



# ENGINEERING NOTEBOOK





## *FIRST*<sup>®</sup> LEGO<sup>®</sup> League Global Sponsors

---



The LEGO Foundation



# Welcome to the RePLAY<sup>SM</sup> Challenge!

Your team can have up to 10 students. We want everyone to experience all the different parts of the program. Sometimes, you will split into two groups and work on different things such as the robot and project. Each group will have an *Engineering Notebook*. Always remember to share what you have learned with the whole team.

## Team Members

### Group 1

- 1.
- 2.
- 3.
- 4.
- 5.

### Group 2

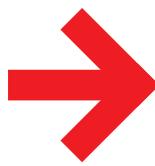
- 1.
- 2.
- 3.
- 4.
- 5.



# Program Overview

## CORE VALUES

Your team will demonstrate **FIRST® Core Values** throughout your season and beyond!



### Your team will:

- Apply **TEAMWORK** and **DISCOVERY** to explore the challenge.
- **INNOVATE** with new ideas about your robot and project.
- Show how your team and your solutions will have an **IMPACT** and be **INCLUSIVE**!
- Celebrate by having **FUN** in everything you do!

## ROBOT DESIGN

Your team will prepare a **short presentation** on your robot design, programs, and strategy.



### Your team will:

- Design and build your robot.
- Program it to solve Robot Game missions.
- Explain how your robot will act based on the code you wrote.
- Describe your strategies for the Robot Game.

## ROBOT GAME

Your team will practice the **2.5-minute matches** to complete as many missions as possible.

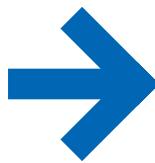


### Your team will:

- Strategize which Robot Game missions to solve.
- Design any attachments your robot will need to complete the missions.
- Test and refine your programs and robot design.
- Compete at an event!

## INNOVATION PROJECT

Your team will prepare a **5-minute presentation** to explain your Innovation Project.



### Your team will:

- Identify a problem to solve.
- Design a solution to the problem for your community.
- Share your ideas, learn from others, and improve your solution.
- Pitch your solution at an event.



Explore the Challenge



Iterate Your Robot Design



Solve Missions in the  
Robot Game



Discover Core Values



Prepare Your Robot and  
Innovation Project Presentations



Design an Innovation  
Project Solution

Celebrate at  
an Event



# Challenge Story

ALL AROUND US, THERE ARE OPPORTUNITIES TO PLAY AND BE ACTIVE – FROM OPEN PARKS TO CEMENT COURTS, IN OUR CLASSROOMS, AND EVEN WHEN WE'RE WAITING IN LINE. BUT MORE AND MORE PEOPLE ARE NOT ACTIVE ENOUGH.



SO MAYA ASKS...

Reward them!

The park bench

HOW AND WHERE  
CAN WE HELP  
PEOPLE BE MORE  
ACTIVE?

Get them  
motivated

On the bus

SO, HOW ARE WE GOING TO  
SOLVE THESE CHALLENGES?

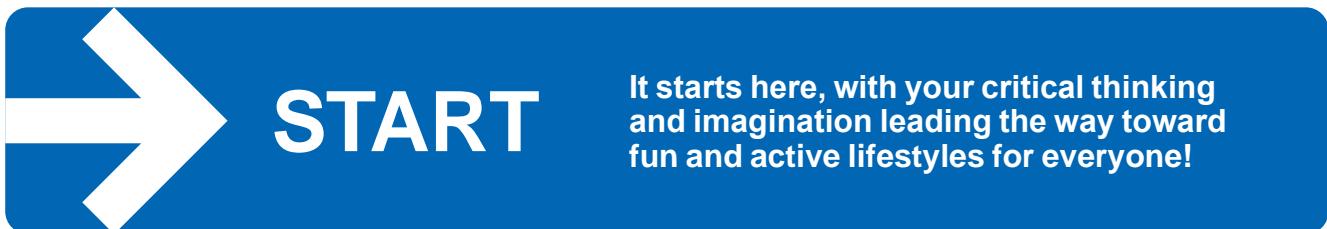
LET'S ASK PEOPLE  
WE KNOW!



PLAYING MAKES BEING ACTIVE MORE  
FUN. YOU GET CREATIVE WHEN YOU  
WANT TO PLAY, AND IT'S THIS  
CREATIVITY – YOUR CREATIVITY – THAT CAN  
HELP MOTIVATE US TO BE MORE ACTIVE.

# RePLAY<sup>SM</sup> Innovation Project

All around us, there are opportunities to play and be active – from open parks to cement courts, in our classrooms, and even when we're waiting in line. But more and more people are not active enough. Playing makes being active more fun. You get creative when you want to play, and it's this creativity that can help motivate us to be more active.



## → Identify a specific problem linked to people not being active enough.

The Project Sparks explore some problems related to the challenge. Your Innovation Project could come from a Project Spark, but it doesn't have to.

## → Research your problem and your solution ideas.

What solutions already exist? Are there any experts who could help you?

## → Design a new piece of technology or improve an existing one.

This is your project solution. Make a model or prototype to show how your solution helps people be active.

## → Share your solution, collect feedback and iterate on your design.

The more you iterate, the more you will learn. What impact will your solution have on your community?

## → Pitch your solution at an event.

Prepare a 5-minute presentation that clearly explains your work. Make sure your whole team is involved.

**Community** can be defined as just your town or city or larger area like your state or country.

# Core Values

Use the Core Values to guide your team through your journey.  
Have lots of FUN as you develop new skills and work together.

## DISCOVERY

We explore new skills and ideas.

## INCLUSION

We respect each other and embrace our differences.

## INNOVATION

We use creativity and persistence to solve problems.

## TEAMWORK

We are stronger when we work together.

## IMPACT

We apply what we learn to improve our world.

## FUN

We enjoy and celebrate what we do!

## COOPERTITION®

We show that learning is more important than winning. We help others even as we compete.

## GRACIOUS PROFESSIONALISM®

We show good work, highlight the value of others, and respect others and the community.

You  
will complete  
this page  
throughout the  
sessions!



# Find Robot Lessons and Building Instructions

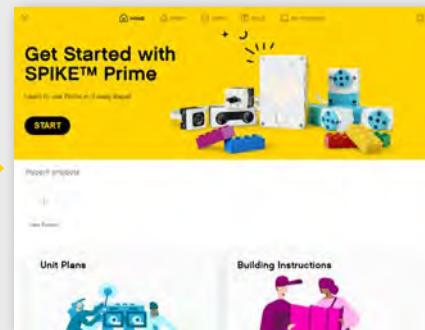
## LEGO Education SPIKE™ Prime

## LEGO® MINDSTORMS® Education EV3 Classroom

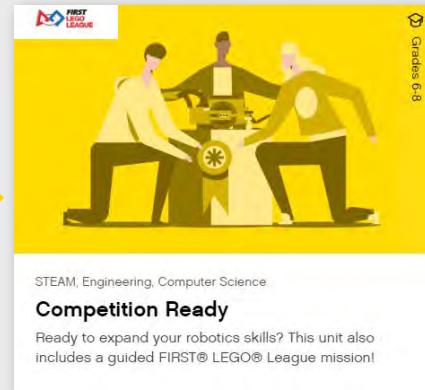
### Find the App

Need to download software? Visit:  
[education.lego.com/en-us/downloads](http://education.lego.com/en-us/downloads)

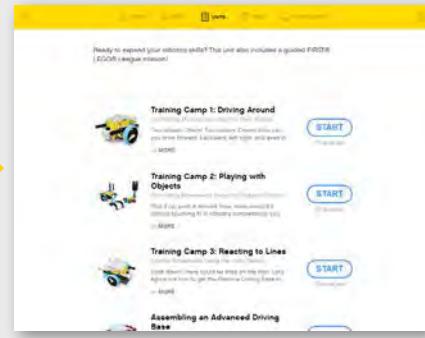
### Find the Lobby



### Find the Unit



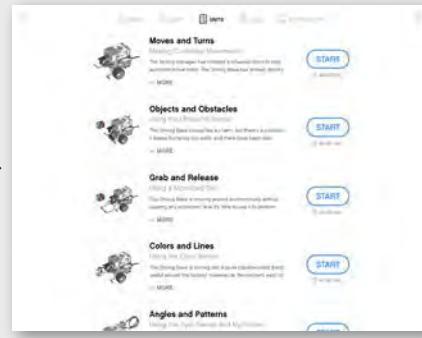
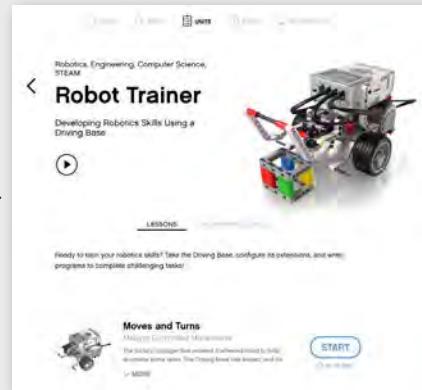
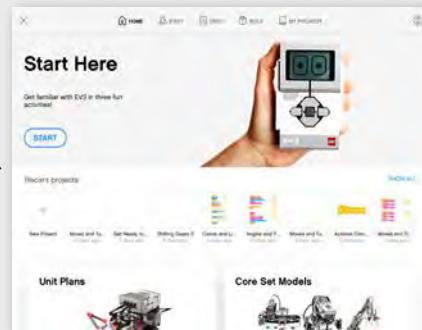
### Find the Lessons



You will build the mission models in Sessions 1-4!



## LEGO® MINDSTORMS® Education EV3 Classroom



**Find Building Instructions:**  
[firstlegoleague.org/missionmodelbuildinginstructions](http://firstlegoleague.org/missionmodelbuildinginstructions)

# Robot Lessons

Select the appropriate lessons for the robot set you are using.  
These lessons will be completed during the sessions.

## LEGO® Education SPIKE™ Prime

### Lesson 1

- Open the Start tab then select **Getting Started**.
  - Do Lesson 1 **Start Here**.
- Open the Unit Plans tab and select **Competition Ready**.
  - Do Steps 1-4 of the **Training Camp 1** Lesson.

### Lesson 2

- Open the Unit Plans tab and select **Competition Ready**.
  - 2A: Do Steps 1-4 of the **Training Camp 2** Lesson.
  - 2B: Do Steps 1-4 of the **Training Camp 3** Lesson.

### Lesson 3

- Open the Unit Plans tab and select **Competition Ready**.
  - Do Steps 1-5 of the **Assembling an Advanced Driving Base** Lesson.

### Lesson 4

- Open the Unit Plans tab and select **Competition Ready**.
  - Do Steps 1-5 of the **My Code, Our Program** Lesson.

### Lesson 5

- Open the Unit Plans tab and select **Competition Ready**.
  - Do the **Guided Mission** Lesson.

## LEGO MINDSTORMS® Education EV3 Classroom

### Lesson 1

- Open the Start tab then select **Getting Started**.
  - Do Lesson 1 **Hello World**.
- Open the Unit Plans tab and select **Robot Trainer**.
  - Do Steps 2-4 of the **Moves and Turns** Lesson.

### Lesson 2

- Open the Unit Plans tab and select **Robot Trainer**.
  - Do Steps 2-4 of the **Objects and Obstacles** Lesson.
  - Do Steps 2-4 of the **Grab and Release** Lesson.

### Lesson 3

- Open the Unit Plans tab and select **Robot Trainer**.
  - Do Steps 2-4 of the **Lines and Color** Lesson.

### Lesson 4

- Open the Unit Plans tab and select **Robot Trainer**.
  - Do the **Angles and Patterns** Lesson.

### Lesson 5

- Open the Unit Plans tab and select **Robot Trainer**.
  - Do the **Guided Mission** Lesson.

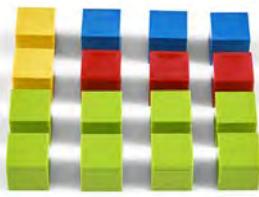
# Project Spark 1

## Problem

→ People struggle to find suitable spaces to get outside, play, and keep fit. How can you change an inactive space to an active space? You could use everyday items you find lying around to get people active and playing or specifically design a piece of equipment that enables everyone to participate and be active together.

These models have been designed to show some equipment that can help with this problem.

M08 Game Cubes (Bag 1)



Boccia Share (Bag 5)



Boccia Aim & Frame (Bag 5)

This game can be played anywhere you can draw a target on the ground. The launcher is designed to make it easy for anyone to play. **Build in Session 1**

M09 Tire Flip (Bag 7)



You don't need special weights to practice your strength training. These old tires can be repurposed for the task. **Build in Session 1**

M10 Cell Phone (Bag 1)



Turn your cell phones off and spend time finding new ways to enjoy playing outside. **Build in Session 1**

M05 Basketball (Bag 3)



M04 Bench (Bag 3)



The clever design on this park bench enables you to convert a place where you are normally seated into a fun and active game of hopscotch. **Build in Session 3**

M06 Pull-Up Bar (Bag 2)



Lifting your own body weight by doing pull-ups on any suitable bar will keep you fit and strong. **Build in Session 3**

A discarded milk crate hung on a lamppost can be turned into a fun game of basketball. **Build in Session 3**

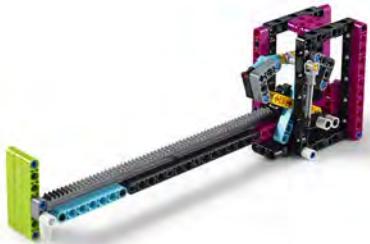
# Project Spark 2

## Problem

Many people are not active enough to stay fit. How can you motivate them to play actively? You could encourage people with FUN experiences or give them rewards for doing exercise. Putting equipment in unexpected places can help.

These models have been designed to show some pieces of technology that are linked to this problem.

M02 Step Counter (Bag 4)



You don't have to run; walking is also great exercise, and counting your steps can motivate you to be more active. **Build in Session 2**

M03 Slide (Bag 4)



Sliding down is so much fun that you don't mind the effort it takes to climb up to the top. Playing on exciting equipment is a great way to stay fit. **Build in Session 2**

M14 Health Units (Bag 1)



Keeping busy by collecting and delivering items is a fun way to stay active. All that exercise is great for your heart! **Build in Session 2**

M11 Treadmill (Bag 7)



You don't actually need to go anywhere when you have a run on this treadmill. You can stay safe and play! **Build in Session 4**

M12 Row Machine (Bag 6)



Stay motivated by learning about the specialized mechanics on this fun row machine while working out! **Build in Session 4**

M13 Weight Machine (Bag 6)



Gym equipment in the park is a great way to encourage people who would not normally use the gym to have a go! **Build in Session 4**

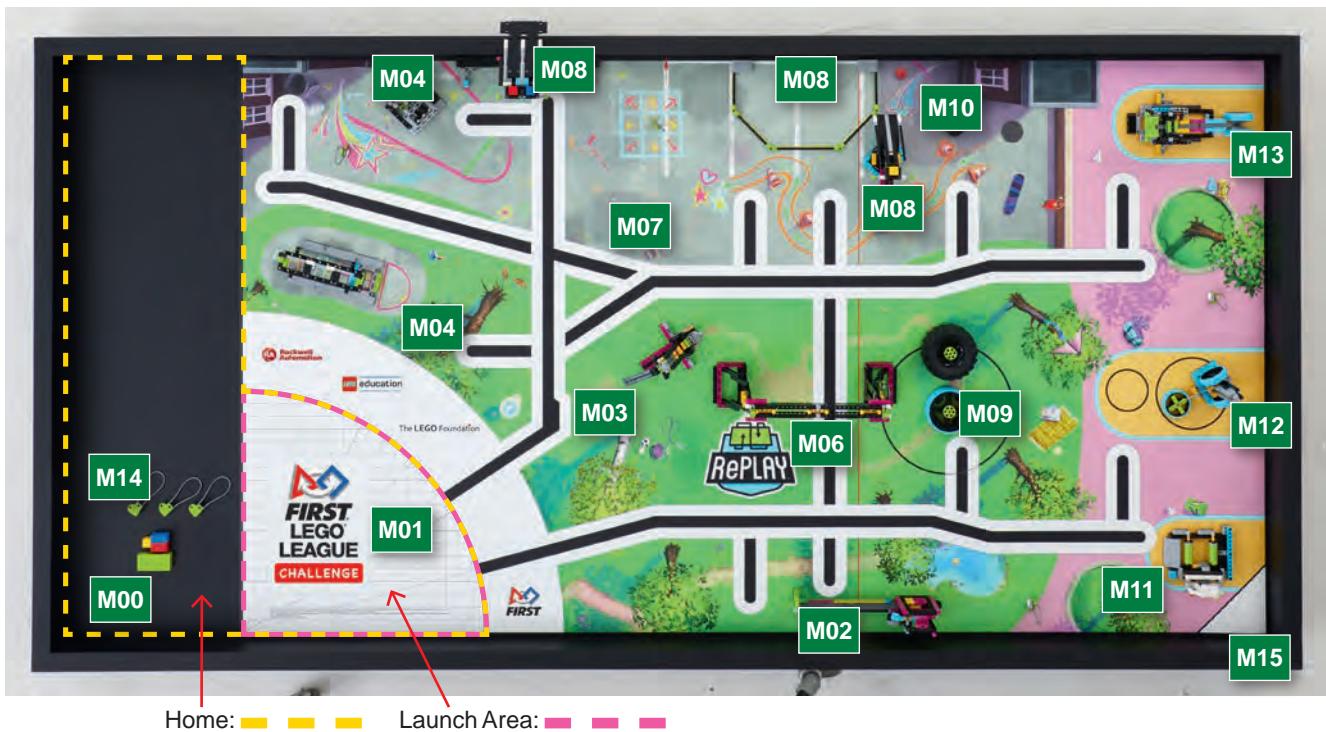
# Robot Game

The team will build a robot using LEGO® elements and technology. They program it to autonomously complete a series of missions in a 2.5-minute Robot Game to score points. The robot starts in the launch area, tries missions in the order chosen by the team, and then returns anywhere into home.

The team can modify the robot when it is in home

before launching it again. If needed, the robot can be brought home by hand, but the team will lose a precision token. The team will play several matches but only the highest score matters.

Use this page to help you set up the mission models on the field. Be sure to check the *Robot Game Rulebook* for more details.



## Field Layout



# Robot Game Missions

Full mission descriptions and Robot Game rules are in *Robot Game Rulebook*.

Mission No.	Name	Description	Values
M00	Equipment Inspection Bonus	"Doing the same with less" can save time and space.	25
M01	Innovation Project	The robot moves your Innovation Project model onto the RePLAY <sup>SM</sup> logo or the gray area around the bench (M04).	20
M02	Step Counter	The robot slides the step counter slow and steady. The farther the "walk," the better.	10-20
M03	Slide	The robot slides the people down the slide and moves them to other areas.	5-50
M04	Bench	The robot removes the backrest, flattens the bench, and gets cubes into the hopscotch spaces.	10-65
M05	Basketball	The robot raises the crate up the post and gets a cube into it.	15-40
M06	Pull-Up Bar	The robot passes completely under the bar any time. Separately, it is held off the mat by the bar at the end of the match.	15-45
M07	Robot Dance	The robot is dancing on the dance floor at the end of the match.	20
M08	Boccia	Boccia is an interactive mission with the opposing team. <i>Talk with the other team so the robots send matching colored cubes onto the opposite field.</i>	5-110
M09	Tire Flip	The robot flips tires so their white centers face up and moves them into the large target circle.	10-35
M10	Cell Phone	The robot flips the cell phone white side up.	15
M11	Treadmill	The robot spins the rollers to move the pointer as far clockwise as possible.	5-30
M12	Row Machine	The robot moves the free wheel out of the large circle and into its small target circle.	15-30
M13	Weight Machine	Before the match, you hand select the machine's lever setting. During the match, the robot moves the lever until the little yellow stopper falls.	10-20
M14	Health Units	The robot collects health units from around the field and moves them to target areas.	5-60
M15	Precision Tokens	The less you interrupt the robot outside home, the more points you keep.	5-60

# How to Follow the Sessions

The following 12 sessions will prepare you to share your team journey at a tournament. Be sure to record what you learn and reflect on how you collaborate to achieve your goals. Be ready to showcase your work on the robot, Innovation Project, and Core Values.

Use the open grid lines to write down your thoughts and draw your ideas.

Each session has instructions of tasks that you will complete:

Red headers represent **Core Values** activities.

Green headers represent **Robot Game** activities.

Blue headers represent **Innovation Project** activities.

Use these guiding questions during your Share time!

**Session 1**

**Introduction**

- Watch the RePLAY™ Season Launch video.
- Read pages 4-7.
- Split your team into two groups.

**Group 1**

- 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.

**Group 2**

- Read Project Spark 1 on page 12.
- Build the Session 1 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.
- Make a list of your amazing ideas.

**Share**

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

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

Sessions

RePLAY™ 17

## TEAM GOALS

**What do you hope to achieve?** You can use these prompts as inspiration:

We will use Core Values to... We aspire to... We plan to... We want to help... We want to experience...  
We want our robot to... We want our Innovation Project to...

1.

2.

3.

You will fill out your team goals in Session 3!



# Session 1

## → Introduction

- Watch the RePLAY<sup>SM</sup> Season Launch video.
- Read pages 4-7.
- Split your team into two groups.

## → Group 1

- 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.

## → Group 2

- Read Project Spark 1 on page 12.
- Build the Session 1 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.
- Make a list of your amazing ideas.

## → Share

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

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

# Session 2

## → Introduction

- Read Core Values page 9. Think about **Inclusion** and your team.
- Record ways you make sure everyone is respected and their voices are heard.

## → Group 1

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

## → Group 2

- Read Project Spark 2 on page 13.
- Build the Session 2 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.

## → Share

- Get your team together at the mat.
- Position each model where it belongs.
- Group 1: Show the robot skills you learned.
- Group 2: Show how the models work.
- Discuss the questions.
- Dismantle your robot when you're done.

## → ROBOT

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

## → PROJECT

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

# 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.

## → 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?

# 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.



## → 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?

# Session 5

## → Introduction

- Work together to create a team name!
- Design a poster of your name as a logo.
- Be sure each person gets to contribute to the poster!

## → Team

- Read and complete Robot Lesson 3 on page 11.

**MINDSTORMS®:** Take turns coding the robot and show what it can do.

**SPIKE™ Prime:** Build your new robot and create a code to get it moving.

## → Team

- Watch The Missions part of the Season Launch video again.
- Discuss which missions your team will tackle first.
- Work together to complete Pseudocode page 30.

## → Share

- Get your team together at the mat.
- Review your Pseudocode page when you look at the mat.
- Make changes to your page if necessary.
- Discuss the questions.

## → ROBOT

- Plan what your robot needs to do to complete the first mission your team has chosen.
- Where does the robot start?
- Are the extra LEGO® pieces you need to add to your robot quick and easy to attach?

# Session 6

## → Introduction

- Refer to Core Values page 9.  
Think about **Teamwork** and your team.
- Record ways your team has learned to work together.

## → Team

- Read and complete Robot Lesson 4 on page 11.
- Take turns to download your programs onto the robot and show what it can do.

## → Team

- Read RePLAY<sup>SM</sup> Innovation Project page 8 and the Project Spark pages 12-13.
- Think about the great solutions you have come up with in the previous sessions.
- Identify the problem you will solve.
- Record your problem statement.

## → Share

- Get your team together at the mat.
- Show the team any new coding skills you learned.
- Discuss the questions.

Are you working together and helping each other?



### YOUR PROBLEM STATEMENT

## → ROBOT

- What missions could you tackle with the robot skills you've learned?
- Can you use extra copies of the Pseudocode page to help you plan additional missions?

## → PROJECT

- Which problem can you explain clearly?
- Is there someone you can talk to that is an expert on the problem?

# Session 7

## → Introduction

- Refer to Core Values page 9.  
Think about **Coopertition®** and **Gracious Professionalism®**.
- Record ways your team will demonstrate these at events.

## → Group 1

- Begin the development of your project.
- Research your problem and any existing solutions.
- Investigate your solution ideas.
- Use Research page 31 as a tool.
- Be sure to use a variety of sources and keep track of them.

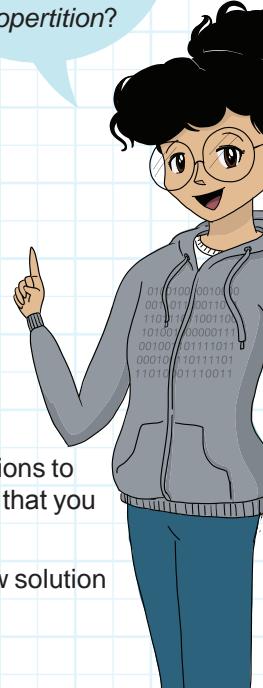
## → Group 2

- 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!

## → Share

- Get your team together at the mat.
- Group 1: Explain what you discovered in your research. Discuss any solution ideas.
- Group 2: Show how your robot scores points on the guided mission.

What does the guided mission show you about Coopertition?



## → 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

- Are there existing solutions to your identified problem that you could improve?
- Do you have brand-new solution ideas to your problem?

# Session 8

## → 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.

## → ROBOT

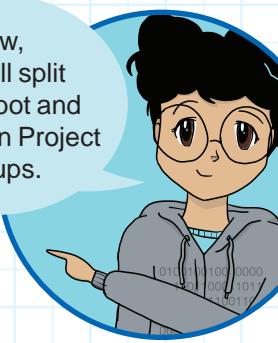
- Can you follow how the code on your device is making your robot move?
- How do you plan to talk with the other team at the Robot Game about the guided mission?

## → PROJECT

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

# Session 9

Now,  
you will split  
into Robot and  
Innovation Project  
Groups.



## → Introduction

- Refer to Core Values page 9.  
Think about **Innovation** and  
your team.
- Record ways your team has  
been creative and solved  
problems.

## → Innovation Project Group

- Make a plan to share about your solution with others!
- Evaluate what you created last session. Iterate and improve if needed.
- Determine if you can do any testing.
- Use the white bricks from bag 8 to build a model that represents your solution.

## → Robot Group

- Decide which mission to tackle next.
- Build any attachments you need.
- Time to code! Refine your code so the robot completes the mission reliably.
- Be sure to document your design process and testing for each mission!

## → Share

- Get your team together at the mat.
- Show any new missions you have been working on.
- Update the team on the solution and how you will share about it with others.

## → ROBOT

- Is the program for each mission saved on your computer?
- In what order will you run the missions in the Robot Game?

## → PROJECT

- How could you realistically implement your project solution?
- Could your project solution be manufactured, and what would it cost?

# Session 10

## → Introduction

- Refer to Core Values page 9. Think about **Impact** and your team.
- Record ways your team had a positive influence on each other and others.

## → Innovation Project Group

- Plan out your project presentation. Refer to the rubric for what to cover.
- Write out your Innovation Project presentation script.
- Make any props or displays that you need. Be engaging and creative!

## → Robot Group

- Continue to create a solution for each mission as time allows.
- Make sure you understand your code for each mission and can explain it.
- Think about your game strategy on the mat and the missions you will solve.
- Practice a 2.5-minute Robot Game with all your completed missions.

## → Share

- Get your team together at the mat.
- Discuss the project presentation work completed.
- Discuss what missions you have completed.
- Discuss how everyone can be involved in both presentations.



## → ROBOT

- What features on your robot show good mechanical design?
- How did you decide which missions to tackle?

## → PROJECT

- What are you going to build with your white bricks to represent your solution?
- Have you made changes to your solution based on advice from others during sharing?

# Session 11

## → Introduction

- Create a sports playing card for each person on the team.
- Explain about yourself and how you enjoy FIRST® LEGO® League Challenge!

## → Innovation Project Group

- Continue working on your project presentation. Be clear and organized!
- Plan out what each person on the team will say.

## → Robot Group

- Use the white brick model of your project solution in Mission 1.
- Program the robot to complete this mission.
- Plan out your robot design presentation. Refer to the rubric for what to cover.
- Write out your robot design presentation script.
- Practice your presentation.

## → Share

- Get your team together at the mat.
- Discuss the project presentation and each person's role.
- Run a practice 2.5-minute match and tell what missions are done. Discuss the robot design presentation.
- Decide what else needs to be done.

## → ROBOT

- Are all the different LEGO pieces you need to attach to the robot for each mission ready?
- Do you have a plan for what to do if one mission does not work?

## → PROJECT

- Have you organized for everyone to have a speaking part in the project presentation?
- Have you told everyone to speak loudly, SMILE, and have FUN?

# Session 12

## → Introduction

- Refer to Core Values page 9.  
Think about **FUN** and your team.
- Record ways your team has had fun throughout this experience.

## → Team

- Rehearse your Innovation Project presentation.
- Demonstrate Core Values when you present!

## → Team

- Practice your Robot Design presentation.
- Be sure to mention how your team has used Core Values!
- Hold practice 2.5-minute Robot Game matches.

## → Share

- Review all the rubrics.
- Provide helpful feedback on each presentation based on the rubrics.

## Have More Time?

Continue solving missions and working on your project before your event!



Have you had a great time in *FIRST® LEGO® League Challenge*?

## WHAT TO EXPECT AT YOUR EVENT

- Your team should have FUN at the event and integrate Core Values into everything you do.
- Your whole team will meet with the judges in a single meeting to share your team's journey throughout the season. Think about where you started out and where you are now. Think about what you have accomplished and what challenges you have faced and overcome.

- You will share about your team's Innovation Project, Robot Design, and how your team incorporated Core Values throughout your experience.
- During the Robot Game, two team members will run the robot at the mat during each 2.5-minute robot match. You can tag in other team members for different missions.

# Prepare for Your Event

- Consider your team's journey throughout the sessions and season.  
Did you face any challenges? How did you overcome them?
- Reflect on the Core Values you used in the Introduction activities.  
How have you applied the Core Values?
- Think about how you shared at the end of each session.  
How can you share your work with the judges in a similar way?
- Look over the goals you wrote on page 16.  
Did you meet your goals? Why or why not?
- Talk about the programs you've created for your robot.  
How would you explain them to a judge who may not know your software?
- Think about all the work you've done on the Innovation Project.  
Can you think of creative ways to showcase all your hard work?



# Pseudocode

Mission Name:

Mission Number:

## CODING STEPS

Write out the moves the robot should make to complete the mission.

Move 1

Move 6

Move 2

Move 7

Move 3

Move 8

Move 4

Move 9

Move 5

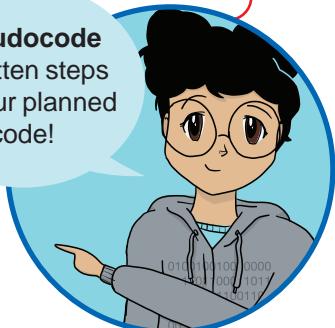
Move 10

## ROBOT PATH DIAGRAM

Draw the route your robot will take to complete the mission.



Pseudocode  
is written steps  
for your planned  
code!



Go to the app and  
start a new project.  
Explore which  
coding blocks will  
make the robot  
move like the  
planned coding  
steps that you  
wrote above.

## Research

Use this page to document the research you do on the project problem and solution. Use extra pages as needed to capture your research.

# PROBLEM AND SOLUTION ANALYSIS

Record important information here.

## Guiding Questions:

What information are you looking for?

Does this source have information relevant to your project?

Can you use different types of sources such as the Internet, books, and experts?

Is this a good and accurate source of information?

You will  
complete this  
page in Sessions  
7-8.

# SOURCES

Write down where you got your information and details such as the title, author, and website.

1.

2.

3.



# Project Development

Use this page to develop your project solution and the process you use to create it.

## DRAWING

Sketch your solution and label its parts.

## DESCRIPTION

Explain your solution and describe how it solves the problem.

## PROCESS

Describe the process you followed to develop your solution.

You will  
complete this  
page in  
Session 8.



# Guided Mission



Being active and playing together is great fun. We can help get people active by designing games and activities that can be played by everyone. Boccia is a great example, and it is one of the competitive sports in the Olympics.

Like all the mission models on the *FIRST® LEGO®* League competition field, the Boccia models in Mission 8 (M08) might inspire you to think of a solution for your Innovation Project.

To help you learn about using a color sensor to follow lines on the mat, we have created a guided mission lesson. You need to read Lesson 5 on page 11. This will direct you to the app for either SPIKE™ Prime or LEGO MINDSTORMS® Education EV3 Classroom.

## M08 Game Cubes (Bag 1)



## Boccia Share (Bag 5)



## Boccia Aim & Frame (Bag 5)



This game can be played anywhere you can draw a target on the ground. The launcher is designed to make it easy for anyone to play.



### In the app, you will:

- Modify the robot you have been working on.
- Build a special attachment to help you solve the mission.
- Start the robot in the right position in the launch area.
- Download the program that solves this mission.
- Run the robot and watch it complete the mission and score the points.
- Apply your new line-following skill to reach the treadmill model.
- Think about how to incorporate the Boccia mission into your 2.5-minute Robot Game round.

# Career Connections

## Jay Flores

Global STEM Ambassador

**Where I work:** Rockwell Automation

**My FIRST® connection:** I helped design the FIRST Robotics Competition experience and help FIRST create the strategies to reach more kids.

**Fun facts about me:** I was on two athletic competition TV shows: *Exaltón Estados Unidos on Telemundo* (2019) and *BattleFrog League Championship* on ESPN (2016).

**My STEM superhero:** FIRST® LEGO® League students who are solving real problems in their community.

**Advice to teams:** Invent the change you want to see in the world!



## Javion Mosley

Mechanical Engineering Senior

**Where I work:** Rockwell Automation

**My FIRST connection:** Riverside Robotigers 2830 mentor, FIRST alumni

**Fun facts about me:** I like to travel a lot and experience as many new things as I can. I was also a Rockwell Automation intern in China.

**My STEM superhero:** Wilbur and Orville Wright. I have an admiration for flight.

**Advice to teams:** FIRST is a great opportunity to get your first steps in engineering. Treat it as part of your building blocks for your future as the steps you take today will affect your outcome tomorrow.



## Leanne Cushing

Mechanical Engineer

**Where I work:** Bellwether Coffee

**My FIRST® connection:** I did FIRST Robotics

Competition in high school, and with the help of my mentors, I learned that mechanical design was the one thing I'm good at and love doing.

**Fun facts about me:** Most of my spare time is dedicated to *Battlebots* and my team, Valkyrie, where we design, build, and compete with our 250 lb robot on Discovery Channel.

**My STEM superhero:** Bill Nye, for his love of entertaining combined with his love of engineering and teaching. He showed me you could be entertaining, social, and brainy. He fed a lot of my curiosity and taught me so much when I was little.

**Advice to teams:** Passion isn't perfection. Be your own favorite version of yourself; don't let other people tell you who to be or what you can or cannot do. Don't talk yourself out of trying something new. Worst case, you have a new opinion or story to share.



## Pedro Alejandro Yang

Manager

**Where I work:** LEGO® Education

**My FIRST connection:** I work in LEGO Education's competition team, and we are a Strategic Partner of FIRST.

**Fun facts about me:** I played badminton in the 2004 Summer Olympics. My hobby is to cook recipes that famous chefs post on YouTube.

**My STEM superhero:** Woodie Flowers. Even though he was a STEM advocate, he also acknowledged the human empathy factor for people to succeed, thus inventing what we know today in our FIRST LEGO League community as *Gracious Professionalism*®.

**Advice to teams:** It's not about winning, but the learnings and friends you make in your journey.



ALL AROUND US, THERE ARE OPPORTUNITIES TO PLAY AND BE ACTIVE – FROM OPEN PARKS TO CEMENT COURTS, IN OUR CLASSROOMS, AND EVEN WHEN WE'RE WAITING IN LINE. BUT MORE AND MORE PEOPLE ARE NOT ACTIVE ENOUGH.



SO MAYA ASKS...

HOW AND WHERE  
CAN WE HELP  
PEOPLE BE MORE  
ACTIVE?

REWARD  
THEM!

THE PARK  
BENCH

GET THEM  
MOTIVATED

ON THE  
BUS

SO, HOW ARE WE GOING TO  
SOLVE THESE CHALLENGES?

LET'S ASK PEOPLE  
WE KNOW!



PLAYING MAKES BEING ACTIVE MORE  
FUN. YOU GET CREATIVE WHEN YOU  
WANT TO PLAY, AND IT'S THIS  
CREATIVITY – YOUR CREATIVITY – THAT CAN  
HELP MOTIVATE US TO BE MORE ACTIVE.



LEGO, the LEGO logo and the Minifigure are trademarks of the LEGO Group. ©2020 The LEGO Group. FIRST® is a registered trademark of For Inspiration and Recognition of Science and Technology (FIRST).

LEGO® is a registered trademark of the LEGO Group.

FIRST® LEGO® League and RePLAY™ are jointly held trademarks of FIRST and the LEGO Group.

©2020 FIRST and the LEGO Group. All rights reserved. 30082002 V1