still over half) reported that they wanted to translate this knowledge into a career as a scientist or engineer when they were older (59%).

Table 14: Impact of FLL on Student Interests

As a result of FLL: (Student Survey)	N	Percent 'Agree'	Percent 'Strongly Agree'	Percent 'Strongly Agree' or 'Agree'
<i>I want to learn more about science and technology</i>	898	44.7%	43.4%	88.1%
<i>I want to learn more about computers and robotics</i>	898	36.6%	56%	92.6%
<i>I want to learn more about how science and technology can be used to solve problems in the real world</i>	899	43%	41.5%	84.5%
<i>I want to learn more about real-life projects like the Mission to Mars</i>	896	35.5%	51.1%	86.6%
<i>I am more interested in having a job that uses science or technology when I am older</i>	893	33.6%	43.7%	77.3%
<i>I want to be a scientist or engineer when I am older</i>	891	28.8%	29.9%	58.7%
<i>I want to be able to solve problems for my community when I am older</i>	896	52.6%	31.1%	83.7%
<i>I am more interested in doing well in school</i>	888	40.7%	44.6%	85.3%
<i>I believe that I can succeed when I try hard</i>	894	29.9%	64.8%	94.7%
<i>I feel like I am better at math or science than I thought I was before FLL</i>	893	33%	32.5%	65.5%

Increased Knowledge and Skills. Most students also indicated that they had learned about the uses of science and technology, and about themselves and their own skills (Table 15). More than 90% of students reported learning that technology can be used to solve problems in the real world; that science and technology are important in everyday life, about science and technology careers, and that subjects studied in school (like math and science) can be used to solve real-world problems. Similar proportions also learned that both boys and girls can be good at computers and robotics; that they have skills that can help other people on a project; and that helping other people solve problems can be fun.

Problem Solving and Teamwork Skills. Students also reported learning a variety of problem-solving and teamwork skills. More than 90% thought that they learned at least a little about working with other team members to solve a complicated problem; brainstorming ideas with other team members; accepting other people's suggestions about their ideas; and offering suggestions to someone else working with them on a project. High proportions of students (over 90%) also felt that they learned project management and problem-solving strategies such as managing their time; deciding who is going to do what on a project; and using trial and error to figure out if something is going to work or not.

As with the coaches' perspectives, students were least likely to report gains on core academic skills. The least common outcome (though still reported by 51%) was learning about how to write a brochure or letter (51%).

Table 15: Student Perceptions of the Impact of FLL on Knowledge and Skills

As a result of FLL, I learned: (Student Survey)	N	Percent 'Agree'	Percent 'Strongly Agree'	Percent 'Strongly Agree' or 'Agree'
<i>That science and technology (like computers and robots) can be used to solve problems in the real world</i>	745	36.5%	60.6%	97.1%
<i>That both boys and girls can be good at computers or robotics</i>	857	26.3%	69.3%	95.6%
<i>That science and technology are important in everyday life</i>	852	36.6%	58.4%	95.0%
<i>That I have skills that can help other people on a project</i>	848	46.4%	48.2%	94.6%
<i>That every team member has ideas that can help make a project better</i>	843	33.8%	60.5%	94.3%
<i>That subjects I study at school (like math or science) can help me solve problems in the real world</i>	838	34.1%	59.2%	93.3%
<i>That helping other people solve problems can be fun</i>	828	43.4%	49.2%	92.6%
<i>About some of the kinds of jobs people do that use science and technology</i>	810	50.9%	39.1%	90.0%
As a result of FLL, how much did you learn to: (Student Survey)	N	Percent 'A Little'	Percent 'A Lot'	Percent 'A Lot' or 'A Little'
<i>Work with other team members to solve a complicated problem</i>	859	36.5%	59.4%	95.9%
<i>Offer suggestions to someone else working with me on a project</i>	854	34.4%	61.3%	95.7%
<i>Identify the steps I need to follow to complete a project</i>	852	37.8	57.8	95.6%
<i>Identify ways in which science (like robotics or computers) can help solve a problem in the real world</i>	855	38.5%	57.0%	95.5%
<i>Accept other people's suggestions about my ideas</i>	850	34.5%	60.7%	95.2%
<i>Brainstorm ideas with other team members</i>	843	34.1%	59.9%	94.0%
<i>Manage my time so that I can get all the steps in a project done</i>	837	37.8%	55.8%	93.6%
<i>Use trial and error to figure out if something (like my robot) is going to work or not</i>	836	27.4%	66.2%	93.6%
<i>Decide who is going to do what job on a project</i>	829	37.5%	55.3%	92.8%
<i>Explain the scientific ideas that my team used in building our robot</i>	789	40.2%	48.9%	89.1%
<i>Solve disagreements between team members working together on a project</i>	794	41.7%	47.3%	89.0%
<i>Use math to help solve a problem in the real world (not just in class)</i>	792	39.3%	49.4%	88.7%
<i>Find the information I need to answer a research question about a science or technology challenge</i>	788	38.9%	49.7%	88.6%
<i>Work well with both girls and boys</i>	772	26.5%	61.3%	87.8%
<i>Make a presentation using charts, graphs, pictures, computers, video, or other types of presentation materials</i>	779	37.8%	49.8%	87.6%
<i>Develop a research question</i>	746	40.4%	43.7%	84.1%
<i>Talk to people I don't know about something I think is important</i>	682	39.6%	37.1%	76.7%
<i>Write a brochure or letter that explains my team's project to someone outside our team</i>	448	29.6%	21.0%	50.6%

Comparison to Other Programs. Finally, FLL students were also asked to compare FLL to other after-school programs that they had been involved in. One-third (33%) of the students reported participating in intramural sports clubs, while one-fifth were involved in art, music, or theatre clubs (20%) and Scouts (19%). Students also reported participating in after school clubs (e.g. debate), volunteer or community service activities, and other activities.

Of those students who participated in after-school activities aside from FLL, high numbers of students thought that FLL had either the same or more of an impact than the other programs (Table 16). The largest relative impact (with 52% of students indicating that FLL had “more of an impact” was in teaching them about cooperation and teamwork. However, almost all (90% or more) felt that the program had the same or a greater impact on motivation and self-confidence as well.

As one student said,

“FLL was a fun activity that I learned a lot in. In fact, I’ve learned more doing this than any other activity. You should continue doing it.”

Table 16: Comparison to Other Programs

How do you think FLL compares to other after-school programs? (Student Survey)	N	Percent FLL had ‘same’ impact	Percent FLL had ‘more’ of an impact	Percent FLL had ‘more’ or ‘same’ of an impact
<i>Teaching me about cooperation and teamwork</i>	636	41.6%	51.9%	93.5%
<i>Motivating me to do my best all the time</i>	429	55.5%	37.4%	92.9%
<i>Helping me feel more self-confident</i>	610	45.4%	44.5%	89.9%

Parents’ Perspectives on Student Impacts

Parents were slightly less likely to report impacts on their children than either the children or the coaches (Table 17). While the reason for this is unclear, it may be more important to note that there was a great deal of congruence on where the impacts occurred. For instance, high numbers of parents noticed increases in their child’s interest in computers and technology (85%), their child’s understanding of how science and technology are used to solve problems in the real world (85%), their understanding of the science involved in space exploration (84%), and their ability to think through the steps involved in solving a problem (81%), while lower proportions of parents saw an increased interest in math or science classes (59%), in school generally (45%), in going to college (40%), and in their math skills (43%).

Table 17: Parents’ Perspectives on Student Impacts

What kinds of impact has FLL had on your child: (Parent Survey)	N	Percent ‘A Little’	Percent ‘A Lot’	Percent ‘A Lot’ or ‘A Little’
<i>Your child's interest in computers and technology</i>	587	50.0%	35.1%	85.1%
<i>Your child's interest in jobs or careers in science and technology</i>	446	39.9%	24.8%	64.7%
<i>Your child's interest in his/her math or science classes at school</i>	408	42.0%	17.1%	59.1%
<i>Your child's interest in school generally</i>	314	33.7%	11.7%	45.4%
<i>Your child's interest in going to college</i>	271	23.2%	16.3%	39.5%
<i>Your child's interest in how science and technology are used to solve problems in the real world</i>	586	55.4%	29.6%	85.0%
<i>Your child's interest in the science associated with the Mission to Mars Challenge</i>	569	40.2%	42.1%	82.3%
Have you noticed changes in any of the following skills or attitudes in your child since he or she started FLL:	N	Percent ‘A Little’	Percent ‘A Lot’	Percent ‘A Lot’ or ‘A Little’
<i>Your child's ability to work in a group with other students</i>	550	54.6%	25.0%	79.6%
<i>Your child's ability to compromise or settle disagreements peacefully</i>	472	50.7%	17.9%	68.6%
<i>Your child's ability to take the lead on a group project</i>	469	46.2%	22.2%	68.4%
<i>Your child's sense of belonging to a group</i>	521	45.1%	30.5%	75.6%
<i>Your child's sense of self-confidence concerning school and schoolwork</i>	431	41.9%	20.8%	62.7%
<i>Your child's ability to think through the steps involved in solving a problem</i>	557	55.3%	25.5%	80.8%
<i>Your child's use of trial and error and other problem-solving strategies</i>	538	53.1%	25.4%	78.5%
<i>Your child's ability to use the library or Internet to find information for school projects</i>	447	44.7%	20.4%	65.1%
<i>Your child's confidence speaking in front of group of people he/she doesn't know</i>	489	44.5%	26.6%	71.1%
<i>Your child's math skills</i>	612	32.4%	10.1%	42.5%
<i>Your child's understanding of the science involved in space exploration</i>	579	51.2%	33.0%	84.2%
<i>Your child's sense that he or she can succeed if he or she tries hard</i>	532	48.0%	29.4%	77.4%

When parents were asked to compare the impact that FLL had on their child to other programs, almost all (96%) responded that FLL had an either comparable or greater effect in terms of motivating their child to succeed, teaching about cooperation and teamwork, and helping them gain a sense of self-confidence (90%) (Table 18). As with the student assessment, parents were most likely to see an impact in terms of teaching about cooperation and teamwork, with more than half of the parents indicating that FLL had “more of an impact” than the other programs in which their children had been involved. It is interesting to note that on these measures, the parent assessments closely matched those of the children in the survey.

Finally, when parents were asked to comment on what they felt was the greatest impact that FLL had on their child, the open-ended responses tended to group into three categories: teamwork (e.g., “his ability to work with others and compromise”); self-confidence (e.g., “confidence that her ideas are valuable and that she has a special talent for coming up with good ideas”); and

student interest in science and technology (e.g., “his interest in science has increased and it has become his favorite subject”). Other remarks were made related to their child’s improved ability to follow through with tasks, meet deadlines, gain a sense of achievement, and develop a work ethic.

Table 18: Comparison to Other Programs

How do you think FLL compares in terms of its impact on your child:	N	Percent FLL had ‘same’ impact	Percent FLL had ‘more’ of an impact	Percent FLL had ‘more’ or ‘same’ of an impact
<i>Teaching your child about cooperation and teamwork</i>	574	42.1%	54.5%	96.6%
<i>Motivating your child to excel</i>	569	52.7%	43.4%	96.1%
<i>Helping your child feel more self-confident</i>	610	45.4%	44.5%	89.9%

Student Satisfaction with FLL

When asked to assess the quality of their FLL experiences and their overall satisfaction of the program, students generally rated their experience highly (Table 19). Students felt supported by the adults working with their team, with over 90% reporting that they got all the help they needed and that the adults paid attention to them, and 87% reporting that they had a chance to do a lot of different jobs. Eighty-seven percent (87%) thought that their coach really made the Mission Mars topic interesting, and 82% reported that they had become interested in learning more about space exploration.

Students also generally expressed positive feelings about their team, with 93% saying that they felt that they were an important part of their team, 93% that they really belonged to their team, and 89% that their team learned to work well together. A smaller percentage felt that their team really listened to their ideas (81%), but almost all students agreed that they had fun working on their FLL team (98%).

Table 19: Student Satisfaction with the FLL Experience

Do you agree with the following statements:	N	Percent ‘Agree’	Percent ‘Strongly Agree’	Percent ‘Strongly Agree’ or ‘Agree’
<i>I had fun working on my FLL team</i>	888	20.9%	77.2%	98.1%
<i>I felt like I really belonged on my team</i>	838	34.7%	58.4%	93.1%
<i>The adults working with my team paid attention to me</i>	826	49.0%	43.0%	92.0%
<i>I felt I was an important part of my team</i>	837	34.3%	58.7%	93%
<i>I got all the help I needed to do my jobs on the team</i>	818	43.3%	47.5%	90.8%
<i>My team learned how to work well together</i>	805	42.4%	47.0%	89.4%
<i>My coach really made the Mission to Mars topic interesting</i>	800	38.0%	50.7%	88.7%
<i>I had a chance to do lots of different jobs on my team</i>	788	42.7%	44.1%	86.8%
<i>I got really interested in learning more about space exploration</i>	745	36.6%	45.8%	82.4%
<i>My team really listened to my ideas</i>	730	53.8%	27.3%	81.1%

Overall, almost all students reported having had a positive experience in FLL, with the majority of students (63%) rating the experience as “excellent” and nearly one-third (31%) rating it as “good.” Only 7% rated their experience as “fair” and 1% rated it “poor.” A significant proportion of students (82%) are planning to participate again next year (Table 20). Of those not returning, most report that it is because they will be too old. Less than 2% reported that they did not like the program.

Table 20: Student Rating of Overall FLL Experience

	N	Percent
Rating of Overall FLL Experience		
<i>Excellent</i>	554	62.8%
<i>Good</i>	270	30.6%
<i>Fair</i>	51	5.8%
<i>Poor</i>	70	0.8%
Planning to participate next year	721	82.2%
Reasons for Not Returning		
<i>Will be too old</i>	96	10.9%
<i>No time</i>	47	5.4%
<i>Did not like program</i>	13	1.5%

When asked what they liked **most** about being in FLL (Table 21), about an equal percentage reported liking building the robot (24%) and going to the tournament (23%). Many students also liked programming the robot (13%) and being with their friends (12%).

When asked what they liked **least** about FLL, students most often selected the research assignment (37%). Despite the fact that many students did not enjoy the research assignment as much as other aspects of the program, most coaches saw its value. Half of the coaches surveyed (49%) rated it as “very important,” while another 37% rated it as “somewhat important” (Table 22). According to 81% of coaches, the real-world focus of FLL increased students’ interest in working on the research assignment.

About the same percentage of students who selected programming as one of the things that they liked most about FLL selected it as one of the things that they liked least about FLL (14%). A fairly substantial proportion of students (34%) noted that there was some other aspect of the program that they liked the least.

Interestingly, only 2% of students selected their coaches as being one of their most liked aspect of their FLL experience and similarly only 2% selected their coach as being their least liked aspect of their FLL experience.

Table 21: Student Likes and Dislikes

Most Liked	N	Percent	Least Liked	N	Percent
<i>Building the robot</i>	201	24.2%	<i>Research assignment</i>	314	37.0%
<i>Going to the FLL tournament</i>	192	23.1%	<i>Something else</i>	287	33.8%
<i>Programming the robot</i>	110	13.2%	<i>Programming the robot</i>	122	14.4%
<i>Being with my friends</i>	99	11.9%	<i>Building the robot</i>	53	6.3%
<i>Something else</i>	81	9.7%	<i>Going to the FLL tournament</i>	25	2.9%
<i>Research assignment</i>	62	7.5%	<i>Working with both boys and girls</i>	18	2.1%
<i>Being part of a team</i>	55	6.6%	<i>My team coach</i>	17	2.0%
<i>My team coach</i>	16	1.9%	<i>Being with my friends</i>	7	0.8%
<i>Working with both boys and girls</i>	15	1.8%	<i>Being part of a team</i>	5	0.6%

Table 22: Importance of Research Assignment

Importance of research assignment: (Coach Survey)	N	Percent
<i>Very important</i>	79	49.4%
<i>Somewhat important</i>	59	36.9%
<i>Not very important</i>	18	11.3%
<i>Not important at all</i>	4	2.5%

Finally, in response to an open-ended question posed to students about whether there was anything else that they liked or didn't like about FLL, many students expressed enthusiasm for the program. Statements such as the following were common:

"I had one of the best experiences I've ever had. I think that we should do more with NASA topics; it is really educational and it makes it fun and interesting!" and "I thought going to the competition was an excellent experience. I would do this again in a heartbeat."

Many students mentioned that building the robots and competing at the tournaments was a fun experience. Many students mentioned that they liked their team and particularly enjoyed the teamwork aspect of FLL. One student commented that:

"I liked how at the tournament nobody argued when we were trying to figure a way to get past the next mission and everybody was shooting ideas of what we could do".

Students enjoyed the challenges presented by the program. As one student said, "I liked having fun while doing something hard at the same time."

Differences in Impacts Among Boys and Girls

Finally, while the program appears to have had a broad, positive impact on the large majority of participants, there were some important differences in impacts between the boys and girls in the program. In many cases, these differences can be seen as positive, with the results for girls suggesting that the program may help them gain self-confidence at a critical time in their development. In other cases, however, the differences mirror broader stereotypes about boys and girls and suggest a need to look more closely at the issue of gender within the program.

As noted earlier in the report, boys were significantly more likely than girls to report involvement in designing and building the team's robot and deciding which mission to do for the challenge, while girls were more likely to report involvement in fundraising, creating team materials, and almost all aspects of the research assignment.

Boys focused on science and technology. These kinds of gender differences were also reflected in the program outcomes (Tables 23-24). Boys were significantly more likely than girls to report that, as a result of FLL, they wanted to learn more about computers and robotics, that they were interested in a job that uses science or technology when they are older, and that they wanted to be a scientist or engineer when they were older. Boys were also more likely to report that they had a chance to do lots of different jobs on their team; that the adults paid attention to them; and that the coach made the Mars topic interesting.

Girls reported gains in self-concept and research skills. While boys were more likely to report outcomes related to the science and engineering focus of the program, girls were more likely to report significantly greater outcomes in terms of self-concept and research skills. Girls were significantly more likely to report that, as a result of FLL, they were more interested in doing well in school; that they believed they could succeed if they tried hard; and that both boys and girls could be good at computers or robotics. Girls were also more likely to report learning how to develop a research question; find the information they need to answer a research question; and write a brochure or letter that explains their team's project. Interestingly, boys and girls were equally likely to rate their program experience as "good" or "excellent" and to intend to participate in the following year.

The gender differences in experiences and outcomes can be understood in several ways, and present a mix of real benefits from the program and areas for further investigation. The fact that girls and boys participated in different aspects of the program (building vs. research, for example) can be seen as reflecting the flexibility of the program and the capacity to attract students with different interests. However, given the goal of fostering interest in science and technology, the program needs to make sure that all participants get solid exposure to both the research and building aspects of the program design. Similarly, the gains related to self-concept for girls should be seen as a particularly powerful outcome for the program, given the well-documented concerns about declining self-esteem among early adolescent girls.⁴ However, the differences in interest in science and technology and technology careers are topics that should be explored further.

Finally, it is important to recognize that there were also many areas where results did not differ by gender. For example, boys and girls showed no differences in levels of interaction with other teams at the tournaments. Similar percentages of girls and boys agreed with statements about feeling part of their team and satisfaction with their team. And, of the 36 items that can be considered to be impact statements, only 10 showed differences by gender. In that regard, the core program experience and outcomes were similar for both boys and girls.

⁴ The study best known for raising the issue of declining self-esteem among young girls is Mary Pipher's Reviving Ophelia: Saving the Selves of Adolescent Girls (New York: Putnam, 1994).

Table 23: Student Outcomes by Gender

As a result of FLL:	N	% of Boys who 'Agree' or 'Strongly Agree'	N	% of Girls who 'Agree' or 'Strongly Agree'
<i>I want to learn more about science and technology</i>	621	89.2%	268	85.8%
<i>I want to learn more about computers and robotics*</i>	620	94.2%	269	89.6%
<i>I want to learn more about how science and technology can be used to solve problems in the real world</i>	621	84.2%	269	85.1%
<i>I want to learn more about real-life projects like Mission to Mars</i>	618	86.9%	269	85.9%
<i>I am more interested in having a job that uses science or technology when I am older*</i>	619	80.6%	265	69.8%
<i>I want to be a scientist or engineer when I am older*</i>	615	64.7%	267	44.6%
<i>I want to be able to solve problems for my community when I am older</i>	619	84.5%	268	82.1%
<i>I am more interested in doing well in school*</i>	613	83.8%	266	89.5%
<i>I believe that I can succeed when I try hard*</i>	618	93.7%	267	97%
<i>I feel like I am better at math or science than I thought I was before FLL</i>	618	64.7%	266	67.3%
As a result of FLL, I learned:	N	% of Boys who 'Agree' or 'Strongly Agree'	N	% of Girls who 'Agree' or 'Strongly Agree'
<i>That science and technology (like computers and robots) can be used to solve problems in the real world</i>	623	97%	270	98.1%
<i>About some of the kinds of jobs people do that use science and technology</i>	621	90.3%	270	89.3%
<i>That science and technology are important in everyday life</i>	620	94.7%	268	96.3%
<i>That subjects I study at school (like math or science) can help me solve problems in the real world</i>	619	93.5%	270	93.3%
<i>That I have skills that can help other people on a project</i>	620	93.9%	268	96.3%
<i>That every team member has ideas that can help make a project better</i>	616	93.5%	269	96.3%
<i>That both boys and girls can be good at computers or robotics*</i>	620	94.7%	267	98.5%
<i>That helping other people solve problems can be fun</i>	618	91.6%	268	94.8%

Table 23: Student Outcomes by Gender, continued

As a result of FLL, how much did you learn to do the following:	N	% of Boys reporting 'A Little' or 'A Lot'	N	% of Girls reporting 'A Little' or 'A Lot'
<i>Work with other team members to solve a complicated problem</i>	620	96.1%	267	95.5%
<i>Brainstorm ideas with other team members</i>	620	93.9%	268	94.4%
<i>Decide who is going to do what job on a project*</i>	617	91.6%	268	95.5%
<i>Solve disagreements between team members working together on a project</i>	617	88.3%	267	90.3%
<i>Accept other people's suggestions about my ideas</i>	617	94.7%	267	96.6%
<i>Offer suggestions to someone else working with me on a project</i>	616	95.3%	267	97%
<i>Work well with both girls and boys</i>	610	88.4%	261	86.6%
<i>Identify the steps I need to follow to complete a project</i>	615	95.4%	267	96.3%
<i>Manage my time so that I can get all the steps in a project done</i>	618	93.7%	268	93.7%
<i>Use trial and error to figure out if something (like my robot) is going to work or not</i>	617	93.8%	267	93.3%
<i>Develop a research question*</i>	612	80.9%	266	91.7%
As a result of FLL, how much did you learn to do the following:	N	% of Boys reporting 'A Little' or 'A Lot'	N	% of Girls reporting 'A Little' or 'A Lot'
<i>Find the information I need to answer a research question about a science or technology challenge*</i>	614	87.1%	267	92.1%
<i>Identify ways in which science (like robotics or computers) can help solve a problem in the real world</i>	618	95.6%	268	95.5%
<i>Use math to help solve a problem in the real world (not just in class)</i>	617	88%	266	90.6%
<i>Make a presentation using charts, graphs, pictures, computers, video, or other types of presentation materials</i>	613	86.6%	268	89.9%
<i>Talk to people I don't know about something I think is important</i>	614	75.9%	266	78.2%
<i>Write a brochure or letter that explains my team's project to someone outside our team*</i>	612	47.1%	263	58.6%
<i>Explain the scientific ideas that my team used in building our robot</i>	613	88.9%	264	89.4%

Note: An asterisk (*) indicates significant differences in responses between girls and boys at the .05 level of significance or above.

Table 24: Student Assessment of Program Quality by Gender

Do you agree or disagree with these statements:	N	% of Boys 'Strongly Agree' or 'Agree'	N	% of Girls 'Strongly Agree' or 'Agree'
<i>The kids on my team made the important decisions, not the adults</i>	627	91.9%	268	95.1%
<i>I had a chance to do lots of different jobs on my team*</i>	627	88.5%	271	83%
<i>I had real responsibilities on my FLL team</i>	624	93.8%	270	94.4%
<i>I got all the help I needed to do my jobs on the team</i>	622	90%	269	92.6%
<i>The adults working with my team paid attention to me*</i>	619	93.2%	269	89.2%
<i>My coach really made the Mission to Mars topic interesting*</i>	624	90.1%	269	85.5%
<i>I had fun working on my FLL team</i>	626	98.2%	270	98.1%
<i>I felt I was an important part of my team</i>	623	92.8%	268	94%
<i>I felt like I really belonged on my team</i>	621	92.9%	270	93.7%
<i>My team learned how to work well together</i>	621	89.7%	270	88.9%
<i>My team really listened to my ideas</i>	622	81%	269	81.4%
<i>I got really interested in learning more about space exploration</i>	626	82.1%	269	83.3%
Overall Rating:				
<i>Overall, how would you rate your experience in FLL this year (percent "good" or "excellent")?</i>	609	93.1%	264	94.7%
<i>Do you plan to participate again next year?</i>	544	92.8%	230	90.0%

Note: An asterisk (*) indicates significant differences in responses between girls and boys at the .05 level of significance or above.

Chapter Five

Parent and Coach Involvement and Satisfaction

The success of FLL also hinges on the involvement and satisfaction of coaches and the parents of participating students. Because of this, one of the major goals for the evaluation was to assess the degree to which parents and coaches were satisfied with their involvement in the program and to identify any issues or concerns that might limit their participation.

The data from the FLL parent and coach surveys show that both groups of adults are very satisfied with their involvement in the program and, in the large majority of cases, expect to continue their participation. The large majority of coaches indicate that they are satisfied with their experience, and those who are teachers report that involvement in FLL has had a positive impact on their teaching as well. Parents also rate their experience positively and most hope to maintain or increase their involvement.

Coach satisfaction

In general, coaches reported having a very positive experience with FLL (Table 25). For example, 87% of the coaches reported that they were “satisfied” (31%) or “very satisfied” (56%) with their experience coaching an FLL team. Only 1 of the 158 coaches responding to the question indicated that they were “not satisfied,” and 88% of the coaches indicated that they planned to return to the program next year.

When asked to select the primary reason that they were coaching an FLL team this year, the most common answer (54% of coaches) was that it was a way to get children interested in science and technology. Another 27% said that it was a way to spend time with their children. When asked to describe the primary benefit of being an FLL coach, coaches discussed enjoying working with young people and getting to know them and their families better, inspiring interest in science and technology, and watching them discover solutions to difficult problems. As one coach noted:

“I’ve really enjoyed the chance to spend time working with the students on a project. Our school curriculum provides little time for exploring and problem solving. This helps fill the void”.

In general, the responses from most coaches indicate a love of learning, teaching and teamwork. As one coach put it, “Memories! I have 4 years of wonderful memories of the ups and downs of our team”.

For the coaches who did not plan to return, the most common reason cited was lack of time, cited by about a third of the non-returners (6.2% of all coaches). Other reasons included their child leaving the program and changing schools. None of the coaches reported disappointment with the program or problems in raising funds to support the team as a reason for not returning.

Table 25: Coach Satisfaction

Overall Coaching Experience	N	Percent
<i>Very satisfied</i>	89	56.3%
<i>Satisfied</i>	49	31.0%
<i>Somewhat satisfied</i>	19	12.0%
<i>Not satisfied</i>	1	0.6%
Plan to Return Next Year	134	88.2%
If Not Returning, Reason Why?		
<i>Lack of time/other obligations</i>	10	6.2%
<i>Changing schools or jobs</i>	5	3.1%
<i>Lack of administrative support</i>	4	2.5%
<i>Lack of funds to support team</i>	1	0.6%
<i>Lack of volunteer support</i>	3	1.9%
<i>Program did not meet my expectations</i>	0	0%
<i>Did not enjoy working with the team members</i>	3	1.9%
<i>My child is no longer on the team</i>	5	3.1%
<i>Other</i>	5	3.1%
Primary Reason Coaching	N	Percent
<i>Way to get children interested in science and technology</i>	88	54.3%
<i>Way to spend time with my child/children</i>	44	27.2%
<i>Want to contribute to my community</i>	26	16%
<i>Way to support the school</i>	23	14.2%
<i>Like to learn new skills or take on challenges</i>	18	11.1%
<i>Part of my job as a teacher</i>	8	4.9%
<i>Socialization/meet new people</i>	7	4.3%
<i>Part of my home-school program</i>	4	2.5%
<i>Part of my company's community involvement program</i>	2	1.2%
<i>Part of my work in a community/youth development program</i>	1	0.6%
<i>Other</i>	24	14.8%

Teacher and School Impacts

Coaches who were teachers were also asked about the impacts of being an FLL coach on their own teaching. The results showed that most teachers saw FLL as having a variety of impacts on their own knowledge and instruction (Table 26). For example, teachers reported that FLL affected their emphasis on the application of science and technology in real-world settings (87%), their own knowledge of current science and technology (88%), their use of computers and robotics in their classrooms (76%) and their use of student-led projects in their teaching (67%). Teachers also reported that FLL helped increase their sense of connection to their students (87%) and their understanding of what young people can accomplish when given the chance (90%). Over 80% of the teachers reported that their own enjoyment or satisfaction in teaching had increased at least a little as a result of their involvement with FLL, and over 50% indicated that it had increased a lot.

It is worth noting, however, that the benefits to teachers did not appear to translate into new and broader benefits for the school as a whole. Only a third of the coaches reported that involvement in FLL had led to new school partnerships with area businesses, and less than 30% indicated an increase in business support for other programs in the school.

Table 26: Teacher and School Impacts

How has your involvement in FLL affected the following? (Coach Survey)	N	Percent Increased 'A Little'	Percent Increased 'A Lot'	Percent Increased 'A Lot' or 'A Little'
<i>My emphasis on the application of science and technology in real-world settings</i>	51	45.8%	40.7%	86.5%
<i>My use of computers and robotics in my classroom</i>	44	27.6%	48.3%	75.9%
<i>My use of student-led projects in my teaching</i>	38	38.6%	28.1%	66.7%
<i>My own knowledge of current science and technology</i>	52	47.5%	40.7%	88.2%
<i>My sense of connection to my students</i>	51	27.1%	59.3%	86.4%
<i>My understanding of what young people can accomplish when given the chance</i>	53	18.6%	71.2%	89.8%
<i>My respect for students' capacity to work as a team independent of an adult</i>	48	27.1%	54.2%	81.3%
<i>My school's partnerships with area businesses</i>	19	21.1%	12.3%	33.4%
<i>Business support for other programs in my school</i>	16	17.9%	10.7%	28.6%
<i>My own enjoyment or satisfaction in teaching</i>	49	30.5%	52.5%	83.0%

Parent Involvement and Satisfaction

The majority of parents responding to the parent survey (82%) indicated that they were involved in FLL to at least a small extent, with slightly less than half (47%) indicating that they were “moderately” or “very” involved (Table 27). The major forms of involvement cited by parents include donating money or materials (51%), providing transportation (46%) and assisting the team with the research assignment (30%). Less than 20% provide engineering or mechanical assistance to the team. Nearly two-thirds of the parents indicated that they had attended local team meetings at least once, and roughly 80% reported attending the state or provincial tournaments.

Of those parents who report that they were actively involved, the most common reasons for their involvement were to spend more time with their children (44%) and as a way to get children interested in science and technology (36%). The majority of parents (67%) are interested in maintaining their current level of involvement in FLL, but a substantial proportion (30%) would like to become more involved. Somewhat surprisingly, about one-fifth of parents (21%) expect to stay involved after their child leaves the program.

Of those not actively involved with FLL, most said that lack of time (71%) had prevented them from becoming involved. Interestingly, however, 21% reported that they did not feel they had much to contribute. This is particularly striking since only 5% said that they lacked an interest in robotics or mechanical things. FIRST might consider ways to make it clear to that 21% that they do have ways of supporting the program when trying to increase parental involvement in and mentoring of the teams.

Table 27: Parent Involvement

Extent of Involvement	N	Percent
<i>Very involved</i>	169	24.2%
<i>Moderately involved</i>	159	22.7%
<i>Slightly involved</i>	245	35.1%
<i>Not involved beyond their child's participation in FLL</i>	128	18.3%
Primary Reason Actively Involved	N	Percent
<i>Way to spend time with my children</i>	121	44.3%
<i>Way to get children interested in science and technology</i>	98	35.9%
<i>Way to support the school</i>	19	7.0%
<i>Want to contribute to my community</i>	3	1.1%
<i>Like to learn new skills or take on challenges</i>	9	3.3%
<i>Wanted to meet new people/get involved with people</i>	3	1.1%
<i>Part of my company's community involvement program</i>	0	0.0%
<i>Other</i>	20	7.3%
Primary Reason NOT Actively Involved	N	Percent
<i>Lack of time</i>	159	71.3%
<i>Do not feel that I have much to contribute</i>	46	20.6%
<i>Lack of interest in Robotics/mechanical things</i>	12	5.4%
<i>Other</i>	9	4.0%
<i>Don't want to make too big a commitment/plan too far in advance</i>	6	2.7%
<i>Uncomfortable with the other adults on team</i>	3	1.3%
<i>Dislike the way team is run</i>	1	0.4%
<i>Program did not meet my expectations</i>	1	0.4%
<i>Too many administrative tasks in the program</i>	1	0.4%
Preferred Level of Future Involvement	N	Percent
<i>Want same level of involvement</i>	445	67.4%
<i>Want to be more involved</i>	195	29.5%
<i>Wanting to be less involved</i>	20	3%
Type of Current Involvement	N	Percent
<i>Donating money or materials</i>	354	50.6%
<i>Providing transportation for children other than their own</i>	318	45.5%
<i>Assisting the team with their research assignment</i>	211	30.2%
<i>Providing other assistance</i>	172	24.6%
<i>Providing mechanical or engineering assistance to team</i>	132	18.9%
<i>Researching possible funding sources</i>	82	11.7%
<i>Providing mechanical or engineering assistance to coach</i>	54	7.7%
Parents Attending		
<i>Team meetings</i>	445	63.7%
<i>Local events</i>	336	48.1%
<i>Local qualifying events</i>	462	66.1%
<i>State/provincial tournaments</i>	561	80.3%
Time Spent on FLL-Related Activities	N	Mean Hours per Week
<i>Time spent by parent during FLL season (including driving child)</i>	648	3.7
<i>Time spent by your child (excluding travel time)</i>	672	5.4
Expectation to Stay Involved After Child Leaves Program	N	Percent
<i>Expect to stay involved after their child leaves program</i>	134	20.9%

Chapter 6

Improving FLL: Comments from the Field

One of the other major goals for the evaluation was to identify strengths and weaknesses of the FLL program and potential strategies for program improvement. As part of that effort, the evaluation included questions in the coach surveys asking how the program could be made better for participating students and for parents and coaches. In addition, as a supplement to the surveys, the evaluation team also conducted telephone interviews with 32 FLL coaches and visited five teams for observation and interviews. In both cases, the goal was to gain a broader set of insights into the operational issues that FLL might want to address as part of its ongoing efforts to strengthen the program.

Both the open-ended responses to the surveys and the telephone interviews generated a variety of positive suggestions for steps that FLL could take. Among the more consistent suggestions was the need to provide a better introduction to the program and its rules or guidelines, ideally through increased use of videos for the coaches and teams. Coaches also pointed to the need to improve the consistency of the judging at the tournaments, both through better materials and training. Training sessions for coaches, video training materials, and mechanisms for peer exchange were also regular suggestions, as were requests for assistance in training and orienting parent volunteers and in marketing the program. Finally, coaches also had suggestions on how to improve the competition itself, including the use of age divisions and improvements to the research assignment.

Two points stand out across the open-ended surveys and interviews. The first was a broad sense of satisfaction with the overall program – the suggestions were presented as positive steps to improve the experience rather than as reflections of any deep-seated dissatisfaction. The second was the clear theme that, as FLL grows, it needs to continue to look for ways to better support the adults working with the program.

Open-Ended Survey Responses

As part of the coach survey, coaches were asked what steps FLL could take to make the program experience better for the young people and to make it easier or more attractive for adults like them to get involved as an FLL coach. There were approximately 100 responses to the first question and 60 to the second. Because these were responses to an open-ended question (rather than an established set of answers), answers tended to vary widely, and no single suggestion represented more than 10-20% of the responses. The items highlighted here represent the categories that were mentioned by five or more of the coaches. The full set of responses is included in the Appendix for the report.

Improving FLL for participants. The most common suggestions for improving the quality of the experience for participating youth included the following:

- **Provide more clarity and objectivity with regard to rules and judging.** In the most common response (about 12 teams), teams asked for better feedback on their performance and scores, and more consistency in the judging, both within individual tournaments and

from tournament to tournament (those who participated at several levels found that the same projects were judged differently at different tournaments).

“Improve information & feedback on performances. Team members have no feedback to use as basis for improvement except scores for robot performance. Makes difficult to gain student interest in research.”

“Better guidelines on what the judges are looking for. Remove judges’ anonymity so that the team gets all the feedback on what was good and bad about their presentations.”

- **Modify the research assignment and research assignment judging.** Teams had a number of suggestions for improving the research assignment, ranging from making better connections between the assignment and robot challenge; providing more structure/direction on the research questions; and providing examples of creative and successful projects.

“Integrate the research project into the robot challenge more, perhaps break it down into short topics or lessons that directly relate to the robot challenges to get the kids interested in research.”

“Research training guide. That is very hard for the younger students.”

“While the research assignment was a great experience, there was just too much to accomplish. Allow first time students to concentrate on the building, programming and marketing. 2nd year FLL participants could add research to the process.”

- **Provide more awards and recognition.** Coaches generally argued that the tournament awards were highly motivational and satisfying for team members and suggested creating more categories for recipients.

“More awards, example: 2nd and 3rd place.”

“The more ways to get recognition at the tournament the better. We got 2nd in teamwork and a trophy and it meant a lot to the kids even though they didn't get high score.”

- **Provide more information, especially through videos.** Teams also asked for a variety of video-based products or guides. In terms of improving the student experience, two areas were mentioned in particular: videos that would introduce the FLL process as a whole (and reinforce the importance of the research project), and videos showing exemplary projects.

“A video to be used at the beginning of the whole program would be useful, building some excitement with concrete pictures and footage (ex. From past Challenges).”

“A video showing the process including research assignment, and clips of the parts of a tournament would be great. I could show the video to interest people instead of explaining it myself.”

- **Create age divisions to make the competition fairer among older and younger students.** The major suggestion here (from around 6 teams) was to establish age divisions so that elementary students could compete with teams in their own age groups.

“Split elementary from middle school.”

“Have age division for the competitions. 4th graders have a hard time competing against experienced 8th grade teams.”

Improving Support for Coaches. There was a similar mix of suggestions from coaches about how to make the program easier and more attractive for them. The major focus of most of those suggestions was to improve the information and support available to coaches.

- **Provide additional training opportunities for coaches.** The most common request (12 of the 63 responses) was for more opportunities for hands-on, in-person training.

“Training sessions, mentoring by ‘veteran’ coaches, videos of past events. For new people that can get extremely overwhelming.”

“Offer a workshop for rookie coaches so that they can have a good overview of the entire process.”

“Early hands-on training, live coaches training beyond a coach simply receiving a packet of information. Not many, just one or two.”

- **Peer discussions/mentoring.** In addition to formal training, coaches also asked for a way to connect to other coaches and/or to set up a system of ‘mentor’ coaches to provide assistance.

“Have a local FLL mentor. Like me, I have my team but I am support for 4 other teams.”

“Notifying people of other local schools/teams so we can communicate on issues, problems, or training.”

“Have a list of coaches people could contact for more info if considering forming a team. Post a list of coaching tips on your website. Invite coaches to contribute to the list.”

- **Simplify information and make it more accessible.** Coaches also asked for improvements to the website to make it easier to access information on the Challenge and the FLL process.

“Easier access to information, registration materials, etc.”

“Make the website easier to find basic information. Ex: Instruction on setting up playing field was buried under table construction site. According to the questions on the forum I wasn’t the only one.”

“Simplify everything.”

- **Announcements/Marketing.** Finally, coaches also asked FLL to both provide sample/pre-designed marketing materials and handouts, and to be more proactive in marketing the program to schools, teachers and parents. The message here was that FLL is a good program, and that FIRST needs to be more active in letting people know about it.

“Publicize more – especially newspaper, clips or videos showing the fun and excitement of competition.”

“FLL could create a handout for children to give to their parents, who could in turn use it to generate funds from their employees.”

“Spread the word of the program to all schools in the country. More people and schools need to hear about this.”

Coach Interviews

The evaluation team asked a similar set of questions in a set of telephone interviews with 32 FLL coaches and in the site visits made to a small number of teams (5 teams). The sample of coaches interviewed was drawn from coaches responding to the FLL survey and was stratified to represent a mix of rookie (first-time) and veteran teams throughout each of the eight tournaments included in the original survey sample. The major focus of the interviews was to gather additional insights into issues that had emerged from the initial review of the student, coach, and parent surveys. In particular, the interviews focused on five topics:

- Recruitment of Girls
- User’s Guide and Manuals
- Tournament
- Research Assignment
- Support for Volunteers

In each case, as with the open-ended survey responses, coaches had a variety of stories and ideas. As such, the responses here reflect more a systematic collection of suggestions rather than a fully-developed set of recommendations for FLL.

Recruitment of Girls. One of the main topics of the coach interviews was the question of how to improve the recruitment and involvement of girls in FLL. Out of the 21 coaches with whom we discussed recruitment issues, 10 had been able to assemble a fairly even mix of both girls and boys on their teams. One coach from California said that the “girls just walked up to her and asked if they could be on the team.” This coach was a rookie coach, but one of the girls had participated last year and had told her friends about it.

However, 11 of the coaches had teams with an uneven distribution of girls and boys and typically found it difficult to recruit girls to their teams. For example, a rookie coach from Indiana said that he had initially recruited one girl to his team, but she left because she was the only girl. Two coaches commented that there were not enough girls interested or available at their schools. One veteran coach found that “girls seem to flock to ‘Odyssey of the Mind’.” A

coach from Rhode Island said she asked a group of girls why they were not signing up for FLL. They responded that, “boys take over.”

However, coaches did have a number of suggestions for the recruitment efforts. They included the following:

- **Recruit girls at younger ages.** Two coaches mentioned that it was easier recruiting girls when they were building their team from a younger group of students. A coach from an elementary school in Rhode Island said that recruitment of girls is “more of an issue at the middle school level.” She saw no difference in the interest of girls and boys at the elementary school level.
- **Recruit through teacher referrals.** Several coaches noted that they had more success when using teacher referrals than through the use of general announcements or posters. Girls appeared more likely to follow through and explore joining the team when it was directly suggested by one of their teachers.
- **Encourage girls to recruit their friends.** Another key aspect of building a gender-mixed team was having more than one girl join at once. Five of the coaches mentioned that the girls on their teams were friends who joined together, thus avoiding the problem of being the only girl on the team.
- **Market the program/conduct demonstrations.** One of the observations from the site visits was that many of the boys who joined FLL did so because of their interest in using LEGO[®]s. This is particularly true for younger boys. But the girls at those sites tended to think of that as “babyish,” and to avoid the team if it was seen as “just playing with LEGO[®]s.” Stories from those sites and the coach interviews suggest that teams need to demonstrate the program (and the robots) as a way of engaging a broader group of girls. Once the program is seen as more complex, involving robotics as opposed to toys, girls were more comfortable joining. In addition, some coaches reported that the research assignment attracted some girls to join. FLL may want to highlight this aspect of the program to increase the female participation.

Overall, many coaches related stories of girls and boys working well together and supporting each other. We had one coach say that she would only want to coach a mixed-gender group, and another that said that the boys and girls on her teams were friends outside of the team as well. In general, girls seemed to thrive on teams when they were exposed to FLL at an earlier age and when they were recruited with other girls.

User’s Guide and Manuals. The interviews also asked coaches for information on their use of the FLL manuals and materials and suggestions for improvements. All had used the User’s Manual to some extent. Experienced coaches often checked through it to see what had changed since the previous year, while rookie coaches clung to it more tightly. One veteran coach said that he used it very little because “the rules don’t change. If you’ve done it in the past, there was very little new information.”

Coaches frequently revisited both the manuals and the website for clarification of rules, however. Eight of the coaches mentioned having difficulty with the interpretation of rules. One coach “did not understand the rules,” another said the team had a “big issue of how to interpret the rules,” and another found the rules to be “vague.”

Coaches did turn to other resources on a regular basis. Thirteen of the coaches specifically mentioned the FLL web forum as one of the most useful tools for getting answers to their questions and for rule clarification, with a veteran coach commenting that it was “superb.” Though two coaches were disappointed in some of the exchanges they had seen on the forum (i.e., “snippy” responses instructing the person posing the question to “read the rule book”), the others found that they were able to get answers to their questions. The forum was particularly helpful in clarifying the subtleties in some rules or situations.

A few coaches went beyond the manuals and website to learn about FLL and this year’s Challenge. A couple of coaches contacted more experienced coaches in their area for guidance, and found this very helpful. Another found a document on a local FLL website that was useful. This lengthy guide reviewed “generic things to be aware of,” and clarified the rules. Several coaches mentioned the coach orientation provided by the Rhode Island School of the Future. The Rhode Island state partner calls all of her coaches together and walks them through the Challenge. This was described as a “wonderful group” and several participants noted that “it would have been hard without it.”

Similarly, one coach wished there was more information related to the engineering and the building of the robot. He would like to see specifics such as how to mount a wheel. He found that the Minnesota FLL website did a nice job of this.

The major suggestion to emerge in this area was the development of orientation and/or training videos that coaches could use with their teams. As one veteran coach put it, they need a “quick and dirty prototype for coaches who know nothing.” Suggestions included an overview of how to maneuver around the board, and basic building and programming plans. Another coach suggested that the FLL website provide a sample timeline for coaches that shows what needs to be accomplished week by week. For example, the chart might list the date that t-shirts should be ordered, or the week that the propulsion system should be complete.

A couple of coaches specifically suggested that having an orientation video would be helpful. One coach suggested that FLL create a video that would introduce the various aspects of the project, such as the robot, the research assignment and the documentation of their decision-making and building. She and her husband, who assisted her with coaching the team, felt that the students would be very receptive to having an outsider (i.e., a speaker in the video) present the importance of the research assignment. They found FLL “hard to visualize from paper” and thought a video would serve to both “orient” and “motivate” kids as well as adults. A couple of coaches had seen clips about FLL on the television show *ZOOM*, and suggested that FLL string these clips together to create an overview of the program.

The major point here (as was also the case in the open-ended survey response) was the need for more visual-oriented materials. While the guides may provide a detailed orientation to the program, there is a clear need for a video introduction as well.

Improving Tournament Quality. When asked about their experience at the tournaments, most coaches had positive feedback. Seventeen of the coaches mentioned that their students had fun, and at least four coaches mentioned that they were impressed with the efforts of specific tournament directors from their state.

When asked about improvements that could be made, most also had suggestions. Many of the suggestions related to the standardization of the judging. While one coach commented that the judges were “fair, nurturing, and not out to get the kids,” others found the judging itself to be too “subjective” and “haphazard.”

Six coaches reported that the judgments were not consistent across or even within tournaments. One of the coaches had had the experience of being a technical judge for FLL. He noticed that most of the judges were computer software engineers and did not have the mechanical engineering background needed. He was given a 5-minute training and then sent in to judge. As he put it, this type of orientation “is not going to produce good judgments.” He also found that because most judges did not want to be critical or negative, they did not adequately fulfill their judging duties. He noted that he had judged in many tournaments and found this lack of engineering knowledge and training to contribute to the inconsistency among judges.

Another standardization problem at the tournaments related to equipment and materials. Four coaches mentioned that the competition tables and field items were not built to specification. One team had a problem because the ball launch was not properly attached. The judges would not give the team a second chance, and things “went downhill from there, the kids lost heart.” Another coach reported that the time allotted for the research assignment component varied between tournaments. The same coach said that she “saw a lot of things going on that was not according to the rules.” For example, judges were helping some of the teams, attachments were not secured, and the habitation module was not set up correctly.

The two consistent recommendations to emerge from these interviews were to provide better training for the judges to ensure more standardization and to strengthen the quality control process to better ensure standardization of the competition equipment. In both instances, these are areas where some combination of more visual (video or graphic) materials might be helpful along with additional training and orientation for tournament volunteers.

Research Assignment. According to the results from the surveys, phone interviews, and field visits, the research assignment is the least engaging part of FLL for many teams. Some students enjoyed conducting the research projects and others enjoyed the theatrical performances. However, as the surveys suggest, a substantial proportion of participants indicated that the project was their least favorite part of FLL. In that context, the telephone interviews and site visits all included questions about how teams worked on the assignment and what methods, if any, they had found useful for engaging team members in the process.

Many teams had one or two students who gravitated toward the research assignment each year and those students often enjoyed it. For example, one team had a student who “liked to draw and got into making pictures.” Another coach said that some of the girls on the team were very interested in creating a habitat.

Other students, however, had to be “corralled into doing it.” One coach described the research assignment as “painful,” another said it brought about “fear” and “loathing.” Others simply found it to be confusing.

Several specific suggestions emerged from the interviews, as follows:

- **Provide more structure.** Ten of the coaches said that they thought the assignment could be improved by adding more structure to it – it is a little too “free form” for many students (and coaches). For example, a veteran coach from Wisconsin said that, for him, “the goal was unclear – what are we trying to do?” A rookie coach from South Carolina reported that he needed “clearer guidelines,” and that his students “didn't know how to make a choice and didn't know what to do. Even those who said they were interested in it initially lost interest in it.” While there are clear benefits in encouraging the teams to make their own decisions (since identifying a question/topic is an essential part of the research process), it seems equally clear that more guidance is needed.
- **Closely align the research assignment and robot-building challenge, and maintain the connection to current events.** While the research assignment is always designed to complement the robot challenge, some years that connection is clearer than others. One coach thought that this year’s topic was more closely tied in with the robot, and found that “CityScapes just didn’t make the connection between the research assignment and the robot.” This coach really appreciated when the different pieces of the Challenge are closely related. Eight of the coaches found that the current events nature of the Mars topic also made it much more interesting and engaging for students. They saw the Mars rovers in the news and learned about the planets in class. One coach noted that the Mars topic “got them [team members] excited and it kept her excited too”.
- **Encourage teams to use skits and animation.** When asked how coaches can make the research assignment more interesting for students, six of the coaches mentioned engaging them through adding animation or some type of theatrical aspects to it. The use of skits allows children to write, act, and videotape. The coaches that had used animation and/or theatrical presentations reported that their team members were much more actively engaged.

Supporting Volunteers. Finally, all of the interviews also included some discussion of the roles that volunteers play and how best to support their positive involvement. Two recommendations in particular emerged from those discussions:

- **Provide tools or materials that coaches can use to orient volunteers.** The coaches interviewed identified several challenges that they faced in using volunteers, ranging from helping them to understand the program and the rules to helping to define the supportive and

facilitative role that adults needed to play with the FLL teams. In that context, coaches asked for orientation videos and materials that they could use to help train/orient their volunteers for working with the teams.

- **Provide regional training sessions for parents, students, and other volunteers.** In much the same vein, coaches suggested that there be regional training sessions for parents and volunteers, again with the goal of imparting the philosophy of the program as well as practical skills in managing the team process.

Taken together, the various survey responses and interview discussions highlight the need for continued development of the support systems for FLL coaches and volunteers. Key program improvements include: improved materials for coaches and teams (including the development of new video materials); increased training for judges to help improve the consistency and quality of the tournament process; and training and orientation materials for parents and other volunteers to help them understand both the mechanics and the philosophy behind FLL. Other areas for possible work include the development of additional marketing and promotional materials and assistance (possibly including some ‘best practice’ guides) that will help teams address operational issues like the recruitment of girls.

Chapter Seven

Summary and Conclusions

The data collected for this evaluation show that the FIRST LEGO® League program has largely succeeded in its goals of providing an engaging and effective learning experience for older elementary and middle school-aged young people. Based on the survey data, as well as the site visits and telephone interviews, it is clear that the large majority of FLL teams have implemented the major elements of the program and are providing participants with opportunities for the kinds of hands-on learning that the program is designed to promote. Students, parents, and coaches all agree that the program has increased student interest in science and technology and has helped students strengthen a wide variety of teamwork, problem-solving, planning and project management skills. Students, coaches and parents also voice a high degree of satisfaction with the program experience, and the large majority indicate an interest in continuing their involvement in the program next year.

At the same time, the study does help to identify a number of areas where FLL can look to further strengthen program operations. While the program hopes to increase the involvement of female and minority students, more than three-quarters of program participants are male and White. In terms of program outcomes, the program is less successful in introducing students to science and technology careers than other areas of the program, and there appear to be relatively few links to more traditional academic skills and subjects, such as math and writing. It may be that these are areas that are not high priorities for the program; alternatively, program staff need to look at ways to strengthen the connections between the program experience and these kinds of skills.

In operational terms, the surveys and coach interviews suggest several opportunities for improved support for coaches and parents. As suggested above, recruitment of girls and minorities remains a concern, with some suggestions and strategies emerging from the telephone interviews. Coaches also had a number of suggestions for ways to improve or supplement the FLL materials to make it easier for teams to ‘get up to speed’ on the program and tournament rules. The surveys and interviews also suggest ways of improving the research assignments and tournaments, primarily by providing better structure and guidance for teams and tournament officials. Finally, the surveys and coaches also pointed to some opportunities for increasing parent involvement, primarily by better defining clear roles for parents and making it clear that parents do not need to be technologically savvy to be active in the FLL process.

As the first major evaluation of the program, the goal of the study was to provide an initial assessment of the program’s effectiveness and to identify those issues and concerns that warranted further investigation. As such, the major recommendations from the study are for FIRST program staff to begin to look at some of the key areas identified in the study – for example, recruitment of girls and teams in urban and minority communities; differences in experience and impact among girls and boys; improved materials for coaches and volunteers; quality control at the tournaments; and increased hands-on training opportunities for coaches and volunteers – and to begin working in-house and with the tournament partners to determine how best to address them in a practical way. In some cases, additional study may be warranted: one specific recommendation would be for a more in-depth look at the experience of FLL teams in

urban settings to identify implementation and ‘best practice’ issues in recruiting and supporting teams serving low-income and minority communities. In other cases (such as the development of new training resources), the best solutions may be found by simply bringing together the right collection of FIRST staff, tournament partners, and experienced coaches to examine existing resources and develop the tools needed to fill any gaps.

What is abundantly clear, however, is that FIRST has a solid, well-conceived base to work from. In a relatively short time, and in the context of very rapid growth, FIRST has established a solid programmatic base and has begun to provide an engaging introduction to science and technology for substantial numbers of youth.

Appendix

OPEN-ENDED ITEMS (from Coach Survey)

OPEN-ENDED ITEMS (from Student Survey)

OPEN-ENDED ITEMS (from Parent Survey)

COACH SURVEY

STUDENT SURVEY

PARENT SURVEY

COACH SURVEY - OPEN-ENDED ITEMS

Question #30: What other impacts do you believe FLL has had on your team members this year?

Self-Confidence:

- “Self-confidence, trust in other individuals work within a team.”
- “Self-confidence increased.”
- “Children performing below grade level at school have enjoyed tremendous success in FLL and demonstrate leadership strength and boost self-confidence.”
- “Since most of the students in this program at our school are limited in their experiences, I believe that this also helped with their self-image. They were proud that they were doing something different.”
- “Self-confidence increased a lot.”
- “The program built their confidence and got them excited about a whole new concept.”
- “Increased self-confidence in their abilities, more willing to take risks, sportsmanship.”
- “Confidence building, belonging to a group.”
- “Self-confidence has improved; ability to think creatively has improved.”
- “Created self-confidence in their ability to solve problems from then on. Excitement about robotics!”
- “Increased self confidence, expanded horizons, new friends.”

Teamwork:

- “An understanding that each person is different and brings something to the team. Everyone needs to be heard even the quiet ones; they may solve the problem.”
- “Trying to work as a group and learn from each other.”
- “Kids see how effort and teamwork accomplish a goal. Kids developed a broad understanding about the Mars projects and how science lends the way in exploration. They like competition.”
- “The team members learned the value of working as a team; learned that “mind work” can be as exciting as sports; sense of accomplishment and taste of how valuable working hard is.”
- “An appreciation of the need for time management, planning and teamwork in solving problems.”
- “An awareness of what can be done with a group of people work together.”
- “The kids realized the importance of working with others and that even if say one aspect was perfect (ex. Programming) they still had to depend upon the builder to do their job well.”
- “Working together as a team, how different function working together can achieve favorable results.”
- “They learned that it takes dedication to accomplish tasks, and that they have to work out differences when working in a group.”
- “This was the first year for us and it was mostly about learning how to work together as a team instead of as individuals and learning to compromise, listen, debate, make decisions, etc.”

Learning:

- “Excitement about science and technology.”
- “Got them excited about school in general.”
- “I believe they learned that science and technology can be fun.”
- “They felt they learned and accomplished a lot.”
- “Big increase in interest in space exploration.”
- “The kids understand why math is important.”
- “Made education fun.”
- “I think it made all of them so interested in what’s going on in space! I think all the kids came out of this feeling more confident about themselves.”

Opportunity/Life Experience:

- “Encourages them to join robotics at high school. Will provide them with a niche there, an instant connection.”
- “Especially for the girls this allows the opportunity to shine in math and science with out the influence of boys.”
- “A fabulous opportunity in a small community, has never been involved in anything other then on.”
- “FLL offers real world problem solving chances in real pressure situation. Just like in life, what a great challenge.”
- “Going to the state tournament was an eye opener for a few and the kids who don’t travel much.”
- “Learned how to deal with stress, the better you’re prepared the less stress as well.”
- “For one, an outlet to keep busy and not think about home life for a few hours per week.”
- “Provides a positive male influence on team members that came from single parent families.”

Pride:

- “Sense of belonging, pride”
- “It has a great impact on our low ability students. This program gave them a feeling of success and it made the information they were learning make sense.”
- “FLL challenged, motivated, and provided them with a sense of accomplishment. It allowed them to experience success and failure; but moreover provided them with a learning tool. Failure can be positive.”
- “Pride in their accomplishments.”
- “Pride in their work, increase in self-confidence.”
- “They had fun and a feeling of accomplishment.”

Communication:

- “Over 3 years I have seen 2 of the 3 year members go from being very shy with judges and skit to being very comfortable talking with the judges and even reporters. 3rd has gradually increased interest.”
- “A couple of shy students had a chance to be presenters and work on speaking in front of others. One student in particular had not been a part of any extra-curricular activity until now.”
- “Ability to express ideas to adults as well as peers.”
- “How to present themselves when communicating to others (judges).”

Hard Work:

- “Learning responsibility.”
- “If the members were faced with a challenge they can overcome the challenge with hard work.”
- “As always, the entire program is a huge motivator. The tournament draws to a close all the activities we’ve worked so hard on, and the challenges that are met always increase students’ efforts.”

Motivation:

- “Team members realized the self-motivation of accomplishment. They learned to work with each other’s strengths to solve problems.”
- “Don’t give up when things don’t work.”

Goals:

- “Gave the team a goal and a dream.”
- “Setting and reaching goals, overcoming adversity.”

Career Interest:

- “Some of the girls no longer believe science oriented career is for boys only.”
- “Career decisions.”

Question #34: What has been the primary benefit of being an FLL coach?

Seeing kids' enjoyment/excitement/achievement/etc.:

- “Getting to watch the students come together as a team and support each other and seeing the quiet one shine and the confidence this gives them.”
- “Getting to watch how excited kids are about competing with their creations.”
- “Seeing kids work and come together as a team instead of taking care of themselves first, accomplish a challenging goal, create lego apparatuses to solve problems, apply problem solving skills.”
- “The enjoyment of watching learning take place.”
- “Satisfaction of seeing kids accomplish a task and enjoy the experience while learning value of engineering and problem solving.”
- “Watching the growth and confidence of the team and my daughters.”
- “Watching children grow and overcome challenges.”
- “Seeing students who were ‘good’ at academic subjects actually stretching their imaginations and being challenged to work harder.”
- “Watching kids ‘get it.’ When the light goes on it’s worth all the hassle.”
- “Watching the kids succeed after all the hard work/effort they put into it.”
- “Memories! I have 4 years of wonderful memories of the ups and downs of our team.”

Spending time with kids/families:

- “Enjoy working with children and watching the light come on and them solve problems, use logic, trial and error.”
- “Spending time with my son, getting to know the parents.”
- “I’ve really enjoyed the chance to spend time working with the students on a project. Our school curriculum provides little time for exploring and problem solving. This helps fill the void.”
- “Spending time with my kids working on challenging project, watching them learn and grow.”
- “Spending time with my children.”
- “Opportunity to work with my child and a group of her peers in a team atmosphere.”
- “Getting to know the students/parents, other instructors, meeting new people with same interest.”
- “Getting to work with kids who are excited about science and technology.”
- “Meeting and spending time with my daughter’s friends and parents.”
- “Sports are not my thing, I love FLL. I love seeing my non-sport child loving FLL robotics. My son’s favorite quote is, “I love to use my mind,” the more you help with a team, the more you learn.”

Learning to coach/Changing lives:

- “Having to tolerate all the kinds of kids and learning to teach.”
- “Taught me patience and gave me faith in our youth!”
- “Helping children learn about and appreciate science and technology. Helping the coach understand that coaching an FLL team is much more than a technical and scientific teaching endeavor.”
- “Feeling like I contributed to the kids, very similar to other types of coaching.”
- “Learning what it takes to be a coach, passing along my interest in science and math.”
- “I enjoy working with young people, giving them a chance.”
- “Learning patience, how to teach without doing any of the work.”
- “I have had an opportunity to work with some intelligent students and have a direct impact in their increased interest in science. I also enjoyed working with the parents and getting to know family.”
- “Learning to coach.”

Teaching/Helping:

- “Reinvigorated interests in teaching and helping kids discover and learn.”
- “Learning just how much the kids can accomplish if you just let them do it – from the actual tasks (robots and research) to working out how to act as a team.”
- “Meeting, working with students, providing an otherwise unavailable activity/resource/experience.”

- “The reward of mentoring the kids to design, build, research and present a science/technology related activity from beginning to end. Good to see the team come together at the end.”
- “Helping kids apply math and science to useful ends.”
- “Helping the school and the students interested in FLL.”
- “I enjoy working with kids and exposing their minds to new thoughts/ideas.”
- “It’s fun working with the students even though they got rambunctious at times. I think they appreciated having a working engineer coach them rather than a teacher.”
- “Helping team members learn that with persistence and good teamwork they can succeed.”

Elicit Interest:

- “I’m a former research engineer, now a high school physic and biology teacher, who really enjoys working with middle-school kids to cultivate their interest and skills in science.”
- “Work with kids and get them interested in science.”
- “Inspiring so many disadvantaged children that would not have this opportunity otherwise.”
- “Introducing the children to a fun way of learning science and technology.”
- “Providing an interesting and fun opportunity for my sons and nephews.”
- “Getting kids involved in science technology.”
- “Instilling an interest in math/science/technology among elementary school aged children.”
- “Enjoyed helping the students get involved with FLL.”
- “I feel I helped children develop interests in science and technology.”

Learning:

- “Learning about robotics and gaining an appreciation for students’ capabilities and interests.”
- “I’ve learned a lot and can tie info from research to class.”
- “Helping children learn about and appreciate science and technology. Helping the coach understand that coaching an FLL team is much more than a technical and scientific teaching endeavor.”
- “The reward of knowing I taught the kids some technical things and that they enjoyed learning.”
- “I have learned so much about robotics and have incorporated it into my fifth grade science and math classes.”
- “I learned about robotics and programming. I am now offering an elective on LEGO robotics in our school.”
- “Appreciation for teachers work, learning how children interact with each other, hopefully I can use this knowledge in the future.”
- “Inspire kids to do better in school and broaden scientific knowledge.”

Problem Solving:

- “I have benefited from being a guide to the process of problem-solving among students. I have been able to pass on long-term themes such as simplicity and building on each other’s strengths.”
- “Learning to teach children about problem solving and teamwork by guiding them to solutions without telling them solutions.”
- “Looking at a different way to solve problems.”
- “Watching the kids solve problems they thought were too hard.”
- “Seeing the kids grow in their knowledge and abilities, watching them solve problems and get really amazed that they were able to.”
- “Seeing children develop problem solving skills and team membership.”
- “The primary benefit of being an FLL coach has been to see the team members problem solve and persevere with difficult tasks.”

Teamwork:

- “Experiencing the achievement of the team. Listening to the team members discuss their robot design and the mechanics behind, seeing the kids perform under pressure, at the field and presentation.”
- “Seeing the members work together as a team.”
- “Watching the kids learn to work together.”
- “Watching the kids learn that teamwork and competition exist on other than a sports field.”
- “Watching a group of inner-city middle school students band together and work as a team.”
- “Seeing the reward of teamwork.”

Fun:

- “Fun learning experience with son.”

Question #35: What has been the primary challenge in being an FLL coach?

Growth:

- “Making sure I allowed the team members to grow and work together without adult intervention. Very tricky to do.”
- “Learning to deal with kids instead of adults.”
- “Getting students to realize that there is a whole world outside of the boundaries of their neighborhood.”
- “Getting smart elementary school kids used to the idea that they’ll get stomped by middle school kids at the tournament. For many, it’s their first taste of failure.”
- “Finding a balance between how much to let children work on their own and try their ideas vs. how much to do things for them.”
- “Keeping the children’s/teams long term focus; raising children’s expectation to compete at a higher level; keeping a balance between coaches, kids, and parents expectations.”
- “Allowing the team to work to solve problems while limiting adult intervention.”
- “Inspire all the team members to excel in the things and activities that they enjoy the most and to explore those areas that they had never thought they could accomplish. Hard to teach programming.”
- “The biggest challenge is maintaining one’s perspective when discipline is required. I give teachers a lot of credit for going after their dream of teaching.”
- “Managing my time and resisting the urge to say ‘do it this way’ – by finding teaching materials to give kids more tools, methods, approaches to choose from.”
- Young team – (10-11 years); recognizing their capability and not trying to do for them.”

Keeping them busy/focused:

- “Sometimes it is difficult to keep all team members with an active assignment at meetings. I toy with alternative viewpoints of team members as experts as opposed to team members as jack-of-all-trades.”
- “Too many kids on the team, and not enough equipment to keep them all busy.”
- “With 10 team members it has been challenging to keep everyone engaged at all times.”
- “Keeping the kids focused and on-task; ensuring cooperation between strong willed participants.”
- “Keeping the kids focused.”)
- “Trying to find ways to keep all 8 team members busy at the same time. It can be a challenge to find ways to have all of them continually contributing when there is only one robot and only one mission.”
- “Learning for myself that children (ages 10-11) are primarily children, and do not have the focused attention of adults (they still like to be wild).”
- “Making sure that every student is included in different aspects of FLL and see to it that they feel and understand the significance of that belongingness.”
- “Making sure that all the team members are equal in assignments and duties. Also picking who runs it during the rounds.”
- “Keeping all of the team members focused on the FLL activities.”

Teamwork:

- “Getting young people to respect each other’s ideas and intellect and to integrate individual students into a cooperative, well functioning team.”)
- “Getting students to work together as a team.”
- “To teach the students how to work together, to listen to others and to act as one.”
- “Promoting working as a group. There are always one or two who want to take over.”
- “Trying to get a group of smart students to work together as a team. Trying to accept the team’s goals and not force my goals on them.”
- “Teaching the kids to be a team. I have 8 kids who know everything.”
- “Maintaining the group dynamics, keeping the attention of several diverse kids as well as making sure they stay on task.”
- “Teaching positive teamwork skills with 7 fourth grade boys.”
- “Getting the kids to respect the coach and working through competitions within the team itself.”

- “Coordinating all the students, mentors and observers to reach, figuring out all the various strengths, weaknesses and talents of group, guiding people to work as a team first.”

Time:

- “Finding adequate time for both coaches and students to meet and practice.”
- “Time away from work and family.”
- “Amount of time required.”
- “Allocating enough time to have the students be successful in their missions; teaching the students to work as a team.”
- “Keeping the kids focused and scheduling a time we can meet.”
- “Getting everybody’s schedule to mesh was difficult. I ended up having 2-3 members of the team working after school every day, which meant no break from it for me.”
- “The limited time available to do such a monumental task!”
- “Finding enough time to coach 2 teams to allow all the students who are interested to be on a team.”
- “Completing as many of the activities as possible in the time I have to give to/meet with the student.”
- “Time management for team members.”

Parents:

- “Parent involvement and/or participation.”
- “Not enough other parents willing to be involved.”
- “Dealing with children who didn’t really want to be there, but were forced by overachieving parents.”
- “Working with broad group of parents.”
- “Dealing with the ‘bad apples’...Kids that may have just been dropped off for free babysitting, are disruptive and don’t make any effort.”
- “Meeting parent expectations. Many students were ‘encouraged’ by parents to join, they expected me to provide the program. As opposed to letting the students learn in constructive manner.”
- “It was just me. There was almost no parent help. I struggled to get rides there and home for students, need additional time to find answers for questions.”

Motivation:

- “Motivating team members with very few academic and extra-curricular programs to spend time on for activities.”
- “Motivating for presentation, most are researched out from classes.”
- “Keeping kids focused and motivated.”
- “Getting the kids excited about robotics and space.”

Robotics/Programming:

- “1) Very time consuming. 2) Batteries performing inconsistently, robot work optimally for short period of time with full strength batteries.”
- “The robot.”
- “Trying to teach kids how to get accuracy, repeatability, and precision from a toy.”
- “I had to learn the programming and building of a robot to complete particular missions. I had never done that before.”

Research:

- “The research assignment was hard for 5th grade. It was a challenge to help students understand the concepts. They worked very hard on the research. They received the 1st place award on research.”
- “Getting the team interested in the Research assignment.”
- “Lack of consistent volunteers and the science research demands too much time in the very short time line season. Release the research project early to allow coaches time to prepare and guide students.”

Money:

- “Time, money.”
- “Time and money. Now more teams want to form at our school, and we have no idea how to fund them or be fair about limiting the numbers.”
- “Financing the team.”

Organization:

- “Organization.”
- “Teacher support is so needed. I helped more with the research while our other coach, a parent, helped with the technical.”

Competition:

- “FLL can have a competitive emphasis that overshadows the more important aspects of what we are trying to do.”

Recruiting:

- “Recruiting students.”

Question #39: What steps could FIRST LEGO® League take to make it easier or more attractive for adults like you to get involved as an FLL Coach?

Training:

- “A little more explanation so we have a clue what to do.”
- “Training sessions, mentoring by ‘veteran,’ coaches video’s of past events. For new people that can get extremely overwhelming.”
- “Provide targeted training for both technical and non-technical coaches.”
- “Much more support (a manual-easy steps, easy to read) for new coaches, more tournaments to choose from, funding sources (this is the single most prohibiting factor).”
- “Possibly offer a workshop for rookie coaches so that they can have a good overview of the entire process.”
- “Technical support. It takes considerable time to learn how to deal with the variability inherent with LEGO®’s.”
- “Provide training or more complete training and support materials for coaches, especially beginning coaches. Help obtain corporate and school support.”
- “Early hands-on training, live coaches training beyond a coach simply receiving a packet of information. Not many, just one or two.”
- “Training.”
- “Coach training.”
- “Offer more guidance and support especially in the research area.”
- “More hands-on lesson plans and guides in notebook form.”
- “More practice materials to prepare them for the challenge. Team building – pre building and programming activities.”

Simplify info and make it more accessible:

- “Easier access to information, registration materials, etc.”
- “Keep improving clarity of communication on shipments, etc. For example, no info was included with the parts for the playing.”
- “Keep adding to the resource section of the website, send the pieces for building the competition board in bags for each structure and include directions already printed out and on CD.”
- “Make the website easier to find basic information. Ex: Instruction on setting up playing field was buried under table construction site. According to the questions on the forum I wasn’t the only one.”
- “Simplify everything.”
- “Show more robots in action on the website.”
- “I think it would be nice to videotape some of the better presentations just to see what the judges think is good.”
- “All results of competitions should be public. All judges comments and ratings should be given to coaches to share with students.”
- “Easier internet info.”
- “Also make it easier to get replacement or missing parts.”

Peer discussion/ coach mentoring:

- “Concise forum online to exchange team management ideas.”
- “Being able to ask an experienced coach some questions as to expectations.”
- “Have a local FLL mentor. Like me, I have my team but I am support for 4 other teams.”
- “Have more mentoring available for teams via FRC ‘workshops’ to understand the game, funding resources.”
- “Notifying people of other local schools/teams so we can communicate on issues, problems, or training.”
- “Have a one hour or so coaches’ meeting where someone with experience can give some ideas.”
- “Have a list of coaches people could contact for more info if considering forming a team. Post a list of coaching tips on your website. Invite coaches to contribute to the list.”
- “Having another coach mentor me in my first year. I would have found it much easier to get started. The FLL web page should list new or interested people in my region, pair up with others.”

Announcements:

- “More announcements in newspaper.”
- “Exposure in industry, (literature, advertisement, etc)”
- “Publicize more – especially newspaper, clips or videos showing the fun and excitement of competition.”
- “Advertise the program; get the engineering businesses to work with the teams.”
- “FLL could create a handout for children to give to their parents, who could in turn use it to generate funds from their employees.”
- “Spread the word of the program to all schools in the country, possibly offer some pilot program incentives.”
- “More people and schools need to hear about this.”

Longer Season:

- “Make the season longer. There is simply too much to do in 8 weeks.”
- “Extend time period for season in order to give teams more time to prepare. Since teams only had 3 months to prepare for regional competition, we had to meet too many hours a week during the evening.”
- “At this age time pressures are difficult, the kids are not independent.”
- “A longer season reduces stress!”
- “More awareness. Less intense schedule.”
- “Release the science research earlier. I will have 10 FLL teams (independent) and 15-30 (compensatory low income) school teams next year.”

More Parent/Mentor Involvement:

- “Have more parent involvement so less work is required by the coach.”
- “List of local mentors”
- “Encourage ‘old timers’ to ask for volunteers.”
- “Help set up mentoring programs.”
- “More teacher involvement. First year, we had no help at all. It was difficult to get started, wasn’t sure what we were doing.”

Support:

- “Get support from community sponsors.”
- “Technical support from a real person = eye to eye.”
- “List of local mentors, business partnerships to help financially.”
- “Approach companies like you do the first HS program. Most adults and kids are not aware of the program or the opportunities that it offers. The LEGO® ideas is that it is primarily for boys to build with.”
- “Representation at PTO meetings, involve FLL into CATE (career and technology ed.) at middle school level.

Money:

- “1) Concites forum online to exchange team management ideas 2) Giants, \$\$\$”
- “Reasonable pay and creating a portion of the program where coaches compete with one another.”
- “Affordable.”

Start Earlier:

- “Get parent involved by starting programs earlier, 1st or 2nd grade.
- “Provide the challenge in early August so that teams can start at the beginning of the school year.”
- “Announce the challenge in January with the competition in April.”

Split Age Groups:

- “Split into 2 divisions, 4-6 grade and 7-9 grade. It is overwhelming for first year coach/team to compete against experienced coach/team.”
- “Segregate the teams by age and experience. I think that many rookie teams improperly judge their performance against older teams.”

More Reliable resource:

- “Find a more reliable resource. Robots only work consistently with full powered batteries.”

- “Realize that no matter what you say, to the kids, it’s all about the robot.”

Smaller Teams:

- “Smaller teams, encourage schools to set up tables and computers.”

Communication:

- “For me, two things were key: communication, to learn about the program and the support and encouragement my boss had for the program and for his direct reports to consider participating.”

Question #40: What steps could FIRST LEGO® League take to make the FLL experience better for the young people in the program?

More clarity and objectivity with regard to rules and judging

- “Research and technical presentations are both somewhat unspecific and unfocused. Could be improved.”
- “Improve information & feedback on performances. Team members have no feedback to use as basis for improvement except scores for robot performance. Makes difficult to gain student interest in research
- “Better instruction on rules and research project.”
- “Remove the grey area when it comes to some of the missions. It seems these areas are exploited by coaches which leave students believing they are not judged fairly because others go beyond boundaries.”
- “Make the scores more objective and less subjective.”
- “Better guidelines on what the judges are looking for. Remove judges anonymity so that the team gets all the feedback on what was good and bad about their presentations.”
- “An average or top score for teamwork presentations and robot design might help students evaluate how well they did compared to others.”
- “Not have so much obiquity in the rules and regulations.”
- “Clear and specific opportunities to understand the research aspect of the program. Allow parents to observe presentation, give written inputs on judging.”
- “Publishing rules so parents and children know exactly where all parties are coming from.”
- “It was a challenge for a first year team to learn the programming and address the challenges; the rules and info were not very specific.”
- “More feedback during competition.”

Modify the research assignment/research judging

- “Research team puts in a lot of time and deserves to know how they did. Unless they win, they never know how they did. Why can't standings be posted?”
- “Integrate the research project into the robot challenge more, perhaps break it down into short topics or lessons that directly relate to the robot challenges to get the kids interested in research.”
- “Allow first time students to concentrate on the building, programming and marketing. 2nd year FLL could participants could add research to the process or diminish the research for new FLL.”
- “Research training guide. That is very hard for the younger students.”
- “Do not have a research assignment. It's a robotics program, not a giant long research project.
- “The research topic could be narrowed and be given more guidelines.”
- “The research assignment is very difficult for the 4th graders. I would make that easier so that 8th graders don't have an advantage.”
- “I like the combination of robotics and research. The students would prefer to by-pass the research but I think it serves a valuable purpose.”
- “While the research assignment was a great experience, I felt that there was just too much to accomplish between the robot and the research assignment.”

Have more awards/recognition

- “Not put so much pressure with the competitions on winning, it was great this year because everyone got a medal. Make that an ongoing thing.”
- “Special recognition of specific talents.”
- “More awards, example: 2nd and 3rd place”
- “Badges: we give out Programmer, Structure, Robot, Leader, and Reasearcher badges as the kids win them by achieving.”
- “Acknowledgement of first year teams. Kids worked hard (we had a young team), competition against older/experienced kids. It would have been nice to have the regionals/state say something.”
- “The more ways to get recognition at the tournament the better. We got 2nd in teamwork and a trophy and it meant a lot to the kids even though they didn't get high score.”
- “The awards at FLL competitions are great!”
- “I like that awards are spread out and medals for all. Staying with a low key focus helps make it more fun.”

Provide more information, especially videos

- “A video to be used at the beginning of the whole program would be useful, building some excitement with concrete pictures and footage (ex. From past challenges).”
- “A video showing the process including research assignment, and clips of the parts of a tournament would be great.”
- “Make your videotapes available to potential schools. Ask a PBS station to do a special on FLL.”
- “Provide videos of past entries to new teams so they have a better idea of what to expect at competition.”
- “Have more information (multimedia) on the FLL website (or on a video) that shows the whole experience. I could show the video to interest people instead of explaining it myself.”
- “Send more informational info out to schools about the program.”
- “Emphasize the character aspects of participating in a program like this: patience, resourcefulness, attentiveness, responsibility rather than just competitive aspects.”
- “Student videos- presentations etc”

Make age/experience differences more fair

- “Split elementary from middle school.”
- “Find a way to make it a little more fair. For 9-10 year olds up against 13-14 year olds. There's a huge difference in maturity and capability.”
- “Have some sort of separate scoring or handicapping so middle-schoolers don't win everything.”
- “Have age division for the competitions. 4th graders have a hard time competing against experienced 8th grade teams.”
- “Younger students have a difficult time with the complexity of building and programming”
- “Younger and older teams competing in separate age divisions.”

Nothing, it was great

- “They had a great experience.”
- “It's so great that it's very difficult to give you an answer!”
- “It's a great program for the kids, can't think of any improvements.”
- “Nothing, it was great.”
- “Can't say at this point.”
- “I don't know that you could make it any better. It's a wonderful program. All the girls on my team are sad that it's their final year.”

Reduce team size

- “Limit team size to 6 max. The tournament days are too long. More sites to less than 2 hour wait.”
- “Reduce max team size to 8.”
- “Smaller teams, suggest size of 6, minimum 5, maximum 8.”
- “Smaller team size recommendation (6-8 would be better).”
- “I felt that a team size of 10 was too large for keeping all of the children involved.”

Provide more training and practice opportunities

- “More practice exercises with "how to" instructions.”
- “Just as coaches have to attend workshops students should also attend workshops. Network and gain and share better knowledge with other teams so that everyone comes out of it knowing some more.”
- “Possibly an interactive web page that would allow some basic building and programming games.”
- “Mini events before kids sign up so they know what they're getting into”
- “Training in programming.”

Lengthen the season

- “Move the date to April/May so the team and school may have longer prep time; emphasize that although this is very interesting, it is also very exhausting and demanding.”
- “Longer time to prepare for competition. This schedule rushes the kids.”
- “Lengthen the season to give more time to work on the research and robot.”

- “Start in May rather than in Sept. Giving the kids something like this to work on over the summer will make it a much more educational and fun experience.”
- “Give them a little more time to work on their projects.”

Have more competitions/tournaments

- “Need more competitions to work on something for 6 weeks and only attend one competition; most children don't get to enjoy the full experience.”
- “Making more tournaments. 12/year with different roles!”
- “More tournaments”
- “More opportunities for competition.”

Limit adult intervention

- “Look for ways to limit adult intervention so that the children do more of the work.”
- “My team members were a little let down by the number of teams with adults that were too involved.”
- “Continue to implement tasks that encourage the students to do the work. We observed several teams that were obviously an outlet for adults to prove how well they could build a robot.”
- “Make sure there are enough coaches who allow the kids to do the work themselves”

Decrease/limit the cost

- “Less cost!”
- “More grants for LEGO® parts and other instructional aids.”
- “Place limits on money and parts to level playing field for all. A beginning team has little chance of advancing against well-funded experienced teams.”
- “Reduce the \$150 registration fee so schools can afford to send more teams to the competition.”

It was too hard

- “For coach guided teams the challenge is too difficult.”
- “Don't keep making it more difficult. Every year the task is larger and harder, but the 8 week time period remains the same.”
- “Having fun and making programming easier for kids.”

Mentors

- “List of local mentors”
- “More mentor training/involvement”

Tournaments are too long

- “The tournament days are too long. More sites to less than 2 hour wait.”
- “Reduce idle time at competitions.”

Tournament was too crowded

- “Do not potentially jeopardize the safety of so many young people by putting them in such confined spaces. The Fire Marshall would love to see a pic of crowded facility.”
- “We felt that this year's tournament was crowded...”

Miscellaneous

- “The state competition in Novi, MI was terrible for the Research/technical presentations. Please provide a quiet room where these presentations can be heard. Hard for kids to concentrate.”
- “Produce paper roll out mat for each student, most can build similar LEGO® objects at home and want to do more outside of the meetings.”
- “Our high school chose to keep the web portion of the program. It really helped keep our team going. I would like to see it actually brought back to the competition.”
- “Extend the software licensing to make it legal for each child to have the software on a computer in their home.”
- “Every young person needs sufficient support to succeed.”
- “Consider having a senior hs LEGO® league division for using NQC or java. It might compete with FRC, but it's less expensive.”
- “Start program with 1st-2nd graders. Keep working and doing the great job FLL has been doing for years.
- “Allow more students to participate in the FIRST LEGO® league program.”
- “Coaches need to make team members more aware of all aspects of the program, not just focus on robot performance.”
- “Begin planning and research early.”
- “Improve the consistency of the LEGO® computer (RCX) to the point that small changes in battery voltage will not significantly change the robot’s performance. Many became frustrated over this.”
- “Have all tournaments in December, SC's tournament was in January and the season lasted too long. Kids burned out.”
- “More time during the competition, they get tired out.”

STUDENT SURVEY – OPEN-ENDED ITEMS

Question # 25: Is there anything else you want to tell us about what you liked or didn't like about FLL?

General feelings of like or love:

- “I liked building the robot because I like LEGO®'s a lot.”
- “I liked the overall experience.”
- “I had one of the best experiences I've ever had. I think that we should do more with NASA topics; it is really educational and it makes it fun and interesting!”
- “A truly great experience.”
- “This is the best. I would always do this. I also love the award ceremony!”
- “I love FLL. It is the greatest. I hope I can do it again next year.”
- “FLL was awesome! I definitely want to do it again. I learned a lot that will help me in the future.”
- “FLL was a fun activity that I learned a lot in. In fact, I've learned more doing this than any other activity. You should continue doing it.”
- “I really enjoyed FLL because my coach was always encouraging me.”
- “I thought going to the competition was an excellent experience. I would do this again in a heartbeat. It was so much fun.”

Fun/Enjoyed it/Good experience:

- “I had a lot of fun in LEGO® League, but a lot of the skills asked in the survey I already had.”
- “I enjoyed it – I got to work with new people and just having fun with them.”
- “It was extremely fun and interesting.”
- “It's a lot of fun and I hope FLL is around for my kids when I grow up.”
- “The fun of the whole thing.”
- “Good job!! Had lots of fun!”
- “I think it was fun and challenging, every kid should try it.”
- “I liked having fun while doing something hard at the same time.”
- “It was really fun and I loved my team.”
- “I liked the fact that it was fun throughout the whole process, from making it to competing at the tournament even though we came in last place.”

Competition:

- “The competitions ran very well and they were very organized.”
- “I liked the state and local tournament but mostly building and running the robot.”
- “I liked doing our teams presentation in front of everyone at state.”
- “I liked seeing everybody's faces after our robot did something good.”
- “I liked building the robot and bringing it to competition so we could see what other people did and other people could see what we did.”
- “We need some activities to keep us occupied while we are waiting for our turn, judging, or scheduling.”
- “I liked the professional atmosphere of the competitions.”
- “The judging was very lax at competition. Teams were using illegal tether and were not kicked out. My team is very happy that we won the Director's Award and can't wait to go to the nationals!”
- “I loved going to the competitions – it was always something to look forward to.”
- “I thought that the tournament was the best part because you don't know how your robot will do. It was exciting!”

Teamwork:

- “I like the fact that everyone's working together in a giant team project.”
- “I had a good time with other kids on my team.”

- “Being with friends, working with the team, and being a part of the FLL.”
- “I liked having 2 teams at the same school, working together.”
- “I enjoyed getting to know my teammates better.”
- “It shows you how important it is to work together.”
- “I really like the fact that I had a good team.”
- “I love working together and learning a lot. I think this is a great program!”
- “I liked how at the tournament nobody argued when we were trying to figure a way to get past the next mission and everybody was shooting ideas of what we could do. LEGO® League was a blast this year.”
- “The competition taught me a lot about patience with my teammates.”

Not working together:

- “I didn’t like when my team wouldn’t work together.”
- “We need to get some people to stop messing around. I know you can have fun. It’s just when some people aren’t doing their work and goofing around. It is a distraction to me and others.”
- “I thought that there was too much arguing about what should be done than getting it done, or changing the programming.”
- “I didn’t like how I did not do anything when building the robot and in the tournament.”
- “2 kids who got kicked off the team after regionals just came to meetings and sat down and chatted. They didn’t help. It didn’t seem fair, or like something allowed.”
- “Some team members didn’t care about challenge. They just wanted to play and build LEGO® stuff.”
- “I liked to help drive the robot and help build missions. I did not like all the fights.”
- “My friends can be distracting when I am working.”
- “One of our teammates was very mean and negative. He also would forget his part of our presentation.”

Didn’t like the survey:

- “I didn’t like this survey.”
- “Yes, I loved not to take this survey.”
- “No more surveys.”
- “Not really. It was really fun. I don’t live surveys very much at all.”
- “This survey is too long.”
- “This survey is way too long!”
- “I do not like this pop quiz.”

Bullied/mean kids/feeling left out:

- “I don’t like when I’m left out and ignored.”
- “I didn’t like when I was not included or made fun of, or not listened to, which happened a lot.”
- “Sometimes people get on my nerves. That was a thing I didn’t like.”
- “Some kids were very mean. They acted like they were smarter than me and they also took pieces to my costumes and broke different belts...”
- “What I didn’t like when the team talked about me.”
- “Some kids thinking they’re the boss.”
- “The team I have or had hated me and they didn’t let me do much and the only person who believed in me was the team coach or volunteer.”

Should be more organized:

- “They need to get more organized.”
- “Give us better rules (more description).”
- “Write a more DETAILED rule book. We had to change the whole program at competition because we never knew the pieces were glued on. (We read it 3 times.)”
- “It was too short this year and challenges weren’t that good. Too many rules and you won’t know the point values unless you go on the web.”
- “Some of the directions were unclear.”
- “I think they need to give us clearer instructions.”

Robots:

- “I liked programming the robot.”
- “I liked building the robot and being with my friends.”
- “Robots are cool!”
- “It’s cool that we can use any LEGO® piece. Next year we should be able to use more motors, wires, sensors, and RCX’s.”
- “I enjoyed building and programming, researching, meeting new friends, and the tournaments were a lot of fun. God bless you FLL.”
- “I also like programming and learning how the robot works because I like computers and electronics.”

More time needed:

- “I liked everything, but we needed more time.”
- “Plan the tournament better, time wise.”
- “I don’t think we had enough time in the competing part. There was a lot of stress on all the kids. Way too much waiting around.”
- “I didn’t like only having 30 minutes in between the matches, at state 45 minutes would have been better.”
- “We kept running out of time on some days.”

Learning:

- “I learned a ton about programming.”
- “I love all the learning I do.”
- “I thought the challenge was very, well, challenging.”
- “FLL should try to get kids involved who don’t know much about computers and LEGO®’s to give them new opportunity.”

Breaks:

- “Music and dancing during breaks.”
- “I liked how long lunch was.”
- “I liked having pizza parties.”

Practice Tournament:

- “We need to have a practice tournament.”
- “I didn’t like how some teams took over the practice boards, and I loved the spirit and the overall FLL competition. I also love robotics!”

Self-Confidence:

- “I liked the team work that FLL taught me. I feel more self-confident.”
- “It is hard for me to express my ideas to others but I think FLL has helped give me the confidence to do this.”

Did our best:

- “We did our best.”
- “Trying my best and having some success this season.”

Being on the news:

- “That I got to be on global news.”

General Dislikes:

- “I did not like my assistant coach.”
- “Yes, I didn’t like having the dad take over the project. He stayed up late and had one of his friends come over to help him work on it. Other than that, I really liked FLL!”
- “I liked to build and program the robot to go around certain obstacles. What I didn’t like about FLL is that it takes up a bunch of valuable time.”
- “I did like being one of the main characters in the skit but I still do not like that only two members of the team are allowed up at the tables.”

- “I would encourage coaches to try to make teams with 1 or 2 grades. Otherwise, older kids may ignore younger kids. Also, kids should have to turn in mandatory teacher recommendations when applying.”
- “Judges not seeing that parents do most of the robot building, programming, etc.”
- “I think that the challenges are too easy for a LEGO® robot.”
- “I like the age limit. I didn’t like having to work when I wanted to play with my friends. My coach (mom) made me work.”
- “I thought it was really, really fun but I didn’t like the tasks very much. I hope the tasks are funner and better.”
- “I didn’t like the times (spending all day at tournaments).”
- “I think the missions were too hard. It’s hard to program. And you should make sure the missions correlate with debate!”

PARENT SURVEY – OPEN-ENDED ITEMS

Question # 15: What was the greatest impact of First LEGO® League on your child?

Teamwork:

- “Shown how teamwork is needed and can be successful”
- “To be a team member on a successful team – how much planning, preparation, and work is involved”
- “A great and very patient and organized coach provided a wonderful experience and guidance for a positive overall experience in learning how to work as a team with various personalities”
- “Working with a group on a common goal”
- “Learning to deal with a team – disagreements, compromises, encouragement of others”
- “Experience in working as a team member”
- “Teaching him to work as a member of a team and to respect other’s ideas and input”
- “His ability to work with others and compromise”
- “Dedication to see a project through to the end with a team rather than individually”
- “That it takes a whole team to get a project done/ One person can’t always do it all.”

Skills:

- “He learned more about programming.”
- “Science and math use to solve problems. Group cooperation. Speaking in front of others.”
- “It acts as extension of classroom, enabling her to use skills taught in class on other projects.”
- “His interest in science has increased and it has become his favorite subject.”
- “Greater experience in another different use of computers.”
- “Making her comfortable in the use of technology.”
- “Increased awareness and interest in technology and science.”
- “Understanding simple programming steps.”
- “Problem solving skills.”
- “Public speaking.”

Confidence:

- “Increased self-confidence”
- “He is more active, more enthusiastic in what he does.”
- “If she tries hard, she can succeed”
- “Confidence that her ideas are valuable, and that she has a special talent for coming up with good ideas”
- “She has more self-confidence in a group of her peers”
- “It gave my child confidence during and after participation on the team. He is also looking forward to joining the middle school team next year”
- “Being able to see how his ideas can be put to practical use”
- “He was very happy and wants to participate again He has more self-confidence now”
- “Self-confidence and self-esteem”

Motivation:

- “Motivated him to do well at school and complete homework on time.”
- “Focus on problem and not giving up.”
- “Motivated him to do programming.”
- “Being able to work though and solve any problem he may face.”

Hard Work:

- “It was a very stimulating project that required dedication and hard work and resulted in a very impressive and honorable award.”
- “Great sense of achievement.”

Opportunity:

- “Overall, this was something he has always been interested in doing, so his excitement has just grown. He had not been able to do something like this – this was a perfect opportunity that he had been waiting for.”
- “Getting him into the real world and away from TV and video games.”

Competition:

- “Provides a cooperative, ‘sports like’ environment; i.e., competition, trophies, compliments, etc. in a scientific field.”
- “Competing in a school competition.”

Deadlines:

- “Meeting a deadline.”
- “Following through from beginning to end in a complex and lengthy project.”

Fun:

- “The fun involved made him forget there was ‘work’ involved. He did the research without any nagging from me!”
- “Putting together his lifelong love of LEGO®’s with computers and friends.”

Dedication:

- “Dedication in completing a project and not wanting to quit when it got tough, staying focused!”
- “Teaching him to take time to work out a problem without expecting a quick, easy answer.”

Social Aspect:

- “Chance to be with kids with similar interests to his.”

Future:

“One of our sons wants to go to MIT and be a mechanical engineer because of FLL & coach.”

Question #26: What steps could FIRST LEGO® League take to make it easier or more attractive for parents to get involved in their child's FLL team?

More Exposure:

- “At the beginning, it is difficult to get parents to understand what FLL is about. Many don't go to the website. More printed brochures might help.
- “More exposure. I think a video presentation of the competition experience would get more students and parents involved. It is difficult to describe. Be prepared to have more media coverage.”
- “More exposure at schools.”
- “Need to get the word out about FLL! Mailers to the elem & MS tech depts.. Most people know about LEGO®, but very few know about FLL.”
- “At present they are doing what they can; however, they could advertise more for parents with engineering or programming experience.”
- “To get more school involvement; Perhaps set up a demonstration at a basketball game. Have high school kids come in and show school.”
- “Provide more opportunities for the child to learn by having an open house, tour, or in-school presentation.”
- “Perhaps explain the program at Back to School Night or at PTA.”
- “A newsletter with upcoming events, suggestions for projections at home.”
- “Advertise the challenge in school newspapers.”
- “Need a brochure/website setting expectations/opportunities to help.”
- “Publicize it more at other schools.”
- “More information to parents from school.”
- “More exposure in media (tv, radio, newspaper) from the state/national level. Local teams provide releases & interviews. FLL should too. Parents won't get involved unless they know about FLL.”
- “Ask for involvement from parents with various backgrounds and have some weekend activities.”
- “Sell the idea to as many schools as possible!”
- “By increasing awareness of the program through pamphlets that are sent home with student from the school.”
- “More literature sent home from school.”
- “They need to get more information out to prospective parents and students alike. More consistency in the tables at competition; Biggest problem is the schools do not recognize what a great experience.”

More Information:

- “To have programs where the parents could come in and be able to do stuff and know all about it.”
- “It's hard being a first-time coach – there are so many unwritten things that you have to find out from other coaches who have been there before. The website is not very user-friendly, either.”
- “Have more documentation on the aspects of building and running of the challenge portion. The research is pretty much up to the team.”
- “Have a list of activities that parents need to do so parents can sign up for discrete area of interest.”
- “Give info on what needs to be done.”
- “Not familiar enough with the program.”
- “Provide sample program print-out manual for kids to copy programs at home with a parent to increase learning. Many parents want to learn more about the programming aspect.”
- “Booklet to send home to parents with more details, times of work – but that is determined by each team.”
- “A specified set-up list of responsibilities and ideas for parents to become involved in.”
- “Provide more information to parents and describe in detail what goals are being involved with the team so parents can assist.”
- “Educated schools to the benefits of having FLL teams; Most think it's just a ‘battle-bots’ thing.”
- “More structured information for setting up teams – example: job descriptions for positions like fundraising, spirit, etc.”
- “Create a video explaining what FLL is all about AND outlining past challenge and what kids could learn about through them. Many parents would like to help but don't know what they could do.”
- “Have FLL representatives meet with interested parents to answer questions and help them to know how to put a team together.”

- “More straight-forward information to parents about what is involved, benefits to kids, parent training.”
- “Have a parent meeting to inform parents of ideas and schedules. Let kids do skits to practice in front of parents.”

More Assistance Needed:

- “Instruct coaches on delegating tasks to team parents, providing information to new parents to assist them in identifying areas they can be useful to.”
- “More effective personal communication with actual experience in technical aspect. We’re not all computer/engineer ‘geeks.’ No one on our team had building/comp. Experience & we were at a great disadvantage.
- “Perhaps more supporting material online? How can a parent help their child without getting in the way of the children solving the problems themselves?”
- “Require more volunteerism from parents.”
- “Have different leaders, i.e., one for building and programming – an engineer, and a second coach for research only, a third parents leader to coordinate meetings, emails, tournament application, etc.”
- “1. The rules were difficult for a first-time team to interpret. 2. Coaching ideas or tips would help.”
- “Make research portion less intimidating. Many parents have a hard time with science.”
- “More local knowledge, community support.”
- “More training programs for coaches and parents; Our parents are not that involved because they feel lost regarding programming and technical aspects.”

Bad Scheduling:

- “If the competitions were not scheduled on Sundays, we would be more supportive of the program. When a child works for months & then can’t attend the competitions, it’s VERY DISAPPOINTING!!!!”
- “Not so much of a time commitment; Between homework and one sport there was no time to just relax and be a kid.”
- “Make it an in-school program.”

Sponsors:

- “Obtaining sponsors.”

Good Coaches:

- “Our team was led by a 5th grade teacher. SHE made it very accessible. The school had to decline 5th graders and several others because we did not have enough coaches.”

No Improvements Suggested:

- “Nothing – the coaches were great and very much in touch with each person.”
- “Already seems easy and attractive from my perspective.”
- “Everything is good, but I wanted to have more communication between the parents and the coaches of First LEGO[®].”
- “I can’t understand why any parents wouldn’t want to be involved.”
- “This is not an issue in our community. We have a lot of parent support and volunteers.”
- “I think they do a great job. It’s just a matter of how much time parents have and other kids and activities.”
- “I don’t have to get my child involved in this. She always wanted to do it, she always wanted to be involved in it.”
- “Can’t think of anything.”
- “Our parents were very involved this year. The meetings were fun for all and parents were encouraged to stay.”
- “None – coaches doing great job.”
- “FLL does a great job – I just wish parents wanted to be more involved.”
- “I believe that there are plenty of opportunities to get involved.”
- “Can’t really give ideas – the parents who want their children on a team and/or want to be with their children will do it no matter what.”

Question 27: What steps could FIRST LEGO® League take to make the FLL experience better for the children in the program?

Organization:

- “Organize the state tournament better.”
- “It was a great experience but the group didn’t understand the criteria for some of the awards. One award (rookie) was not even given out at the assembly. Also some of the awards were very subjective.”
- “Consistent competition rules!”
- “Have more organized and set responsibilities to follow.”
- “The Melbourne Tournament was much improve from last year – less congest in Team Tables area, less noise at same & in stands due to great move in dividing teams into “1/2s,” the kids kept moving with less wait time. More organized.”
- “More brainstorming activities.”
- “Programs are too long and judges take too long. Makes a real long day for the children.”
- “State tournaments way TOO LOUD and too long; Please discourage team spirit from being displayed as NOISE. This makes the day VERY long and uncomfortable.”

Information and Assistance:

- “Give coaches ‘practical’ materials and methods for teambuilding skills (similar to mini-challenge materials). Help us know how to teach the kids how to work as a cohesive unit!”
- “I think parents and students should see presentation and technical aspects of programs. They could learn from the different teams.”
- “Children get teased in middle school if they participate in FLL. Students should be more informed that there’s more to FLL than just playing with LEGO®s.”
- “Provide video of robot designs in detail for instruction so students could view at home.”
- “Providing more initial help for first time teams so they get off to an easier start, providing more competitions to put all the work they did to some use.”
- “A short video explaining the events might help. Note: Our regional director, Dr. John Widerman, has been great. Many communications via email, friendly, and welcoming.”
- “Send more information to the schools.”
- “Sponsor more training events.”

Tournaments:

- “Have a ‘pre-regional’ tournament. That way, teams can compete at least twice.”
- “Small local events like the Sonora Meeting (8 teams) are better for the children than the larger ones – they could ‘visit’ and learn from each other without being overwhelmed by the size of the event.”
- “Have more competitions, and closer to home.”
- “Make a regional event – more winners of state before going to national.”
- “Do a regional meet PAST state BEFORE nationals; Give more opportunities to go to nationals.”
- “Need more local events.”
- “Make sure the ‘field’ was more even at tournaments. It was evident that some teams had much more adult help than others. This league is a kids competition. Maybe break down age groups so younger ones can have the supervision they need vs. the older ones who should do it on their own.”
- “Not sure – publish a ‘result’ or follow-up to previous years’ team designs, outcomes, etc. for education purposes.”
- “Give them scores on presentation with a critique so that the kids know what to do to improve.”

Scheduling Problems:

- “Our son was unable to attend the State competition with his team because it was held on a Sunday. He has other church related activities on Sunday and it was a great disappointment for him.”
- “That they have more meeting hours; that there should be more modes of transportation to go to school activities.”
- “Summer programs/camps where they can learn more; We are sending our son to a camp that specifies robotics/use of LEGO® Mindstorms.”
- “Lengthen the season.”
- “The time between getting the mission board/research and the tournaments is too short, too rushed – this causes parents to be too involved. Parents should be coached/instructed as to how to lead the kids.”
- “Shorter practices with the sub-teams to maintain the interest of those students present.”

Exposure:

- “More advertising to get more community involvement.”
- “Advertise the challenge in school newspapers.”
- “Do demos at schools so more children know what it is.”
- “Promote the program. Not enough children are aware of the League.”

Kids do the work:

- “Set standards on how much is REALLY done by the kids vs. ‘helping parents & coaches.’ Make the tournaments less noisy. Our child’s coach really LET the kids do the work!”
- “Don’t let coaches out on the floor to help a team during a ‘run.’ (This happened with a team in Sonora.)”
- “Take significant steps to limit ‘over-involvement’ on the part of coaches and parents. Evaluate why certain coaches’ teams consistently take top honors even though the kids on the team are changing.”

Recognition:

- “Give trophies to each child for placement instead of just to leaders.”
- “Acknowledge the hard work of the winning team (regional) better.”

Money/Affordability:

- “Decrease the costs to participate so that more students could afford to be involved. Registration fees and costs for robot kits/ LEGO® parts are very expensive. We are a school of 920 students and could barely afford to fund a team of ten students. So many more wanted to participate and it’s hard to find a fair way to select the few that we could find funds for.”
- “Offering discounts on LEGO® products so we could easily afford to offer the LEGO® robotics toys at home.”

Research Assignment:

- “The research assignment is too much like homework. My son had too much homework this year so he wasn’t interested in the research project. He preferred to play with LEGO® s and program.”
- “1. Let all children program at meets. 2. Everyone work on research program.”

Switch teams:

- “Switch teams more often and try to work the kids with different partners.”

Workshops:

- “Workshops with experienced instructors/participants to help.”

Mandatory participation:

- “Mandate participation regardless of interest.”

Provide a mat:

- “Provide a paper roll-out mat for each team member. Most kids can build similar models at home and many have a robotic kit.”

Smaller Groups:

- “Have smaller groups in the tournaments so all could have the same judges to make it more fair.”

No Improvements Needed:

- “Nothing, really they are doing pretty good now and in the next generation kids will understand better because they are growing up with computers.”
- “My child’s experience was great – always an emphasis to have the kids do the work rather than the coaches. Our coaches did a great job of guiding the team (not doing the work for them).”
- “I am completely satisfied with program as it is.”
- “It has been a great experience.”
- “No comment at this time.”
- “None – the kids love the program.”
- “It’s been great! Thank you!”
- “No suggestions – doing a good job thus far.”
- “I am not sure they could. It was a great experience for our child and family!”
- “This is our 1st year & it was wonderful!”
- “Program appears to be a great experience for kids.”
- “This was a wonderful and exciting experience for my child.”
- “Can’t think of anything.”
- “Nothing! Great job.”
- “None – coaches doing great job.”
- “This is a great program! Keep it going!”
- “It’s a wonderful program as is.”
- “We had a great experience.”
- “We had a great experience and a great deal had to do with the coaches. They were great.”