



Week Two

Basic Engineering

Session Overview

Team members will...

- Check the Game Rulings on the FIRST website (usfirst.org/fll).
- Review team roles and responsibilities.
- Review all challenge documents for the robot game and program.
- Finish building the mission models.
- Learn basic building techniques.
- Learn basic programming skills...

Key Knowledge and Skills

Team Members will know...

- A team is more effective than an individual.
- A team functions best when everyone knows his or her role.
- A robot needs to be structurally sound.
- There are different methods for strengthening a structure.
- The Robot Game has specific rules and guidelines.
- Each mission earns a different amount of points. Achieving all the missions will score 400 points.
- The Game RULINGS are located on the FLL website and is updated regularly by FIRST. It is important for a team member to check this before each meeting.

Team Members will be able to...

- Demonstrate familiarity with the LEGO pieces in the robot kit.
- Build a basic robot.

Team Members will...

- Know the Teams Ground Rules and contribute a few rules of their own.

Before the Session

Coach Preparation

Background Reading

- LET'S GO FLL manual – Section Three: FLL team roles, and team binders.
- Lego Engineering Constructopedia. – search for a digital copy on the web.
- FIRST LEGO League: The Unofficial Guide – Chapters 10, 11, 12, 13 and 14.

Lesson Preparation

- Print copy of Challenge documents from the FLL website (if you didn't do it last week) (usfirst.org/fll). You need at least 2 copies of each document. 1 set for the Coaches Notebook



and 2 sets for the Team Notebooks. You may want to make a set for all team members or encourage them to print out a set at home.

- Field Set Up, Missions, Rules, Project and Project Topic Guide.
- Most recent Game RULINGS.

Equipment Preparation

- Charge batteries.
- Organize parts: See Section Three: Storage and Organization in the LET'S GO FLL manual for ideas. You can either do this ahead of time or have team members do this.

Equipment

- NXT Tutorial – See the Appendices in the LET'S GO FLL manual for directions on how to install onto your computer.

Documents

- Copies of Challenge documents – 3 for the Notebooks/Binders. Optional – 1 per team member.
- Copy of most recent Game Rulings.
- Team roles handout – 1 copy per person.
- Lego Engineering Constructopedia –
- FLL Core Values Handout. – You will need to create your own FLL Core Values handout.
- Top 10 Qualities of a Team Member or TEAM handout – 1 copy per team member
- Team Meeting Ground Rules Handout – 1 copy per team member
- Download and print the building directions from the FIRST website

Session Details

Team Building Activity

Bumpity Bump Bump

Arrange all players in a circle. Give them time to ask the names of the players on either side of them.

Once the names are known, the person in the middle goes up to a player and says, "You, *Left or Right* bumpity bump bump bump." That person then has to say the name of the person standing on his *left or right* or their own name for 'you' before the middle person finishes saying "bumpity bump bump bump."

ADDED TWIST:

The person in the middle can randomly yell out bumpity bump bump bump and everyone has to find a new spot on the edge of the circle. Then repeat.

Discussion

- Introduce the Core Values.
- Talk about what makes a good team – use your reading and either the Top 10 Qualities of a Team Member or the TEAM poster.
- Introduce the Session Ground Rules – Use the handout and have the team add a few rules of their own.
- Review the Game Rulings.
- Goal Setting – Ask these 3 questions and have each member share if you have a small team. Or have the Programming, Building and Project Team leader share for their unit.
- What did I work on last session?



- What do I want to work on this session?
- What is getting in my way of achieving my goal?
- Review the mission and rules.
- Have team members share what they remember about the missions and rules
- Brainstorm a possible strategy for the missions.
- See Section Three: Team Strategy Time in the LET'S GO FLL manual –. Some teams do this as a large group, while other teams designate 1 or 2 people to specialize in this.
- Use the 'Table Items Strategy' worksheet posted on the LET'S GO website. Using this worksheet, break up team into small groups or pairs and have them brainstorm ways to solve the missions.
- Review team roles – start to discuss who might want to focus where
- Give out the 'team roles' handout. – see Section Seven: Reproducibles

Robot Game

You might want to break up into 2 or 3 groups and divide up the following activities.

Builders

- Finish building the mission models if they were not finished in the previous session.
- Set up the Practice Field. In the Field Set up guidelines you will find directions on how to use the Dual Lock (Mission Model Arrangement – Dual Lock). **The model details will tell you where the mission model is located on the field mat and where Dual Lock is applied (not all mission models will use dual lock).**
- Review engineering and building techniques. Using the following guides, have the students practice building.
- Section I of the Lego Engineering NXT Constructopedia.
- Chapter 10 of FLL: The Unofficial Guide.
- Divide team members into a couple of groups and experiment with chassis designs – See Section Three: Introducing Building of LET'S GO FLL manual for ideas.
- Build 2-3 robots with available parts.
- See Section Three: Introducing Building of the LET'S GO FLL manual for ideas
- Lego Engineering Constructopedia: Sections IV – Full Car Model or II Ways to attach motors and front end setups.
- www.NXTPrograms.com.
- Suggestions: Motor Chassis, Five Minute Bot, Modular Test Vehicle (MTV), Bumper Car, Castor Bot, Line Follower.

Programmers

- Introduce the Programming Language – See Section Four – Programming Lesson.
- You can also use the tutorials provided with the NXT –G software.
- For more advanced programmers see *FLL: The unofficial Guide* Chapter 14, the Advanced section of the NXT Tutorial by Dale Yocum or consider buying one of the books listed in the programming resource section of the LET'S GO FLL manual.

Project

- Watch the FLL Challenge Project Training DVD that was sent with your registration packet.
- Review the research project guidelines
- Brainstorm problems to focus on. Share some examples of 'problems' and innovative solutions that have been invented.
- Food getting stuck in between teeth – a toothpick.
- Plastic bags filling up landfill: SunChip uses a biodegradable bag, reusable shopping bags.



- People having trouble walking on the sand down to the ocean – a plastic carpet rolled out on the sand extending the boardwalk.
- Begin researching the problem and existing solutions.
- Assign this as homework (optional.)
- Brainstorm field trip ideas.
- Research can be done at the library or on the internet and should include interviewing experts either in person or on the phone or by email.
- Put all research material in the Team Project Notebook.

Session Wrap Up

After the team has cleaned up, close with a brief discussion:

- What did you learn this week?
- What problems or issues arose today?
- What do you need to research/learn before next week?
- The one thing we did really well as a team was?
- One area where the team could use improvement was?
- One thing our team really enjoyed was?
- Give out congratulations and recognition for what each person or sub-team accomplished
- Set goals for next week

→ TIP

- Remember – Regularly challenge the kids to stop, think, communicate and THEN act.
- Encourage and reward failed experiments.
- Send out an email reminder each week to the team members and their parents letting them know what they need to be working on at home.

Don't forget to have the team...

- **Photographer** takes photos.
- **Technical Writer** update the team journal, blog or website.
- **Robot Recovery Manager** document the robot design and current attachments (draw or photograph.)
- **Battery Manager** charge the robot and spare batteries.
- **Program Back Up Manager** save and back up all programs.
- **Robot Designers** update their notebook with drawings, plans and documents they have printed out. (It is helpful if put dates on their work.)
- **Programmers** file all their ideas in the programming notebook. All ideas should be dated.