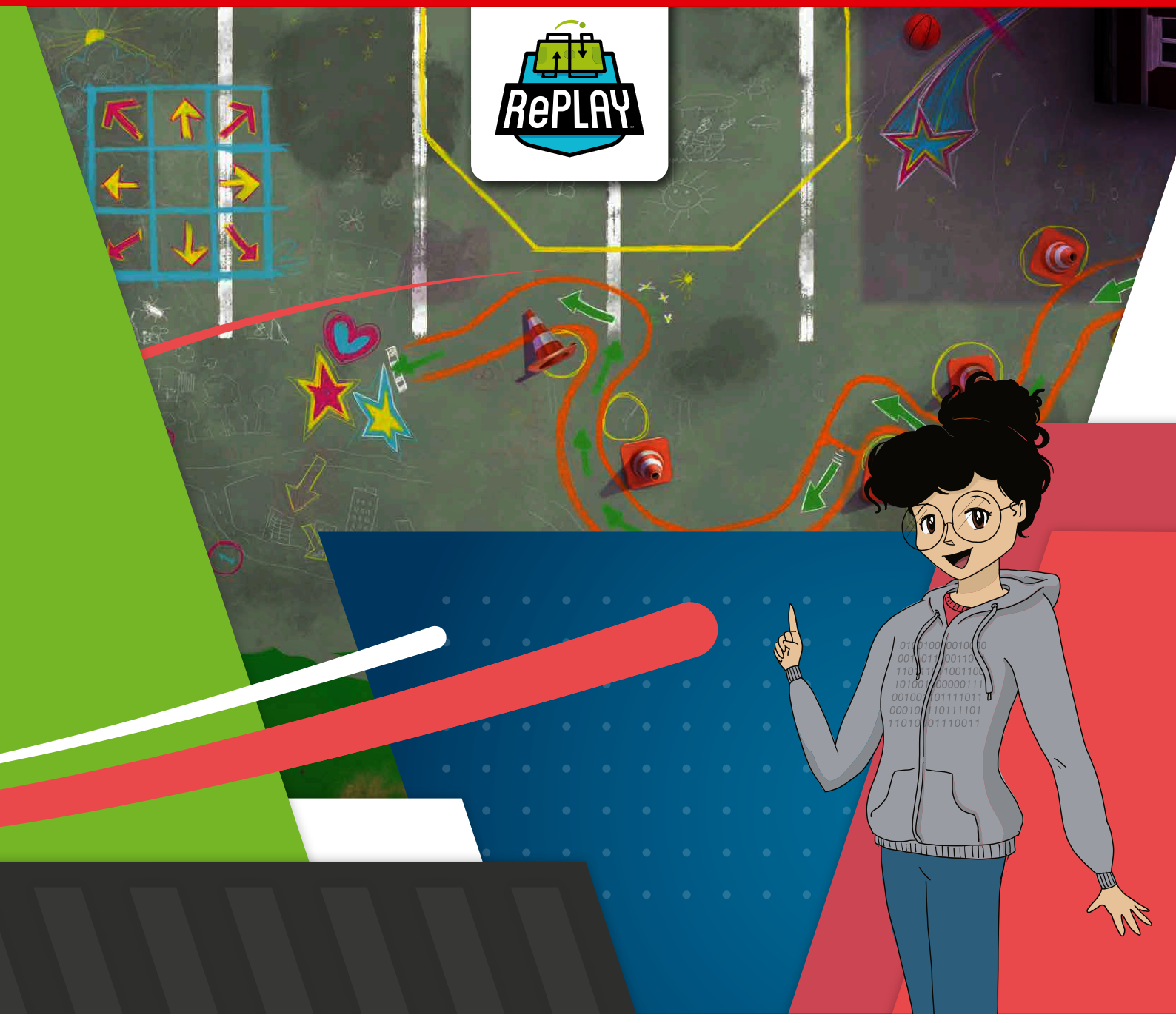
FIRST LEGO LEAGUE CHALLENGE

TEAM MEETING GUIDE



FIRST

LEGO education

Within this area you can place your logo and the logos of your local sponsors.
It's not allowed to alter either the global sponsor area below or the front and back covers of the guides.

FIRST® LEGO® League Global Sponsors

FIRST

LEGO education

The LEGO Foundation

Rockwell Automation

Table of Contents

Getting Started

Guide Basics 4
What Does the Team Need? 5
Engineering Notebook Explained 6
Session Layout 7
General Management Tips 8

Pre-Session Checkpoint 9

Sessions

Session 1 10
Session 2 11
Session 3 12
Session 4 13

Checkpoint 1 14

Session 5 15
Session 6 16
Session 7 17
Session 8 18

Checkpoint 2 19

Session 9 20
Session 10 21
Session 11 22
Session 12 23

Final Checkpoint 24

Extension Activity Ideas 25

Guide Basics

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 90 minutes, but each session can be adjusted to meet your own implementation needs.

Your role during each session is to lead the introduction and divide the team to complete their group activities. Each group will have a different set of tasks to complete. At the end of the session, they will come back together and share what each group did. Finally, the team will clean up and put away their materials.

Working as a Team and in Groups

The team works together to create their robot and design their Innovation Project solution. Teammates should be encouraged to work with each other, listen to each other, take turns, and share ideas. For most sessions, the team is divided into two groups. The goal is for all members on the team to have an equal experience working on the robot and the project.

Available Resources

Your country might have a specific *FIRST* LEGO League website, which you can find by going to firstlegoleague.org and clicking your region on the world map. To find available resources, visit the firstinspires.org. Sign up for email blasts from *FIRST* for news and blogs and follow us on social media.

Resources

LEGO Support	education.lego.com/en-us/support Phone: (800) 422-5346
Main Websites	firstlegoleague.org/ firstinspires.org/robotics/fll
Team Resources	firstinspires.org/resource-library/fll/challenge/team-management-resources
General Support Questions	fllchallenge@firstinspires.org
Judging Questions	flljudge@firstinspires.org
Robot Game Questions	fllrobotgame@firstinspires.org
Innovation Project Questions	fllprojects@firstinspires.org
Equity, Diversity, & Inclusion	firstinspires.org/about/diversityinclusion
Youth Protection	firstinspires.org/resource-library/youth-protection-policy
Fundraising	firstinspires.org/resource-library/fundraising-toolkit
LEGO Education Teacher Community	community.lego.education.com

What Does the Team Need?

LEGO® Education Robot Set

LEGO Education SPIKE™ Prime

Core set

Expansion set (required)

LEGO MINDSTORMS® Education EV3

Core set

Expansion set (recommended)

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 or LEGO MINDSTORMS Education EV3 Classroom) onto the hardware device. To view system requirements and download software, visit LEGOeducation.com/downloads.

RePLAY℠ 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: firstlegoleague.org/missionmodelbuildinginstructions.

Competition Table

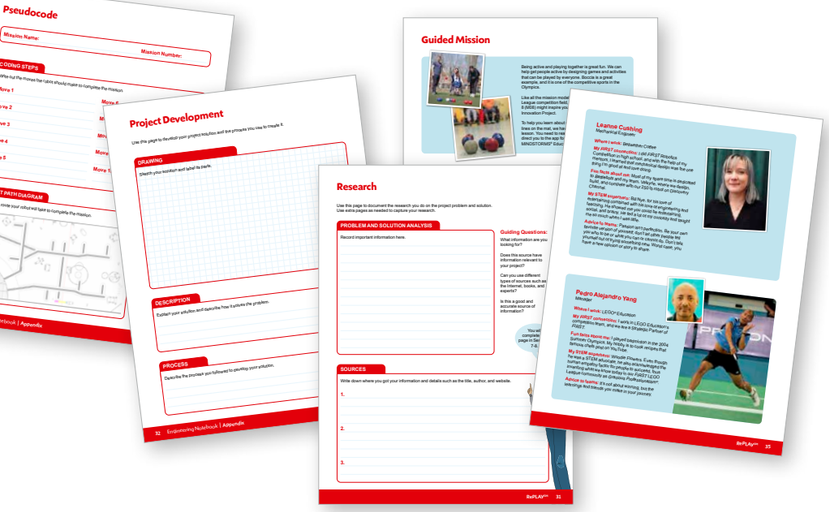
You might not be able to set up a table in your classroom or meeting space. Even if you cannot build the whole table, building just the four walls will be useful. You can find out more, including how to build the table, at firstinspires.org/resource-library/fll/challenge/season.
It is also possible to use the mat on the floor.

Engineering Notebook Explained

Read the *Engineering Notebook* carefully. There are two for each team, one per group. The students can record their team journey in the notebooks with diagrams, ideas and designs. It contains all the information they need and guides them through the sessions. The tips in this *Team Meeting Guide* will direct you how to support with each session.

Getting Started Pages

- Program Overview
- Team Journey
- Challenge Story
- RePLAY^{SM} Innovation Project
- Core Values
- Find Robot Lessons and Building Instructions
- Robot Lessons
- Project Sparks
- Robot Game
- Robot Game Missions
- How to Follow the Sessions



Appendix Pages

- Pseudocode
- Research
- Project Development
- Guided Mission
- Career Connections

Session Layout

	Introduction (15 minutes)	Group and Team Tasks (60 minutes)		Share and Clean Up (15 minutes)
Session 1	Introduction to Challenge	Group 1: Robot Lesson 1	Group 2: Project Spark 1	Share
Session 2	Core Values: Inclusion	Group 1: Robot Lesson 2	Group 2: Project Spark 2	Share
Session 3	Goal Setting and Team Processes	Group 1: Project Spark 1	Group 2: Robot Lesson 1	Share
Session 4	Core Values: Discovery	Group 1: Project Spark 2	Group 2: Robot Lesson 2	Share
Session 5	Create Team Name and Logo	Team: Robot Lesson 3	Team: Pseudocode	Share
Session 6	Core Values: Teamwork	Team: Robot Lesson 4	Team: Choose Problem	Share
Session 7	*Coopertition®* & *Gracious Professionalism®*	Group 1: Project Research	Group 2: Robot Lesson 5	Share
Session 8	Choose Project Solution	Group 1: Robot Lesson 5	Group 2: Project Development	Share
Session 9	Core Values: Innovation	Project Group: Project Work	Robot Group: Solve Missions	Share
Session 10	Core Values: Impact	Project Group: Presentation Work	Robot Group: Solve Missions	Share
Session 11	Create Sports Playing Card	Project Group: Prepare Presentation	Robot Group: Prepare Presentation	Share
Session 12	Core Values: Fun	Project Group: Practice Presentation	Robot Group: Present and Practice Match	Share

General Management Tips

COACH TIPS

- Determine your timeline. How often will you meet and for how long? How many meetings will you have before your official event?
- Set team guidelines, procedures, and behaviors for your meetings.
- Get into the mind-set that the team should be doing most of the work and learning. You are there to facilitate their journey and remove any major obstacles.
- Celebrate the failures and every success, no matter how small. Failure is a learning opportunity, and the goal of this program isn't to win! It is to learn and have fun!

TEAM MANAGEMENT

- When the team is doing the Innovation Project, you could assign students these roles:
    - Communicator
    - Researcher
    - Project manager
    - Creative designer
- When the team is working on the robot, you could assign students these roles:
    - Programmer
    - Builder
    - LEGO element finder
    - Mission strategist
- You could make this your team cheer: "Together Everyone Achieves More (TEAM)."
- Remind teams of their goals and have them revisit and adjust as needed.

TEACHER TIPS

- If you are running this program with a classroom of students, place them into teams of six.
- If you are implementing during the school day, adapt the sessions to fit your needs.
- Number and label the LEGO® sets. Assign each team a set for the whole time.
- If you are sharing Challenge sets across multiple teams, split up the session model builds across the teams.
- If you aren't sending all your teams to an official event, check out the *Class Pack Tournament Guide* for how to host your own event for your teams.

MATERIAL MANAGEMENT

LEGO Parts

- Place any extra or found LEGO pieces in a cup. Have students who are missing pieces come to the cup to look for them.
- Wait to dismiss students until you look over their LEGO set.
- The bin lid of the LEGO set can be used as a tray to keep pieces from rolling away.
- Use plastic bags to store any unfinished models and their pieces between sessions.

General Materials

- Provide additional grid paper to use as extra pages for *Engineering Notebooks*.
- Have a space planned for charging robots and storing built items in a safe location.

Pre-Session Checkpoint

- ☐ Make sure you have at least two devices per team with Internet access and appropriate robot programming software installed.
- ☐ Unpack the robot set and sort the LEGO® elements into the trays.
- ☐ Make sure the controller is charged or has batteries in it.
- ☐ Read over the *Engineering Notebook* and this guide to gain an understanding of the materials.
- ☐ Explore the *FIRST*® Core Values. These are the essential foundation for your team.
- ☐ Watch the RePLAY℠ Season Launch video and other videos on *FIRST* LEGO League YouTube channel.

New to LEGO Education Robotics?

If the team is new to using their LEGO Education robot set, it would be beneficial to take some time for them to get acquainted with building and coding with the set. Here are suggested activities that the team could complete before starting the session.

SPIKE™ PRIME Getting Started Activities:

1. Start Here
2. Motors and Sensors
3. Make It Move

MINDSTORMS® EV3 Getting Started Activities:

1. Hello World
2. Motors and Sensors
3. Get Moving

Tips for Sessions 1-4

CORE VALUES

If the team talks over each other, try using one of these approaches:

- Appoint a leader who listens to each idea, one person at a time.
- Provide the team with one item and only the person with the item can talk.

INNOVATION PROJECT

- Designate a storage space for the mission models built with the Project Spark activities.
- Help the team to find suitable websites and resources for research on their project.

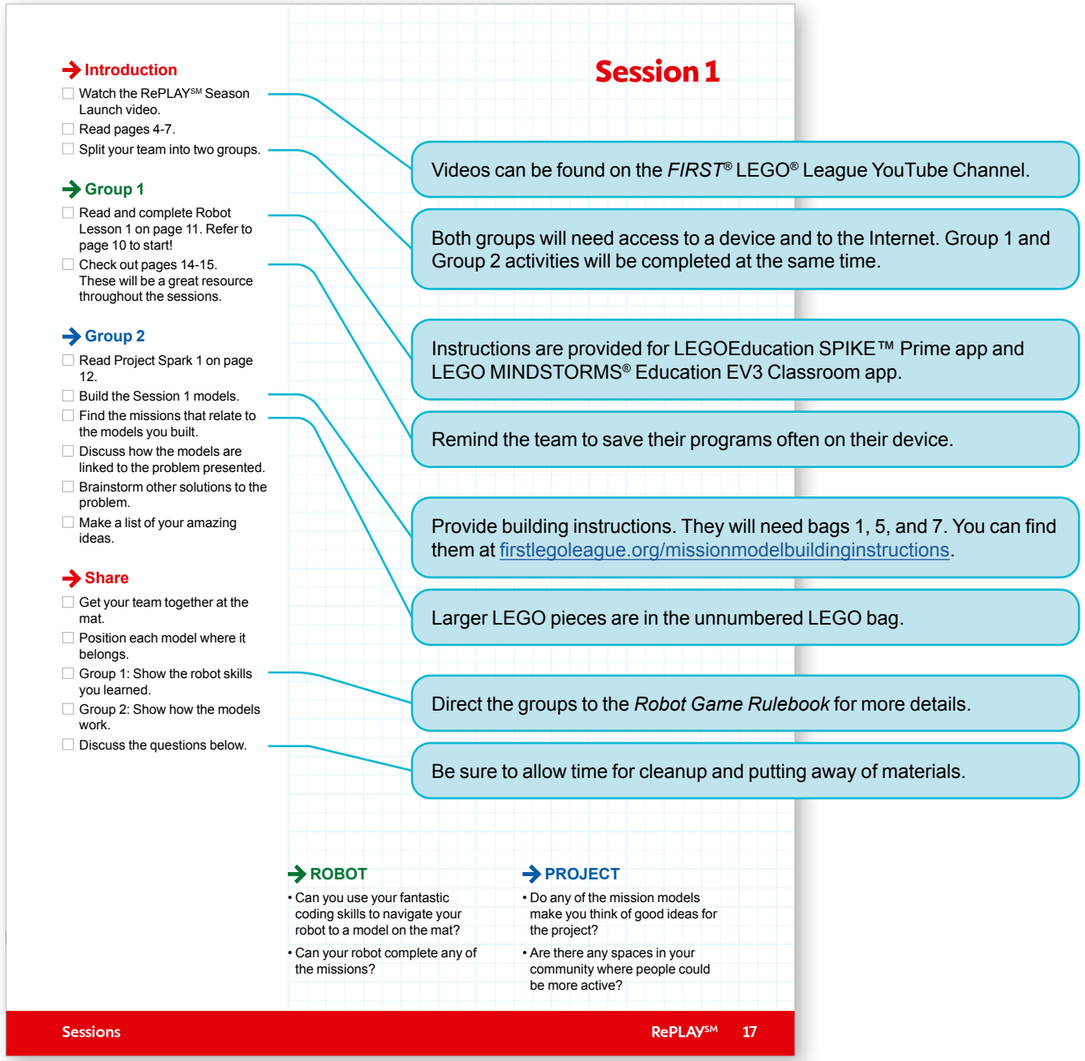
ROBOT

- Designate a storage space for the built robot and robot container.
- If you are using MINDSTORMS Education EV3 LabVIEW software, you have access to robot lessons in the Tutorials (Robot Educator) Unit that are comparable to those provided in this guide.

Session 1

Outcomes

- Group 1 will be able to program their robot to move forward and backward and turn.
- Group 2 will be able to make connections from the models to the project problem and share solution ideas.



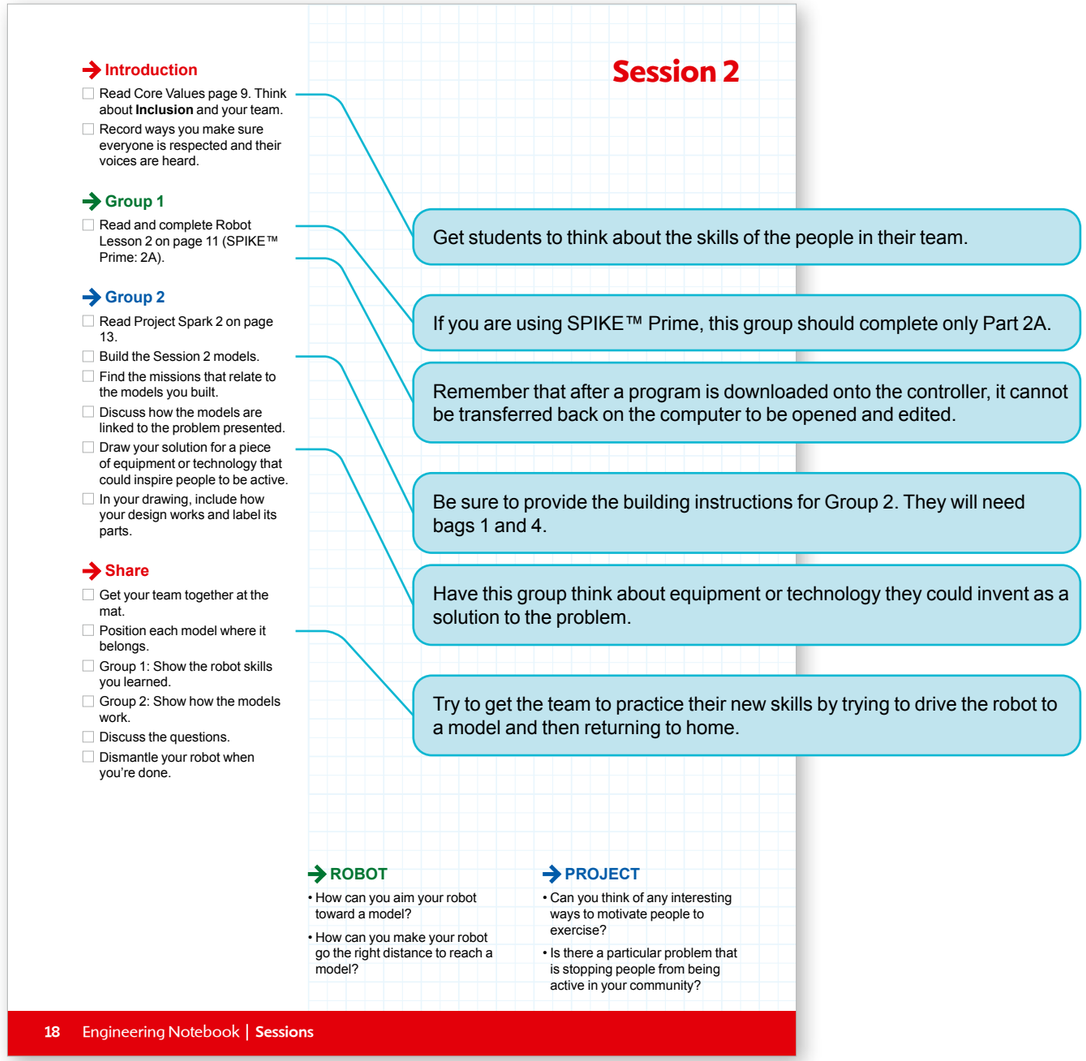
Cleanup Pointers

- Place the completed models on the mat with the dual lock.
- Make sure you have a location to place the mat and models after each session if they have to be stored.

Session 2

Outcomes

- Group 1 will be able to program their robot to avoid obstacles using a sensor and power an attachment.
- Group 2 will be able to create an annotated drawing of their solution design for the project problem.



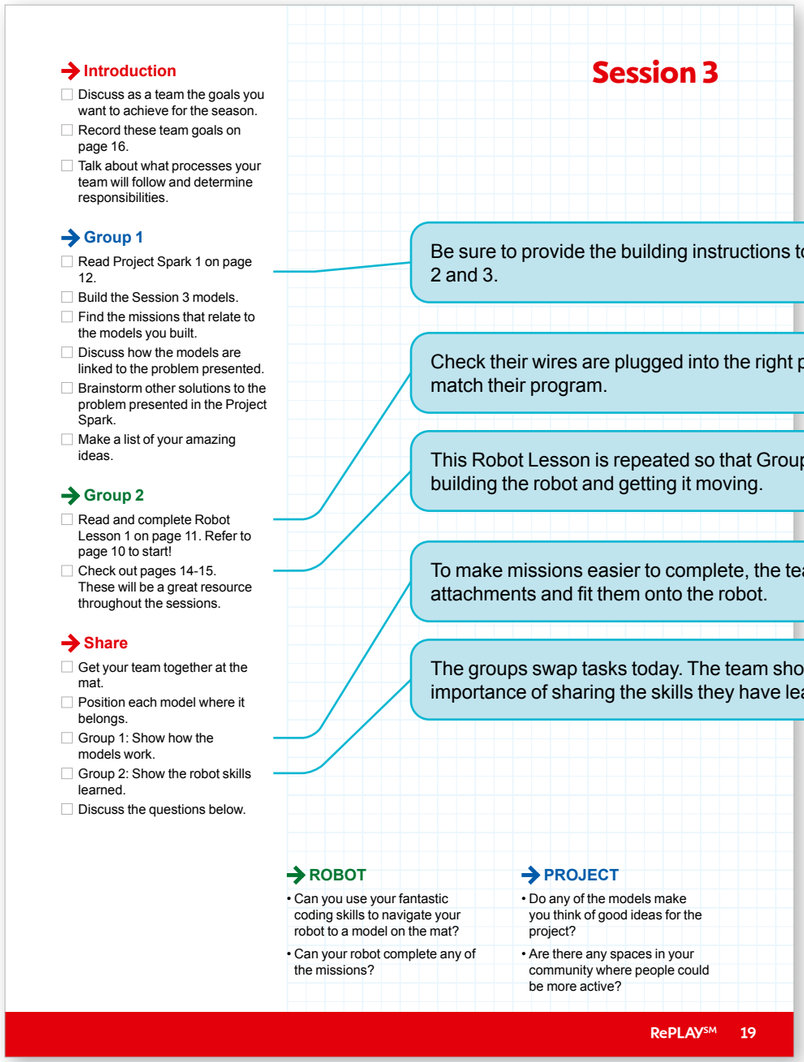
Cleanup Pointers

- Group 1 will need to take apart the robot and return the pieces to the LEGO set.
- If time is short, the robot can be kept intact to give a shortened Robot Lesson in the next session.

Session 3

Outcomes

- Group 1 will be able to make connections from the models to the project problem and share solution ideas.
- Group 2 will be able to program their robot to move forward and backward and turn.



Session 3

Introduction
- ☐ Discuss as a team the goals you want to achieve for the season.
- ☐ Record these team goals on page 16.
- ☐ Talk about what processes your team will follow and determine responsibilities.

Group 1
- ☐ Read Project Spark 1 on page 12.
- ☐ Build the Session 3 models.
- ☐ Find the missions that relate to the models you built.
- ☐ Discuss how the models are linked to the problem presented.
- ☐ Brainstorm other solutions to the problem presented in the Project Spark.
- ☐ Make a list of your amazing ideas.

Group 2
- ☐ Read and complete Robot Lesson 1 on page 11. Refer to page 10 to start!
- ☐ Check out pages 14-15. These will be a great resource throughout the sessions.

Share
- ☐ Get your team together at the mat.
- ☐ Position each model where it belongs.
- ☐ Group 1: Show how the models work.
- ☐ Group 2: Show the robot skills learned.
- ☐ Discuss the questions below.

Be sure to provide the building instructions to Group 1. They will need bags 2 and 3.

Check their wires are plugged into the right ports and that the ports used match their program.

This Robot Lesson is repeated so that Group 2 can also experience building the robot and getting it moving.

To make missions easier to complete, the team might need to build LEGO attachments and fit them onto the robot.

The groups swap tasks today. The team should reflect and discuss the importance of sharing the skills they have learned.

ROBOT
- Can you use your fantastic coding skills to navigate your robot to a model on the mat?
- Can your robot complete any of the missions?

PROJECT
- Do any of the models make you think of good ideas for the project?
- Are there any spaces in your community where people could be more active?

RePLAY[SM] 19

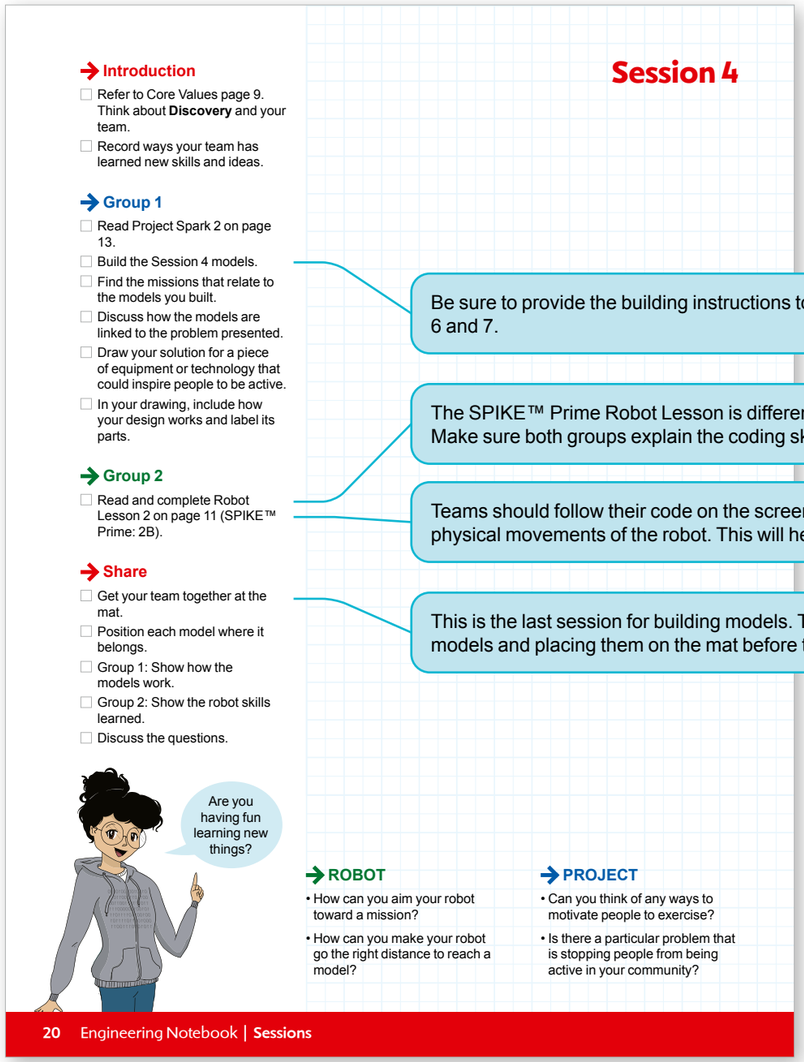
Cleanup Pointers

- Select team members who are responsible to put away specific items such as the robot.
- Make sure the robots are charged for the next session.

Session 4

Outcomes

- Group 1 will be able to create an annotated drawing of their solution design for the project problem.
- Group 2 will be able to program their robot to avoid obstacles using a sensor and power an attachment.



Session 4

Introduction
- ☐ Refer to Core Values page 9. Think about **Discovery** and your team.
- ☐ Record ways your team has learned new skills and ideas.

Group 1
- ☐ Read Project Spark 2 on page 13.
- ☐ Build the Session 4 models.
- ☐ Find the missions that relate to the models you built.
- ☐ Discuss how the models are linked to the problem presented.
- ☐ Draw your solution for a piece of equipment or technology that could inspire people to be active.
- ☐ In your drawing, include how your design works and label its parts.

Group 2
- ☐ Read and complete Robot Lesson 2 on page 11 (SPIKE™ Prime: 2B).

Share
- ☐ Get your team together at the mat.
- ☐ Position each model where it belongs.
- ☐ Group 1: Show how the models work.
- ☐ Group 2: Show the robot skills learned.
- ☐ Discuss the questions.

Are you having fun learning new things?

Be sure to provide the building instructions to Group 1. They will need bags 6 and 7.

The SPIKE™ Prime Robot Lesson is different from the one Group 1 did. Make sure both groups explain the coding skills learned in the Share time.

Teams should follow their code on the screen to see how it matches the physical movements of the robot. This will help them to debug their code.

This is the last session for building models. Try to finish building all the models and placing them on the mat before the next session.

ROBOT
- How can you aim your robot toward a mission?
- How can you make your robot go the right distance to reach a model?

PROJECT
- Can you think of any ways to motivate people to exercise?
- Is there a particular problem that is stopping people from being active in your community?

20 Engineering Notebook | **Sessions**

Cleanup Pointers

- If you are using SPIKE Prime, Group 2 will need to take apart the robot to be ready for Robot Lesson 5.
- MINDSTORMS® EV3 robots should not be taken apart.

Checkpoint 1

- [ ] All models must be built and placed on the mat, secured with the dual lock.
- [ ] Extra time can be spent on the Robot Lessons before moving on.
- [ ] SPIKE™ Prime robot is dismantled and ready for Advanced Driving Base build in Session 5.
- [ ] MINDSTORMS® EV3 robot should remain intact for further programming tasks in Session 5.
- [ ] Both groups have explored and designed solutions for both Project Sparks 1 and 2.
- [ ] The team has reviewed the missions and rules in the *Robot Game Rulebook*.

Tips for Sessions 5-8

CORE VALUES

- Remember the Core Values are about HOW the team behaves and works together. They should be demonstrated by all the team, all the time.

ROBOT DESIGN

- At the event, two mats will be set up next to each other. However, during the sessions, you will probably work with a single mat.

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.

ROBOT GAME

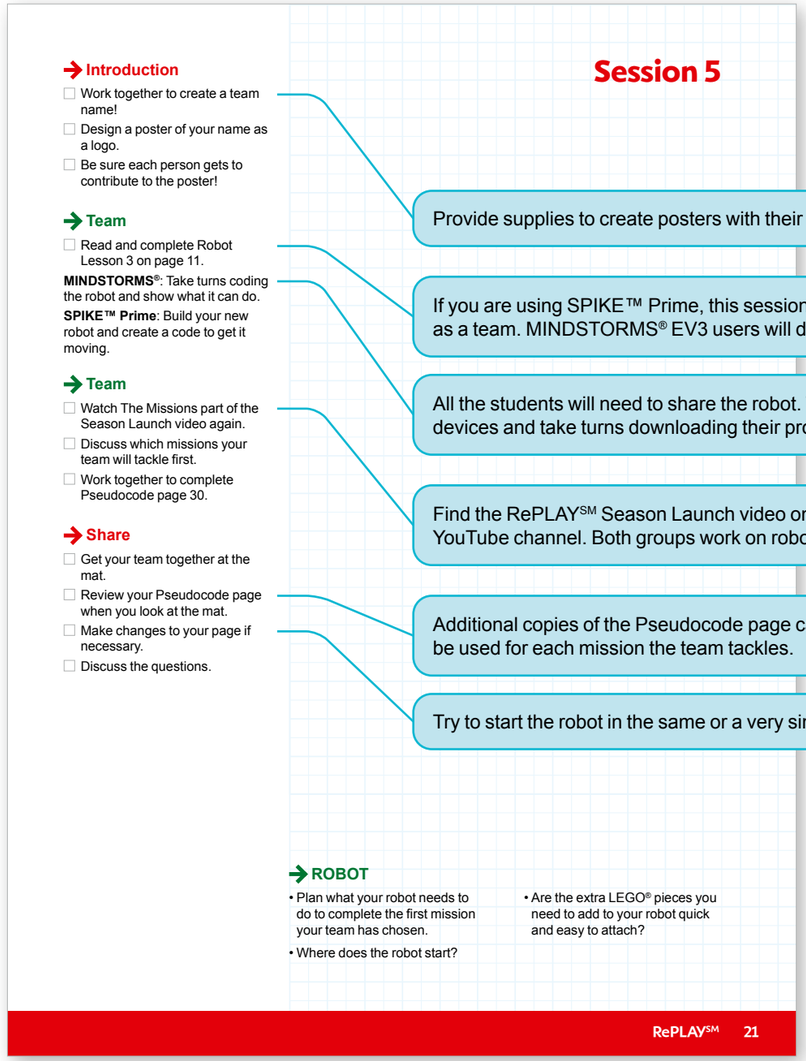
The team could look for missions that use basic robot skills like:

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

Session 5

Outcomes

- The team will be able to build a driving base and program it to move and follow a line.
- The team will be able to create a mission strategy plan and write pseudocode for a mission.



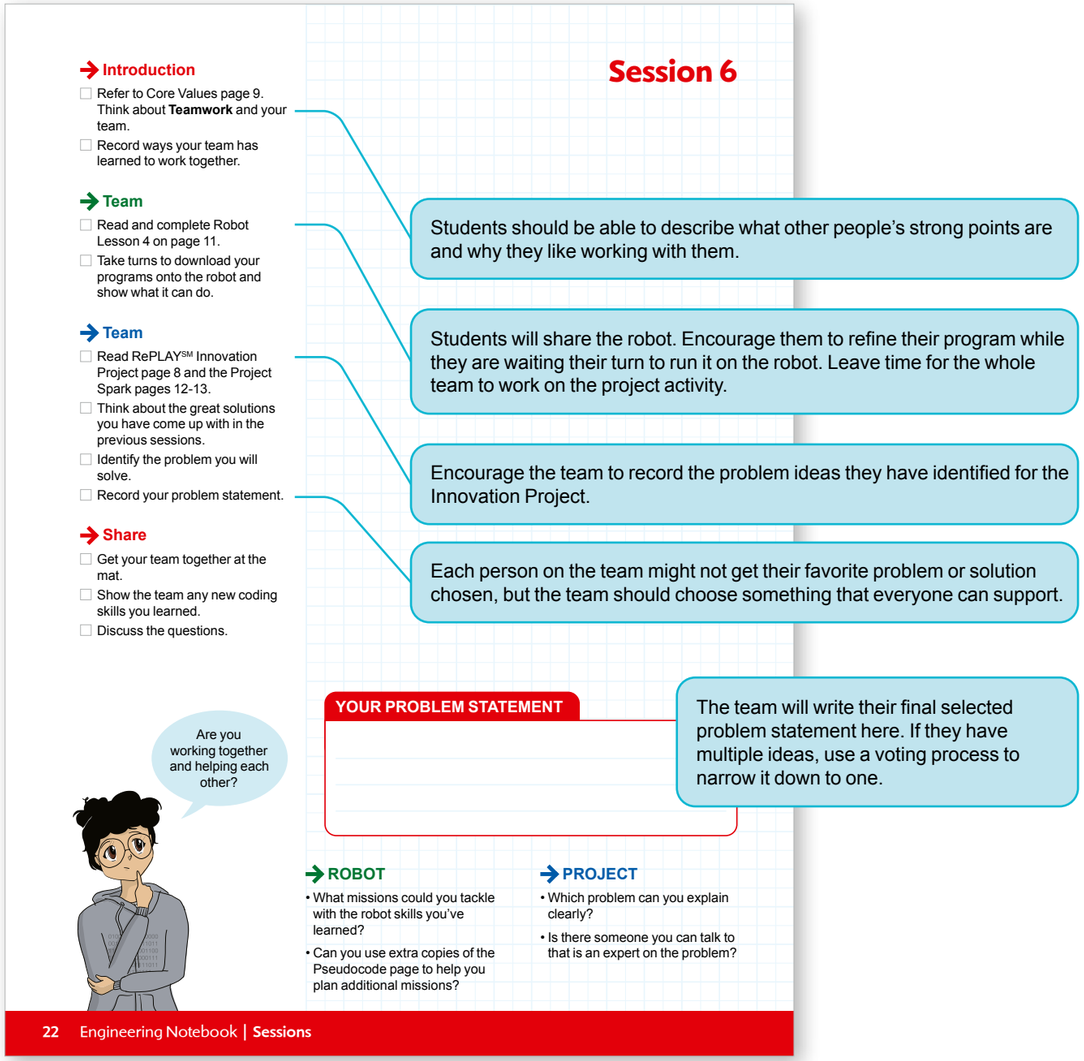
Cleanup Pointers

- Keep your base robot in a secure place until the next session.
- If any attachments are needed for a mission, keep them in a plastic bag labeled with the mission number.

Session 6

Outcomes

- The team will be able to use more advanced programming blocks and coding skills with their robot.
- The team will be able to identify, choose, and define their Innovation Project problem statement.



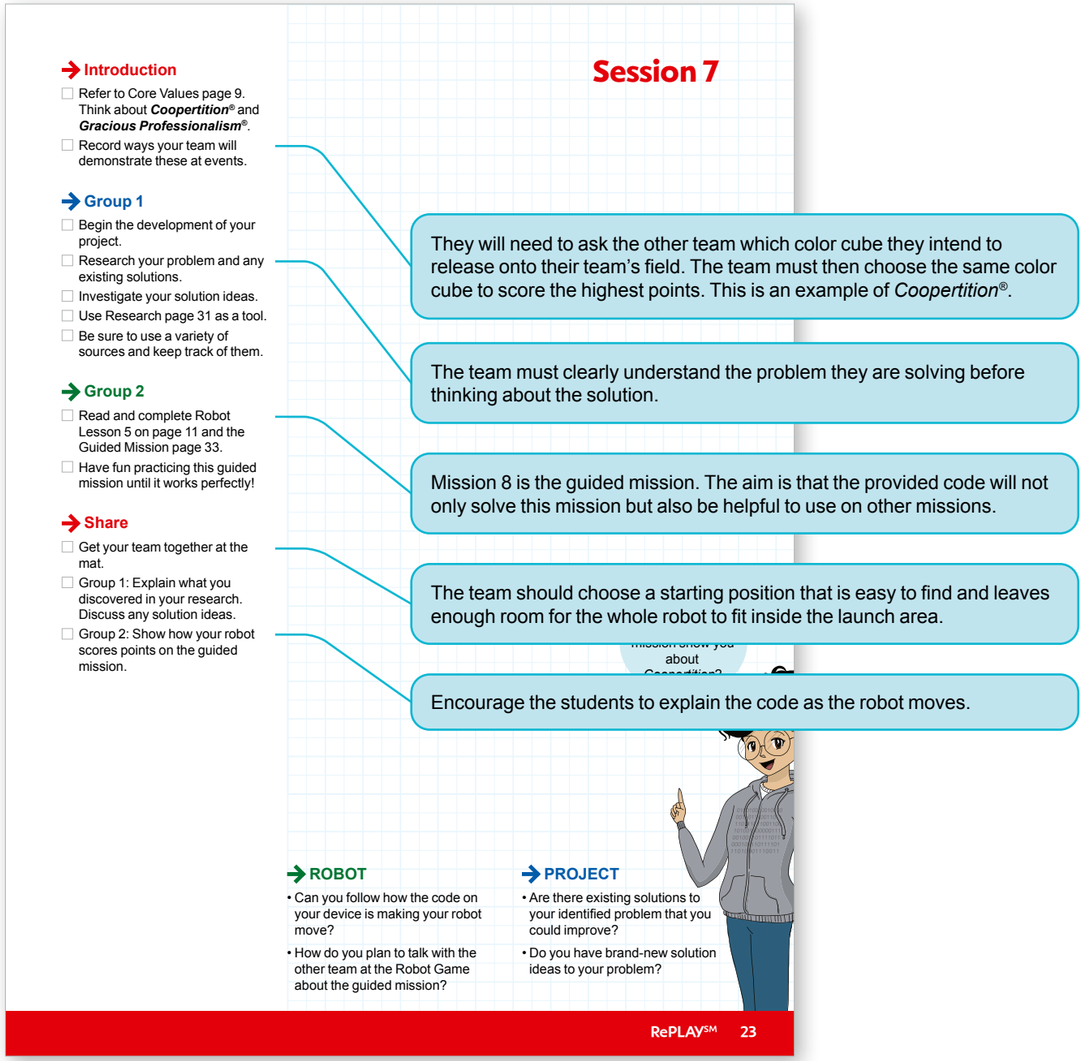
Cleanup Pointers

- Keep your base robot in a secure place until the next session.
- If any attachments are needed for a mission, keep them in a plastic bag labeled with the mission number.

Session 7

Outcomes

- Group 1 will be able to conduct research on their identified problem to complete the Research page.
- Group 2 will be able to complete the Robot Lesson to apply coding principles to the guided mission.



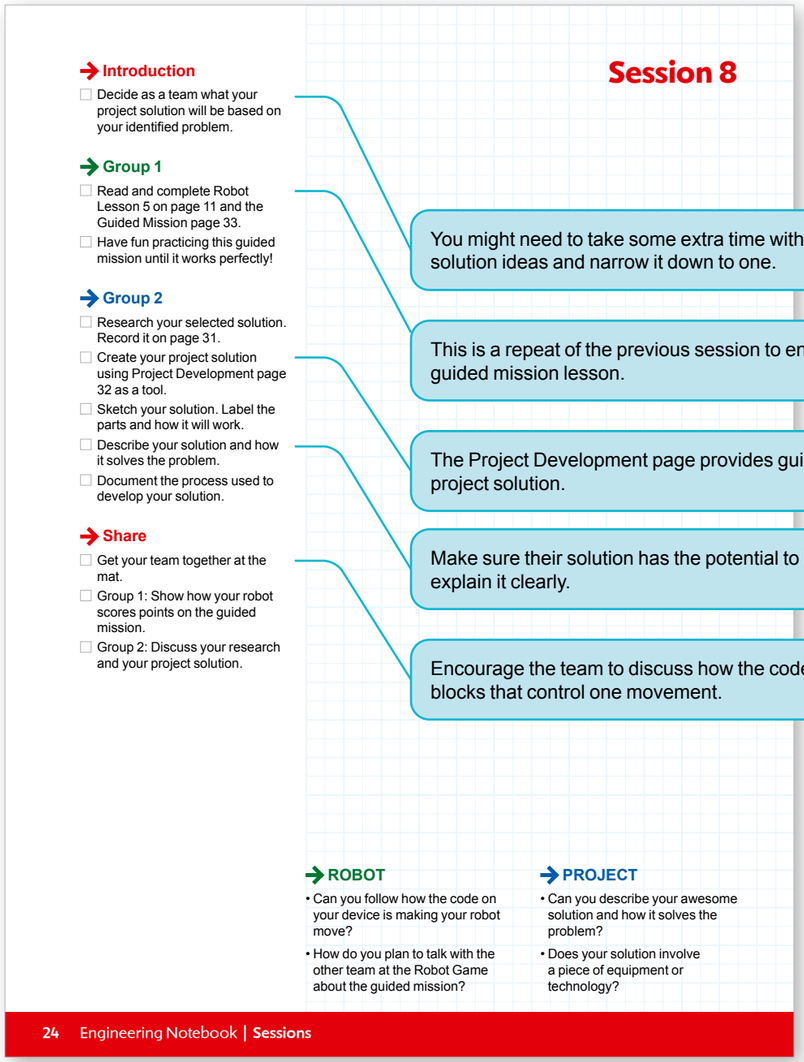
Cleanup Pointers

- Keep and store any white brick models made by the team. They are specifically given the task to build the final model in Session 9.
- Collect the remaining white bricks from bag 8 in a sealed plastic bag. They do NOT have to use all the white bricks.

Session 8

Outcomes

- Group 1 will be able to complete the Robot Lesson to apply coding principles to the guided mission.
- Group 2 will be able to create their project solution and document it on the Project Development page.



Introduction

- ☐ Decide as a team what your project solution will be based on your identified problem.

Group 1

- ☐ Read and complete Robot Lesson 5 on page 11 and the Guided Mission page 33.
- ☐ Have fun practicing this guided mission until it works perfectly!

Group 2

- ☐ Research your selected solution. Record it on page 31.
- ☐ Create your project solution using Project Development page 32 as a tool.
- ☐ Sketch your solution. Label the parts and how it will work.
- ☐ Describe your solution and how it solves the problem.
- ☐ Document the process used to develop your solution.

Share

- ☐ Get your team together at the mat.
- ☐ Group 1: Show how your robot scores points on the guided mission.
- ☐ Group 2: Discuss your research and your project solution.

Session 8

ROBOT

- Can you follow how the code on your device is making your robot move?
- How do you plan to talk with the other team at the Robot Game about the guided mission?

PROJECT

- Can you describe your awesome solution and how it solves the problem?
- Does your solution involve a piece of equipment or technology?

24 Engineering Notebook | Sessions

You might need to take some extra time with the team to explore all the solution ideas and narrow it down to one.

This is a repeat of the previous session to enable Group 1 to experience the guided mission lesson.

The Project Development page provides guidance on how to develop the project solution.

Make sure their solution has the potential to be developed and they can explain it clearly.

Encourage the team to discuss how the code works. Break the code into blocks that control one movement.

Robot Tip

- You could provide sticky notes and planning cards for team to place on the mat to map out their strategy.

Innovation Project Tip

- Some examples of project resources include the Internet, books, magazines, personal stories, and experts (both in person and virtual).

Checkpoint 2

- ☐ The team has completed all the Robot Lessons outlined in the sessions.
- ☐ The team has selected an Innovation Project problem and solution and conducted research.
- ☐ The coach/teacher should split the team into two new groups for the remaining sessions – the Robot Group and the Innovation Project Group. An equal split is recommended.
- ☐ The coach/teacher should provide the judging rubrics along with the sample judging questions.

Visit the *FIRST*® LEGO® League Challenge Resource page to print copies of any event preparation pages and the rubrics (Innovation Project and Robot Design). The team will need these for the next sessions!

Tips for Sessions 9-12

CORE VALUES

- Make sure the team not only knows each Core Value but also can provide concrete examples of them in use by the team. Don't forget *Coopertition*® and *Gracious Professionalism*®.

ROBOT DESIGN

- The team should bring the robot, all the LEGO attachments, and their computer or program printouts to the Robot Design presentation.
- Remind the team to explain their mission strategy. Why did they choose to tackle certain missions?

INNOVATION PROJECT

- The team should be decisive about choosing which idea to develop for their solution. They 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 solution.

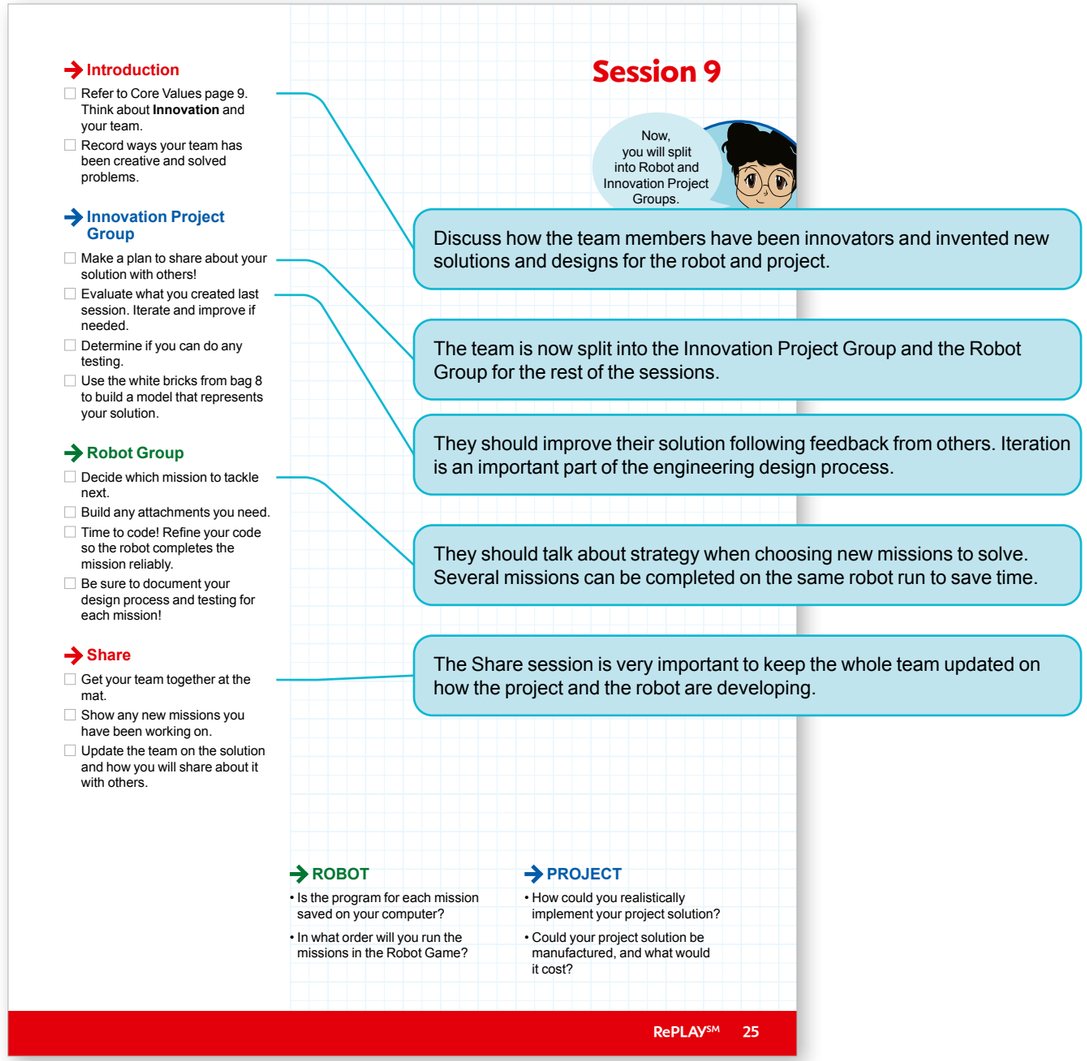
ROBOT GAME

- The team needs a very well-practiced and reliable robot run that they know will score them points.

Session 9

Outcomes

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



Robot Tip

- Encourage the team to find the missions where points can be scored more easily and do these first.

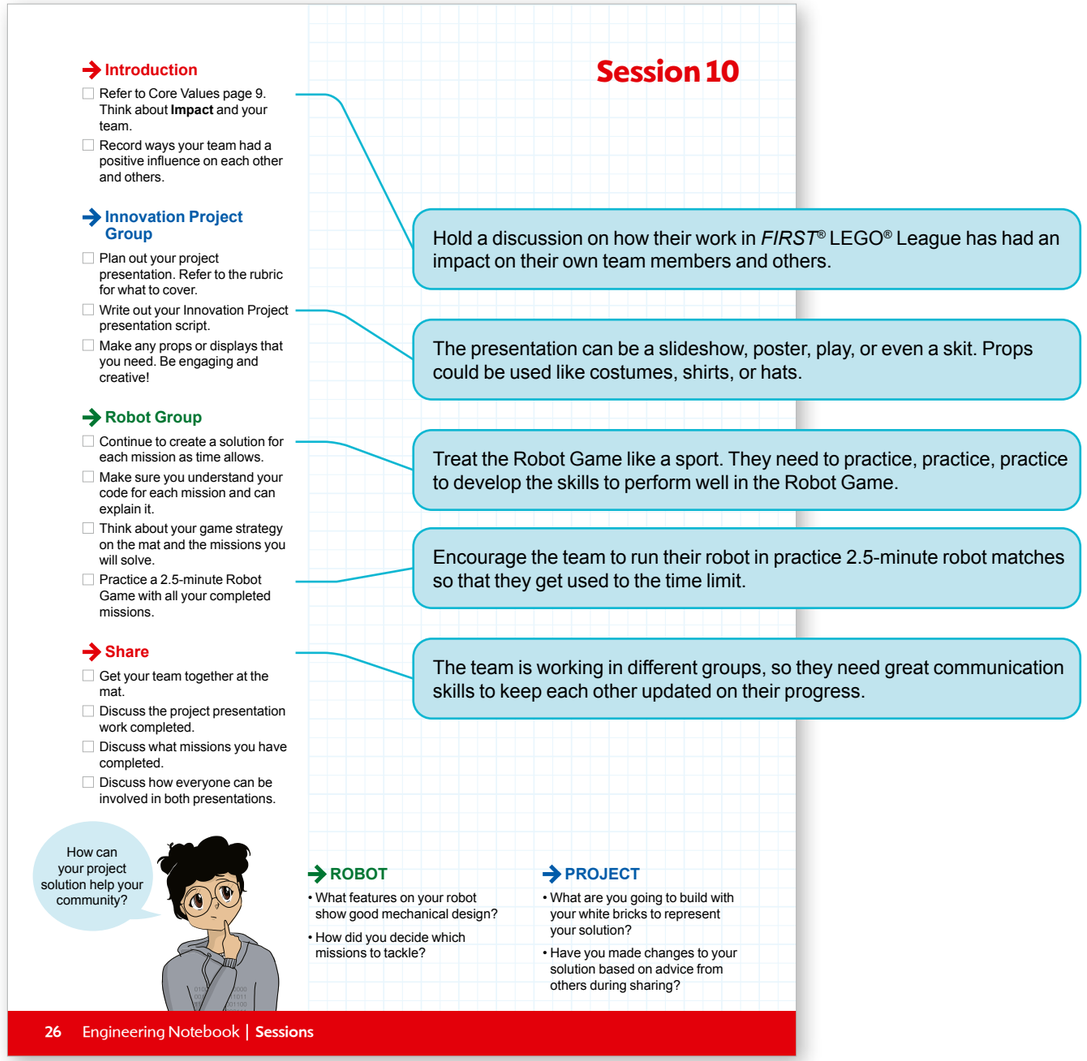
Innovation Project Tip

- Be sure the team collects their references in a shared location, either online or on paper.

Session 10

Outcomes

- The Innovation Project Group will be able to develop their Innovation Project presentation.
- The Robot Group will be able to design robot attachments and create programs to solve missions.



Robot Tip

- Have the team follow their code on the screen to see how it matches the physical movements of the robot.

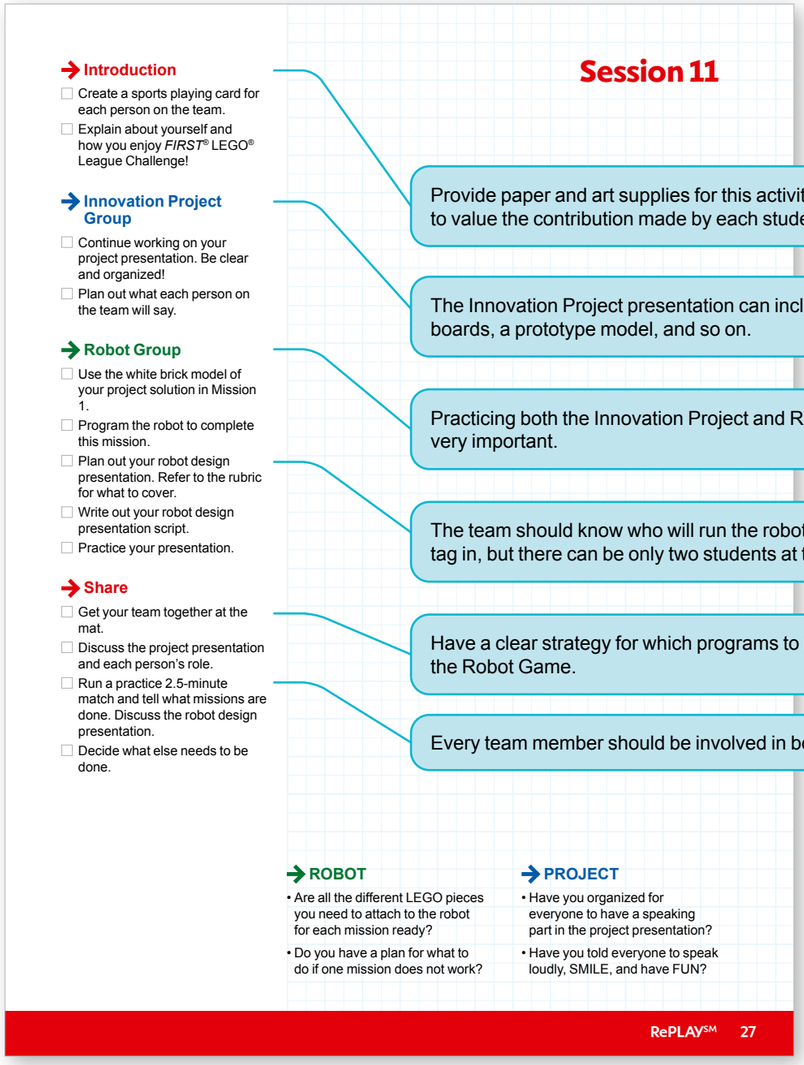
Innovation Project Tip

- The team might need a bit more space to store all the materials they have created for their project.

Session 11

Outcomes

- The Innovation Project Group will be able to finalize their Innovation Project presentation.
- The Robot Group will be able to finalize their robot for the Robot Game and create their Robot Design presentation.



Provide paper and art supplies for this activity. This activity helps the team to value the contribution made by each student.

The Innovation Project presentation can include a short drama, display boards, a prototype model, and so on.

Practicing both the Innovation Project and Robot Design presentations is very important.

The team should know who will run the robot for each mission. They can tag in, but there can be only two students at the mat at one time.

Have a clear strategy for which programs to run and in what order during the Robot Game.

Every team member should be involved in both presentations.

Robot Tip

- If things don't go as planned during the Robot Game, the team might want a contingency plan for other missions they could run.

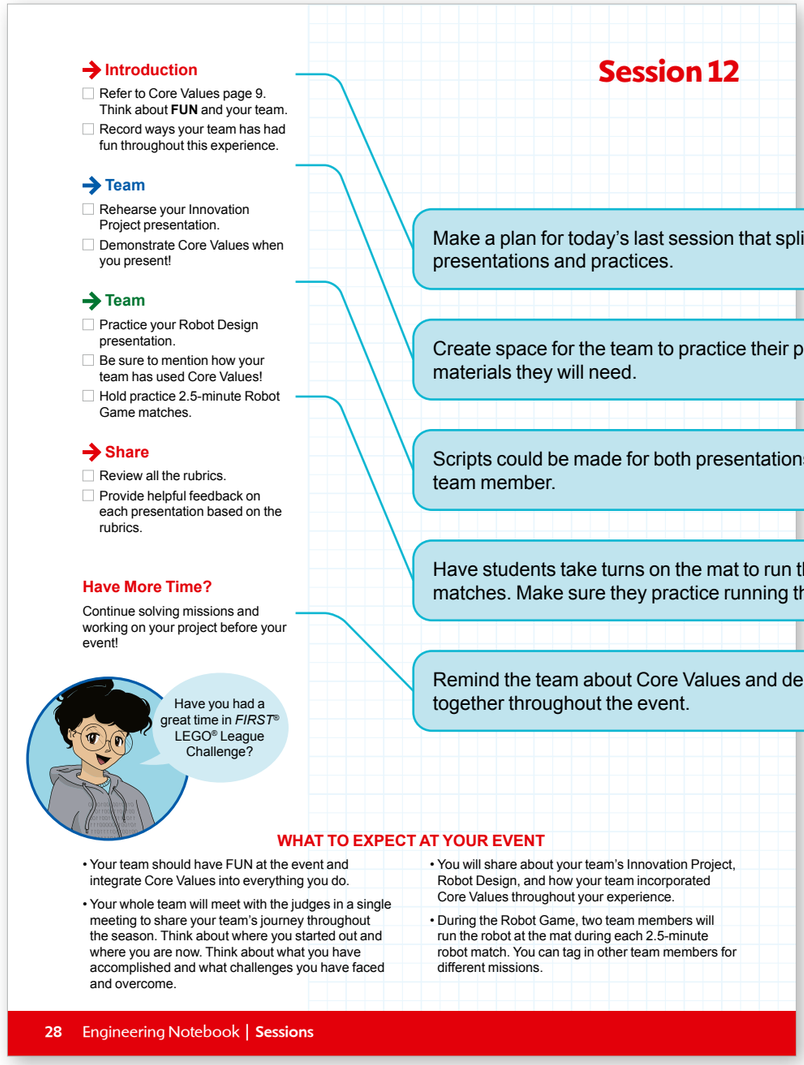
Innovation Project Tip

- Encourage the team to practice their presentation before the event. They can share their solution with others.

Session 12

Outcomes

- The team will be able to practice their Innovation Project presentation.
- The team will be able to practice their Robot Design presentation and practice a Robot Game match.



Make a plan for today's last session that splits the time equally among the presentations and practices.

Create space for the team to practice their presentations with all the materials they will need.

Scripts could be made for both presentations and copies provided for each team member.

Have students take turns on the mat to run their robots in 2.5-minute robot matches. Make sure they practice running their programs in the right order.

Remind the team about Core Values and demonstrating how well they work together throughout the event.

Robot Tip

- Make sure the robot, any attachments, and the electronic device (with programs on it) are stored and ready to be transported to the event.

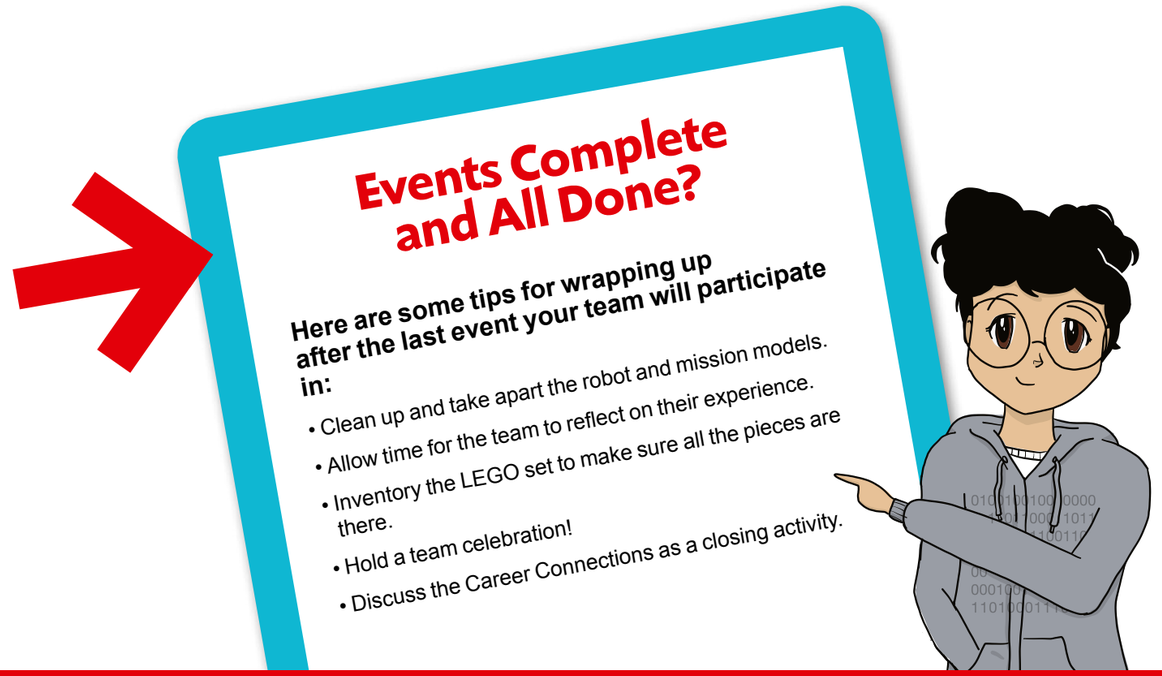
Innovation Project Tip

- Make sure all the Innovation Project materials are stored and ready to be transported to the event.

Final Checkpoint

Prepare for Your Tournament!

- [ ] Make sure your team has reviewed the rubrics again. Remember, you can find these on the *FIRST*® LEGO® League website or in the tournament guide.
- [ ] The main goal of an event is for the team to have FUN and to feel that their work is valued.
- [ ] Remind students that the event is also a learning experience and the goal is not to be an expert when they arrive.
- [ ] Encourage them to engage with other teams and students to share what they have learned and to support each other.
- [ ] Determine what type of event you're attending and who the organizer of your event is.
- [ ] If you purchased a class or school pack, the event will be your responsibility. Check out the *Class Pack Tournament Guide* for more details!
- [ ] Check over the details and requirements for the tournament you are attending. They can vary depending on the type you plan to attend.
- [ ] Have students on the team prepare a checklist of materials that are needed to go to the event and where they will be stored.
- [ ] Have the team assign one person in charge of completing the checklist and ensuring everything is packed for the event. Then, double-check everything is ready yourself.
- [ ] Review the time and location where you are meeting for the event and how long the team is expected to stay – share this with parents. Encourage parents to attend if this is possible.



Extension Activity Ideas

SESSION 1

Robot:

Plan how to get your robot to one of the models.

Innovation Project:

Bring in an expert or user that would be useful to talk about the Project Spark.

SESSION 2

Robot:

Write down the steps needed (pseudocode) for the robot to get to the model.

Innovation Project:

Think of people you would like to get feedback from on your solution.

SESSION 3

Robot:

Program your robot to push an object and deliver it to a target area on the mat.

Innovation Project:

You could provide a variety of materials for the project group to use to make models of their project ideas.

SESSION 4

Robot:

Think about what attachment your robot needs to activate a model and complete the mission.

Innovation Project:

Use the white bricks to do a mini-build that represents your solution.

SESSION 5

Robot:

Explain what the code means as the robot moves through the mission.

Innovation Project:

Arrange a visit to look at spaces in your community that could be the focus of your project.

SESSION 6

Robot:

Pick out lines on the mat that will help you navigate the robot to different mat areas.

Innovation Project:

Invite an expert to your next session to share about your identified problem.

Notes