

Step-by-Step Guide

to hosting your own



created by the Ponytail Posse

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Step-by-Step Guide to the FLL Sampler Class

Information, supplies, and instructions needed to run an “FLL Sampler” class at any elementary school.

This document includes:

- An explanation of what the FLL Sampler class is and why to bring it to your elementary school.
- Instructions for a research/presentation, engineering, and programming station.
- Instructions for six different core values activities.
- A list of supplies needed for all stations and core values activities.

What is the FLL Sampler class?

The after-school class was created by the Ponytail Posse robotics team as a fun way to give 3rd grade students an idea of what FLL is, as well as basic skills that they will need if they decide to join a team the following year. The Posse created the class because many students at their local elementary school did not know if they were interested or had signed up without knowing what LEGO League involved.

This class is *not* a coding camp or engineering course. Instead, it’s meant to be an opportunity for students to have their first exposure to all parts LEGO League. It is designed to be fast-paced and lightly touch on every subject rather than going in-depth.

IMPACT: The overall response once the class was finished were very positive. Many students (and their parents) were enthusiastic about signing up for FLL in the spring. Every student learned valuable skills that would come in handy if they joined a team, but more importantly, the vast majority said they had fun and that they would want to do the class again.

Being in this class greatly improves the chance that a student will join the program. In our experience, over 90% of students joined an FLL team the following year (2016).

“ I wish our parents would never come! ”
- a student who was enjoying the programming station

Who is the Ponytail Posse?

We are an FTC (*FIRST* Tech Challenge) team in St. Paul, MN. Our team began with the FLL program in 2008 and we competed for five years before moving on to FTC, which is one of the *FIRST* robotics programs for high schoolers.

We first created and ran the class in 2014; it was a success, but we knew we could do a better job of teaching the students what FLL is all about. Since then, we have done a lot of planning and eventually created FLL Sampler class described in this document.

If you have any questions, you can email us at team@theponytailposse.com.

Overview

The class runs for three 1.5 hour sessions and is designed for about 18 students, but that number can vary depending on resources. The students are split into three permanent groups that rotate between stations.

	STATION:		
	Programming	Building	Research/Presentation
Session 1	Team Red	Team Blue	Team Green
Session 2	Team Green	Team Red	Team Blue
Session 3	Team Blue	Team Green	Team Red

The daily station schedule is broken down into three 20 minute lessons with 5-10 minute core values exercises in between. It doesn't matter which station has which core values exercises, as long as they all have two total (or enough to fill the time between lessons).

Visit each of the stations' sections to see a summary of what students will learn.

Example of Welcome Speech

You may want to give a short welcome to the students on each day of the class. This is what we said at the start of the first session:

“ Hi guys! Welcome to the LEGO League Sampler class. We are the Ponytail Posse, a high school robotics team. LEGO League is an activity where you not only can make LEGO robots, but use your research skills to solve problems and your teamwork skills to work together.

We have put all of you into teams. Your team will learn how to build, program, research, and work as a together in this class for the next 3 weeks. The color of your nametag shows which team you are on. Just go to the table with the balloon that matches your name tag color.

Now, I'm going to count down from three. When I get to one, we're all going to shout 'LEGO!' and go to our color table. Ready?

3... 2... 1... LEGO! ”

Supplies - required at every class

- ☐ One or two “coaches” for each station
 - The coaches at the programming station should take the time to familiarize themselves and play around with the EV3 programming software. (resource: <http://www.theponytailposse.com/wp-content/uploads/2015/09/EV3-Programming-2015.ppt.pdf>)
- ☐ Nametags for students and coaches
- ☐ Class check in/out sheet
- ☐ Class list that includes parents phone numbers and aftercare instructions
- ☐ **OPTIONAL:** Balloons (red, green, blue to designate stations)
- ☐ **OPTIONAL:** Snacks

RESEARCH/PRESENTATION STATION:

- ☐ 3 laptops/chromebooks connected through wifi to Google search page
- ☐ Whiteboard markers
- ☐ Large die or spin the wheel with various topics
- ☐ Blank paper
- ☐ Pencils

ENGINEERING STATION:

- ☐ A picture of each simple machine (6)
- ☐ Enough LEGO plates (preferably 6”x6”) for each student in the group
- ☐ LEGOs to build with

PROGRAMMING STATION:

- ☐ Several computers with Mindstorms programming installed
- ☐ Several prebuilt kitbots (charged) for students to program
 - Default port assignments can be found here: www.depts.ttu.edu/coe/stem/gear/ev3/documents/Ev3-Connect-Computer.pdf
- ☐ Several download cables
- ☐ Blue tape and an area to make 2D mazes

CORE VALUES ACTIVITIES:

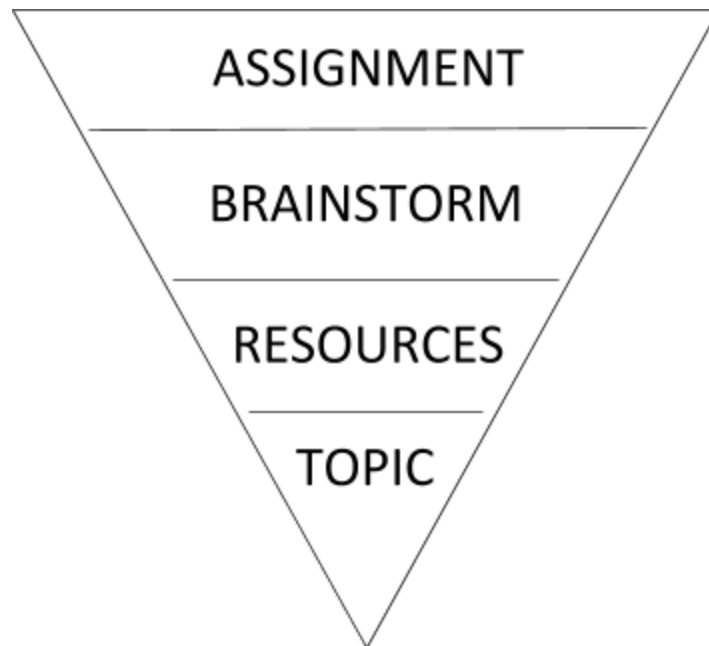
- ☐ **LEGO cup:** Blanket and cup of LEGOs
- ☐ **Move the balloons:** 10 blown up balloons
- ☐ **Move the balloons:** 2 boxes that can hold the balloons
- ☐ **Mystery words & Matching:** Blank stickers OR paper, scissors, and tape
- ☐ **Mystery words & Matching:** A pen or marker
- ☐ **Back-to-back LEGO building:** Two identical sets of LEGOS (one with pieces assembled randomly, one with the pieces separate)

Research/Presentation Station (1 hour, 30 minutes)

PART 1: The research process (20 min lesson)

Create and explain the Brainstorming Pyramid: look at your assignment, brainstorm possible things to research, look at the resources available, and make a decision on your topic.

- **TIP:** In 3rd grade, Minnesota requires a research project in the curriculum. Find out what the students did that year and use that as an example.
- **TIP:** When talking with them, assess how much they know about research. (for example: have they done internet research? Book research? interviews?) If they have limited internet skills, expect to help them research during the Fact Off (Lesson 3).



ACTIVITY: Choose a fun, general theme and make a brainstorm pyramid centered around that theme. (For example: playgrounds, school lunches)

1. **Assignment:** Verify the assignment or topic that is given by the teacher or *FIRST*.
2. **Brainstorm:** Brainstorm ideas within the provided theme. Make them wild, crazy, and fun! Listen to each other's ideas and bounce off of them creating an even cooler idea.
3. **Resources:** Think about what resources you have: who do you know, what is nearby, etc.?
4. **Topic:** Make a strategic decision on what topic to choose based on what resources you have, what sounds feasible, and what the team is excited about. Usually, the ultimate topic is fairly obvious by process of elimination.

PART 2: Core Values (5-10 min exercise)

See pages 13-14 or choose your own.

PART 3: Interviews (20 min lesson)

Explain that interviewing is essential to learn quality information. In LEGO League, the students will need to interview professionals and specialists. Have instructors demonstrate the correct and incorrect ways to interview someone. Explain what they did well and what was wrong with their interview.

Discuss the 5 critical components of an interview:

1. **Preparation:** Develop questions before you go into the interview. Gather all materials you may need (pencil, paper, etc.)
2. **Introductions:** Open with your name, a strong handshake, and a smile on your face.
3. **Questioning:** Ask the expert's name and how to spell it. Ask questions you thought about during the preparation phase. Ask questions that follow up information the **person** says during the interview.
4. **Documentation:** Always write down important information the **person** said during the interview. Take clear, detailed notes so you can look back later and accurately remember the interview. Be sure to list any fun statistics or facts that may be useful in the future.
 - After the interview, be sure to thank whoever you spoke to!
5. **Sharing:** It is important to share the information you learned with your peers. Present what you learned by speaking loud and slow. If you are reading off of a piece of paper. Remember to keep it below your face so your voice isn't muffled!

ACTIVITY: Have the students practice interviews in pairs.

1. Decide roles: who will be the expert, and who will be the interviewer?
2. What is your partner an expert in?
3. Create a couple questions to ask your partner.
4. Ask and document questions.
5. Switch roles!

Once all partner groups finished their mock interview, come together and share what they learned using appropriate sharing methods.

PART 4: Core Values (5-10 min exercise)

See pages 13-14 or choose your own.

Part 5: Fact-Off (20 min lesson)

The first step is to teach students the basics of internet research. Show students how to use key words and what questions you want to know the answer to.

Teach students about factual websites and what makes a website reliable or unreliable:

- Explain the difference between .com .gov .org
- Explain why not to use Wikipedia or similar sites.
- “ What would be better, a site by nonprofit or a site from a someone selling a product? ”

ACTIVITY: Fact off! Break the students into teams of 2-3.

1. Using die or spin the wheel to assign teams a topic to research. (For example: bicycles, trees)
2. Teams have 5 minutes to find 3 cool facts about topic.
3. Have teams face each other and share their facts, going back and forth between each fact.

Repeat as many times as time allows (about 3x).

Engineering Station (1 hour, 30 minutes)

PART 1: The engineering process (20 min lesson)

Explain each step of the engineering process (Ask, Imagine, Plan, Create, Improve) and that you follow this process to build something.

TIP: Emphasize that engineers use this process to build things every day.

ACTIVITY: There are three imaginary scenarios with problems that the students must solve using three separate mechanisms. They need to figure out how to:

1. Lift a heavy box five feet from the floor to the table
2. Slingshot a ball across a room
3. Carefully lower a heavy glass sculpture five feet from the table to the ground

After you explain these problems, split up the team so that there is one coach per group.

Walk through the steps of the engineering process with your group.

1. **Ask:**
 - a. What are we building to solve the problem?
 - Something to move a heavy box onto a table
 - Something to slingshot a ball
 - Something to move a sculpture to the ground
 - b. What are the rules?
 - You must lift the box and lower the sculpture the full five feet
 - You cannot use your hands to throw the ball across the room
 - You cannot break the sculpture into little pieces and deliver them down that way
2. **Imagine:** Brainstorm ideas for each scenario. Quickly move on from one scenario to the next to prevent them getting stuck on one problem.
3. **Plan:** help them draw out a plan. This can go together with the “imagine” step.
4. **Create:** once they have decided on a method, talk through the ultimate plan.
5. **Improve:** discuss how their ideas could be improved.

PART 2: Core Values (5-10 min exercise)

See pages 13-14 or choose your own.

PART 3: Simple machines (20 min lesson)

Introduce the idea of simple machines, which are mechanisms that make accomplishing tasks easier.

- Show pictures and explain the six simple machines:
 - **Inclined plane:** help you raise and lower something with a ramp
 - **Wedge:** forces two things apart
 - **Screw:** spiral staircase that can lift things or hold things together
 - **Pulley:** reduces the effort for lifting things
 - **Lever:** pivot point that helps you accomplish a task based on the strength you apply against the force of gravity (see-saws, hammer, elbow, etc.)
 - **Wheel and axle:** reduces friction (wheelbarrow, car, etc.)

TIP: Explain that the students will use these simple machines every time they build a robot in LEGO League.

ACTIVITY: Have them split into partners and go through the “Improve” step of the engineering process based on what they just learned. Can they come up with a new way to accomplish the tasks using simple machines?

Answer any questions or give suggestions, but let them create the ideas.

PART 4: Core Values (5-10 min exercise)

See pages 13-14 or choose your own.

PART 5: Marble maze (20 min lesson)

Have the students sit next to each other or stand in a line. Give each student one small LEGO board.

ACTIVITY: Their task is to make one long track out of LEGOs for a ball to reach a trash can (or some other kind of goal).

- Each of them will be making their own track.
- They will need to communicate with the people next to them so that when they connect the tracks, the ball can roll from one to the next.
- “ You may have to change your ending to fit with the next person’s beginning! ”

Answer any questions or give suggestions, but let them create the ideas. Once everyone is finished, run the tracks together.

As a group, go through the “Improve” step of the process. How can they improve the track to make it work better?

TIP: If the students successfully complete the track, it’s a great thing to show parents afterwards!

Programming Station (1 hour, 30 minutes)

PART 1: Programming-a-parent (20 min lesson)

ACTIVITY: Follow the activity at www.legoleaguecoaching.org/2010/09/21/programming-a-parent (summarized below).

1. Choose one coach to be the “robot”. Give the students a task to accomplish (i.e. close a laptop, take a book off a shelf, etc.) and tell them to give directions the robot to complete the task.
2. As they give the robot directions, make them break down the individual actions as much as possible.
 - a. For example, if they tell the robot to go forward, verify what that means (left foot forward one step, right foot forward one step). Once they have defined that, they can combine those two movements into a block called “step”.
 - b. **WHY?** This activity helps them think about how to communicate to the robot with specific descriptions applying to each separate part (like how you might tell the left and right wheel on the robot to spin forwards).
3. If they complete this activity early, then begin Lesson 2.

PART 2: Core Values (5-10 min exercise)

See pages 13-14 or choose your own.

PART 3: Intro to Mindstorms programming (20 min lesson)

Depending on how many computers and students you have, let them divide themselves into groups of 2 or 3. Give each group a computer, a robot, and a coach/helper to guide them.

ACTIVITY: Their first task is to make the robot turn 90 degrees (first verify that they know what this means). As you guide them, be sure to teach them by asking questions, rather than just giving them the answer.

1. Show each group how to use a “move” block to make the robot move. Have them determine whether to turn with one or both motors. Then, show them how to change the “rotations” measurement to “degrees” and let them put in 90 degrees.
2. When the robot doesn’t turn enough, ask them why. Give them the answer if they’re stumped. Then, let them do trial and error until they get roughly the right number.
 - a. The answer is that the robot itself doesn’t turn 90 degrees, but the wheel turns 90 degrees. This isn’t far enough for the robot to look like it has complete a right turn.

ACTIVITY: Their next mission is to have the robot drive in a square.

1. Show them how to add a block that makes the robot drive forward. Let them repeat the two steps (turn 90 degrees, drive forward) four times until they have made a square.
2. After they are successful, show them how a loop works to reduce the number of blocks needed. Teach them how to use a loop and delete the unnecessary blocks.

OPTIONAL ACTIVITY: Their last mission is to have the robot drive forward until it hits an obstacle (a wall, a book, a shoe, etc).

1. Use the loop method of programming a sensor. Guide them through the process of deleting the turn, making the forward move block unlimited, and changing the loop's settings to use a touch sensor.

If there's more time, let them play around with the programming. They'll probably discover the sound blocks and that will keep them busy until it's time for the core values activity.

PART 4: Core Values (5-10 min exercise)

See pages 13-14 or choose your own.

PART 5: Maze (20 min lesson)

Using blue tape and a flat surface, pre-make a few different mazes for the students to use. Make it with right angles (no curves) and clear starting/ending points.

ACTIVITY: The students must program their robot to navigate through a maze.

Show the groups the mazes and let them choose which one they want to try. There isn't a lot of guidance necessary for this activity unless your group gets stuck.

- If you think your group needs a bigger challenge, set up a book or other obstacle on an edge of the maze. See if they can remember how to use a touch sensor.

TIP: If the students complete the maze, it's a great thing to show parents afterwards!

Core Values Exercises

These are activities that the students did in our class. Feel free to replace any of these with your own!

TIP: As they go through the activities, take note of any behavior to talk about afterwards. The purpose of these activities is to encourage teamwork skills and tell them what to improve on so they can work together more effectively.

Make an elephant

PREP: All you need is an open space.

Have students work as a team to make item using their bodies (elephant, couch, bridge, boat, train). Let them talk for first few rounds, then no talking for later rounds.

WHAT TO WATCH FOR: Are all students participating? Is one person taking over?

“ I wish we could do this a hundred more times! ”
- a student in the class

LEGO cup

PREP: Mark a starting and finish line. On the starting side, lay circular fabric down on ground and place cup with LEGOs in the center.

All students must pick up and transport the towel with the cup of LEGOs balanced in the center. If the cup tips over, students must go all the way back to the beginning. Give them encouragement throughout the activity.

WHAT TO WATCH FOR: Are all students participating? Are they communicating effectively in a positive manner?

Human knot

PREP: Have the students stand in a circle and cross their right arm over left. Tell them to hold someone else's hand who isn't standing next to them.

Their task is to untangle themselves without breaking any links.

WHAT TO WATCH FOR: Are they communicating effectively? It's okay if one person takes a leadership role, but are they dominating the activity?

Move the balloons

PREP: Bring out the box of balloons and set up an empty box a good distance away from it.

The students have 1.5 minutes to move all the balloons from one box to the other *without using their hands*. Give them 1 minute to strategize, then say “Go!” and start the timer.
If they finish the activity with leftover time, have them do the same activity *without using their arms*.

WHAT TO WATCH FOR: Are they working independently or can they figure out a way to work together?

Mystery words & Matching

PREP: Create several pairs of stickers with matching words. For example, the words “umbrella” and “rain” would go on two separate stickers. Make enough pairs for every student in the group to have their own sticker.

Have the students line up with their backs facing towards you. Put a sticker on each person’s back.

- **TIP:** If you don’t have blank stickers, you can just write the words on paper and cut them out individually.

They have 3 minutes to figure out what their word is by talking to their team members. For the first minute, only allow “yes” or “no” questions.

Once everyone knows what their word is, tell them to pair up based on the matching words.

WHAT TO WATCH FOR: Are all students participating? Are they communicating effectively in a positive manner? When matching, is one person taking over?

Back-to-back LEGO building

PREP: Tell the students to divide themselves into two groups. Have the two groups sit facing away from each other, but close enough so that one can hear the other speak. The Build group will need a table.

Give the Instructions group the finished model and the Build group corresponding LEGO pieces to build the model.

They have five minutes for the Build group to successfully build the model based on the Instruction group’s spoken directions. The two groups can talk back and forth, but they cannot look at each other.

WHAT TO WATCH FOR: Is everyone in the Instruction group taking turns speaking? Is everyone in the Build group sharing the task of building? Is the Build group asking clear questions if they don’t understand something? Is the Instruction group being patient and listening?

After the activity, hold up both of the models and let the students see. Explain that even though they (probably) didn’t complete the model, it doesn’t matter as long as they worked well as a team.

FLL Demos

If you know any FLL teams, have them come in for a demonstration on the last day of class. This is a great way to encourage students to sign up for a team as well as show them how they can apply their new skills.

When we ran the class, the demo extended the last session for about 15 minutes. Parents were invited to come and ask any questions they might have about FLL. Pre-season signup sheets were also passed out to parents, which allowed them to sign their child up for FLL next year.



TIP: Several days before the last class, send a reminder to parents that it will run late. This is when you can take the opportunity to invite them.

TIP: This is a good time to invite *everyone* to come and see the robots! Be sure to invite parents, teachers, principals (both of the school and other schools interested in the program), and the school's FLL coordinator to answer questions.

TIP: If possible, it is better to have 2 or more teams demo their robot. If one robot isn't working properly, the other can still show theirs. It also gives the audience an idea of how creative teams can be and all the different ways of doing the same task.

TIP: As teams are running their robots, make sure they explain what the missions are. These students and their parents don't know any of the challenges.