

TEAM MEETING GUIDE







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Introduction to FIRST® LEGO® League Challenge

Friendly competition is at the heart of *FIRST*[®] LEGO[®] League Challenge, as teams of up to 10 children engage in research, problem-solving, coding, and engineering – building and programming a LEGO[®] robot that navigates the missions of the Robot Game. Teams also participate in an Innovation Project to identify and solve a relevant real-world problem. *FIRST* LEGO League Challenge is one of three divisions by age group of the *FIRST* LEGO League program. This program inspires young people to experiment and grow their confidence, critical thinking, and design skills through hands-on STEM learning. *FIRST* LEGO League was created through an alliance between *FIRST* and LEGO[®] Education.



Welcome to FIRST[®] FORWARD[™] and CARGO CONNECT[™]

Welcome to the *FIRST*[®] FORWARDSM season. This year's *FIRST* LEGO League challenge is called CARGO CONNECTSM. Children will learn about how cargo is transported, sorted, and delivered to its destinations. As more demands are placed on transportation systems, the children need to rethink how cargo is transported from place to place. We have the power to build a path forward and invent the future of transportation. And it starts here, with you.

During the sessions, the team will experience the **engineering design process**. The team will identify, design, and create solutions and test, iterate, and improve them. The team will then share and communicate what they learned with others. The rubrics used in judging capture the engineering design process used to create both the robot and Innovation Project solutions.

Working as a Team

The team will create their robot to compete in the Robot Game and design their Innovation Project solution. Teammates should be encouraged to work with each other, listen to each other, take turns, and share ideas.

Team roles are outlined in the *Engineering Notebook*. Using roles helps your team function more efficiently and ensures that everyone on the team is involved.



Overview

How to Use this Guide

The 12 sessions outlined give your team a guided experience in *FIRST*[®] LEGO[®] League Challenge. The sessions are designed to be flexible so that teams of varying experiences can use the materials. In general, plan for each session to last 120 minutes, but each session can be adjusted to meet your own implementation needs.

Your role is to facilitate and guide the team during the sessions to complete the team tasks. Besides the main tasks, there is an introduction and a very important share session, where the team meets around the mat to discuss what they have learned. Finally, the team will clean up and put away their materials. The tips within this guide are suggestions, and you may not want to follow all of them. Remember to do whatever is best for you and your implementation.

FIRST[®] Core Values

The *FIRST*[®] Core Values are the cornerstones of the program. They are among the fundamental elements of *FIRST* LEGO League. By embracing the Core Values, children use discovery and exploration of the theme in each session and learn that helping one another is the foundation of teamwork. It is important that the children have fun. The more playful the sessions are, the more motivated the children will be.

Gracious Professionalism[®] is a way of doing things that encourages high-quality work, emphasizes the value of others, and respects individuals and the community. The team's Core Values and *Gracious Professionalism* will be evaluated during Robot Game matches and during the judging session at the tournament. The team demonstrates *Coopertition*[®] by showing that learning is more important than winning and they can help others even as they compete.





We enjoyed and celebrated what we did!



We explored new skills and ideas.



We used creativity and persistence to solve problems.

What Does the Team Need?

LEGO[®] Education Robot Set



Electronic Devices

Each team will need two compatible devices such as a laptop, tablet, or computer. Prior to starting Session 1, you need to download the appropriate software (LEGO[®] Education SPIKE[™] Prime or LEGO[®] MINDSTORMS[®] Education EV3 Classroom) onto the hardware device. To view system requirements and download software, visit <u>legoeducation.com/downloads</u>.



CARGO CONNECT[™] Challenge Set

This challenge set comes in a box that contains the mission models, challenge mat, and some miscellaneous pieces. The team should build the models very carefully using the building instructions. This is completed during Sessions 1-4: <u>firstlegoleague.org/season#resources</u>. The miscellaneous items include 3M[™] Dual Lock[™] Reclosable Fasteners, coach pins, and season tiles for the team members.

Challenge Mat and Table

Set up a table with the challenge mat in your classroom or meeting space. Even if you cannot build the whole table, building just the four walls will be useful. It is also possible to use the mat on the floor. Find out more, including how to build the table, at <u>firstlegoleague</u>. org/season#resources.



Session Layout

EVERY SESSION STARTS WITH AN INTRODUCTION AND ENDS WITH A SHARE ACTIVITY. DETAILS FOR THESE ACTIVITIES ARE GIVEN IN THE SESSION PAGES THAT FOLLOW, ALONG WITH NOTES AND TIPS TO HELP YOU RUN THE SESSION.

	Introduction (10 minutes)	Team Tasks (100 minutes)		Share (10 minutes)
Session 1	Introduction to Challenge	Robot Lesson 1	Efficiency Project Spark	Share
Session 2	Inclusion Examples	Robot Lesson 2	Safety Project Spark	Share
Session 3	Goals and Processes	Robot Lesson 3	Access Project Spark	Share
Session 4	Discovery Examples	Robot Lesson 4	Connections Project Spark	Share
Session 5	Team Name and Logo	Guided Mission	Identify Project	Share
Session 6	Teamwork Examples	Pseudocode and Mission Strategy	Project Planning	Share
Session 7	Gracious Professionalism®	Solve Missions	Develop Project Solution	Share
Session 8	Coopertition [®] Examples	Solve Missions	Evaluate and Test Project Solution	Share
Session 9	Innovation Examples	Iterate and Improve Robot Solution	Iterate and Improve Project Solution	Share
Session 10	Impact Examples	Iterate and Improve Robot Solution	Plan Project Presentation	Share
Session 11	Team Playing Card	Plan Robot Design Explanation	Practice Project Presentation	Share
Session 12	Fun Examples	Practice Robot Game Matches	Practice Full Presentation	Share

Pre-Session Checkpoint

Please read the student *Engineering Notebook*, *Robot Game Rulebook*, and this *Team Meeting Guide* before starting the sessions. They are full of very useful information to guide you through this experience. Use this checkpoint to help you get started and guide you toward success.



ENGINEERING NOTEBOOK TIPS

- Read the *Engineering Notebook* carefully. The team will share the notebooks and work on them collaboratively.
- The notebook contains relevant information and guides the team through the sessions.
- The tips in this *Team Meeting Guide* will direct you how to support each session.
- As facilitator, help guide the team members in the performance of their roles during each session.

• Using the team roles outlined in the notebook can help your team function more efficiently and ensures that everyone on the team is involved.



See <u>page 16</u> for more useful tips and resources.

- The team will learn how to connect and use the sensors and motors.
- The team will make connections from the mission models to the Efficiency Project Spark ideas.



Efficiency

Facilitator Tips

Each session in this guide is two hours. If needed, split each session into two separate 60-minute meetings by having the team complete each page in a 60-minute meeting.

SEE PAGE 3 IN THE ROBOT GAME RULEBOOK FOR A SUMMARY PAGE OF THE MISSION MODELS AND THEIR BAG NUMBERS.

Efficiency

Project Spark

Being more efficient with the way we transport cargo is beneficial for many reasons.

How can you make the journey of cargo more efficient?

Think about...

- The cost of transporting cargo.
- The time it takes to transport cargo.
- The energy used to transport cargo
- Ensuring cargo arrives undamaged.

The models you built this session relate to missions in the Robot Game that represent improving the efficiency of transporting cargo.

Our Ideas:

PROJECT SPARKS PROVIDE THE TEAM WITH IDEAS FOR THEIR INNOVATION PROJECT AND HOW THE MISSION MODELS CONNECT TO THE THEME.

> THE TEAM CAN USE THESE REFLECTION QUESTIONS DURING THE SHARE TIME. SHARING AT THE END IS AN IMPORTANT WAY FOR THE TEAM TO SUMMARIZE AND REFLECT.



Use the QR code on the mat to find the building instructions.



8

in Bags 1-4 using Building Instruction Books 1-4. Check out the *Robot Game Rulebook*. This will be a great resource throughout the sessions.

- Review the missions that relate to the models you built.
- Discuss how the mission models are linked to the Project Spark.
- Brainstorm and record your
 ideas that relate to this Project Spark.

→ Share (10 minutes)



- *Rulebook.*Show the robot skills you
- learned.
- Show how the models work and explain how they relate to the Project Spark.
- Discuss the reflection questions.
- **10** Clean up your space.

→ Reflection Questions

Do any of the mission models make you think of good ideas for the Innovation Project?
What could you create that would improve the efficiency of transporting a particular product?

CARGO CONNECTSM 11

6 Provide the digital building instructions Books 1-4 to the team. Find them at <u>firstlegoleague.org/</u> <u>season#resources</u>.

- 7 The team will need Bags 1-4 from the Challenge set. Larger pieces may be in an unnumbered LEGO[®] bag.
- 8 Have the team record their brainstorming ideas as a bulleted list in the *Engineering Notebook* or in another location.
- 9 Place the completed models on the mat with Dual Lock™ according to the field setup in the Robot Game Rulebook.
- 10 Allow time for cleanup and place any unfinished models and their pieces in a sealed plastic bag.

- The team will build a driving base and code it to move forward, move backward, and turn.
- The team will make connections from the mission models to the Safety Project Spark ideas.





Facilitator Tips

Some of the team may excel at model building and can help others who get stuck. If the team talks over each other, refer them to the team roles and designate one person as the communicator.

🔶 Tasks

Safety

Project Spark

How does safety affect how cargo is transported? How can you make transporting cargo safer?

Think about...

- People driving different forms of transportation.
- · Loading and unloading cargo.
- Different forms of transportation used to transport cargo.
- The infrastructure used in transportation

The models you built this session relate to missions in the Robot Game that represent improving the safety of transporting cargo.

Diagram of our solution:



How would a safety specialist do a safety check before transporting large cargo?



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(50 minutes) Explore the Project Spark. Build the Safety models in Bags 5-9 using Building Instruction Books 5-9.

correspond to the models.

 Talk about how the mission models relate to the Project Spark.

Draw your solution for a piece of equipment or technology that could improve safety.

In your drawing, include how your solution works and label its parts.

→ Share (10 minutes)

Get together at the mat.

- Place each model where it belongs. Refer to the Field Setup section in the Robot Game Rulebook.
- Share the robot skills you learned.
- Show how the models work and explain their connections to the Project Spark.
- Chat about the reflection questions.
- Clean up your space.

→ Reflection Questions

 Can you think of interesting ways to safely transport cargo?
 What are examples of transportation safety features in your community?

CARGO CONNECTSM 13

6 Provide the digital building instructions Books 5-9 to the team. Find them at <u>firstlegoleague.org/</u> <u>season#resources</u>.

7 The team will need Bags 5-9 from the Challenge set. Larger pieces may be in an unnumbered LEGO[®] bag.

8 Have the team think about equipment or technology they could invent as a solution to the Project Spark.

9 The team can use visual aids to help explain their Innovation Project solution, so this gives them practice at creating a detailed diagram.

10 Check out Career Connections pages in the Engineering Notebook that link to jobs listed in the sessions.

- The team will code their robot to avoid obstacles using a sensor and to power an attachment.
- The team will make connections from the mission models to the Access Project Spark ideas.





Facilitator Tips

As the team completes the sessions, ask them to collect evidence of their use of the Core Values. What does it look like, what does it sound like when people are using the Core Values appropriately?

(50 minutes)

Access

Project Spark

How can you ensure cargo is transported to where it needs to go. especially when the location is difficult to access? Well-maintained infrastructure and innovative ways to reach isolated areas should be considered.

Think about...

- Maintenance of roads, tracks, and transportation systems.
- · Repair of infrastructure.
- Creation of new transportation networks to improve access.

Innovative new forms of transportation.

The models you built this session relate to missions in the Robot Game that represent improving access to delivery destinations.

Diagram of our solution:





Look over the Project Spark. Build the Access models in Bags 10-12 using Building Instruction Books 10-12. Connect the missions to the models you built.

Discuss how the models are linked to the problem presented.

Brainstorm and record your 9 ideas that relate to this Project Spark

Create a list of your innovative 10 ideas.

→ Share (10 minutes)

Get together at the mat.

- Place each model where it belongs.
- Share how the models work and the robot skills you learned.
- Demonstrate the models' functions and how they connect to the Project Spark.
- Talk about the reflection questions.
- Clean up your space.

→ Reflection Questions

- · Are there any places in your community that would be hard to access to make a delivery?
- Can you think of ways to improve access to remote areas?



- The team will need Bags 10-12 from the Challenge set.
- 8 Consider inviting an expert or someone who works in this area to talk about the Project Sparks.
- 9 The team will learn about four different Project Sparks to inspire their Innovation Project. Have them keep notes of their ideas.
- 10 The team can think of ways to improve existing solutions to the Project Sparks. Their ideas don't have to be brand new.

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- The team will build a driving base and code it to move and use the color sensor to follow a line.
- The team will make connections from the mission models to the Connections Project Spark ideas.



Connections

Facilitator Tips

Have the team pick a few mission models to highlight and tell stories about. Provide resources to the team to learn more about the real-world examples and problems the mission models represent and solve.

Connections

Project Spark 10

Transporting cargo across different forms of transportation can have a great impact on the overall journey. How can we improve the connections between different forms of transportation?

Think about

- Mechanisms for sorting goods.
- Devices for unloading or loading cargo.
- Tracking cargo on its journey.
- · Communication with the consumer.

The models you built this session relate to missions in the Robot Game that represent improving connections between different forms of transportation.

Diagram of our solution:



How does a freight driver know what routes to use when transporting

🔶 Tasks (50 minutes) Read the Project Spark.

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Build the Connection models in Bags 13-15 using Building Instruction Books 13-15.

Identify the missions that relate to the models you built.

Discuss how the Project Spark and models are linked.

Draw your solution for a piece of equipment or technology that could improve how different vehicles make connections.

In your drawing, include how your solution works and label its parts.

→ Share (10 minutes)

- Get together at the mat. Put each model where it belongs.
- Show how the models operate and their connection to the Project Spark.
- Show the robot skills you have learned
- Discuss the reflection questions.
- Clean up your space.

Reflection Questions

- Can you think of any ways to make better connections between different forms of transportation?
- · What different connection points are used for transportation in your community?

6 Provide the digital building instructions Books 13-15 to the team.

The team will need Bags 13-15 from the Challenge set.

8 This is the last session for building models. Finish building all the models and placing them on the mat before the next session.

9 Make sure the team label their diagram with lots of details that explains how their solution works.

(10) The four Project Sparks presented in Sessions 1-4 provided different ideas for the team for their final Innovation Project.

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Team Meeting Guide | Sessions

Management Tips

FACILITATOR TIPS

- Determine your timeline. How often will you meet and for how long? How many meetings will you have before your tournament?
- Set team guidelines, procedures, and expected behaviors for your meetings.
- Get into the mindset that the team should be doing most of the work and learning. You are there to facilitate their journey and remove any major obstacles.
- Guide your team as they work independently through the tasks provided in each session.
- Use the guiding questions in the sessions to provide focus and direction on what the team will do.
- Jobs are listed in some sessions that connect to the Career Connections pages in the back



of the *Engineering Notebook*. Additional enrichment activities are also provided on these pages.

MATERIAL MANAGEMENT

- Place any extra or found LEGO[®] pieces in a cup.
- Have kids who are missing pieces come to the cup to look for them.
- Wait to dismiss your team until you look over their LEGO set.
- The lid of the LEGO set can be used as a tray to keep pieces from rolling away.
- Use plastic bags or containers to store any unfinished builds and their associated pieces or assembled models.
- Designate a storage space for the built mission models, challenge mat/table, and LEGO container.
- The role of the Material Manager is to help with the process of clearing away and storing materials.



Helpful Resources				
LEGO [®] Education Support	education.lego.com/en-us/support Phone: (800) 422-5346			
Main Website	firstlegoleague.org			
General Support Questions	fllchallenge@firstinspires.org			
Equity, Diversity, & Inclusion Training	firstinspires.org/about/diversityinclusion			
LEGO Education Teacher Community	community.lego.education.com			
CARGO CONNECT [™] Resources	firstlegoleague.org/season			
Educator Resources	Find additional digital resources here!			
Hybrid Learning	education.lego.com/en-us/support/managing-todays-classroom#hybrid firstinspires.org/covid-19			

Checkpoint1



Tips for Sessions 5-8



INNOVATION PROJECT

 Teams will have to select a final problem and solution to focus on, so thinking about this goal during each session is helpful.



The team could look for missions that use basic robot skills like:

- Push, pull, or lift
- Models close to home
- Navigation with line following
- Easy access to return
 home

- The team will apply coding principles to the guided mission.
- The team will research solutions and identify their Innovation Project problem to solve.



Investigations

Facilitator Tips

Team-building activities are great way for teams to develop and use their Core Values and learn how to work together. Search online for great activities developed by the *FIRST*[®] community.



- The team will create a mission strategy plan and write pseudocode for a mission.
- The team will conduct research on their identified problem and start the Innovation Project Planning page.



Teamwork

Facilitator Tips

Provide extra paper or shared online file for the team to capture the process used to create their robot and project solutions. The team will be judged on their final solutions as well as the process they used.



- The team will create their project solution and complete the Innovation Project Planning page.
- The team will design and create a robot to complete Robot Game missions.



Solutions

Facilitator Tips

By embracing Core Values, the team learns that friendly competition and mutual gain are not separate goals, and that helping one another is the foundation of teamwork.



CARGO CONNECTSM 25

- The team will evaluate and improve on their Innovation Project solution.
- The team will design robot attachments and create programs to solve missions.



Planning

Facilitator Tips

Use the Core Values where appropriate to encourage the team. To celebrate the team learning these important values, highlight examples of these principles being demonstrated by the team.



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Checkpoint 2



Sessions 9-12 Tips



• Make sure the team can provide concrete examples of the Core Values in use by the team. Don't forget *Coopertition*[®] and *Gracious Professionalism*[®].



• The team should bring their robot, all the LEGO[®] attachments, and their computer or program printouts to their judging session when they provide their explanation to the judges. Remind the team to include their mission strategy.

INNOVATION PROJECT

• The team will need plenty of time to iterate, improve, and build a model or prototype of their idea. From Session 9 on, they should focus only on their final solution.



• The team needs a well-practiced and reliable robot run that they know will score them points. If they have time, they can have additional runs to score more points.

Innovate

- The team will code their robot to deliver their Innovation Project model and solve missions.
- The team will test, iterate, and improve their Innovation Project solution.



Iterate

- The team will plan and create their Innovation Project presentation.
- The team will continue to solve missions for the Robot Game.



Practice

- The team will finalize their Innovation Project presentation.
- The team will finalize their robot for the Robot Game and create their Robot Design explanation.



- The team will practice their Innovation Project presentation and Robot Design explanation.
- The team will run practice Robot Game matches.



Final Checkpoint









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