

By Nancy McIntyre

A Day at FIRST Lego League

As the 3 p.m. bell sounds at Chaminade Middle School in Chatsworth, California, USA, a thundering herd of middle school students heads up the stairs to the sixth grade science lab, which is home to four FIRST Lego League (FLL) teams. The lab tables are arranged to hold two playing fields, and the students' many hands make light work of the setup. They eagerly place their Lego models—or field elements—around their mats and engage in various challenges. As one of their teachers, Steve Clark, arrives, the kids quickly take their seats to start the FLL meeting.

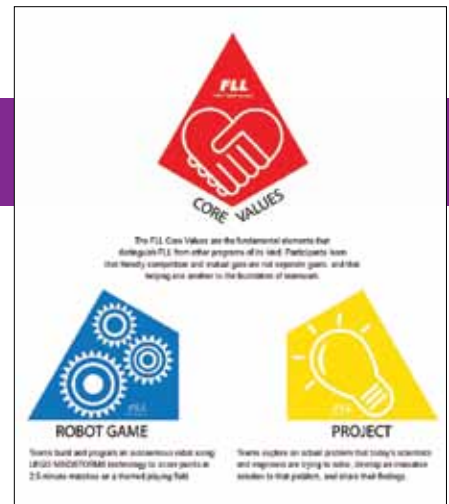
After Clark makes a few announcements about team shirts, a local tournament, and his willingness to let programmers come in during lunchtime, the students break into groups and move to four areas of the classroom to discuss their progress on their robots, programming, projects, and plans to move forward.

The Program

Clark, who is a science teacher, and Jeff Bean, an English teacher, run the FLL team meetings after school twice a week. Together, these two teachers showcase concepts that the students learned in the classroom and demonstrate how they fit into the real world. They help students solve problems, conduct research, make technical presentations, work in teams with adult mentors, and prepare for the regional competition. Next year, we hope to make this a two-day event and allow 96 area teams to participate.

Our after-school FLL program feeds into the high school FIRST Robotics Competition (FRC) program that I coach. When these aspiring young engineers come to the high school team

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with several years of FLL experience, they easily make the transition to the FRC team, and when they head off to college, they leave with seven years of robotics experience.

The Chaminade FLL program has grown over the past eight years and now serves 40 students in grades 6–8. There are no admission requirements for the team, but all participants and coaches have to make a commitment to attend work sessions two afternoons each week as well as a few tournaments throughout the year.

The Teams

Teams consist of 10 students, each of whom chooses the role of engineer, programmer, or researcher. Everyone helps out where needed, but these subteams specialize in one aspect of the competition for the season and lead the team in that portion.

Traditionally, the eighth grade students lead and oversee all the builders, programmers, and research team members. The new sixth grade students are eager to contribute to the team using the laptops issued

at the start of the school year. They love finding information on a variety of topics and organizing their projects into PowerPoint slides for their presentations. The seventh graders help the younger students, as they remember what it was like to be new but now know what they need to do to be successful on the team and at the competitions.

Most of these kids played with Legos when they were younger and are interested in science, technology, engineering, and math (STEM), so being able to work with robots is a perfect stepping stone to their dreams of becoming engineers or scientists.

The FLL experience also provides an opportunity for students to work alongside several local engineer mentors in our lab each week. Today, Cindy Chung, who is a mentor engineer from Xerox, meets individually with the Lawngnomes, Robotic Hotdogs, Explosive Legos, and Jelly Bellies to see how each team is progressing on the research portion of its project.

The Challenge

FIRST issues a different challenge each year to each of its programs. The FLL students have to tackle a two-part challenge: researching a current issue and solving the issue with a robotic solution.

In 2010, the FLL challenge was called “Body Forward: Engineering Meets Medicine” (<http://tinyurl.com/7ud5mqf>). The teams were challenged to design, build, and program an autonomous robot using a Lego Mindstorms NXT kit, with a goal of scoring as many points as possible in the 2.5-minute matches that they play on the themed playing field. Some of the tasks they program their robots to do include:

- Setting a broken bone and applying scaffolding, which will allow a bone to grow back together when the normal healing process is not working

- Inserting a stent to help expand and support constricted vessels where fluids need to pass through
- Creating a dispensing system to separate different simulated medications so patients can be more self-sufficient

In the research portion of the competition, teams choose and explore a problem that today's scientists and engineers are trying to solve. They develop an innovative solution to the problem either by creating something that does not exist or by building on a current solution. They also share their findings in the local community.

In today's meeting, students share their latest research and discuss how they can better organize their programming missions to be more efficient and collect more points in an FLL match. Many of the kids on the FLL team have never participated in traditional team sports, so this is a new concept to them.

The students have been focusing on how biomedical engineering has been used throughout history and how current applications are solving problems in all areas of the body. They have brainstormed ideas for the problems that need to be solved, and now they are applying this groundbreaking research and technology to ways that they believe could improve lives.

The teams design their robots to perform a variety of tasks, and it is up to the programmers to make the autonomous robots come alive and tackle the challenges on their own. A huddled group of students collaborates to figure out which route the robot needs to take to maximize its efficiency to complete each of the missions, which will allow them to score as many points as possible. The returning students show the younger ones the ins and outs of writing and testing the programming and encourage them to help with the program. They happily make multiple trips back

and forth between the computer stations and the playing field.

Final Results

As it approaches 5:15 p.m., Clark announces that it's time to begin the clean-up process. This is met with many groans because it means that the build session is nearly over for the day and homework is not far behind. He adds a reminder for an upcoming parent meeting about our school's help in hosting the regional tournament, and everyone is on their way.

As the future engineers gather their books, musical instruments, jackets, and backpacks, their engineer mentor Cindy Chung and I take a seat to catch up. She relays a story about the last competition, where Chris from the Robotic Hot Dog team came dressed as a giant hot dog to cheer on his team.

I check in with the teams every week, along with members of my high school team, who come to help mentor their younger colleagues. Watching the transformation of these young students over the season into cohesive teams that are helping each other to reach their goals is what FLL is all about. When these students come to the high school for dual campus events, they always give me an update about their lives.

At the end of the season, after a well-earned pizza party, the teams shared with me some of their proudest moments, including:

- The Lawnmowers earned Best Robot Performance and the Champions Award.
- The Lawnmowers earned first place in the Teamwork category at the L.A. FLL Championship.
- The Explosive Legos took first place in the Teamwork category at our qualifying event.
- The Explosive Legos took fifth place in the FIRST Core Values category at a showcase event at Legoland in San Diego, California, USA.

I am confident that our FLL teams will continue to do great things at the middle school level and that the students will be well prepared to join their high school classmates in the next couple of years, providing us with many more opportunities to continue to strive toward the National Chairman's Award, which is the most prestigious recognition that FIRST offers.

The greatest reward for me, as a teacher and mentor, is seeing how exploring, learning, and thriving in FIRST programs spur students to find a purpose and passion in engineering. Their FIRST experiences enhance their natural curiosity and maximize their learning. They see classroom lessons come to life as they engage in hands-on engineering lessons, solve problems, and build robots to complete complex challenges.

Every year, I graduate seniors from our high school team who go on to engineering schools across the United States with a variety of scholarships. Last year, several young men had been part of our program since sixth grade. Eric, our team president; Chris, our lead in electronics; and Garrett, our lead builder, are perfect examples of how FLL develops in students not only a love of STEM but also leadership skills and the ability to confidently solve problems, work together, complete a job on time and within budget, and make friendships that will last a lifetime.



Nancy McIntyre is the program director of the Eagle Engineering Team at Chaminade High School in Chatsworth, California, USA. She oversees the robotics programs at Chaminade Middle School and Chaminade High School and is the Southern California FIRST senior mentor.