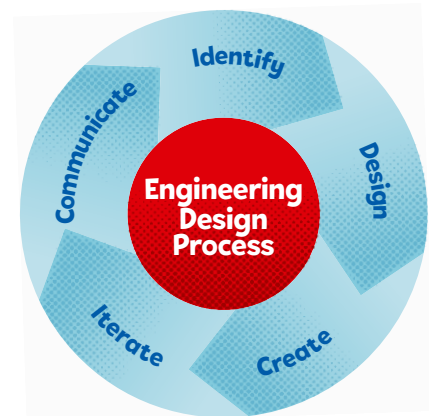


Welcome!



This overview of the *FIRST*® LEGO® League Challenge *SUBMERGED*™ season, a part of the *FIRST*® *DIVE*™ season presented by Qualcomm, can be used to introduce the season theme and as a reference when working through the sessions outline in the *Engineering Notebook*.

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



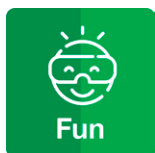
We are stronger when we work together.



We respect each other and embrace our differences.



We apply what we learn to improve our world.



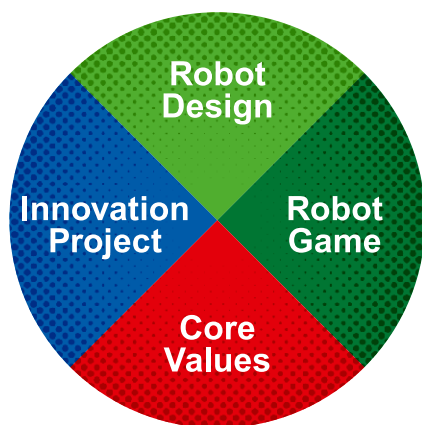
We enjoy and celebrate what we do!



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.

Your team should have fun and show team spirit and enthusiasm at the event. Be sure to display Core Values in everything you do.



Watch this video to prepare for your event.

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

Your team will:

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

- 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:

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

- **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:

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

- 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:

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

- **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.

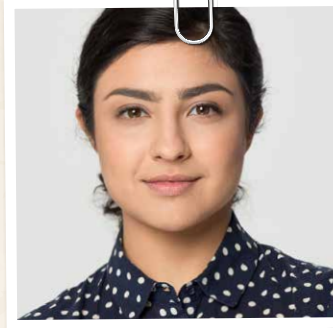
Your presentation should explain the problem you selected and the work you did to address it. Get creative! Think about how your team will summarize your work. The judges will ask questions when they want to know more and will provide the team with feedback. Make sure your whole team is involved in sharing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



**Innovation
Project
Resources**

Project Sparks

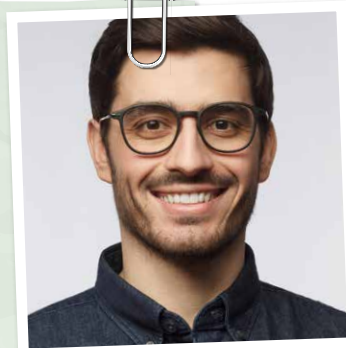
Hi, I'm a **Marine Biologist**. I study shark migration patterns. My team and I use tracking devices to determine where and why sharks move throughout the ocean. We are interested in tracking some different species in the sunlight zone of the ocean. **Can you help me think of a better way to track a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

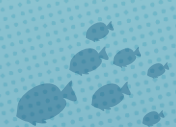
Robot game mission models 9, 11, and 15 might inspire your project.

More ideas to explore:

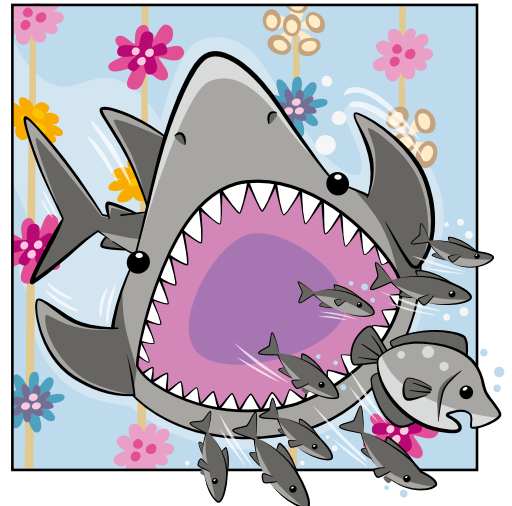
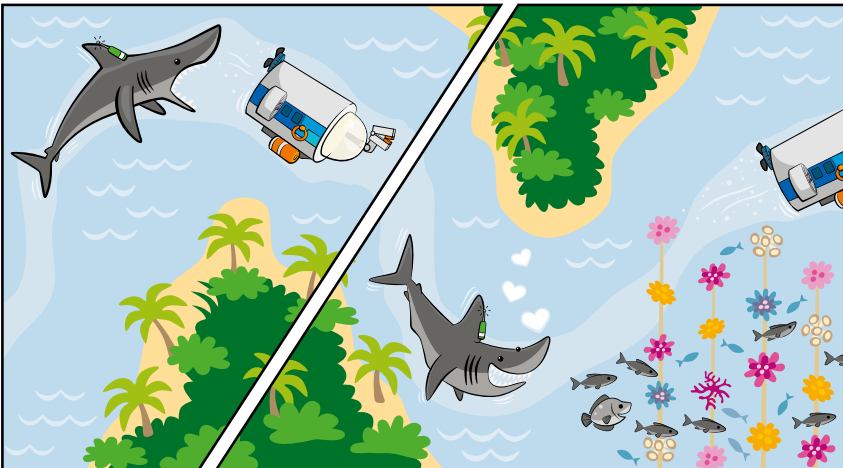
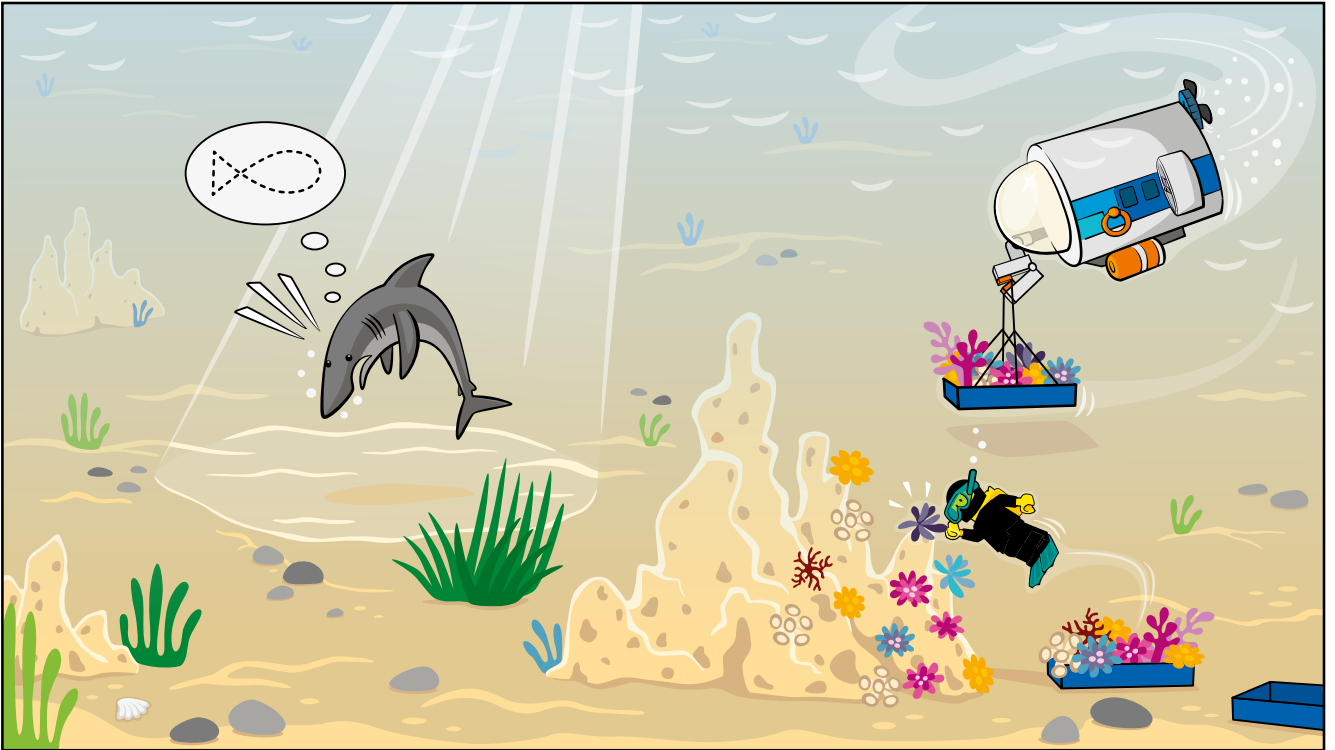
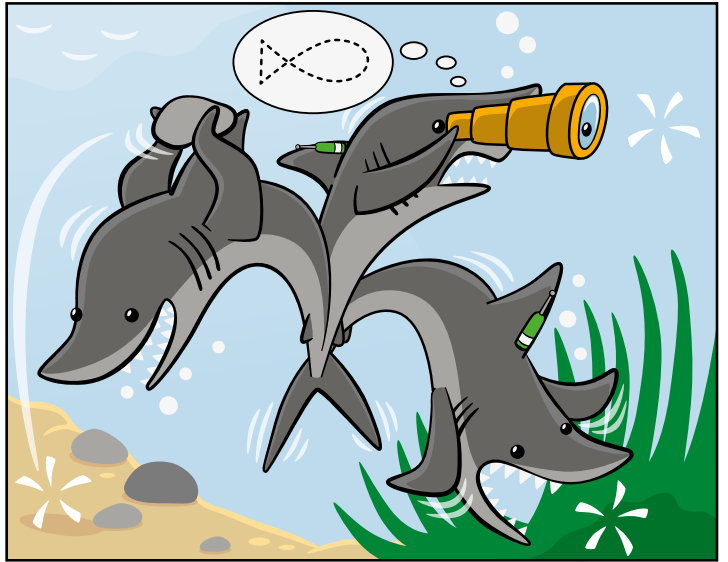
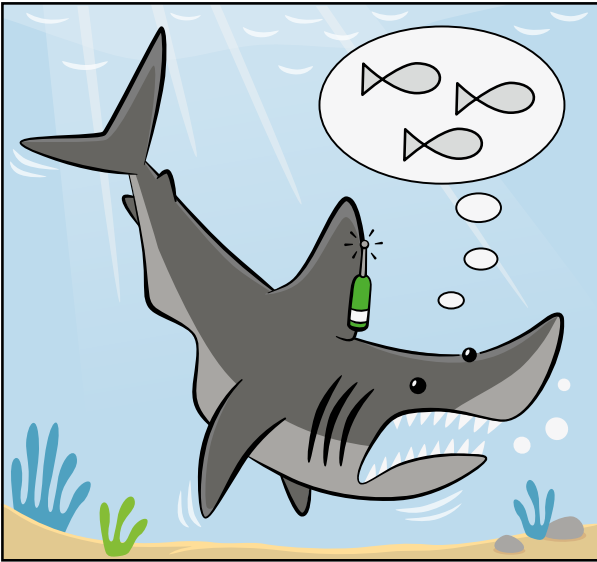
- Marine Researcher** – living at sea during science expeditions
- Ecologist** – reducing human impact on marine ecosystems
- Photographer** – diving with specialized equipment

... or choose your own!

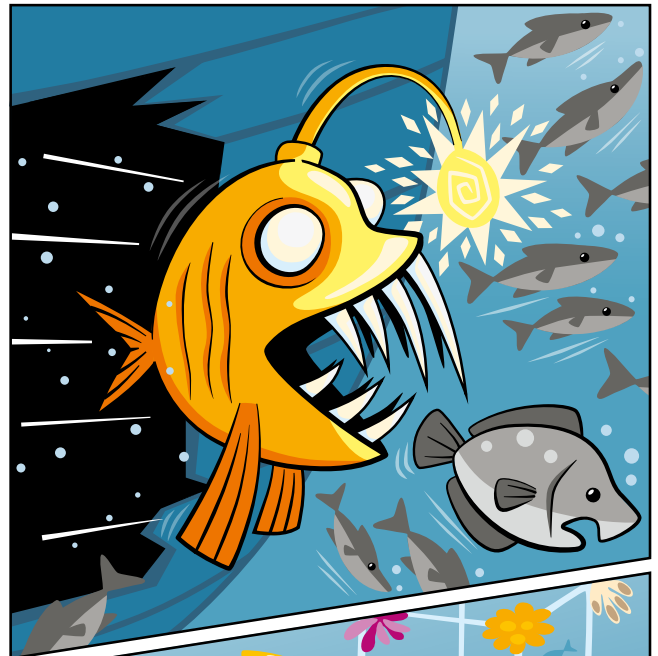
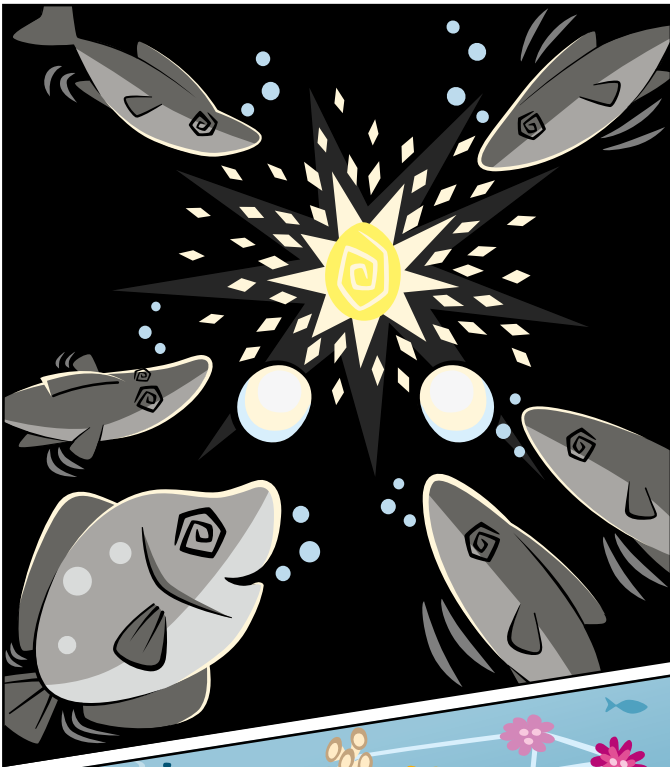
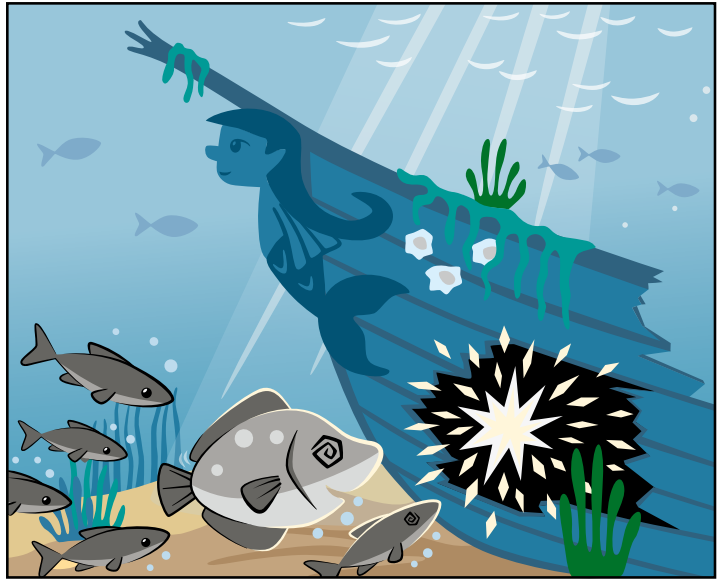
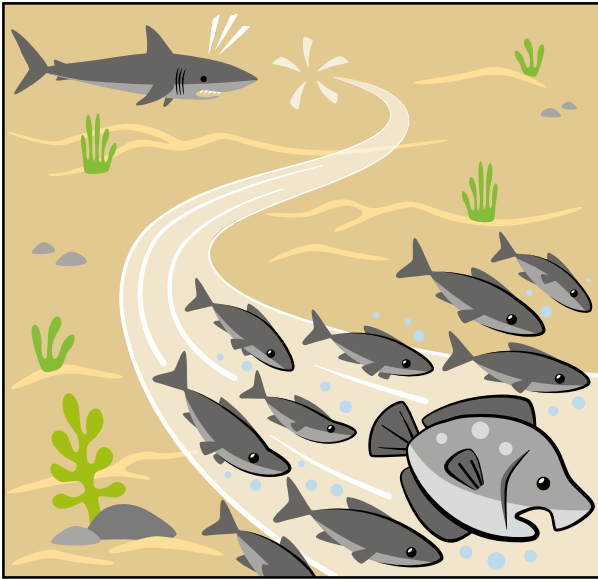
Explore all mission models and the Challenge story to inspire more project ideas!



Challenge Story



Challenge Story



Challenge Story



Challenge Story

