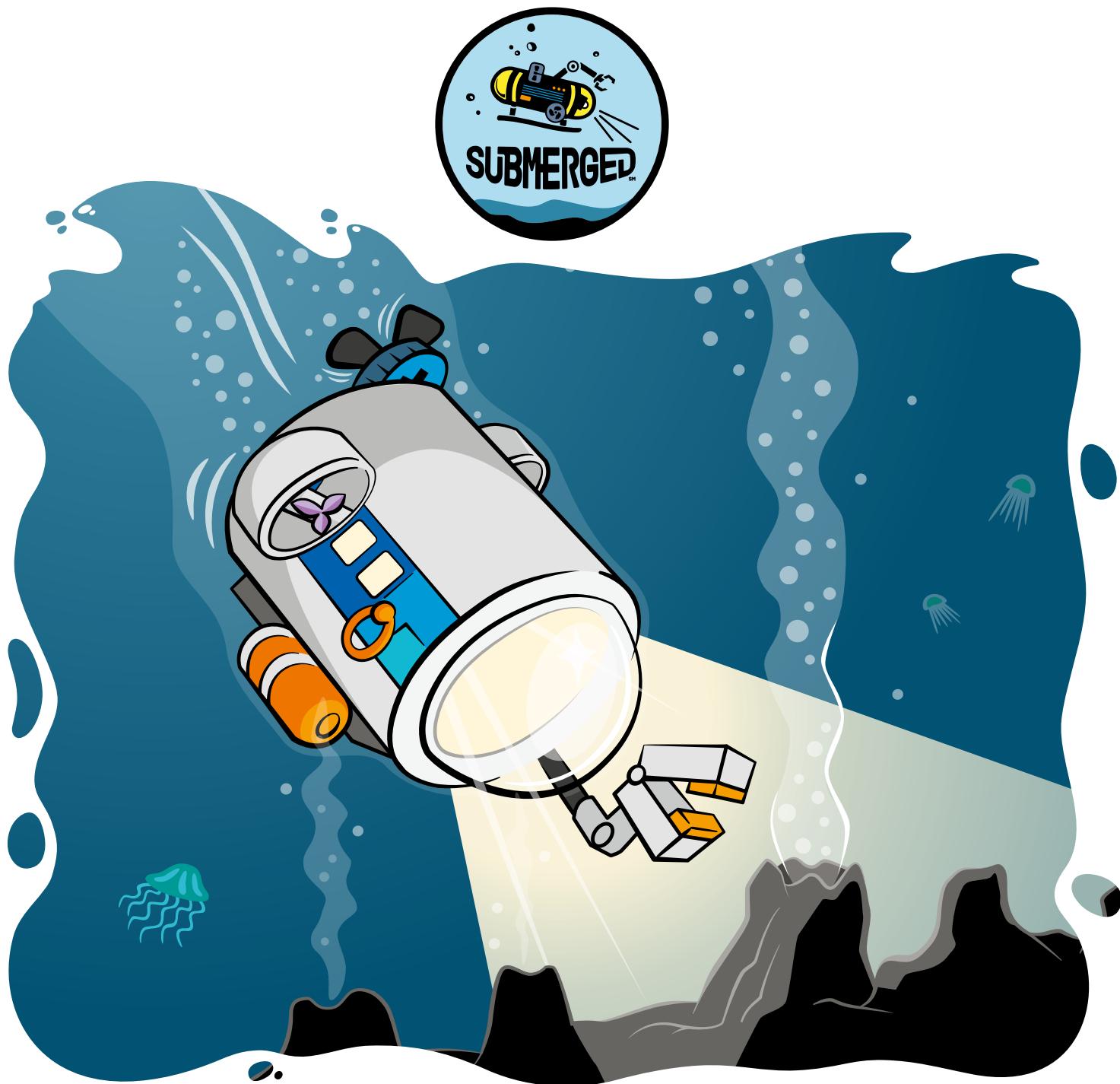


**FIRST®
LEGO®
LEAGUE
CHALLENGE**

ENGINEERING NOTEBOOK





FIRST® LEGO® LEAGUE GLOBAL SPONSORS



The LEGO Foundation

CHALLENGE DIVISION SPONSOR

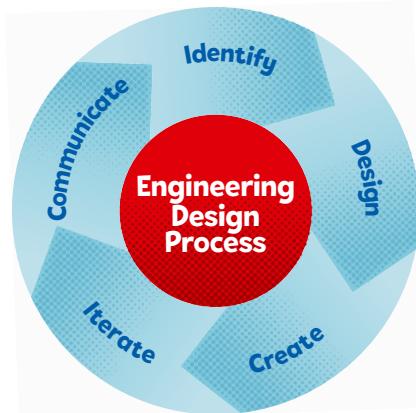


Welcome!

Use the sessions in this *Engineering Notebook* as a guide for your team's journey through the FIRST® DIVESM presented by Qualcomm season and SUBMERGEDSM challenge.

Use the **Core Values** and the engineering design process

throughout your team journey. Have lots of fun as you develop new skills and work together! This notebook is a great resource to share at your judging event, but it isn't required. Check out careers related to the season theme at the end of this notebook.



FIRST® Core Values



We are stronger when we work together.



We respect each other and embrace our differences.



We apply what we learn to improve our world.



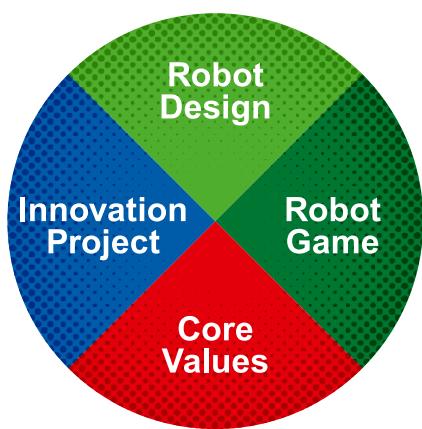
We enjoy and celebrate what we do!



We explore new skills and ideas.



We use creativity and persistence to solve problems.



Each of these four equally weighted parts of FIRST® LEGO® League Challenge accounts for 25% of your total performance at your event.

Core Values should be demonstrated at the event, where you will showcase your team's amazing work on robot design and the innovation project. These three parts will be evaluated during the judging session. Your robot's performance will be evaluated during the robot game.

We express our Core Values through *Gracious Professionalism*[®] and *Coopertition*[®], and this will be evaluated during robot game matches.

Gracious Professionalism is a way of doing things that encourages high-quality work, emphasizes the value of others, and respects individuals and the community.

Coopertition is showing that learning is more important than winning. Teams can help others even as they compete.

FIRST® LEGO® League Challenge Overview

CORE VALUES

Demonstrate *FIRST® Core Values* in everything you do. Your team will be evaluated during the robot game and the judging session.

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 explanation on your robot design, programs, and strategy.

Your team will:

- **Identify** your mission strategy.
- **Design** your robot and programs and create an effective plan.
- **Create** your robot and coding solution.
- **Iterate**, test, and improve your robot and program.
- **Communicate** your robot design process and everyone's contributions.

ROBOT GAME

Your team will have three 2.5-minute matches to complete as many missions as possible.

Your team will:

- Build the mission models and follow the field setup to put the models on the mat.
- Review the missions and rules.
- Design and build a robot.
- Explore building and coding skills while practicing with your robot on the mat.
- Compete at an event!

INNOVATION PROJECT

Your team will prepare a live, engaging presentation to explain the work you have done on your innovation project.

Your team will:

- **Identify** and research a problem to solve.
- **Design** a new solution or improve an existing one based on your selected idea, brainstorming, and plan.
- **Create** a model, drawing, or prototype.
- **Iterate** on your solution by sharing it with others and collecting feedback.
- **Communicate** your solution's impact.

Robot Design and Robot Game

Get ready to dive deep into the oceanic abyss, as this year's robot game will take you through a thrilling adventure of varying habitats found in different ocean layers. Starting from the sunlight zone, your team will plunge headfirst into a coral reef that is in dire need of restoration. As you venture farther down into the twilight and midnight zones, you'll retrieve an artifact from a sunken ship, which will surely put your skills to the test.

The real challenge awaits you in the deepest trenches of the abyss where you'll explore a mysterious cold seep. Finally, you'll return to the twilight zone to further your research and uncover the secrets lurking beneath the ocean's surface. Get ready to embark on an unforgettable journey of discovery!

Design and create a robot that will complete missions in the robot game.

Build your mission models and identify your mission strategy.

Each mission and model provides inspiration for possible solutions to your innovation project. You will learn about multiple ocean environments and

the mission models associated with them. You can complete the missions in any order.

Design and create your autonomous robot and programs.

Create a plan for your robot design. Build a robot and its attachments using LEGO® Education SPIKE™ Prime or any LEGO Education-compatible set. Code your robot

to complete a series of missions autonomously in a 2.5-minute robot game to score points.

Test and iterate on your robot solution to complete missions.

Iterate on your robot design and programs with continual testing and improvements.

Communicate your robot design process.

Prepare a short presentation that clearly explains the process your team used to create your robot and programs and how they work. Make sure your whole team is involved.

Compete in robot game matches.

Your robot starts in a launch area, tries missions in an order your team chooses, and returns anywhere into home. You can modify your robot when it is in home before launching it again. Your team will play multiple matches, but only your highest score is used for awards.



Robot
Resources

Innovation Project

More than 70% of the Earth's surface is covered by oceans. Explorers throughout history have searched and studied the oceans to understand the impact on our lives. Society's interest in the oceans has led to innovations in technology and a greater appreciation for

the complex relationship between life on land and under the sea. There is so much more to learn about marine life, ecosystems, and the effects humans have on ocean health.

This season, your challenge is to dive into a problem faced by people who explore the oceans.

Start here ...

Identify and research a problem related to exploring the oceans.

Read the Project Sparks to see if one of the problems outlined interests your team. The Challenge story might also give you some ideas. You can choose to design a solution for one of the problems listed or do some research to identify a different problem. Conduct research to explore existing solutions to the problem and to determine what challenges are still faced. You may want to create something new or improve on an existing solution; that's what innovation is all about.

You can research your problem any way you like, but try to use multiple sources. After your team has researched your selected problem, develop a plan to test your ideas. It might be necessary to change or update parts of your solution as you learn more from testing your ideas or sharing with others. You may even find that your ideas about exploring the oceans lead you to solutions applicable to life on land.

Think about ...

Review the rubrics and the judging process.

Plan to share your experience developing your solution, including what you learned in your research and testing. Your work on the innovation project will be evaluated by judges at an event at the end of your season. Review the rubrics to understand what you should focus on telling the judges. They will be interested in the progress

you and your team have made this season, even if the work is still underway.

Create a prototype model or drawing that represents your innovative solution to help explain it to others and to the judges. Keep in mind that whether your problem is big or small, the impact it could have on someone, or something, could be huge.

Before the event ...

Prepare a live presentation to communicate your solution.

Your presentation should explain the problem you selected and the work you did to address it. Get creative! Think about how your team will summarize your work. The judges will ask questions when they want to know more and will provide the team with feedback. Make sure your whole team is involved in sharing your progress. Check out our event preparation video found in the season resources.



Innovation
Project
Resources

Project Sparks

Hi, I'm a **Marine Biologist**. I study shark migration patterns. My team and I use tracking devices to determine where and why sharks move throughout the ocean. We are interested in tracking some different species in the sunlight zone of the ocean. **Can you help me think of a better way to track a large school of fish?**



→ Sunlight Zone

Robot game mission models 1, 2, and 3 might inspire your project.

Hello, I'm a **Submarine Pilot** for an underwater engineering company. My job is to drive remotely operated vehicles (ROV) to inspect structures that are underwater. There are a lot of challenges, including low visibility, underwater currents, and high-pressure environments. **Can you help my team and me navigate through difficult conditions while keeping our equipment safe?**



→ Twilight Zone

Robot game mission models 8, 10, and 14 might inspire your project.

Hi, I am an **Oceanographer**. I am very interested in unlocking the mysteries of the deep sea. It can be difficult and expensive to study this part of the ocean. We don't always know what we are looking for – it might be an undiscovered species, a shipwreck, or a geological formation. **Can you help me improve the way we collect or analyze artifacts found in the abyss?**



→ Abyssal Zone

Robot game mission models 9, 11, and 15 might inspire your project.

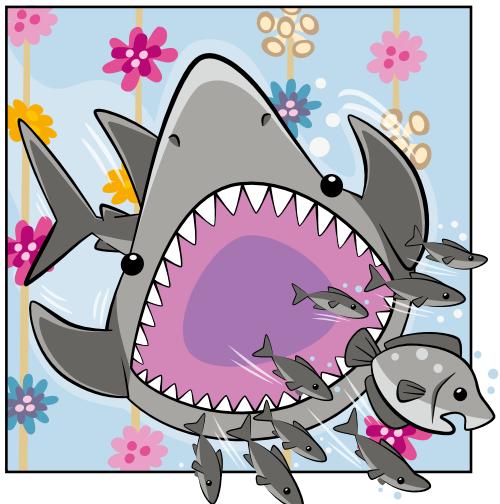
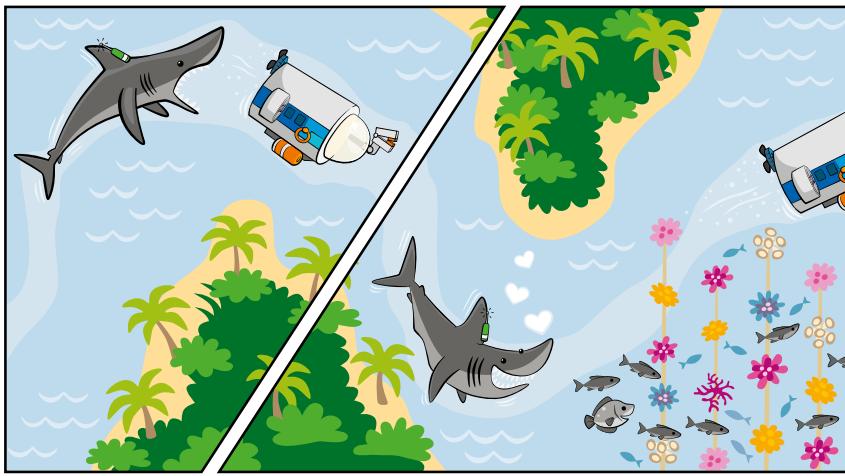
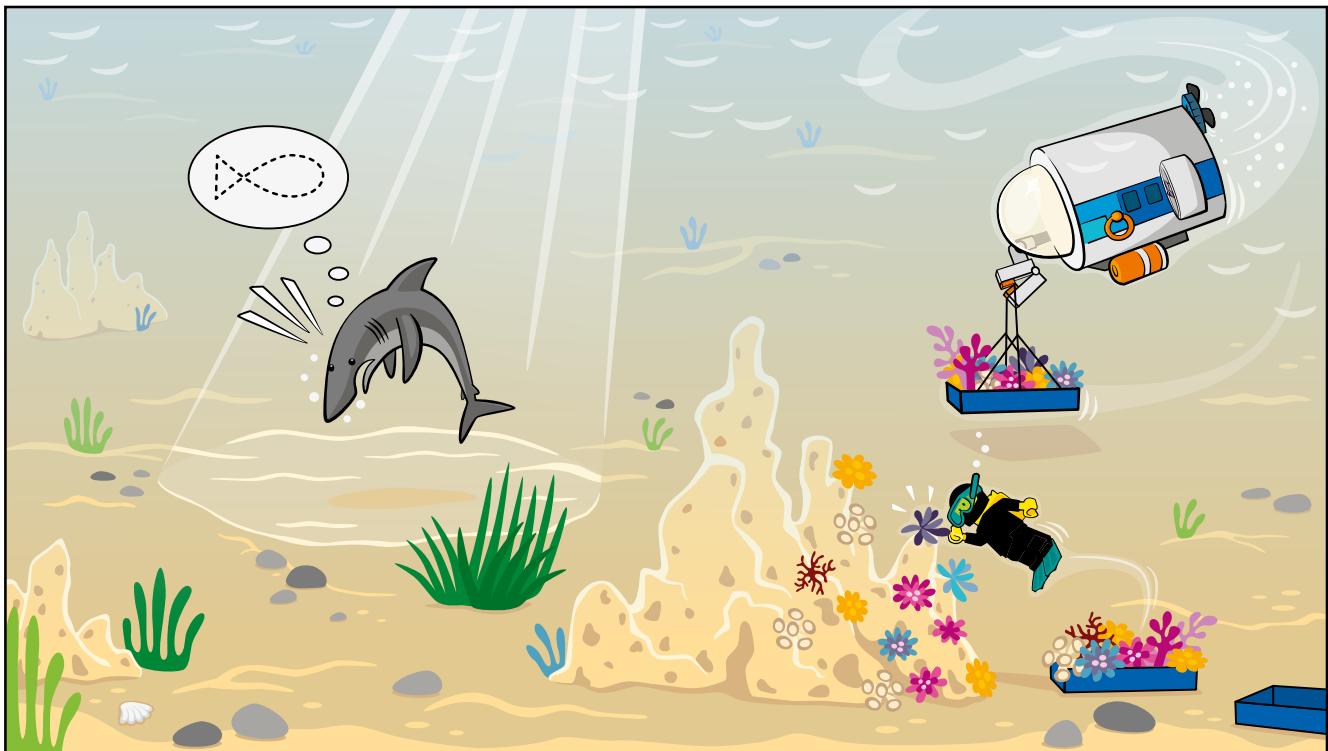
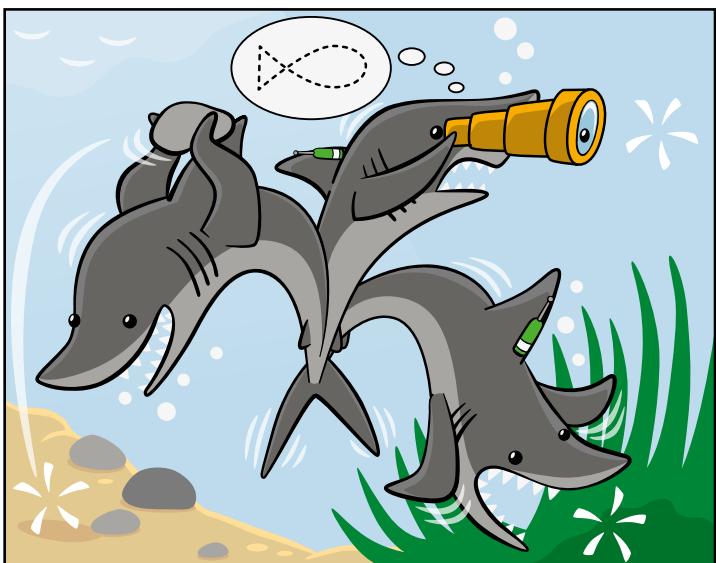
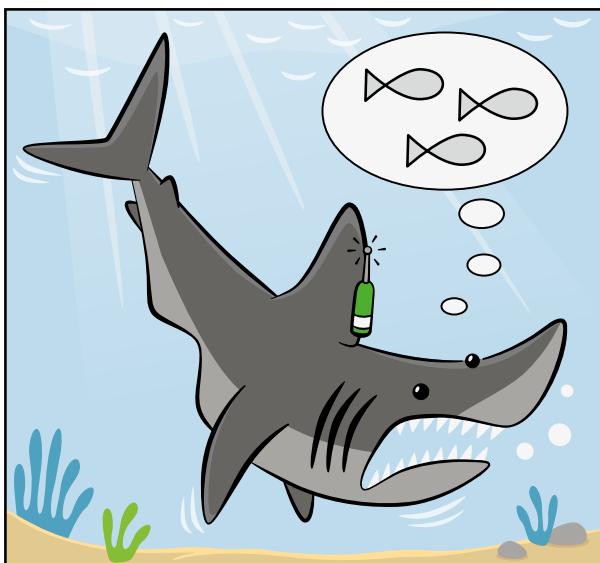
More ideas to explore:

Marine Researcher – living at sea during science expeditions
Ecologist – reducing human impact on marine ecosystems
Photographer – diving with specialized equipment

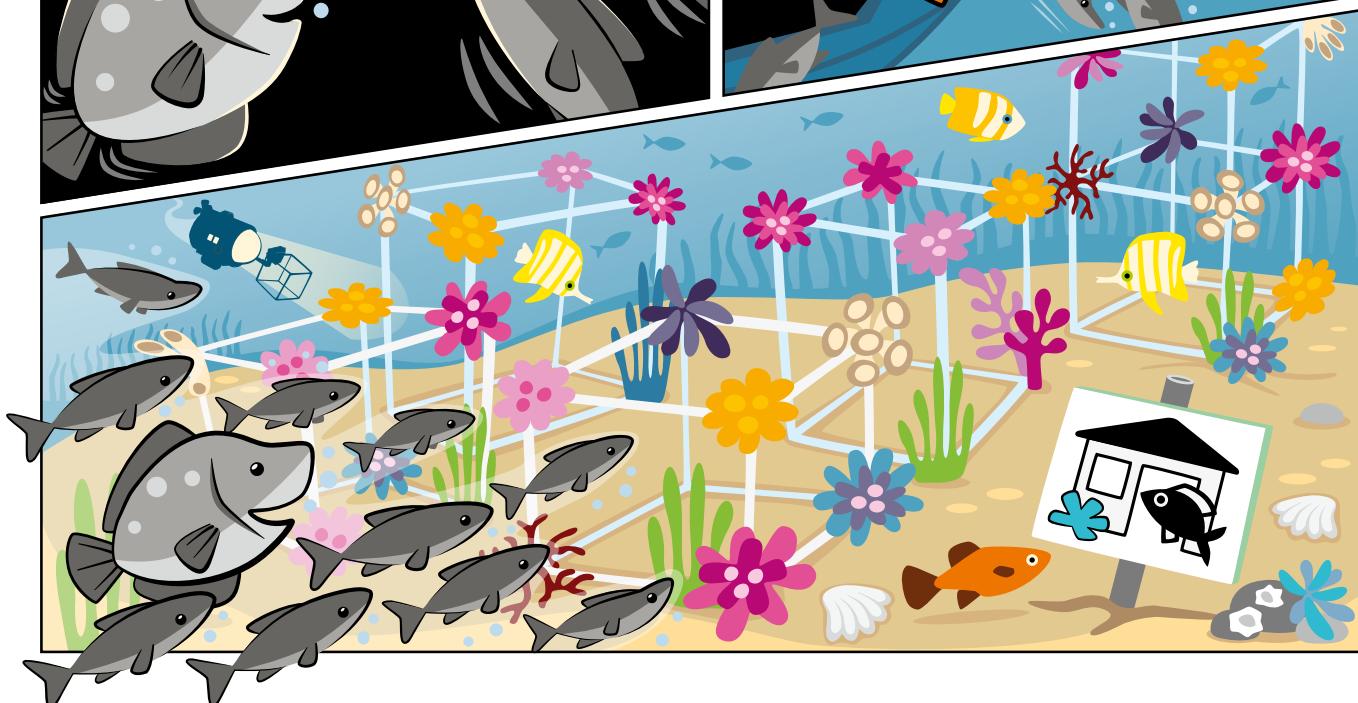
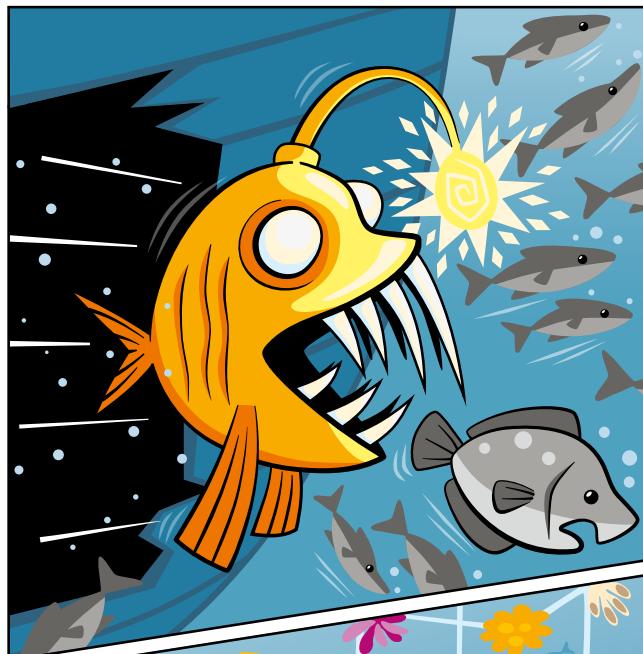
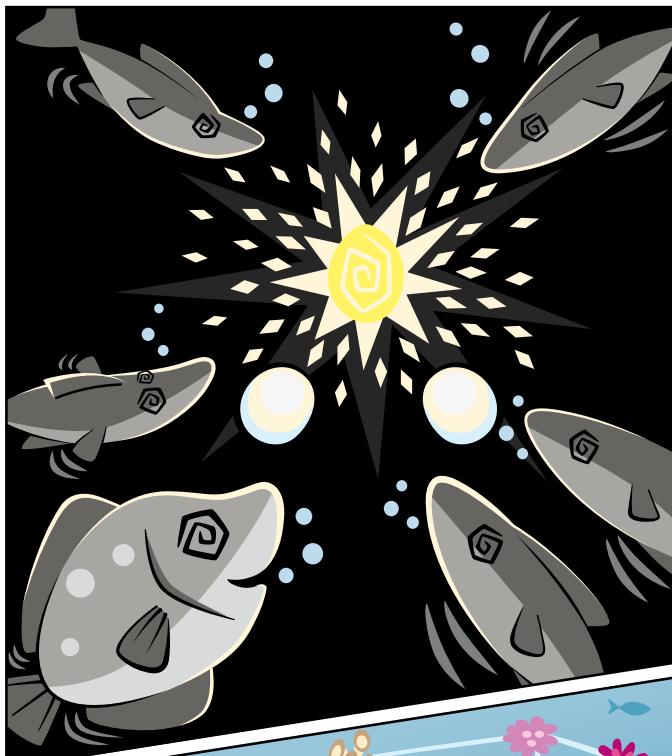
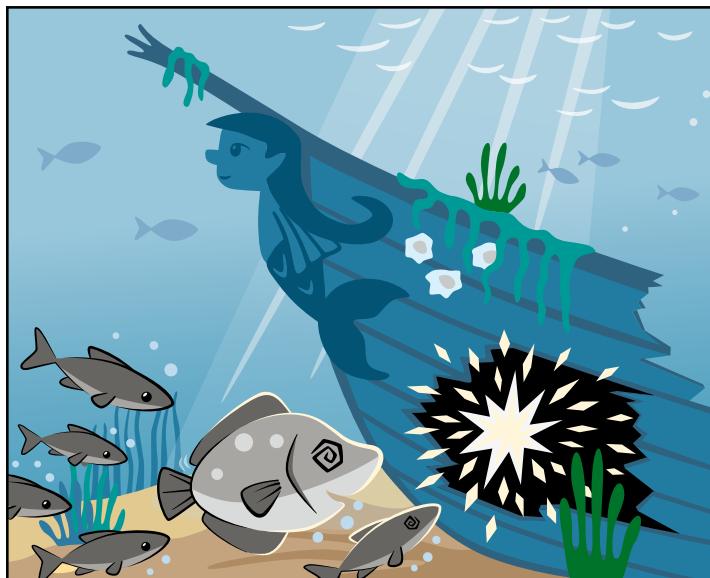
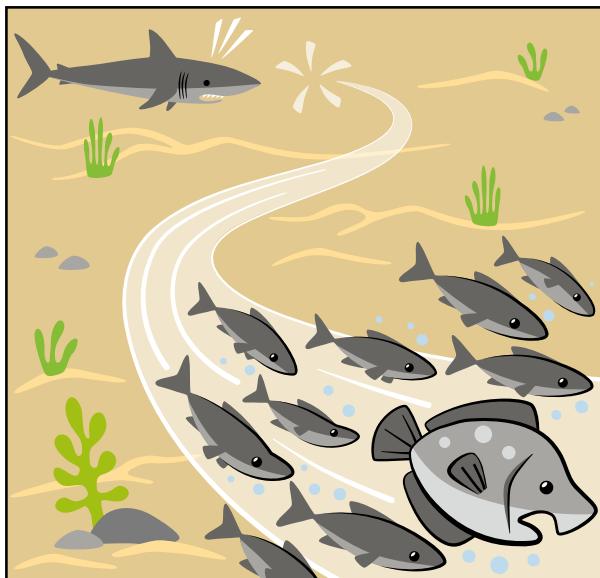
... or choose your own!

Explore all mission models and the Challenge story to inspire more project ideas!

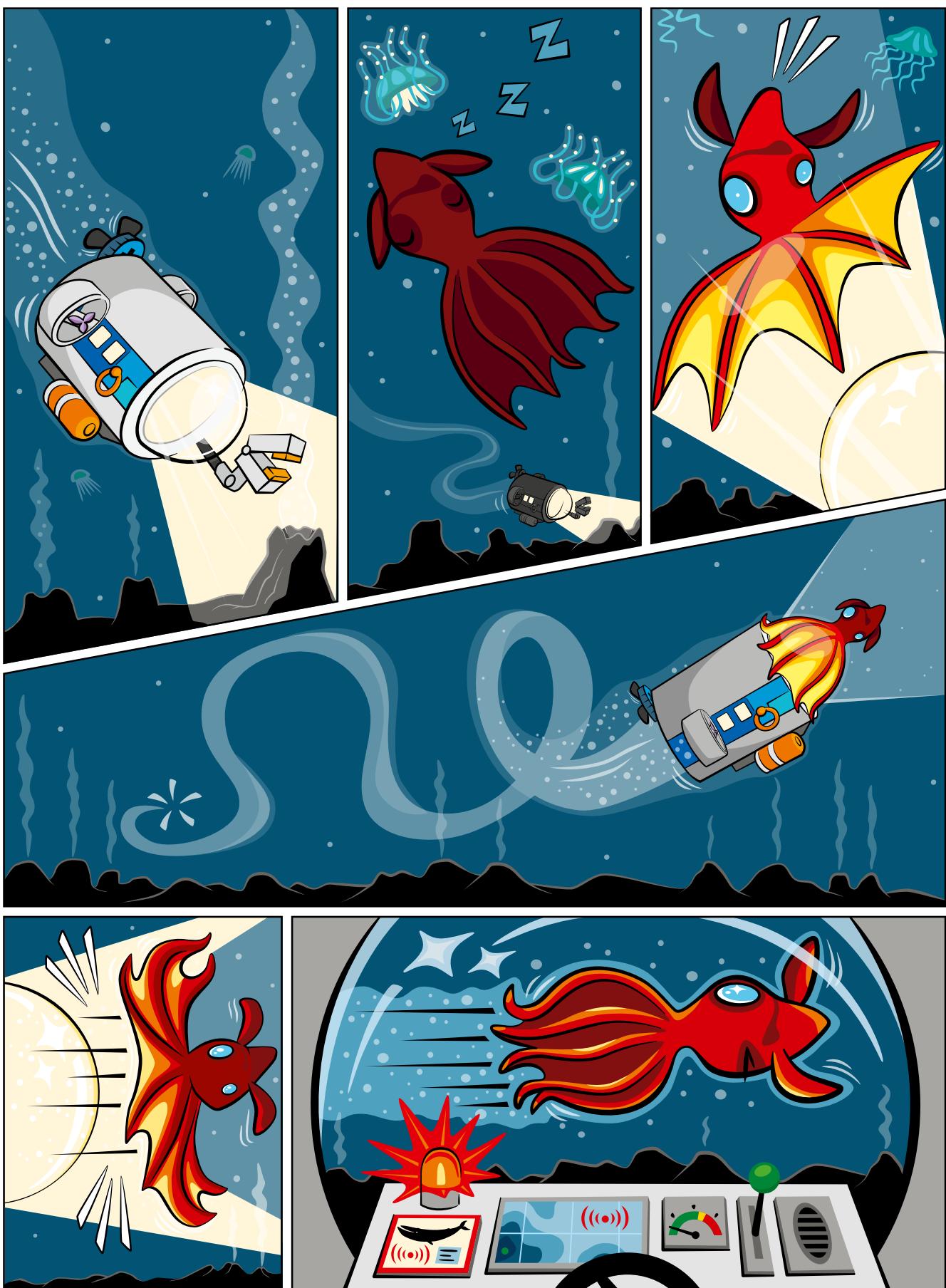
Challenge Story



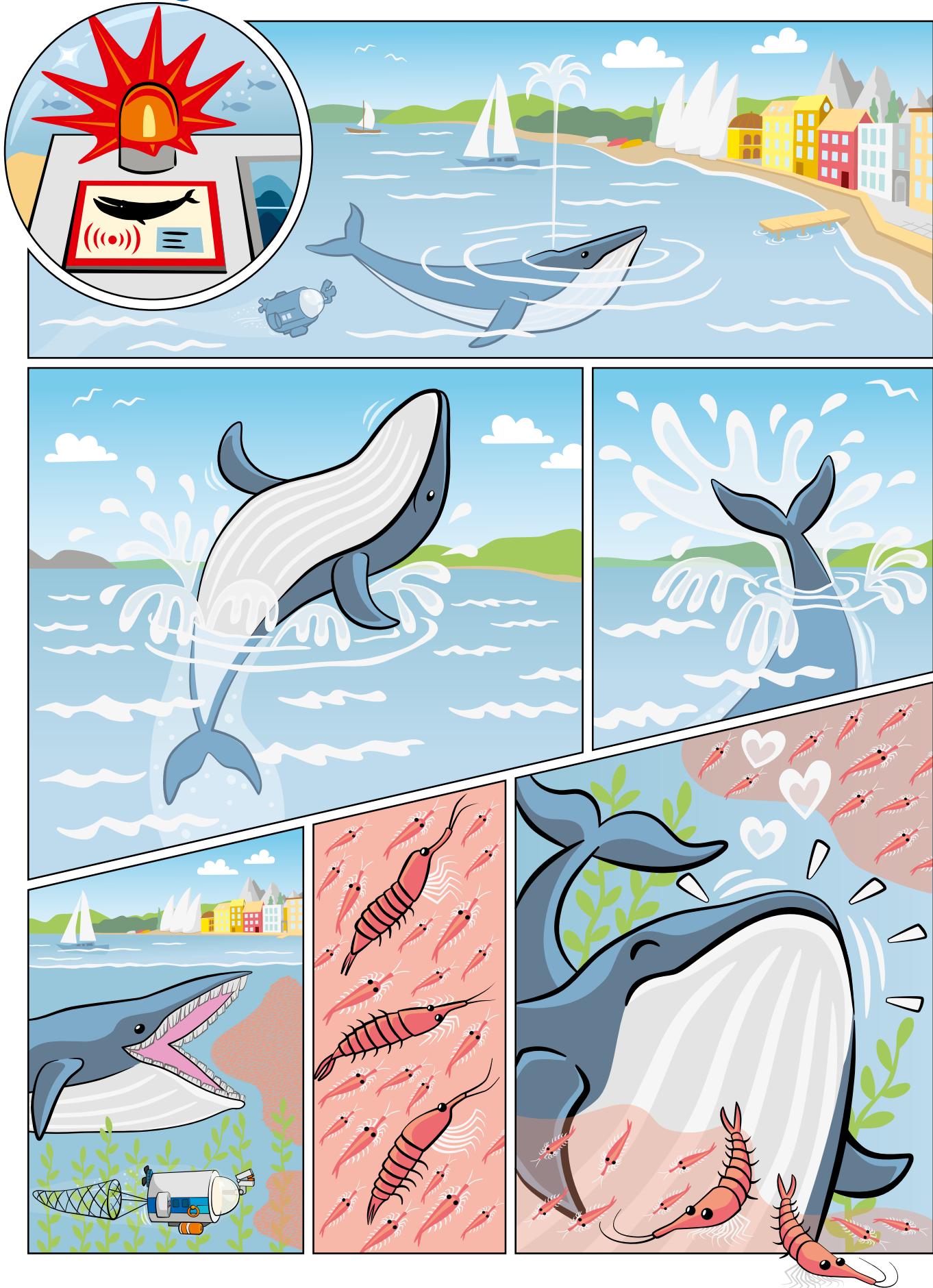
Challenge Story



Challenge Story



Challenge Story



Team Progress

Come back to this page throughout your season to update your team's goals and share your progress.

START HERE

My goals for this season are ...

HALFWAY THERE

So far, I have learned ...

I want to learn more about ...

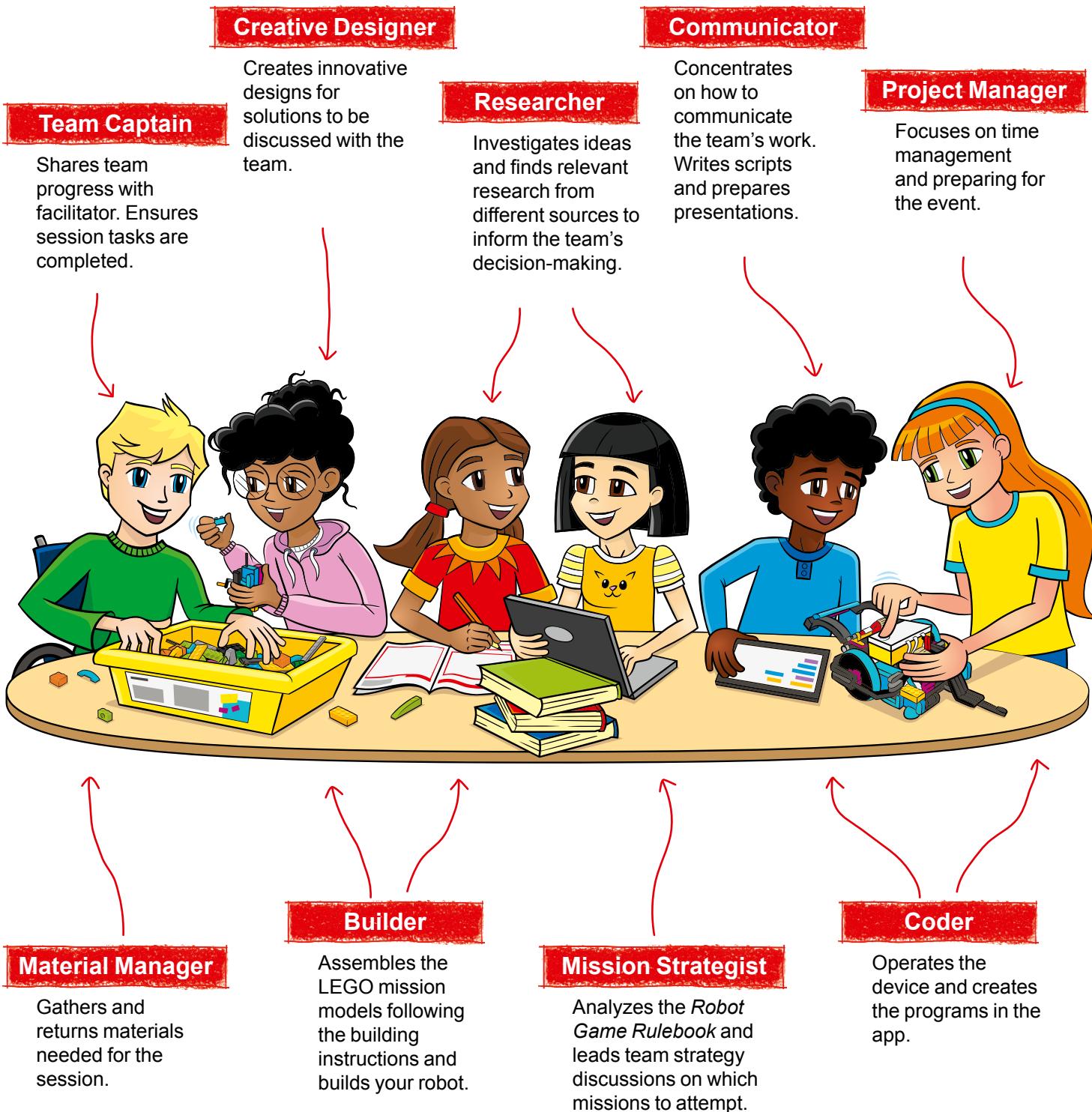
EVENT TIME

I am proud of my team because we ...

Team Roles

Here are sample roles your team can use during the sessions. Everyone on the team should experience each role throughout their *FIRST® LEGO® League*

Challenge experience. The goal is to build your team to be confident and capable in all aspects of *FIRST LEGO League Challenge*.



→ Introduction

- Watch the season videos and read [pages 3-11](#) to learn how FIRST® LEGO® League Challenge works and about the SUBMERGED™ robot game and innovation project.
- Get to know your team members and select your team name.

→ Tasks

- Dive in to the season theme by building the robot game mission models.
- Place each model where it belongs on the mat. Refer to the field setup section of the *Robot Game Rulebook*.
- Explore how the models work and how they might connect to the Project Sparks on [page 7](#).

→ Share

- Get together at the mat.
- Show how the mission models connect to the SUBMERGED™ theme.
- Discuss the reflection questions.
- Clean up your space.

→ Reflection Questions

- Which mission models look the most interesting to you?
- How do the models relate to the Challenge story or Project Sparks?
- What resources will you use to learn more about the season theme?



Session 1 Get Started

What are the four parts of FIRST LEGO League Challenge?

Our Notes:

Record your ideas during each team meeting!



The *Robot Game Rulebook* is a great resource to use throughout the season.

Session 2 Training Camp 1

Discovery: We explore new skills and ideas.

Our Notes:

Use these goal prompts for inspiration!

We will use Core Values to ...

We want to experience ...

We want our robot to ...

We want our innovation project to ...



→ Introduction

- Think about how you will use the Core Value of **discovery** in your team's journey.
- Record examples of how your team plans to investigate ideas and learn new skills.

→ Tasks (optional)

- Open the SPIKE™ app. Click the Start button.



Tutorial Activities: 1-6

- Check out the *Robot Game Rulebook* for mission details.

→ Tasks

- Open the SPIKE™ app. Find your lesson.



Competition Ready Unit: Training Camp 1: Driving Around

- Determine what coding and building skills you can apply in the robot game.
- See if you can use the skills you learned to drive your robot to one of the mission models.

→ Share

- Get together at the mat.
- Share the robot skills you learned.
- Chat about the reflection questions.
- Clean up your space.

→ Reflection Questions

- Which of the careers in the Project Sparks does your team want to explore more?
- How can you aim your robot toward a model?
- How did you use the engineering design process and team roles in this session?



Session 3 Training Camp 2

→ Introduction

- Review the innovation project page and the Project Sparks.
- Share your ideas for the project with your team. Make sure everyone has a chance to share.

→ Tasks

- Open the SPIKE™ app. Find your lesson.



Competition Ready Unit: Training Camp 2: Playing with Objects

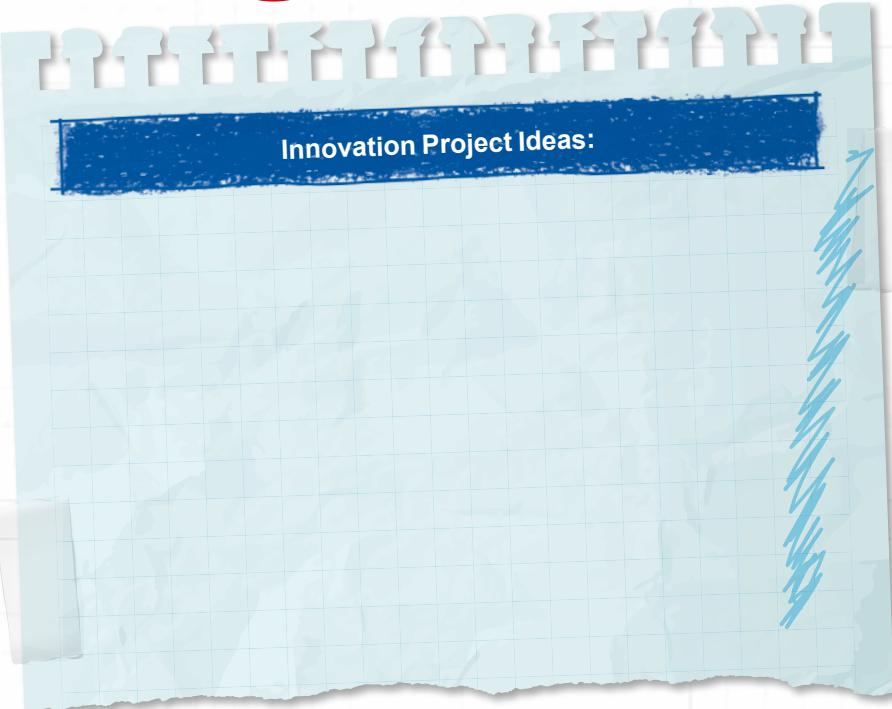
- Reflect on the skills you learned that will be beneficial in completing missions.
- Try it out! See if you can code your robot to attempt a mission.

→ Share

- Get together at the mat.
- Share the robot skills you learned.
- Chat about the reflection questions.
- Clean up your space.

→ Reflection Questions

- What research can you do to explore the ideas for your innovation project?
- What objects does your robot need to avoid?



Our Notes:



Session 4 Training Camp 3

Innovation Project Problem Ideas:

Our Notes:

→ Introduction

- Work as a team to narrow down your ideas for your innovation project problem.
- Record which problems are most interesting to your team.

→ Tasks

- Open the SPIKE™ app. Find your lesson.



Competition Ready
Unit: Training Camp 3:
Reacting to Lines

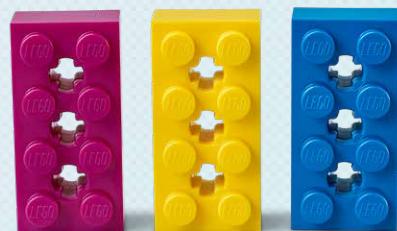
- Determine what building and coding skills will help you in the robot game.
- Try it out! See if you can use the skills you learned to attempt another mission.

→ Share

- Get together at the mat.
- Share the robot skills you learned.
- Chat about the reflection questions.
- Clean up your space.

→ Reflection Questions

- How did testing and debugging your program help make your robot more accurate?
- How could you use the lines on the mat in your mission strategy?
- What do you want the focus of your innovation project to be?



→ Introduction

- Think about **teamwork** and your team.
- Record examples of how your team has learned to work together.

→ Tasks

- Open the SPIKE™ app. Find your lesson.



Competition Ready
Unit: Guided Mission

- Read over the guided mission.
- Have fun practicing this guided mission until it works perfectly.

→ Reflection Questions

- What does the guided mission teach you about *Coopertition*®?
- How could you change the program so that the mission works when you start the robot from the opposite launch area?

Session 5 Investigate Ideas

Teamwork: We are stronger when we work together.

John

10 Send over the Submersible



Some waters are too difficult to reach with larger ships. Send the submersible to explore the opposing field's waters.

- If your team's yellow flag is down: 30
- If the submersible is clearly closer to the opposing field: 10

*Teams may not block the opposing team.
It is not possible to earn the bonus in remote
competitions or if there is no opposing team.*

Guided Mission: Mission 10: "Send over the Submersible"

1. To help you learn about navigating and interacting with a model, complete this guided mission.
2. In the app, download the program that solves this mission.
3. Start your robot in the correct position in the left launch area. Run your robot and watch it complete the mission and score the points.
4. Like all the mission models, Mission 10: "Send over the Submersible" might inspire you to think of a solution for your innovation project.
5. Think about how to incorporate the Submersible mission into your mission strategy.
6. Apply your new line-following skill to a different mission model.

PROBLEMS

Problem Statement:

Research Findings:

→ Tasks

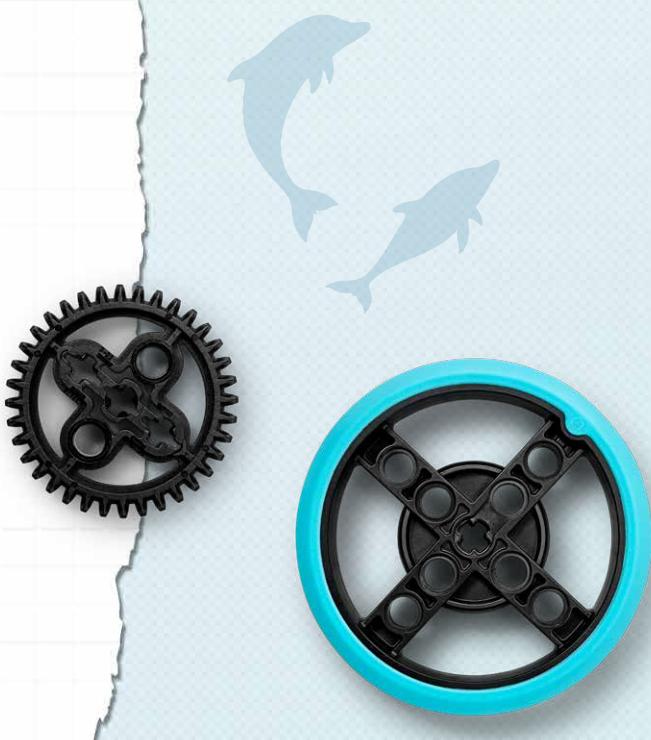
- Identify the problem your team will solve and record your problem statement.
- Think about why the problem exists and who or what is affected.
- Research the problem you have chosen.
- Use this page to capture your research.

→ Share

- Get together at the mat.
- Show how your robot scores points on the guided mission.
- Discuss the problem your team has identified and think about next steps.
- Discuss the reflection questions.
- Clean up your space.

→ Reflection Questions

- What problem did you decide to solve?
- Is there someone you can talk to that is knowledgeable about the problem?



Session 6 Identify Solutions

→ Introduction

- Think about what your team has learned so far and discuss what you still want to explore.
- Record what your team wants to continue to work on.

→ Tasks

- Review the “Robot Game Missions” video and *Robot Game Rulebook*.
- Discuss which missions your team will attempt first. Start to develop a mission strategy.
- Come up with a plan to effectively test and improve your robot.
- Complete [page 22](#), Pseudocode.
- Think about how the program will make your robot act.
- Revisit the earlier lessons or do the optional lesson listed here.



Competition Ready Unit: Assembling an Advanced Driving Base

→ Reflection Questions

- How could you use the lines on the mat to help you navigate your robot?
- How did you use the engineering design process to create your mission strategy?

Pseudocode is a written description of the steps for your planned robot program.

What does our team need to spend more time on?

Robot Game Strategy Notes:



PROBLEM AND SOLUTION ANALYSIS

Record important information here:

→ Tasks

- Continue to research the problem you chose and any existing solutions.
- Make a plan for how you will develop your solution. Use [page 23](#), Innovation Project Planning, as a tool.
- Use a variety of sources and keep track of them on the Innovation Project Planning page.
- Select your project's final solution as a team.

→ Share

- Get together at the mat.
- Review your Pseudocode page. Make changes to the page if necessary.
- Explain what you discovered in your project research and discuss any solution ideas.
- Discuss the reflection questions. Clean up your space.

→ Reflection Questions

- What types of improvements do existing solutions need?
- What are your innovative ideas to solve the problem?

Guiding Questions:

- What questions are you trying to answer?
- What information are you looking for?

- Can you use different types of sources such as credible websites, videos, books, or experts?
- Does your source have information relevant to your project?
- Is this a good and accurate source of information?
- How do your innovation project plans connect with the innovation project rubric?

???



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

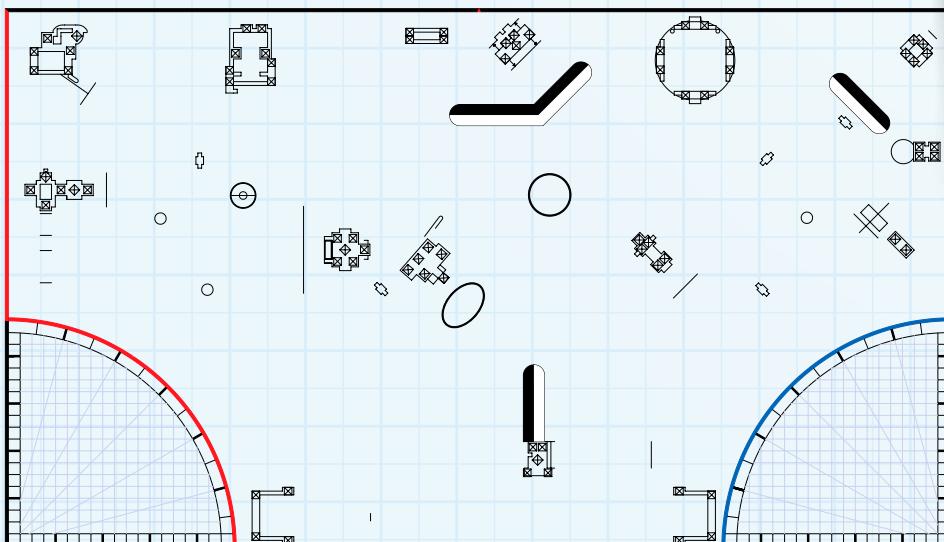
Move 9

Move 5

Move 10

ROBOT PATH DIAGRAM

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



Go to the app and start a new project. Explore which coding blocks will move your robot the same way as your planned coding steps would move it.

Complete this page in Session 6.

Innovation Project Planning

PROCESS

Describe the process you followed to develop your innovative solution.

SOURCES

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

1.

2.

3.

Complete this page in Session 6.

Session 7 Create Solutions

→ Introduction

- Think about *Gracious Professionalism*®.
- Write ways your team will demonstrate this in everything you do.
- Look over page 6 in the *Robot Game Rulebook* to see how *Gracious Professionalism* is evaluated during the tournament.

→ Tasks

- Continue to develop your robot and its attachments to complete missions in the robot game.
- You can improve the existing robot used in the previous sessions or create a new design.
- Create a program for each new mission you attempt. You could combine mission solutions into one program.
- Test and improve your robot and its programs.
- Revisit previous lessons to develop your coding skills or work on solving the missions.

→ Reflection Questions

- Practice explaining how the program on your device is making your robot move.
- How can you iterate and improve on the existing robot design used in previous sessions?

Gracious Professionalism:

We show high-quality work, emphasize the value of others, and respect individuals and the community.

Robot Design:

You could modify the existing robot you've used in past sessions.

Project Sketch



Project Description:

→ Tasks

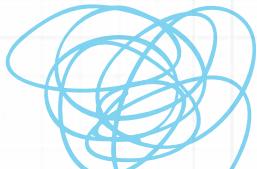
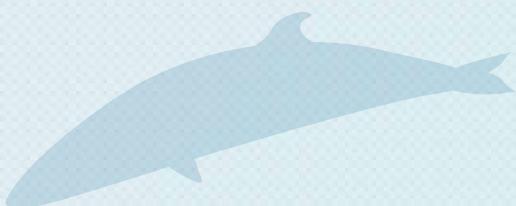
- Develop and create your innovation project solution.
- Sketch your solution.
- Describe your solution and explain how it solves the problem.
- Create a prototype, model, or drawing of your solution.
- Continue to document the process you use to develop your solution on [page 23](#), Innovation Project Planning.

→ Share

- Get together at the mat.
 - Show any missions you are working on or have completed.
 - Discuss your research and your innovation project solution.
 - Discuss the reflection questions.
- Clean up your space.

→ Reflection Questions

- Can you describe your innovative solution in less than five minutes?
- How does your solution address your identified problem?
- Who can you share your solution with for feedback?



→ Introduction

- Reflect on **Coopertition®**.
- Note ways your team will demonstrate this at an event.

→ Tasks

- Decide which mission to attempt next.
- Think about your mission strategy and plan.
- Build any attachments you need to complete missions.
- Iterate and refine your program so your robot completes the mission reliably.
- Be sure to document your design process and testing for each mission!

→ Reflection Questions

- How has your team used Core Values to develop your robot solution?
- In what order will you run the missions in the robot game?



Session 8 Continue Creating

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

Robot Design Process Notes:

Guiding Questions:

- Describe the attachments you built.
- Explain your different programs and what the robot will do.

- How did you test your programs and attachments?
- What changes did you make to your robot and programs?
- How does your robot plan connect with the robot design rubric?

???

Plan to Share:

→ Tasks

- Make a plan to share about your project solution with others.
- Decide what feedback to use to iterate on your solution.
- Determine if you can do any testing of your solution.

→ Share

- Get together at the mat.
 - Show any missions you are working on or have completed.
 - Discuss how you will improve your project and decide what to work on next.
 - Discuss the reflection questions.
- Clean up your space.

→ Reflection Questions

- How can you test your innovation project solution?
- How will you know if your solution is going to make a positive impact on others?

Project Notes:



Session 9 Solution Planning

→ Introduction

- Think about **innovation** and your team.
- Record examples of how your team has been creative and solved problems.

→ Tasks

- Think about your mission strategy on the mat and the missions you will solve.
- Continue to create a solution for each mission as time allows.
- Test, iterate, and improve your robot and innovation project solutions. Be sure to document what happens in each step.

→ Share

- Get together at the mat.
- Show the work completed on the innovation project and robot game.
- Talk about how you will demonstrate Core Values at the event and judging session.
- Clean up your space.

→ Reflection Questions

- What features on your robot show good mechanics?
- What changes have you made to your innovation project based on feedback from others?
- What progress have you made on the goals you set on [page 12](#)?

Innovation: We use creativity and persistence to solve problems.

Iterations and Improvements:

Session 10 Iterate Solutions

Impact: We apply what we learn to improve our world.

Presentation Outline:

→ Introduction

- Think about **impact** and your team.
- Record examples of how your team has had a positive influence on you and others.

→ Tasks

- Plan out your project presentation. Refer to the innovation project rubric for what to cover.
- Write out your innovation project presentation script.
- Make any props or displays that you need. Be engaging and creative!
- Continue to create, test, and iterate on your robot solution.
- Practice a 2.5-minute robot game with all your completed missions.

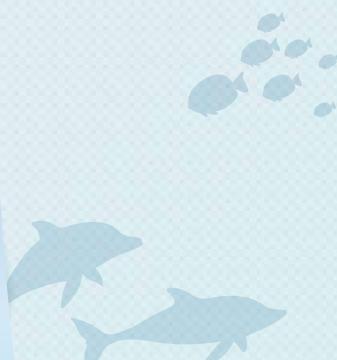
→ Share

- Get together at the mat.
- Share the project presentation work completed.
- Share what missions you have completed.
- Discuss how everyone will be involved in the presentation.
- Discuss the reflection questions and clean up your space.

→ Reflection Questions

- How did you decide which missions to attempt?
- How could your innovation project help your community?
- What skills have you developed throughout your SUBMERGEDSM experience?

How will your innovation project solution have an impact on others?



→ Introduction

- Think about **inclusion** and your team.
- Record examples of how your team makes sure everyone is respected and their voices are heard.

→ Tasks

- Continue working on your innovation project presentation.
- Plan and write out your robot design explanation. Refer to the robot design rubric for what to cover.
- Make sure everyone can communicate about your design process and programs.
- Determine what each person on the team will say.
- Practice your full explanation.

→ Share

- Get together at the mat.
- Discuss the presentation and each person's role.
- Run a practice 2.5-minute match and explain what missions were done.
- Discuss the reflection questions.
- Decide what else needs to be done and clean up your space.

→ Reflection Questions

- What will you do if one mission does not work?
- How is everyone involved in the presentation?
- How has *FIRST® LEGO®* League impacted you?

Review the judging session flowchart to see how you will share about your innovation project and robot design.

Session 11 Presentation Planning

Inclusion: We respect each other and embrace our differences.

Robot Design Explanation Outline:

Session 12 Communicate Solutions

Fun: We enjoy and celebrate what we do!

Presentation Feedback:

→ Introduction

- Reflect on how your team has had **fun** while exploring the season theme.
- Record examples of how your team has had fun throughout this experience.
- Think about your team's goals. Did you meet them?

→ Tasks

- Rehearse your full presentation communicating your innovation project and robot design work.
- Demonstrate Core Values when you present.
- Practice multiple 2.5-minute robot game matches.
- Review [page 32](#), Prepare for Your Event, and [page 33](#), Rubrics.

→ Share

- Review the judging rubrics and robot game score sheets.
- Provide helpful feedback after the presentation to each other based on the rubrics.
- Discuss the reflection questions. Clean up your space.

→ Reflection Questions

- What is your plan for having any LEGO® attachments ready for the robot game?
- What has your team accomplished?

Have more time?
Continue solving
missions and
working on
your innovation
project before
your event!

Prepare for Your Event

- Make a list of what you need to bring to your event. Read over the event day schedule.**
- Think about your team.**
How will each person on the team participate in the live presentations and at the robot game?
- Reflect on the Core Values your team has used.**
How did you make sure every team member was involved and could share their ideas? What did your team learn from working together on your project and robot this season? Can you provide examples of how your team using Core Values and demonstrating *Gracious Professionalism*®?
- Think about all the work you've done on the innovation project.**
Can you describe the problem you chose and how it connects to the season theme? Can you describe

the steps your team took to create, share, and iterate on your project solution? What is innovative about your solution and how could it help others?

- Talk about the programs and attachments you've created for your robot.**
How do your programs match your mission strategy? How do your programs make your robot act?
- Think about your robot design.**
Which missions did your team attempt to solve and why? What resources helped your team learn how to build and code your robot? How will you describe your team's testing plan and what improvements you made along the way?

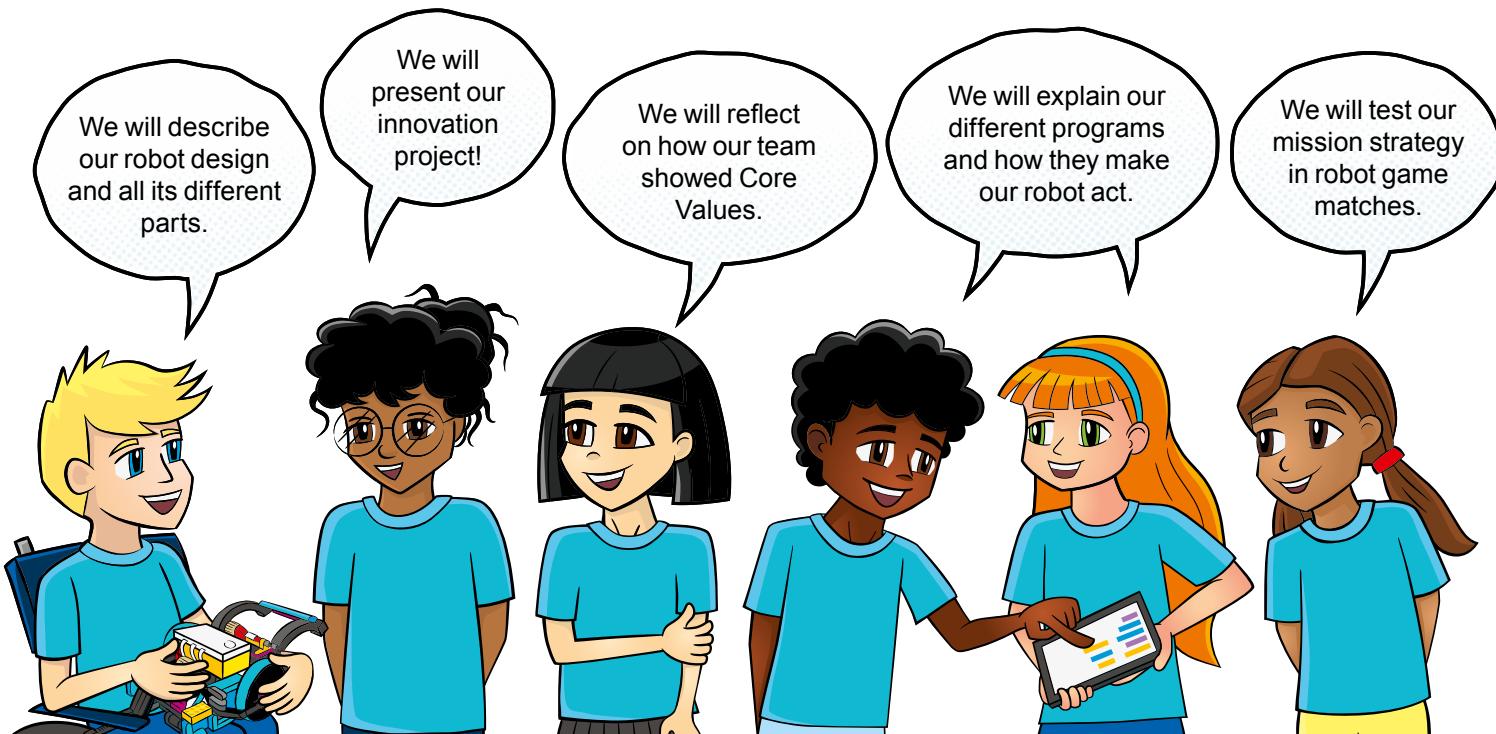
What to Expect at Your Event

- Your team should have fun and show team spirit and enthusiasm at the event. Be sure to display Core Values in everything you do.
- Your whole team will meet with the judges in a single judging session to share your team's journey throughout the season. Think about what you have achieved and what challenges you have faced and overcome.

- You will be able to test your mission strategy by competing in matches at the robot game. You will have several chances to compete, but only your highest score counts.



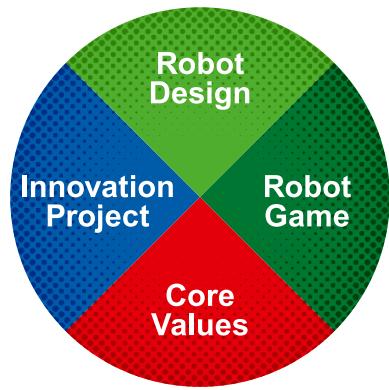
Watch this video to prepare for your event.



Rubrics

FIRST® LEGO® League is evaluated equally in four areas: Core Values, Innovation Project, Robot Design, and Robot Game. The judges and referees use the rubrics and robot game scoresheets to make this evaluation.

Make sure you are familiar with the rubrics. It is your team's job to explain everything to the judges during the session. Judges will ask questions about your work and give feedback at the end of the session.



Judging Session Feedback	
Team Name:	Judging Room:
Instructions	
This sheet should be used by the judges after feedback following the Innovation Project presentation and Robot Game competition. The FIRST® LEGO® League judges will evaluate the team based on the following criteria: The following page contains the scoresheets for the judges to use. The judges will be asked to leave their feedback at the end of the event.	
Great Job!	Think about...
Core Values - How did the team demonstrate research, discovery, inclusion, innovation, impact, and/or their spirit?	
Innovation Project - How did the team identify and implement a solution connected to the season theme?	
Robot Design - How did the team approach solving robot game missions using building and coding?	
<small>If the team is a candidate for one of these awards, please list the appropriate box. Check with your referee if you are not sure what they mean.</small>	
<input type="checkbox"/> Breakthrough Award - A team that makes significant progress in their confidence and capability in at least one area of the season. <input type="checkbox"/> Rising Star - A team that the judges notice and expect great things from in the future. <input type="checkbox"/> Methods - A team that embodies the culture of FIRST® LEGO® League through building, discovery, and problem solving.	

Innovation Project			
Team Name:	Judging Room:		
Instructions			
Teams should communicate to the judges their achievement in each of the following criteria. These should be listed in the order of the following sections: Discovery, Research, Impact, Inclusion, Innovation, and Spirit. Judges are required to tick one box on each separate row to indicate the level the team has achieved in that specific area. The judges will be asked to leave their feedback at the end of the event.			
BEGINNING	DEVELOPING	ACCOMPLISHED	EXCITED
How did the team accomplish this?			
IDENTIFY - Team identified what problem they were presented <input type="checkbox"/> Minor identification of problem <input type="checkbox"/> Partial identification of problem <input checked="" type="checkbox"/> Clear definition of the problem <input type="checkbox"/> Clear research from others DESIGN - Team worked together while creating a plan and drawing their ideas <input type="checkbox"/> Minor avoidance of risk <input type="checkbox"/> Partial avoidance of risk <input checked="" type="checkbox"/> Clear avoidance of risk <input type="checkbox"/> Clear communication of risk CREATE - Team executed an original idea or built an existing one with a problem modification to connect them together <input type="checkbox"/> Minor modification of idea <input type="checkbox"/> Partial modification of idea <input checked="" type="checkbox"/> Clear modification of idea <input type="checkbox"/> Clear communication of idea ITERATE - Team shared their ideas with others, collected feedback, and included improvements to their solution <input type="checkbox"/> Minor sharing of ideas <input type="checkbox"/> Partial sharing of ideas <input checked="" type="checkbox"/> Clear sharing of ideas <input type="checkbox"/> Clear communication of ideas COMMUNICATE - Team shared an effective presentation of their solution, its impact on others, and outcomes for their project <input type="checkbox"/> Minor sharing of impact <input type="checkbox"/> Partial sharing of impact <input checked="" type="checkbox"/> Clear sharing of impact <input type="checkbox"/> Clear communication of impact			

Robot Design			
Team Name:	Judging Room:		
Instructions			
Teams should communicate to the judges their achievement in each of the following criteria. These should be listed in the order of the following sections: Discovery, Research, Impact, Inclusion, Innovation, and Spirit. Judges are required to tick one box on each separate row to indicate the level the team has achieved in that specific area. The judges will be asked to leave their feedback at the end of the event.			
BEGINNING	DEVELOPING	ACCOMPLISHED	EXCITED
How did the team accomplish this?			
IDENTIFY - Team identified what problem they were presented <input type="checkbox"/> Minor identification of problem <input type="checkbox"/> Partial identification of problem <input checked="" type="checkbox"/> Clear identification of problem <input type="checkbox"/> Clear communication of problem DESIGN - Team generated innovative ideas independently before collecting and combining them <input type="checkbox"/> Minor avoidance of risk <input type="checkbox"/> Partial avoidance of risk <input checked="" type="checkbox"/> Clear avoidance of risk <input type="checkbox"/> Clear communication of risk CREATE - Team members worked independently on their design and combined them using tools <input type="checkbox"/> Minor modification of idea <input type="checkbox"/> Partial modification of idea <input checked="" type="checkbox"/> Clear modification of idea <input type="checkbox"/> Clear communication of idea ITERATE - Team modified their design and communicated changes according to their mentor's critique <input type="checkbox"/> Minor sharing of ideas <input type="checkbox"/> Partial sharing of ideas <input checked="" type="checkbox"/> Clear sharing of ideas <input type="checkbox"/> Clear communication of ideas COMMUNICATE - Team effectively communicated their final design to others and explained how it solves the problem <input type="checkbox"/> Minor sharing of impact <input type="checkbox"/> Partial sharing of impact <input checked="" type="checkbox"/> Clear sharing of impact <input type="checkbox"/> Clear communication of impact			

Class Pack Rubric	
Team Name:	Judging Room:
Instructions	
Judges are required to tick one box on each separate row to indicate the level the team has achieved in that specific area. The judges will be asked to leave their feedback at the end of the event.	
Innovation Project <input type="checkbox"/> Minor identification of problem <input type="checkbox"/> Partial identification of problem <input checked="" type="checkbox"/> Clear identification of problem <input type="checkbox"/> Clear communication of problem Robot Design <input type="checkbox"/> Minor identification of problem <input type="checkbox"/> Partial identification of problem <input checked="" type="checkbox"/> Clear identification of problem <input type="checkbox"/> Clear communication of problem Core Values <input type="checkbox"/> Minor avoidance of risk <input type="checkbox"/> Partial avoidance of risk <input checked="" type="checkbox"/> Clear avoidance of risk <input type="checkbox"/> Clear communication of risk Discovery <input type="checkbox"/> Minor research skills and ideas <input type="checkbox"/> Partial research skills and ideas <input checked="" type="checkbox"/> Clear research skills and ideas <input type="checkbox"/> Clear communication of research skills and ideas Impact <input type="checkbox"/> Minor impact to their community <input type="checkbox"/> Partial impact to their community <input checked="" type="checkbox"/> Clear impact to their community <input type="checkbox"/> Clear communication of impact Inclusion <input type="checkbox"/> Minor inclusion of others <input type="checkbox"/> Partial inclusion of others <input checked="" type="checkbox"/> Clear inclusion of others <input type="checkbox"/> Clear communication of inclusion Teamwork <input type="checkbox"/> Minor teamwork <input type="checkbox"/> Partial teamwork <input checked="" type="checkbox"/> Clear teamwork <input type="checkbox"/> Clear communication of teamwork Excellence <input type="checkbox"/> Minor achievement <input type="checkbox"/> Partial achievement <input checked="" type="checkbox"/> Clear achievement <input type="checkbox"/> Clear communication of achievement	
Great Job!	Think about...
Feedback Comments	

Team Rubrics



Rubrics



FIRST LEGO League teams express their Core Values through *Gracious Professionalism*®. This will be evaluated by referees for each team at every robot game match.

During the robot game, up to four team members can be at the table during the 2.5-minute match. You can tag in other team members for different missions.



Career Connections



Marine Biologist

A marine biologist studies ocean ecosystems and ocean life. Their focus might be on large animals like whales and dolphins or small organisms like plankton and algae.



Oceanographer

Oceanographers study a wide range of ocean concepts. These scientists might research the seafloor, water chemistry, or coastal erosion and waves.



Submarine Pilot

A submarine pilot is responsible for driving underwater vehicles that may or may not have passengers. This specialized role requires training to ensure the safety of the passengers and the environment.

Exploration

(Recommend completing after Session 4 or 9)

Look at the careers on these pages. Choose a job role, research it, and answer the questions.

- Explain the job. What are some of this job's daily tasks?
- What education or training is required?
- What is this job's yearly salary?
- What companies could people in this job work for?

Fields of Study

- Oceanography
- Marine Biology
- Coastal Management
- Marine Chemistry
- Geology
- Marine Technology
- Underwater Photography



Ecologist

An ecologist studies the relationship between living things and their environment. They might investigate how coral adapts to changing conditions or what plants are growing along the seashore.



Underwater Photographer

Underwater photographers give people a chance to see what is beneath the ocean surface. This job requires specialized equipment and dive training.



Marine Educator

A marine educator teaches people about the oceans. They might also conduct research of their own. This role can cover a wide range of ocean topics including history, science, and ocean conservation.

Reflection

(Recommend completing after Session 12)

Look at the careers on these pages. Think about these jobs and what interests you.

- What skills are needed in these jobs?
- What interests you about these jobs?
- Think about what other jobs relate to studying the oceans.
- Can you explore one of these jobs for more information?



Career
Resources

Team Journey



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