Introduction to Coaching a FIRST Lego League Team

by Paul Barbone

About FIRST Lego League: FIRST Lego League (FLL) is attractive to many parents seeking a way to leverage a child's interests in Lego building toward some desired end, be it technology education, socialization, or something else. This article is meant to try to help you decide whether FLL is right for you and your child.

FIRST is an acronym meaning "For Inspiration in Science and Technology." The US FIRST organization sponsors robotics competitions at many levels; FLL is the level intended for children 9-14 years old. That "FIRST" comes before "Lego" in FLL indicates an important fact to keep in mind when considering FLL for your child: The emphasis is clearly on science, technology, and robotics; the Lego in FLL merely provides an age-appropriate and accessible means toward that end.

FIRST Lego League Season: FLL sponsors international competitions in league format with one season per year. Each year in late summer, the yearly "Challenge" is announced, which sets the theme and rules of the competition for that year. FLL teams will work for the next 6-8 weeks to prepare for a tournament. Tournaments in the greater Boston area tend to be held from shortly before through shortly after November. A team can officially enter only one (qualifying) tournament. Thus the typical season runs from early September to late November.

FLL Competition: The annual Challenge includes a theme, which is a societal problem that might be (at least partially) addressed through technology. The competitions are designed around that theme and therefore change annually. Nevertheless, they always contain three main elements: FLL "core values," a research project focused on the annual theme, and a robot game. To be eligible for prizes in the competitions, an FLL team must compete in each of these three categories.

FLL's core values include "Gracious Professionalism® and Coopertition®". Teams are scored in this area based on how well team members communicate and work together toward some common goal. This is assessed at a tournament by challenging the team to complete a task before a panel of judges.

The FLL research project requires the team to (1) define a real-world problem, (2) learn about that problem, (3) invent and propose a potential solution to that problem, and (4) reach out to potential stakeholders. Recent themes have been food safety, assisted living for the elderly, and natural disasters. In my coaching, I called this the "invention challenge" part of the competition.

The FLL robot game is the best known part of FLL competition. To compete in the game, a team must build a Lego robot (e.g., a small motorized and computer-controlled car), program the robot to move autonomously (i.e., by itself) around a playing field, and to perform any of a series of tasks at different locations on the field. A team scores a specified number of points for each task successfully performed by its robot.

Is FLL right for your child? FLL is great for children who are interested in science and technology in general, and particularly those who enjoy competition. FLL is a competitive league, after all, and children participating should expect to contribute to all parts of that competition, including research for

the invention challenge and programming for the robot challenge.

FLL is not, however, a Lego building club. Once the robot is built, it's built and the team needs to move to other aspects of the competition. In my coaching of middle school teams, I've encountered many children who were disappointed by how little Lego building there was, and others who were frustrated by other team members who kept dismantling and rebuilding previously settled designs.

Should you coach your child's team? Here's what you need to run your own FLL team:

- **Time:** For the duration of the season, the team should meet at least once per week for several hours at a time. Multiple shorter meetings per week are often more productive for the kids than fewer longer meetings.
- **Space:** The 4' x 8' plywood playing field is roughly ping-pong table size. It can sit on the floor or on a table. Setting up and taking down the field can take 15 minutes each, so you'll save a half hour per meeting if the field can stay set up throughout the week.
- **Money:** The minimum cost to run an FLL team is about $400 per year, assuming you already have all the equipment you need. (Costs include $225 team registration fee; $75 field kit, plus roughly $100 in tournament registration fees depending up on the specific tournament.) The cost of the robot kit itself is another $400-$500. (The robots tend to last 2-3 years before needing to be replaced, but we've found it useful and appropriate to budget one new robot kit per team per year.) Hence, expect a total cost of about $1000/team or $100/child. This estimate assumes that your team will have access to one or more computers. Fundraising tips are available on the FLL website.
- **Enthusiasm and Patience:** The children will be motivated by your enthusiasm for the research project and the robot challenge. The FLL invention challenges are deliberately open-ended, and so the children will need your help and guidance to focus and define their projects. They will also need your help when frustrated by a program that's not working like they think it should.
- **No particular programming or robotics knowledge:** Your job as coach is not to tell the children what to do, nor even to show them how, but rather to show them how to learn to do what they wish to do. Direct your children to any of a number of excellent tutorials on programming Lego robots. A few minutes poking around the web will identify videos on how to make a robot go straight, on how to write a program to make a robot follow a (curvy) line, on how translate distance on the board to rotations of the wheels, etc. Helping the children help themselves frees them from the limits of your knowledge.

Resources available to coaches and parents: The FLL website contains a wealth of resources for coaches and parents. A very small sampling is:

- Start a team: http://www.firstlegoleague.org/challenge/startateam
- Team resources: http://www.firstlegoleague.org/challenge/teamresources
- EV3 Programming: http://www.stemcentric.com/ev3-tutorial/ (As linked from the FLL website. Note that EV3 is the latest generation of Lego Mindstorms robots (as of 2014).)

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