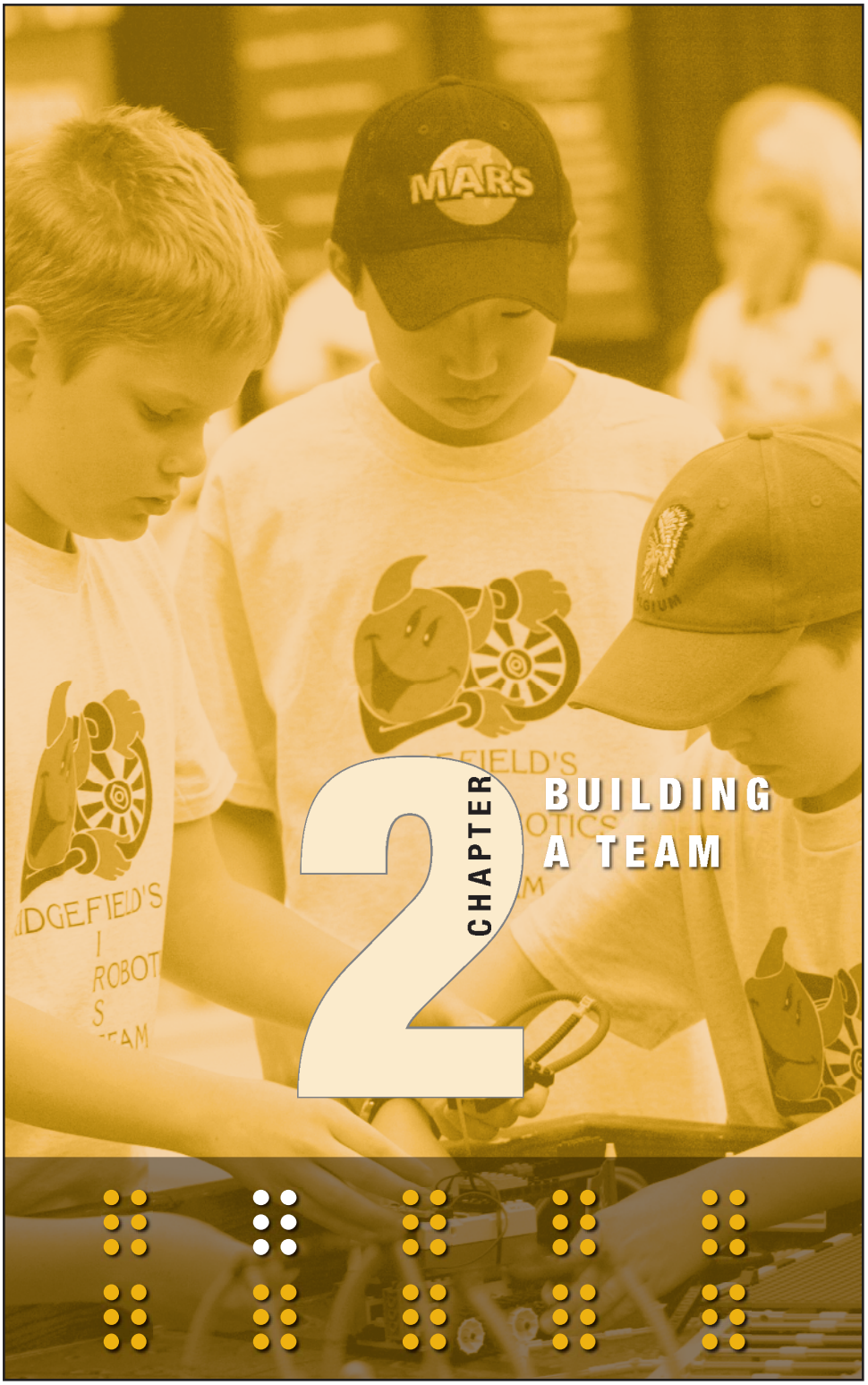

CHAPTER 2
BUILDING A TEAM

Coaching an FLL team can be one of the most rewarding experiences of your life. And like any great reward, it involves a commitment of time and energy.

THE FOUNDATION

To succeed, both the coach and the team members must commit to the entire process. Above all, it's important to remember that the children need you to give them guidance and provide structure, encouragement, and most of all, a fun experience.

> **TIP**
> Use the FLL websites. The *FIRST* website (usfirst.org) has curriculum resources. The FLL forum on firstlegoleague.org contains a message board where you can post questions and read or reply to existing messages. It contains a wealth of information. See the appendix for instructions on using the forum.

Teams require at least one adult coach. As the coach, you must be 18 years or older. Lots of people make good coaches such as parents, teachers, engineers, college students, and scout leaders. It requires no special skill, just patience, dedication, and a willingness to learn alongside the team. You will need to direct the process the team follows to solve the Challenge without providing the solution yourself.

In addition, you must be willing to acquire some basic knowledge of the programming environment and LEGO robot building. We encourage you to enlist the support of a technology mentor or guest speakers for additional assistance. We also recommend that you invite people with backgrounds in engineering, programming, and the science of the Challenge to share their knowledge and experience with your team.

Advice for Coaches

Don't take this too seriously! We want you to enjoy the experience. Our goal is for you to help the children have fun with robots while they get comfortable with technology and learn something about a real-world problem. Whether or not your team scores high marks at a competition, team members win just for participating. If you throw in a discussion about friction while they eat pizza, you're doing a great job.

If it is your rookie year, enjoy it for what it is: a survey of the course. Your goal should be to simply take a lap around the block with FLL. With a fun experience and meeting realistic goals under your belt, you and the children will be brimming with ideas about what you plan to do next year.

The Children

Your FLL team will have up to ten children, ages 9 to 14. For a true team experience, we recommend a minimum of three children per team. To be eligible, a child cannot be older than 14 on January 1 of the year the Challenge is announced. For example, a student who turns 15 in May of 2007 would be eligible to compete in the 2007 season, whereas a child who turned 15 in December 2006 would not.

REMINDER

An FLL team includes a maximum of ten children. In addition, each child may participate on only one FLL team.

Children come to the team from many different avenues such as schools, after-school programs, home-school groups, Girl Scouts, Boy Scouts, Girls Inc., Boys & Girls Clubs, YWCA, YMCA, Big Brothers-Big Sisters, religious groups, and neighborhood groups.

The Mentors

A mentor is any person who works with the team in his area of expertise for at least one team meeting. Mentors help provide valuable one-on-one interaction and serve as resources in their specialties. Here are some mentor types and possible team contributions:

- **Engineer –** Teaches the necessary skills for the robot's design or the project presentation.
- **High school *FIRST* Robotics Competition member –** Helps team work through a practice programming challenge, shares strategizing methods, serves as a possible youth role model.
- **Science professional –** An expert in this year's Challenge subject, presents real examples of science in practice, advises the team on the project research and its solution, recommends new sources of information for the team.
- **Graphic artist –** Provides advice on the team logo and T-shirts.
- **General volunteer –** Schedules meetings, provides transportation and snacks, helps with fundraising, and provides carpentry assistance for building table borders.

- **Programmer –** Teaches the team about programming principles and helps the team troubleshoot programs.
- **Marketing expert –** Teaches the children about marketing the team to others.

When recruiting a mentor, be sure to consider diversity. Children from diverse backgrounds may be more comfortable if there are adults with backgrounds similar to their own. Below are just some of the sources to recruit a diverse group of mentors. You can visit their national websites to connect with someone from a local chapter:

- Society for Women Engineers (SWE)
- National Society of Black Engineers (NSBE)
- Society of Hispanic Professional Engineers (SHPE)

TIP

It is a good idea to have the parents review and agree to the **FLL Coaches' Promise** to reinforce the goal that the children do all the work. Parents may want to help, but remind them it has to be hands off. Additionally, you might consider holding a meeting for parents at the start of the season to set expectations and recruit mentors.

Other sources for mentors include organizations that strongly encourage their members to volunteer in the community, such as:

- Local chapters of the American Society of Mechanical Engineers (ASME)
- IBM On Demand Community
- Leading corporations in your community
- Senior Corps

Be sure to use the search engine on the *FIRST* website (usfirst.org) for a variety of mentor documents, resources, and links.

The Parents

Parents of team members often volunteer to help. Their cooperation and support are invaluable. They can help with fundraising, logistics, team building, mentoring, or opening their homes for a team meeting. A parent could handle all of the paperwork for tournaments or coordinate the team's travel arrangements. Another could coordinate the materials and resources the team needs throughout the season by finding how-to guides and expert resources on the FLL Challenge topic, or leading brainstorming practice and teambuilding activities.

If your team has more than one parent volunteer, make the most of your good luck by asking a parent to read the FLL team forum on the Web. And don't forget the most important volunteer duty — organizing refreshments so your team never runs out of fuel. As coach, you can perform all of these tasks, but sharing the workload makes your team more efficient, reduces stress, and increases team spirit and cohesion.

SNAPSHOT

Columbia University junior Wayne Penn began his *FIRST* career as a member of the ThunderChickens, a *FIRST* Robotics Competition (FRC) team from Washington, MI.

Wayne serves as the director of Columbia Robots for Academic Inspiration, a campus group dedicated to mentoring middle and high school students from the South Bronx, NY in FRC and FLL.

"Robotic sports are fun for everyone," says Wayne, "but we want each of these children to walk away with a new sense of self-confidence, teamwork, and belonging. Our end goal is to assure that each student has the motivation and support to graduate from high school and go on to college."

Currently mentoring seven FLL teams (four of which he helped start), Wayne's goal is to have an FLL team in every middle school in the Bronx within three years.

TEAM DYNAMICS

Team Size

There are advantages and disadvantages to any team size, but teams must not exceed the maximum of 10 members. Some coaches believe small teams may concentrate better, work as a unit more easily, and provide team members with more opportunities for attention from the coach or mentors. Other coaches believe that larger teams have an advantage because they share the workload and can break into sub-teams to work on tasks.

Breaking larger teams into smaller workgroups works well with this age group as it encourages collaboration. One group can work with a coach or mentor on mechanics while others learn software or work on research. Some coaches believe rearranging members into sub-teams from meeting to meeting helps avoid cliques, builds appreciation of all the team roles between members, and bonds the team. Regardless of your team size, the most important thing is to give your team the best experience possible with the resources you have.

SNAPSHOT

We had 22 children show up for the first FLL meeting. They all decided to register, and we now have three teams. As far as picking the best combination of children, sometimes your choice as a grownup will lead to a very flat team. Be sure to choose a team with a diverse range of skills, keeping in mind that children who are more challenging in the classroom will often shine on an FLL team because of the hands-on and self-directed nature of the activities.

Age Variations

Depending on the age and development of the team members, you may see two distinct developmental phases with mixed-age teams. Younger children often want to take apart and completely rebuild a robot that isn't working, while older children will often want to stick with the current design

TIP

Be aware of age and gender-based cliques. When you see members excluded or the focus moved away from the whole team, discussions and role rearrangements can help.

and alter it. When working together, the two groups may frustrate each other. Neither method is right or wrong; the children are just at different developmental stages. For team members 11 years of age and younger, you and the mentors may consider:

- Presenting problems or explanations visually or with hands-on examples.
- Allowing the students time to understand the game and missions through manipulating and testing repeatedly.

For team members older than 11, you and the mentors may want to:

- Create a structure that encourages crazier, out of the box ideas.
- Provide older team members leadership opportunities, such as explaining ideas and the next steps to the rest of the team.

Time Commitment

FLL teams meet for as little as one hour to up to ten hours a week. The time commitment will vary due to your coaching experience and your team's dynamics. It is up to you and the team to decide what your meeting schedule should be. A rookie team typically needs to meet more often than a veteran team. A new team can have a learning curve and may need to have longer, more frequent meetings. Set your team's schedule according to its goals. We suggest starting with two meetings per week that are two hours long, and adding or subtracting time as your team's needs indicate.

As the coach, you may need additional time each week to prepare for team meetings. Spend this time coordinating help, maintaining equipment, communicating with your sponsoring organization, purchasing supplies, registering for competition, and reading the forum discussions on the FLL website. Create a realistic meeting schedule and don't forget to consider major holidays and school events. You can refer to the sample schedules in Chapter 9: Checklists and Schedules to see how other coaches plan their seasons.

Some meetings will run like clockwork and others will be more challenging. You must accept both. Learn from everyone's mistakes and continue with a smile.

Time vs. Progress

> **TIP**
> If you are planning to attend an event or tournament, check the dates. Some take place as early as November and some are as late as January.

FLL has seen teams with very late starts, in some cases as late as week five in the typical eight-week season. These teams often do as well as teams who started in week one or earlier. The bulk of FLL work is usually done in a span of three or four weeks, so a team that starts late can still do well. The team that gets an early start takes a while to ramp up and make progress. They often second-guess themselves, and usually go through some sort of crunch time in the last week or two, winding up at the tournament showing about 70-80% effectiveness compared to an average veteran team. This is fine.

The late or rushed team is all business for three or four weeks, maybe with some more pressure and no time to regress, and winds up showing about 70-80% effectiveness compared to an average veteran team. We have lost count of the number of post-tournament reports from teams who were worried they were too late and ended up having a blast.

ROLES AND RESPONSIBILITIES

The Coach

There are as many ways to coach an FLL team as there are teams. Some organizations take conformity to the extreme, but FLL encourages fresh thinking. Let your team celebrate its own style. Do what makes sense for you. With that said, consider certain guidelines.

As much as you might like to build it, the team must design and build the robot, not you or any other adult. If you find yourself pushing a solution, you're doing your team a disservice. Not only are children not thinking for themselves, but you may also suppress a revolutionary idea. Additionally, a coach or other mentor doing the work sends the children the message that they are not capable of doing the work. FLL defines children doing the work as children making all critical decisions in the robot-building, programming, and project development processes.

Does this mean you should stand idly by while your team struggles with the Challenge? Absolutely not! You must be involved, but you cannot

be involved in an overtly direct way. Instead of telling the team to "build a gearbox using a worm gear," you could ask the team to brainstorm ideas to make the robot go slower. Or you could encourage the children to run an experiment that may lead them to explore other options.

Coaches differ in how much instruction they give their teams. Some give very little and others give much more. A successful FLL coach controls the process, not the content. You are a facilitator to help your team complete its work and improve the way it works together. One useful coaching method is to reply to a question with another carefully considered question. The following examples force team members to use their knowledge of science and hypothesize logical outcomes:

"What would happen if . . ."

"And then . . ."

"How will that affect . . ."

Children become problem solvers by finding solutions themselves! We understand that adults can be just as passionate about FLL as children, but adults must always remember that **THE CHILDREN COME FIRST.**

Finally, you are responsible for the planning and scheduling of meetings, visits, and trips. You are the liaison between team members, mentors, parents, and volunteers. It is important that you inform children and parents about what is expected of them in terms of their commitment to the team each step of the way.

The Team

Discuss responsibilities with the whole team. It is important for you to be specific when talking about each individual's role and responsibilities. Team members will usually have ideas about what they want to do: programming, building, research, marketing, etc.; but be aware of the child who might be pushed out of doing what he really wants to do. Also, be mindful of those who avoid certain tasks. Remind the children often about the importance of collaboration and teamwork.

Encourage team members to push the limits of their own comfort level and make sure everyone understands or does more than one job. Rotate roles so everyone has an opportunity to try different things.

Children often discover that they enjoy a task they wouldn't have volunteered for on their own. This can also prevent boys and girls from falling into stereotypical gender roles.

Below are examples of the roles or sub-teams you may want to establish within your team. Some children may want to be involved in multiple roles. Do whatever works best for your team, but ensure balanced leadership.

- **Research –** Gather information and prepare the project presentation as described in the Challenge.
- **Building –** Make decisions about building and work to build consensus on the mechanical design among team members.
- **Programming –** Make decisions about programming.
- **Strategy Analysis –** Analyze the robot playing field and formulate various methods for accomplishing the missions. Lead the effort to establish a consensus on the final strategic plan and think about risks and rewards of different strategies.
- **Robot Operators (2) –** Operate the robot at a tournament. Two robot operators are permitted at the playing field at any given time (see Tournament section for details).
- **Project Management –** Get everyone focused, get everyone's ideas heard, find compromises, and keep everyone on schedule with a project timeline.
- **Quality Control –** Conduct independent tests of the robot's performance to

TIP

When my team is frustrated or the team members have a bad day, we take a few minutes to play the game Sandman. In this game, the child who is "it" tries to make the others laugh. Once you laugh, you're out. It means losing the game, but it feels so good to laugh! The team that successfully creates a balance between work and play will feel successful in other challenges.

REMINDER

Do not worry if you don't fully understand some skill or aspect of the Challenge. You can work through it with the team members. In fact, it may be to your advantage. Children love to solve problems that befuddle adults. It promotes creative thinking among children when you have no answers to influence them.

identify potential opportunities for improvement. Test for functions that do not work reliably and make recommendations for improvements.

- **Marketing –** Design and create the team logo. Write a press release and contact the local media, surrounding schools, or civic organizations to increase public awareness of the team and how the team benefits from the FLL experience. Communicate a weekly update on the team's progress to parents, sponsors, and organizations.

- **Documentation –** Record and document the entire team's thoughts, actions, failures, and successes throughout the FLL season in a journal, storyboard, video, or other form you can display or present at events. During the season, these efforts help the team organize information for decision making. At events and tournaments, these are an excellent way to showcase the team's activities, teamwork, and spirit for the judges and event attendees.

- **Fundraiser –** Think of ways to raise money for the team. Recruit parents and other children in the thinking, planning, and doing processes.

- **Team Spirit –** Think of ways your team, families, and friends can show their spirit at the tournament. As part of your team's identity, consider designing T-shirts, making pins, writing a cheer, and inventing ways to showcase your spirit.

Team Goals

An early step in preparing to coach a team should be to work with your team to set goals for the season and put them on paper. Include expectations for the group's success at functioning together as a team. As the coach, write down what concepts you expect the team to learn by the end of the season.

> **TIP**
> MISSION: A mission is a job the robot can complete for points. Missions can be attempted in any order, alone or in groups, re-attempted when possible, or skipped. Teams earn points if the required results on the field are still visible at the end of the match.

FLL events provide excitement and recognition and celebrate each team's accomplishments. The true goals of FLL have nothing to do with winning medals or trophies. If you can look back at the end of the season and say even one of the following, you have achieved the most important goals:

- We learned how useful and fun math and science can be.