

# **FIRST® Robotics Engineering Explorations**

## **Student Guide – The Ball Game**

# Unit 6

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# Activity 1: Preparing for the Game

## Driving Questions

- How can we involve the team during competition?
- How do we plan our competition day?
- How do we know if we are prepared for the game?

## What Will I Be Doing?

- I will learn about our robot's performance through a practice competition.
- I will learn about the different roles each team member might fill during the competition.
- I will find ways to use the *FIRST*® Core Values and philosophies of *Coopertition*® and *Gracious Professionalism*® while I compete in practice matches.

## Getting Started

- It's the first day of the Summer Olympic Games, and everyone from all over the globe is buzzing with excitement. Your favorite athletes have been training for so long. They studied their form, trained their muscles, and practiced their tasks, but nothing is more exciting than finally competing! The competitors and their audience share the joy of their efforts and accomplishments.
- Your ball game is your chance to show off your abilities, just like the Olympics enable athletes to showcase their skills. You have studied, trained, and practiced. Your knowledge and effort will be challenged in the ball game challenge.
- You developed rules and tasks to score points for your ball game challenge; now it is time to implement them.

## WHAT'S NEXT?

- Gather your team.
- Gather your supplies (Engineering Notebook, game manual, robot, device with Internet access).
- Assign roles for this activity.

## HOW WILL I DO IT?

- You will review the rules and guidelines developed in Unit 1 for the ball game challenge.
- You will ensure all team members know the rules and each aspect of scoring in the game.

## Task 1: Event Roles

### DESIGN AND PROTOTYPE:

- It is finally time to compete against others in your class with *Coopertition* and *Gracious Professionalism*. As mentioned earlier, there are many different tasks that engage the players, challenge them, and create a fun and creative outlet for their abilities. During the competition, you will need members to fill these roles.
  - Marketing Specialist
    - Creates flyers, promotes the event, and takes pictures of your robot during the event
    - Describes your robot design and game strategy to other team members
  - Logistics Specialist
    - Organizes game supplies by setting up and resetting the field
    - Takes notes of your robot's performance and any issues that arise during the match
  - Mathematician Specialist
    - Keeps score for the team during the competition
  - Drive and Engineering Team
    - Is responsible for running the robot and making any changes needed (mechanical and programming)

### TEST AND IMPROVE:

- As a team, discuss your roles and interests. Assign possible team members for each role you might need in the competition.

## Career Connections

Creating a fun game is a complex process and involves multiple jobs. Whether the goal is to create a board game, a video game, or a sport, a team of game designers needs to come together to deliver the final product.

- Game designers devise an idea and are tasked with storyboarding the game (creating a graphic representation of how the game will unfold) and establishing gameplay and rules.
- Game developers take those ideas and create a physical or digital copy of the game.
- Web or graphic designers bring the game to life by creating engaging visuals.
- Marketing analysts conduct market research to advertise the game to appropriate audiences.
- Game testers try to “break” the game and find any flaws in the rules and regulations to ensure the game is playable and fun.

For all team members, the end goal of any game is simple: engage the players, challenge them, and create a fun and creative outlet for their abilities.

## Task 2: Planning Your Event

### DESIGN AND PROTOTYPE:

- Competing with just your peers can be fun. It can be more fun if you invite others to join in on the fun and extend the *FIRST* Core Values by creating an impact on others with what you have learned. In this activity, you will help your teacher plan your community event. As a team, discuss the following questions to plan your event:
  - How can you plan the event to have the most impact, capitalizing on other school events?
  - How can you involve members of your local business and industry to become supporters of your event?
  - How can you involve school decision-makers to see the impact of your learning (for example, school administrators or district committee members)?
  - How can you engage and inspire younger students to participate in this program?
  - If a community event is not possible, how might you share your learning and skills with others digitally?
- As you set up the schedule for the competition and interviews, consider the following:
  - How much time do you have?
    - How long can you have students?
    - How long can you have the judges?
  - What facilities will you be using?

## Task 3: Drive Team Competition!

### DESIGN AND PROTOTYPE:

- Now that you have the event details planned, it is time to fill the rest of the roles on your team for competition. Up to this point, a few people might have tested the robot as you were building and prototyping, but do you know who will be the best driver?
- In your competition, you will have matches that determine your robot’s capability to earn points against other robots. In this activity, you will design a driving competition that will enable you to determine the best driver. The competition should include tasks like what your robot will be doing in the ball game challenge, and each driver’s time limit is two minutes. How many tasks can they complete in two minutes?

### TEST AND IMPROVE:

- When you have decided who is competing in the driver challenge, set up the competition and keep score. This is an excellent time for the mathematician specialist and the logistics specialist to get some practice in their roles to be ready for the competition event.

## Task 4: Practice Rounds

### TEST AND IMPROVE:

- Now that you have filled each team role, it is time for some practice rounds. You want your robot and team ready for your community event and the final competition; just as an athlete gets better with practice, so will you. Your teacher will provide you with a match schedule. Conduct a team meeting to ensure that everyone knows what they will be doing.

## TEST AND IMPROVE:

- Have fun competing in your practice matches. This is your time to learn more about your robot and your team roles.
- After you have completed the practice matches, reflect on the evaluation portion of project management. Evaluating your project and team is important to determine how you can improve in the future. Common evaluation prompts are:
  - Identify five things that went well with your team performance and robot performance.
  - Identify five things you would like to improve on.
- Using your project management tools, determine the next steps for what needs to be completed before your community event.

### Tip

Regardless of the practice rounds' outcome, remind yourself and your alliance to celebrate your efforts. Even if you go through all the tasks and thought of everything that could go wrong, the unexpected can happen. Remember to always use the troubleshooting process if you get stuck. The ball game is a chance for you to demonstrate your knowledge and creativity. Don't forget to enjoy yourself and have fun!

## Reflection

- What are your team's greatest strengths going into the community event?
- What skills does your team still need to work on?
- Is your team's robot built for the ball game? Will you have to modify the robot to fit the requirements of the ball game?
- Think about previous units and activities. Which units and/or activities will your team review in order to prepare for the ball game?

## Checkpoint

In your Engineering Notebook:

- Record your answers from the Getting Started section of the activity.
- Record your responses to the Engineering Notebook prompts in Tasks 1-4.
- Record your responses to the reflection questions.

## Activity 2: More than Robots!

### Driving Questions

- What are our next steps for the community event?
- What needs to be done to our robot for the ball game challenge?
- How will we market the community event?
- How will we present our robot and our design in our community?

### What Will I Be Doing?

- I will develop a brand for our team and presentation for our community event.
- I will use project management to improve the robot and event planning for our community event.

### Getting Started

- In the last activity, you practiced how you might compete with your robot in the ball game challenge. You learned how participating in alliances can impact the gameplay of your robot. You also learned the different roles you might fill at a competition against your peers.
- You have learned that making an impact is part of the *FIRST* Core Values, which makes *FIRST* unique and More than Robots. In this activity, you will further develop your plans to make an impact by using your community event to share what you have learned with others and inspire them to become involved in STEM.
- This is all in preparation for your community event, where you will celebrate your accomplishments!

### WHAT'S NEXT?

- Gather your team.
- Gather your supplies (Engineering Notebook, robot, gamepad, device with Internet access, game rules).
- Assign roles for the activity.

### HOW WILL I DO IT?

- *FIRST* events are fun, exciting, and full of energy. They are a celebration of the hard work you have put in. You might have seen in videos of *FIRST* competitions that students dress in attire promoting their team and accomplishments. You will continue to refine your team and plans to promote and celebrate your accomplishments.

## Task 1: Team Identity and Marketing!

### BRAINSTORM AND EXPLORE:

- You want to market your community event to get people to come, but you also want to market your team to stand out at the event. Consider a popular brand you might use in your daily life. How does it represent a product, tell a story, and promote itself? You want the same for your team.
- Details you might need to include to promote and market your team include:
  - Does your robot have a way for others to recognize that it represents you?
  - Can your team develop a way to be unified and appear as a brand?
  - What does your brand and identity represent? How can you make it fun?

### DESIGN AND PROTOTYPE:

- Develop design elements that can help your robot represent you.
- Develop a team costume or attire that can associate you with your robot.
- Have your marketing personnel develop materials that you can use to promote your robot and team brand.

## Task 2: Presentation

### BRAINSTORM AND EXPLORE:

- Storytelling is a marketing technique that engages others in a journey and the impact it makes. You've probably read a book that impacted you through its story. Storytelling is a great way to engage your audience. In this activity, consider the following questions to develop a story that will help you promote your robot, your journey, and your team. Your story or presentation should be less than five minutes.
  - How did you determine your robot design?
  - What was the most challenging part of building the robot?
  - What challenges did you overcome as a team to compete in the game?
  - What was your biggest accomplishment in the designing and building process?

### TEST AND IMPROVE:

- After you have developed your story, take some time to practice presenting it. Take turns presenting to another team in the class. Provide feedback to each other on your presentation.

## Task 3: Improve Your Robot

### TEST AND IMPROVE:

- It takes a lot of testing to create a robot that works the way you want. Since one purpose of your robot is to demonstrate your learning and passion for STEM, you want it to operate to its fullest potential. Apply your skills to your fullest potential to have a robot you can be proud of. Using your project management skills, list the improvements you need to make and work to refine your robot to be prepared for your community event.
- Continue to test and improve your robot. Include the results of your testing in your Engineering Notebook.

## Reflection

- How can your team identity help you improve messaging about your team and how you approach the Engineering Design Process?
- How does demonstrating your learning through a presentation help you increase your skills for future career opportunities?
- How can your project management skills help you improve your time management in the future?

## Checkpoint

In your Engineering Notebook:

- Record your answers from the Getting Started section of the activity.
- Record your responses to the Engineering Notebook prompts in Tasks 1-3.
- Record your responses to the reflection questions.

## Activity 3: Welcome to the Game

### Driving Questions

- Are we ready to have fun competing?
- Are we ready to share our knowledge and what we have learned?
- How does *Coopertition* impact our approach to competing?

### What Will I Be Doing?

- I will play in the ball game challenge in front of my community.
- I will present my learning to my community.
- I will work with the other teams in alliances to excel in the competition.

### Getting Started

- You've done a bunch of cool things since the start of this journey. You've learned about the *FIRST* Core Values and philosophies. You've worked with your team to build ziplines and learned about the Engineering Design Process. You've worked with a kit of robot parts to build an awesome robot. You've learned how to create robot programs, send telemetry, code motors, and use servos and sensors. You've done so many amazing things, and now it's time to use everything to compete in a game that will test your skills and abilities.
- You helped design the rules for your ball game and even participated in practice matches. You can start with a series of practice matches before your community event. Then, it will be time for the actual event. Your teacher will pass out a match schedule.
- Your mathematician specialist will help your teacher finalize the scores when the match ends.
  - How will you avoid penalties while you are playing the ball game?
  - What will each member of your team be doing during the ball game?
  - How can you ensure your team is practicing Coopertition and Gracious Professionalism while you are competing?

### WHAT'S NEXT?

- Gather your team.
- Gather your supplies (Engineering Notebook, robot, Driver Station, and game rules).

### HOW WILL I DO IT?

- Your team should take some time going through the rules of your ball game to make sure you aren't going to cost your alliance points.
- When you've gone over the rules, go through a practice round of the ball game on the game field. Practice all three periods of the game to ensure you are ready for the three matches your team will compete in.
- During the practice round, you might decide to make changes to one of your programs. Use the troubleshooting process and save your program after you've made your changes.
- After your practice round, you will compete in a minimum of three matches. Your teacher has grouped you with other teams into three different alliances, one for each game match you will play.

### Task 1: Practice, Practice, Practice

#### IDENTIFY THE PROBLEM:

- Before you compete, you can practice each period of the ball game in the field. The practice round will be your last opportunity to make changes to your programs before you play the game.
- While one of your team members is driving during the driver-controlled and end game periods, the other members of your team should take notes and think about what your robot can do and what it has trouble with.

### TEST AND IMPROVE:

- As a team, decide who will drive your robot in the Driver Station and who will play any other roles in the ball game.
- When you've decided which team members will be around the game field, place your robot into one of the starting positions and set it up.
- After you've finished your practice round, answer the following questions in your Engineering Notebook:
  - Did the robot perform as expected?
  - Are there mechanical issues that need to be fixed?
  - Are there programming issues that needs to be fixed?
  - Is the robot ready to go?

## Task 2: Match One, Start!

### TEST AND IMPROVE:

- It's finally time to compete in the ball game! You've practiced and prepared, and now you will work with another team to score as many points as possible.
- Your teacher has prepared the alliances you will work in and mapped out who will compete in each match.
- Decide which team members will be in the game field for your first match. Find the other team in your alliance and get ready to play!
- Talk with the other team in your alliance and decide which position your robot will start in. Select the autonomous program you designed for that starting position and ensure your driver is in the Driver Station.
- Team members not participating in the match should find a place near the field and observe. After the match, your teacher will tally the points scored by both alliances and any penalties that may have occurred.
- After you receive your final score, reflect on the following questions with your team and record your responses in your Engineering Notebook:
  - Were you able to score points in each of the ball game periods?
    - How many points did you score in the autonomous period?
    - How many points did you score in the driver-controlled period?
    - How many points did you score in the end game period?
  - Did your team get any penalties during the ball game?
  - Did your alliance win?
  - What did your team do well during the ball game?
  - What can your team do better in the next match?

## Task 3: Match Two, Start!

### IDENTIFY THE PROBLEM:

- Congratulations on competing in your first match of the ball game! You now have two more matches ahead of you, and you want to ensure you score as many points as possible.
- At the end of the competition, the team with the most points will be declared the winner. The points you get from each match are based on your alliance score, not just the score of your team's robot, so you need to ensure you and the other team in your alliance are working together.
- Remember what problems you encountered in the last match and strategize to overcome them.

### TEST AND IMPROVE:

- In the second match, try to improve your score by improving your game strategy and the handling of your robot. Be sure to cheer your drivers on during the match and take notes on your robot's performance.
- After you receive your final score, reflect on the following questions with your team and record your responses in your Engineering Notebook:
  - Were you able to score points in each of the ball game periods?
    - How many points did you score in the autonomous period?
    - How many points did you score in the driver-controlled period?
    - How many points did you score in the end game period?
  - Did your team get any penalties during the ball game?
  - Did your alliance win?
  - What did your team do well during the ball game?
  - What can your team do better in the next match?



## Task 4: The Final Match

### IDENTIFY THE PROBLEM:

- It's time for the last match. This will be your last chance to score points, so make it count!
- Reflect on your performance in the first two matches before you begin your final one. In this match, you will likely be competing against teams you've worked with in previous matches, so be sure to practice *Coopetition* and *Gracious Professionalism*. You should ensure that all team members have had a chance to participate in the competition and fulfill their roles.

### TEST AND IMPROVE:

- You've competed in two matches already, so you know what to do. Find the other team in your alliance, decide on the starting positions of your robots, and pick competition roles for each team member.
- Be sure to support your alliance during the match by cheering them on!
- After you receive your final score, add up the points you've earned through all three matches.
- Record your final score in your Engineering Notebook and then answer the following questions:
  - Were you able to improve your robot's performance between your first and final matches?
  - Did you work well with the other teams in your alliances?
  - What did you do well during the three matches?
  - What could you do better now that you've finished playing?

## Task 5: Team Presentation

### TEST AND IMPROVE:

- Now that you have competed with your robot, it is time to present your robot and brand to your community. You spent time during the last activity preparing your presentation and brand. It's time to deliver your five-minute presentation on your Engineering Design Process and what you have learned on your robot and competition journey.
- After you have presented, take a few minutes to reflect as a team:
  - How did the presentation go?
  - Did you communicate clearly so that the audience could hear?
  - Did each member of your team speak?
  - Did you tell your story in a way that might impact others?

## Reflection

- How many total points did your team earn?
- How did your team's performance compare with the teams you were competing against?
- Did your performance improve between rounds of the competition?
- What was your team able to do well during the game?
- What do you think your team could have done better during the game?

## Checkpoint

In your Engineering Notebook:

- Record your answers from the Getting Started section of the activity.
- Record your responses to the Engineering Notebook prompts in Tasks 1-5.
- Record your responses to the reflection questions.