FIRST LEGO LEAGUE
EXPLORE

TEAM MEETING GUIDE

SUBMERGED

FIRST

LEGO education

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Introduction

Welcome to *FIRST*® LEGO® League Explore!

In *FIRST*® LEGO® League Explore, teams focus on the fundamentals of engineering as they explore real-world problems, learn to design and code, and create unique solutions made with LEGO® bricks and powered by LEGO® Education SPIKE™ Essential.

FIRST LEGO League Explore is one of three divisions by age group of the *FIRST* LEGO League program. This program inspires young people to experiment and grow their confidence, critical thinking, and design skills through hands-on learning. *FIRST* LEGO League was created through an alliance between *FIRST*® and LEGO® Education.

FIRST® DIVE℠ presented by Qualcomm and SUBMERGED℠

Welcome to the *FIRST*® DIVE℠ presented by Qualcomm season. This year's *FIRST* LEGO League challenge is called SUBMERGED℠.

This season, children will learn about how and why people explore the oceans. Our discoveries beneath the ocean surface teach us how this complex ecosystem supports a healthy future for the plants and animals that live there.

During each session, teams will experience the engineering design process. There is no set order for this process, and they may go through each step several times in a single session. This means that during a session, children will be exploring the theme and ideas, creating solutions, testing them, iterating and changing them, and then sharing what they've learned with others.

More than 80% of the ocean remains unexplored, offering curious minds deep opportunities to dive into expeditions.

Working in Teams

Children work together in teams of up to six members using pieces from the LEGO Education SPIKE™ Essential set and an Explore set. Teams will collaborate and communicate to build, learn, and play together.

Children should be encouraged in every session to work with their teammates, listen to each other, take turns, and share ideas and pieces.
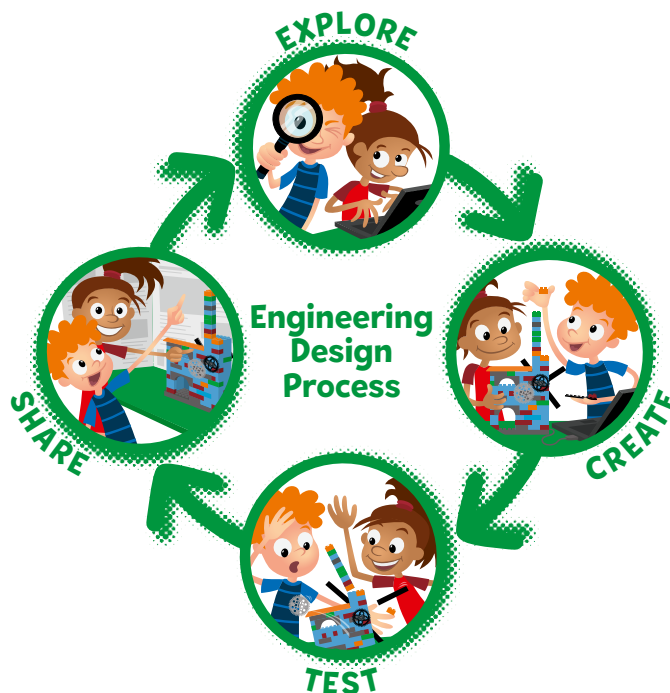
Explore Story
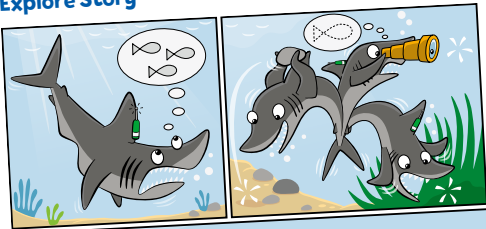
Explore

Welcome to SUBMERGED℠! Throughout this guidebook, children will be asked to investigate concepts in a variety of ocean environments. They should review the Explore story found in the *Engineering Notebook* for clues about ocean life and how people safely observe and support ocean habitats.

Many of the sessions connect to careers related to ocean research and exploration. Encourage children to ask questions about the different jobs and make real world connections to the models they build.

Create and Test

The children will build ocean habitats, animals, vehicles, and places where research can be conducted. They will explore coding and motorizing parts of their team model toward the end of their experience.

Encourage children to build freely and change their models as they have new ideas or when they've learned something new.

Share

The children will record their ideas and designs in their *Engineering Notebooks*. They will share their models and what they learned with others. Finally, they will participate in the festival, where they share their team posters and team models with reviewers, families, and friends. Most importantly they will …

HAVE FUN!
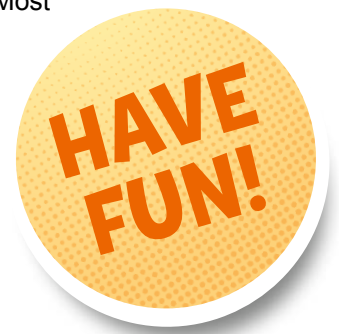
Playful Learning in Action

FIRST® Core Values

The FIRST® Core Values are the cornerstones of the program. They are among the fundamental elements of FIRST® LEGO® League.

By embracing the Core Values, children use discovery and exploration of the theme in each session and learn that helping one another is the foundation

of teamwork. It is important that the children have fun. The more playful the sessions are, the more motivated the children will be.
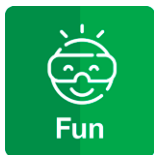
Teamwork — We are stronger when we work together.

Inclusion — We respect each other and embrace our differences.

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

Fun — We enjoy and celebrate what we do!

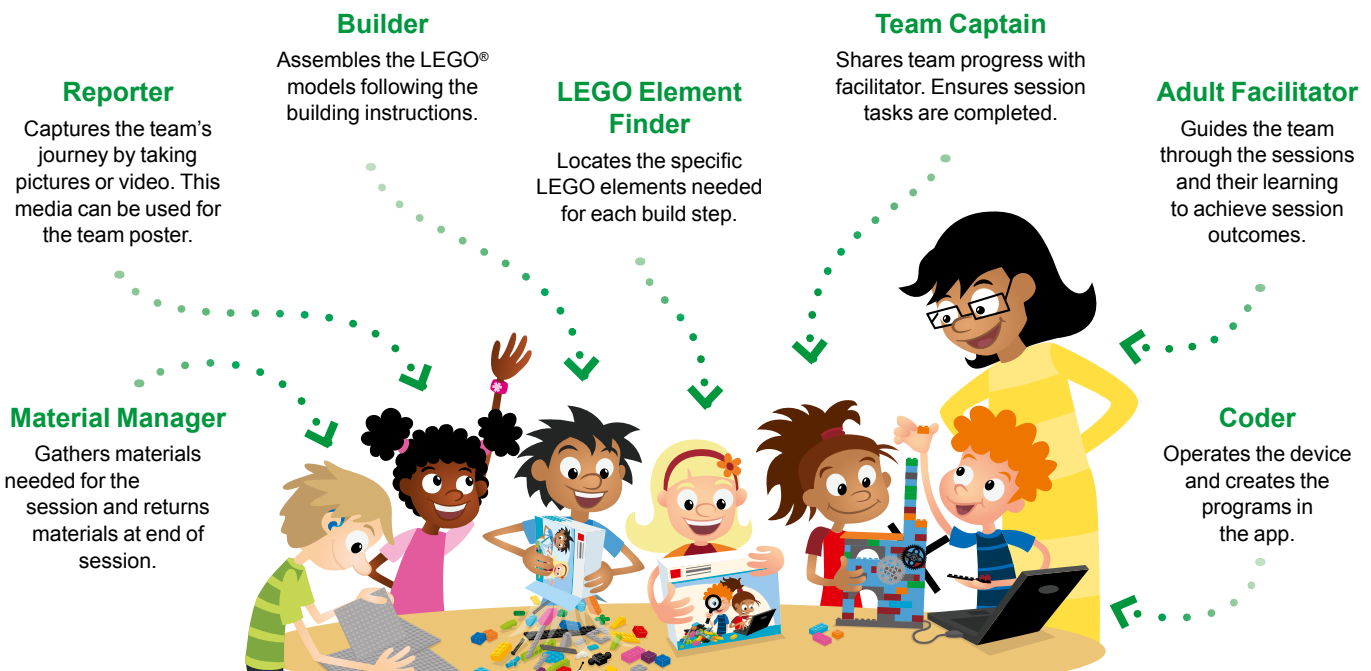**Discovery** — We explore new skills and ideas.

Innovation — We use creativity and persistence to solve problems.

Team Roles

Here are sample team roles to use during the sessions. Everyone could experience each role multiple times throughout their FIRST LEGO League Explore experience.

Using roles helps the team function more efficiently and ensures that everyone on the team is engaged. Some roles, like the builder and coder, could be filled by multiple

children during a session when the experience is designed for a pair of children.

Reporter
Captures the team's journey by taking pictures or video. This media can be used for the team poster.

Builder
Assembles the LEGO® models following the building instructions.

LEGO Element Finder
Locates the specific LEGO elements needed for each build step.

Team Captain
Shares team progress with facilitator. Ensures session tasks are completed.

Adult Facilitator
Guides the team through the sessions and their learning to achieve session outcomes.

Material Manager
Gathers materials needed for the session and returns materials at end of session.

Coder
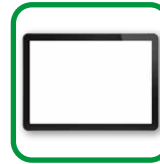Operates the device and creates the programs in the app.

What Does the Team Need?

LEGO® Education Set

LEGO® Education SPIKE™ Essential Set

Note: Other LEGO Education sets such as WeDo 2.0 are also allowed.

SUBMERGED℠ Explore Set

Each team will get one SUBMERGED℠ Explore set. Leave the LEGO® pieces in their bags until the sessions in which they are needed.

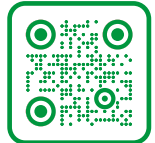Two printed books contain the building instructions for the Explore model.

Electronic Device

Your team will need a compatible Bluetooth-enabled device like a laptop, tablet, or computer. Scan the QR code to view system requirements and download software.

Scan here for system requirements and software download

Team Poster Supplies

Each team will need a large poster board and various art supplies and materials in Sessions 10-11.
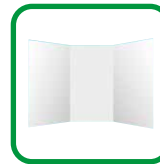
	Submarine	Motor and Hub Pieces*	Sunline Zone Pieces	Twilight Zone Pieces	Abyssal Zone Pieces	Prototyping Pieces
Bag	1, 2	3	4	5	6	7, 8, 9, 10, 11
Book	1	2	2	2	2	-

*The motor and hub are part of the SPIKE Essential set. Bag 3 contains bricks needed to attach these pieces to the submarine model in the Explore set.

Tip
• The prototyping pieces and baseplates are used throughout the sessions to build solutions to the design challenges.

Management Tips

FACILITATOR TIPS

- Determine your timeline. How often will you meet and for how long? How many meetings will you have before your festival?
- Session times are suggestions. You may find that your team needs more or less time to explore and complete the tasks.
- Work with the team to set team guidelines, procedures, and expected behaviors for your meetings.
- Get into the mindset that the team will be doing the work. You will facilitate their journey and remove any major obstacles.
- Guide your team as they work independently through the tasks provided in each session.
- Use the guiding questions in the sessions to provide focus and direction to the team.
- Jobs are listed in some sessions that connect to the Career Connections pages in the back of the *Engineering Notebook*.
- Teammates should be encouraged to work with each other, listen to each other, take turns, and share ideas.

MATERIAL MANAGEMENT

- Place any extra or found LEGO® pieces in a cup. Have children who are missing pieces come to the cup to look for them.
- Wait to dismiss your team until you look over their LEGO set.
- The lid of the LEGO set can be used as a tray to keep pieces from rolling away.
- Use bags or containers to store any unfinished builds or assembled models.
- Designate a storage space for the built mission models and mat.
- The material manager role can help with the process of clearing away and storing materials.

ENGINEERING NOTEBOOK TIPS

- Read the *Engineering Notebook* carefully. The children will work on the notebooks collaboratively and update them each session.
- The *Engineering Notebook* contains relevant information and guides the team through the sessions.
- The tips in this *Team Meeting Guide* will direct you how to support each session.
- As facilitator, help guide the team members in the performance of their roles during each session.

Sessions at a Glance

Every session starts with an introduction and ends with a share activity. Details for these activities are given in the session pages that follow, along with notes and tips to help you run the session.

Session 1 – Dive In!
- Explore SUBMERGED℠ Theme
- Build Submarine Model
- Free Build

Session 2 – Ocean Layers
- Build Sunlight/Twilight/Abyss Models
- Explore Ocean Layers

Session 3 – Sunlight Zone
- Coding Lesson 1
- Explore Sunlight Zone

Session 4 – Twilight Zone
- Coding Lesson 2
- Explore Twilight Zone

Session 5 – Abyssal Zone
- Coding Lesson 3
- Explore Abyssal Zone

Session 6 – Deep Sea Discovery
- Build Unknown Creature
- Build Artificial Habitat

Session 7 – Exploration Station
- Build Exploration Station
- Explore Jobs and Technology

Sessions 8 & 9 – Team Model
- Design Team Model
- Build Team Model

Sessions 10 & 11 – Team Poster
- Design Team Poster
- Create Team Poster

Session 12 – Prepare for Event
- Finish Team Model and Poster
- Practice Sharing

CELEBRATE AT A FESTIVAL!

Pre-Session Checkpoint

Read the student *Engineering Notebook* and this *Team Meeting Guide* before starting the sessions. They are full of very useful information to guide you through this experience. Use this checkpoint to help you get started and guide you toward success.
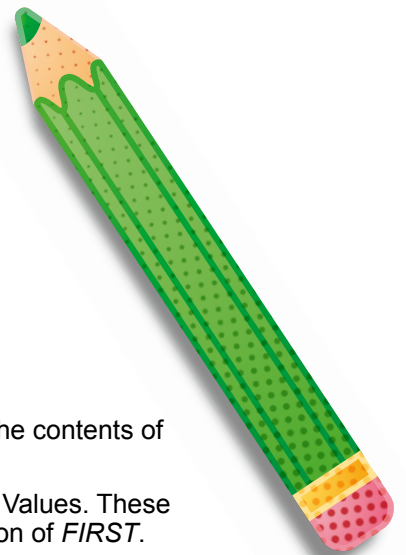
- ☐ Ensure you have received all materials needed to implement the program. See [page 6](#) for what you need.
- ☐ Identify the space you will use and where to store materials between sessions.
- ☐ Think about your final event. Do you need to register for your partner event or are you having your own classroom festival? See [page 30](#) for more details.
- ☐ Create a plan for how you will use the program. How often during the week will you do it? How many weeks will it last?
- ☐ Make sure you have a Bluetooth-enabled device with the SPIKE™ app installed.
- ☐ Unpack the SPIKE™ Essential set (if not already done) and sort the LEGO® elements into the tray before Session 1. Make sure the hub is updated and fully charged.

- ☐ Familiarize yourself with the contents of the Explore set.
- ☐ Explore the *FIRST*® Core Values. These are the essential foundation of *FIRST*.
- ☐ Watch the *FIRST*® LEGO® League Explore season videos on the official *FIRST* LEGO League YouTube channel.
- ☐ The team could complete the Tutorial Activities in the app so that they gain experience in building and coding before starting the sessions.
- ☐ Share theme-related vocabulary with the team. Words could include *ocean*, *submarine*, *coral reef*, *sunlight zone*, *twilight zone*, *abyss*, and *port*.
- ☐ Encourage the team to use the Team Progress page found in their *Engineering Notebook* throughout the sessions to help them keep track of their goals.
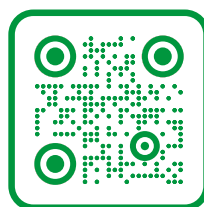
Scan me for helpful resources

Session 1

Outcomes

- The team will use discovery to explore the SUBMERGED℠ theme and share what they know about the oceans.
- The team will build different things found in the ocean and the submarine from the Explore set.

Introduction *(10 minutes)*

Let's Discover

- Read the definition for **discovery** to the team *(see page 5)*.
- Talk about what **discovery** is. Have the team provide examples of this Core Value.
- Extension: Have everyone draw themselves using **discovery** on the Core Values page in the *Engineering Notebook*.

Guiding Questions

- What did the Explore story make you think about?
- What plants and animals live in the ocean?
- How do people explore the oceans?

Session Tips

1 Scan here to find more resources you can use with your team.

2 Look ahead at the next few sessions to see which ocean environments will be discussed and share with the team to help them generate ideas.

3 Writing and drawing space is provided throughout the notebook for each child to capture their thoughts and ideas.

Extension

- Have the team research ocean discoveries and learn about the technology that was used.
- Do an ocean-themed show-and-tell activity with the team.

Session 1

Activity 1 Tasks

1 ☐ Read the Explore story to learn about the SUBMERGED℠ theme.

☐ Talk about what you know about the oceans with your teammates.

2 ☐ There are many ocean mysteries left to explore. Think about what part of the oceans you and your teammates would want to explore and hope to discover.

☐ List your questions about the ocean below.

Your team needs:
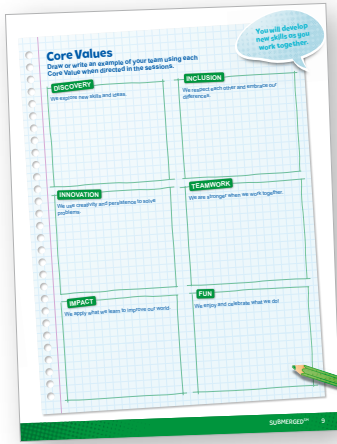
What did you learn from reading the Explore story?

What animals or objects did you recognize in the Explore story?

More than 80% of the ocean has never been mapped, explored, or even seen by humans!

3 What animals and objects do you want to learn more about?

Complete the Core Values page throughout the sessions during the Introduction activities.

Dive In!

Share *(10 minutes)*

Have the team:

- Share what they did in the session.
- Talk about the submarine.
- Share what they want to learn about the oceans.

Your team needs:

5

An autonomous underwater vehicle (AUV) is like a small submarine that doesn't need a person to drive it. A remotely operated vehicle (ROV) requires a person to drive it, and it is connected to the ship with cables.

Dive In!

Activity 2 Tasks

☐ Build the submarine from the Explore set using Bags 1 and 2.

☐ Talk about the different parts of the submarine and what they might be used for.

4

☐ Think of something your submarine might discover in the ocean.

☐ Use the space below to draw your ideas.

Challenge

☐ Use the prototyping pieces to build animals, plants, or unknown object that your team wants to learn about.

6

☐ Share your ideas.

My ideas:

Scan me to see a video of the submarine model.

Guiding Questions

- What is a submarine used for?
- What can a submarine do that a diver cannot do?
- What kinds of animals would you want to discover in the ocean?

Session Tips

4 Keep the submarine model assembled for use in a future session.

5 Give the team the LEGO® prototyping pieces (Bags 7-11) to create their designs.

6 At the end of each session, children should share what they have accomplished.

Cleanup

- Anything built with the prototyping pieces should be taken apart.
- Place the prototyping pieces back in the Explore set box or in a container labeled "Prototyping Pieces."

Session 2

Outcomes

- The team will build the sunlight, twilight, and abyssal zone models.
- The team will learn about ocean layers and what makes each environment unique.

Introduction *(10 minutes)*

Have an Impact

- Read the definition for **impact** to the team (*see page 5*).
- Talk about what **impact** is. Have the team provide examples of this Core Value.
- Extension: Have everyone draw an inventor having an **impact** on the Core Values page in the *Engineering Notebook*.

Guiding Questions

- How do we explore the sunlight zone?
- Can you name other animals that live in the sunlight zone?
- What is different about animals that live in darker parts of the ocean?

Session Tips

1 Have the children work in pairs to build the models. They should talk about what they are building.

2 The mat lines up with the back of the Explore set box to make a larger image of the ocean layers.

3 Lead a discussion about the ocean layers, allowing the children to ask questions.

Extension

- Identify books or movies that relate to the ocean theme.
- Explore other living things found in different ocean layers.

Session 2

Your team needs:

Activity 1 Tasks

Sunlight Zone

1
- [ ] Build the coral reef and shark models using the pieces in Bag 4. Place them on the mat.
- [ ] These living things are found in the sunlight zone of the ocean.

Twilight Zone
- [ ] Build the sunken treasure and anglerfish models using the pieces in Bag 5. Place them on the mat.
- [ ] These things can be found in the twilight zone of the ocean.

Challenge

3
- [ ] Learn about the sunlight and twilight zone in the ocean. What makes them different?

My ideas:

Ocean Layers

Now that the team has learned a bit about the oceans, have them set some goals for the season on page 8 of the *Engineering Notebook*.

Share *(10 minutes)*

Have the team:

- Share what they did in the session.
- Talk about the different models and where they belong on the mat.
- Share what they learned about each ocean layer.

Ocean Layers

Activity 2 Tasks

Abyssal Zone

- [ ] Build the two abyss models in Bag 6. Place them on the mat.
- [ ] These things can be found in the abyssal zone of the ocean.
- [ ] **4** Learn about the abyssal zone. What does ocean life look like in this extreme environment?

Challenge

- [ ] Label the picture of the mat to show the different layers.
- [ ] **6** Share what you learned about the ocean layers.

Your team needs:

Label the ocean layer:

Guiding Questions

- What do you think lives in the deepest parts of the ocean?
- What is challenging about exploring the deepest parts of the ocean?
- How do humans explore the ocean and what do they need to do it?

Session Tips

4 Some abyssal animals have unique adaptations and may be frightening to some children.

5 The team can look at the mat or Explore story to learn more or generate ideas.

6 The team could talk about each model they built and where it exists in the oceans.

Cleanup

- Fold the mat and store it in a place where it won't get damaged.
- Models used in this session should stay assembled.

Session 3

Outcomes

- The team will build the LEGO® model from the lesson and explore motor coding blocks.
- The team will learn about the living things in the ocean's sunlight zone.

Introduction *(10 minutes)*

Go Team

- Read the definition for **teamwork** to the team *(see page 5)*.
- Talk about what **teamwork** is. Have the team provide examples of this Core Value.
- Extension: Have everyone draw a submarine crew using **teamwork** on the Core Values page in the *Engineering Notebook*.

Guiding Questions

- Can you build and code the LEGO model using motor blocks?
- How do you change the program so the LEGO model moves in a different way?

Session Tips

1 Walk the team through how to access the appropriate lesson in the app.

2 If your team is new to coding, you could have them complete the Tutorial Activities.

3 The team will use only their SPIKE™ Essential set for this task.

Extension

- Learn about ocean explorers.
- Research the different types of ships and submarines used to explore the oceans.

Session 3

Activity 1 Tasks

1
- ☐ Open the SPIKE™ Essential app. Complete your lesson.
- ☐ Make the model rotate at a different speed.
- ☐ Write your ideas below for how to change the program.
- ☐ Modify the program based on your ideas. Run your new program. See what happens.
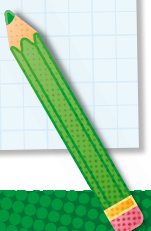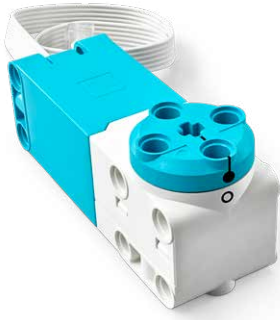
Your team needs:

3

Your lesson:

FIRST® LEGO® League Explore Unit: **Lesson 1 (Boat Trip)** **2**

Great ocean journeys start on the seashore. It's time to launch the ship!

Write your ideas:

Sunlight Zone

Share *(10 minutes)*

Have the team:

- Share what they did in the session.
- Share the motor coding skills they learned.
- Show where the sunlight zone is on the mat and talk about the life found there.
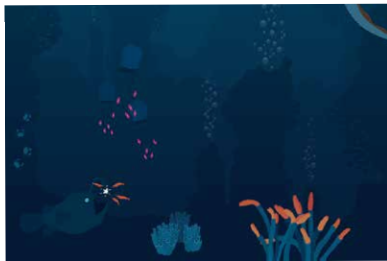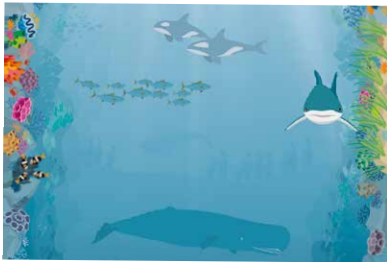
Your team needs:

(5)

Sunlight Zone

Activity 2 Tasks

(4) ☐ Modify the boat model from the previous task so it represents your team. Will you need special tools or equipment?

Challenge

☐ Open the SPIKE™ Essential app.

☐ Change the program to launch your team boat in the sunlight zone. Try it out!

The sunlight zone receives light that warms the water and enables plants to grow.

(6)

CAREER CONNECTION

A marine biologist studies life in all parts of the ocean. There is a lot to observe and discover in the sunlight zone!

Find out more on Page 30.

Guiding Questions

- What would you add to the boat model?
- What tools does a marine biologist use when studying ocean animals?
- Can you launch the boat at a different speed?

Session Tips

(4) The team will determine how to change motor direction and motor speed.

(5) The team should use the SPIKE™ Essential set to modify their boat.

(6) Career connections in the *Engineering Notebook* highlight jobs related to oceans.

Cleanup

- Everything built in this session should be taken apart and returned to storage.
- Fold the mat and store it in a place where it won't get damaged.

Session 4

Outcomes

- The team will build the LEGO® model from the lesson and explore the use of lights and sensors.
- The team will learn about living things in the twilight zone.

Introduction *(10 minutes)*

Let's Have Fun

- Read the definition for **fun** to the team *(see page 5)*.
- Talk about what **fun** is. Have the team provide examples of this Core Value.
- Extension: Have everyone draw a picture of an example of **fun** on the Core Values page in their *Engineering Notebook*.

Guiding Questions

- How do you change the program so the LEGO model displays a different light?
- Can you code the model to make a sound?
- What kinds of sensors would be useful on a submarine?

Session Tips

1 The team will learn about and use light and sound blocks.

2 The team should focus on light blocks in this activity.

3 Questions in the *Engineering Notebook* are meant to start a discussion or generate ideas.

Extension

- Have the team complete another lesson from the SPIKE™ Essential app like the Trash Monster Machine.

Session 4

Activity 1 Tasks

1
- ☐ Open the SPIKE™ Essential app. Complete your lesson.
- ☐ Code the model to flash a light when a team member approaches the sensor.
- ☐ Modify the program based on your ideas and test it out!

Challenge

2
- ☐ Code the model to display a different light pattern that is unique to your team.

Your team needs:

Your lesson:

FIRST® LEGO® League Explore Unit: **Lesson 2 (Animal Alarm)**

Sensors can help scientists detect things that can't be seen with our eyes.

3

How could sensors help us explore the oceans?

Show how you include everyone's awesome ideas!

Write your ideas:

Twilight Zone

Share *(10 minutes)*

Have the team:

- Share what they did in the session.
- Show the sensor coding skills they learned.
- Demonstrate how they modified a model and code so that motion is triggered by a sensor.

Your team needs:

Navigating underwater without any light can be tricky. Submarines must be able to control their speed to avoid colliding with objects.

Twilight Zone

Activity 2 Tasks

4 ☐ Use the building instructions in Book 2 to attach the sensor, motor, and hub to the submarine from Session 1.

☐ Open the SPIKE™ Essential app. Try the program provided in Book 2 to motorize your model.

Challenge

5 ☐ Change the program so that the submarine will do the following:
  ☐ When the sensor detects a black or gray object, the propeller spins quickly to back away.
  ☐ When the sensor detects a blue or yellow object, the propeller spins slowly to move in and get a closer look.

☐ Share what you built and explain how you coded the model.

Guiding Questions

- Can you change the speed of the motor?
- How are submarines used to explore the ocean?
- Can you make the sensor activate a sound?

Session Tips

4 Some extra time may be needed to allow the team to modify the submarine model.

5 Use the prototyping pieces or other objects to activate the sensor.

6 Children can find more information on the careers mentioned in the *Engineering Notebook* on pages 30-31.

Cleanup

- The submarine should be left assembled. Anything built with the prototyping pieces should be taken apart and returned to storage.
- Help the team remove the hub, motor, and sensor pieces from the submarine model and return them to the SPIKE™ Essential set.

My ideas:

6 **CAREER CONNECTION**

A marine archaeologist explores how humans have interacted with the oceans in the past. They can teach us a lot about the history of the oceans.

Learn more on Page 30.

Session 5

Outcomes

- The team will build the LEGO® model from the lesson and code the robot to drive.
- The team will learn about the living things and mysteries of the deep ocean.

Guiding Questions

- Can you modify the robot so it drives with four wheels?
- How do you change the program so the LEGO model moves in a different way?
- How can you modify your model so it represents a deep sea vehicle?

Session Tips

1 The team will create their first mobile robot. Make sure the team watches where the robot drives so that it does not fall if placed on the table.

2 The team can take turns making changes to the program.

3 The team will use only their SPIKE™ Essential set for this session. They won't use anything from the Explore set or Explore model.

Extension

- Look at attachments found on deep sea submarines.
- Modify the vehicle so that it drives on three wheels.

Introduction *(10 minutes)*

Be Innovative

- Read the definition for **innovation** to the team *(see page 5)*.
- Talk about what **innovation** is. Have the team provide examples of this Core Value.
- Extension: Have everyone draw an inventor using **innovation** on the Core Values page in the *Engineering Notebook*.

Session 5

Activity 1 Tasks

1
- ☐ Open the SPIKE™ Essential app. Complete your lesson.
- ☐ Next, code the model to move backward.
- ☐ Write your ideas for how to change the program below.

2
- ☐ Change the existing program based on your ideas. Test it out!

Challenge

3
- ☐ Modify the model so it represents a submarine. What can you add? What would you remove?

Your team needs:

Your lesson:

FIRST® LEGO® League Explore Unit: **Lesson 3 (Arctic Ride)**
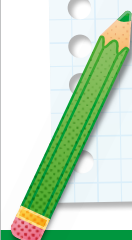
Submarines that travel to the deepest parts of the ocean need special equipment to navigate.

You may need to add lights to see in the dark or an arm attachment to pick up objects.

Draw what changes you made to the model:

Abyssal Zone

The Team Journey page on the back cover of the *Engineering Notebook* provides an overview of the team experience.
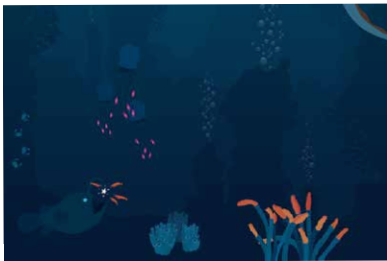
Share *(10 minutes)*

Have the team:

- Share what they did in the session.
- Show how they have applied coding skills learned in previous sessions.
- Explain how technology is used to explore the deep ocean.

Your team needs:

Abyssal Zone

Activity 2 Tasks

☐ Modify the SPIKE model from the previous task so that it represents a submarine and can be driven.

4
☐ Open the SPIKE™ Essential app.
☐ Change the program so that the vehicle drives slowly on the mat.

Challenge

5
☐ Pick two spots on the mat the submarine should visit.
☐ Change the program for your vehicle to move between two icons.

6
☐ Share how you coded your submarine.

There is so much to learn about the abyssal zone because its extreme environment is hard to reach!

CAREER CONNECTION

Oceanographers are scientists that study all areas of the ocean. This could include mapping the seafloor or understanding how different living things survive there.

Discover more careers on **Page 30.**

Guiding Questions

- What do you hope your submarine will discover at the bottom of the ocean?
- Can you code the robot to start in the sunlight zone and stop in the abyssal zone?
- Can you drive the robot at different speeds?

Session Tips

4 The team will practice motor direction and motor speed.

5 The team can practice positioning the robot so that it reaches a specific location on the mat.

6 You could place an obstacle on the mat to encourage the team to code their robot to turn.

Cleanup

- Everything built in this session should be taken apart and returned to storage.
- Fold the mat and store it in a place where it won't get damaged.

Session 6

Outcomes

- The team will build an unknown species discovered in the ocean.
- The team will design an artificial habitat for an unknown species to build empathy and understanding for animals.

Introduction *(10 minutes)*

Be Inclusive

- Read the definition for **inclusion** to the team *(see page 5)*.
- Talk about what **inclusion** is. Have the team provide examples of this Core Value.
- Extension: Have everyone draw an engineer showing **inclusion** on the Core Values page in the *Engineering Notebook*.

Guiding Questions

- What are some animals you know that live in the oceans?
- What does your creature need to be healthy in its environment?
- How would you describe your creature to someone who hasn't seen it?

Session Tips

1 The team will build their creature using the prototyping pieces in the Explore set.

2 The team will complete a profile on the creature in their *Engineering Notebook*.

3 This creature could be part of the team model, or they can build a new one.

Extension

- Research animals that have recently been discovered.

Session 6

Activity 1 Tasks

1
- ☐ Imagine that your team discovers something strange while traveling through the ocean.
- ☐ Use the prototyping pieces to build a mysterious and unknown creature.

Challenge
- ☐ Write a summary of your new species below.
- ☐ Share your newly discovered species with others.

Your team needs:

3 You can share your new species on your team poster later.

New Species Found

2

Year:	Month:	Day:	Place:

What would you call it?

Where in the ocean was it discovered? What ocean layer?

What was it doing?

Was it alone or with other species?

Did you see more than one?

How big is it?

Will it get bigger?

What kind of habitat does it need?

What does it eat?

What else should everyone know about your discovery?

Deep Sea Discovery

Have the team revisit their goals page in their *Engineering Notebooks* to share what they've learned so far.

Share *(10 minutes)*

Have the team:

- Share what they did in the session.
- Share how animals have specific requirements for survival.
- Share how they designed a habitat.

Your team needs:

4

Artificial habitats are created by humans for many reasons. They can provide protection for fish and other small animals. They can also help protect a coast from erosion!

Deep Sea Discovery

Activity 2 Tasks

- ☐ Build an artificial habitat for the new species using the prototyping pieces.
- ☐ Draw your team's ideas for a habitat below.
- ☐ Think about what part of the ocean your creature is from and what protection it may need.
- **5** ☐ Keep your creature in the artificial habitat to share in your team model later.

6

My ideas:

Guiding Questions

- How much space does your creature need?
- Does your creature live in a cave or in open water?
- Can you draw the habitat you are going to build?

Session Tips

4 Give examples of artificial habitats in different environments.

5 Keep the creature and habitat assembled so the team can include them in their team model.

6 The ideas space can be used to write down the design steps planned or which blocks the team will use.

Cleanup

- Place the creature in its habitat and put them away so they don't get damaged.

Session 7

Outcomes

- The team will learn about different ocean jobs.
- The team will learn about tools or equipment needed for an ocean exploration.

Introduction *(10 minutes)*

Discovery Build

- Have the team provide examples of how they have used **discovery** throughout the sessions.
- Have the team build something using the prototyping pieces representing this Core Value or examples of the team using it.

Guiding Questions

- What ocean job sounds the most fun to you?
- What kind of technology would you use?
- Where in the ocean would you want to explore the most?

Session Tips

1 The team can pick one job to focus on to start.

2 Show examples of people working in ocean-related jobs and the tools they use.

3 The team may need to use pieces from the artificial habitat. They can use extra time in this session to return their pieces or modify both models.

Extension

- Research other jobs that use technology to explore different environments.
- Research technologies used to learn about ocean life.

Session 7

Activity 1 Tasks

1 ☐ Explore the ocean jobs on pages 30-31.

2 ☐ Pick a job that interests you. Think about the different tools someone in that role might need to do their work.
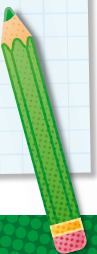
☐ Write or draw your ideas below.

Challenge

☐ Use the prototyping pieces to build a place where people can study the ocean.

3 ☐ Build the tools or equipment the people might need.

Your team needs:

My ideas:

Exploration Station

Share *(10 minutes)*

Have the team:

• Share what they did in the session.
• Share about different ocean jobs.
• Share about tools and technology used in ocean exploration.

Exploration Station

Your team needs:

Activity 2 Tasks

4 ☐ Think of a different job that explores or studies the ocean.

☐ Talk about what new tools or equipment the job might require.

☐ Change your model so it matches the job.

☐ Place your model on the mat.

5 ☐ Talk about what you built.

6 Draw and label the parts of your exploration station on this scene from the Explore story.

Guiding Questions

• Does a marine biologist use different technology than a submarine pilot?
• What kind of education is needed for this job?
• What else would you want to learn about the oceans?

Session Tips

4 Help the team think of different jobs to give them additional challenges.

5 The team could be challenged to modify their model based on a different spot on the mat.

6 Use this time to reinforce vocabulary and concepts explored throughout the sessions.

Cleanup

• Make sure unused pieces from the SPIKE™ Essential set are returned to it.

Sessions 8&9

Outcomes

- The team will draw their team model design and label its required parts.
- The team will create a team model to showcase what they have discovered in their ocean exploration.

Introduction *(10 minutes)*

Teamwork and Fun Builds

- Have the team provide examples of how they have used **teamwork** (Session 8) and **fun** (Session 9) throughout the sessions.
- Have the team build something using the prototyping pieces representing these Core Values or examples of the team using them.

Guiding Questions

- How will you plan out your design for your team model?
- What do you think is the most important part of your team model?
- What are you most proud of in your team model?

Session Tips

1 The team will need all parts of their Explore model and the mat.

2 Each team member could build a part of the team model.

3 The team model can use extra LEGO® bricks, minifigures, baseplates, and other LEGO elements. You may NOT use glue, paint, or art supplies.

Extension

- Create a detailed, labeled drawing of the team model and all its parts.
- Look back at the Explore story for additional building ideas.

Sessions 8&9

Session Tasks

1 ☐ Your team has learned a lot about the oceans!

2 ☐ Design a team model that shows your team's ocean journey.

☐ Explore the list of required parts on the next page.

☐ Draw your team model design and label the required parts.

3 ☐ Create your team model together. Use the mat and build the different parts of your ocean journey!

Your team needs:

Build a team model that shows the exploration station, an artificial habitat, and the ocean creature your team discovered!

Draw your team model on the mat:
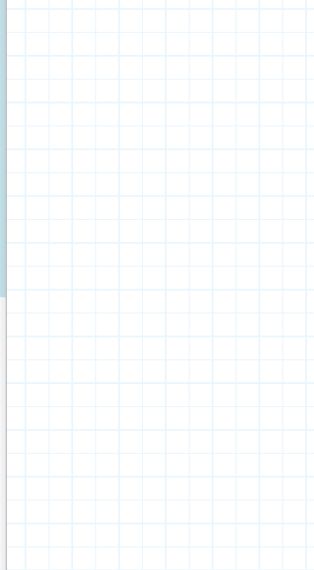
Team Model

Share *(10 minutes)*

Have the team:

- Share what they did at the end of each session.
- Explain the program and how the motor, sensor, and light are used in the model.
- Review the list of required parts and identify them on the team model.
- Demonstrate how the team model works.

Team Model

Build a team model that represents a unique way to share your team's ocean discoveries with others.

Requirements **6**

- ☐ Include your exploration station, an artificial habitat, and an ocean creature.
- ☐ Include all models of the Explore set.
- ☐ Motorize any part of the team model.

7

5

4

- ☐ Use only LEGO® elements.
- ☐ Use the SUBMERGED℠ mat.
- ☐ Use LEGO coding.

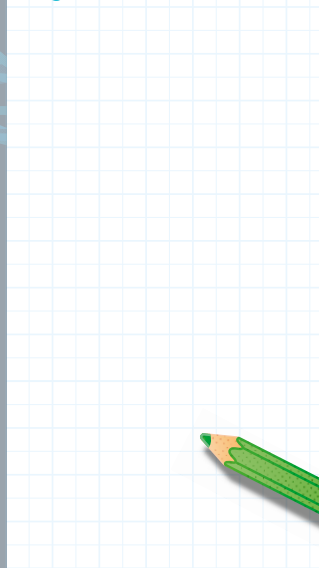**Label the required parts of your team model:**

Guiding Questions

- What are the strengths and the weaknesses of your design?
- How can you motorize part of your team model?
- How can you incorporate everyone's ideas?

Session Tips

4 The team model should be able to fit on a table and be easy to move.

5 The team will apply coding concepts throughout the sessions to create their programs.

6 The team should incorporate all parts of the Explore model into their team model as well as the Explore mat.

7 The team could choose to motorize the submarine model again or use their skills to motorize something new.

Cleanup

- The team model will remain assembled from this point forward until the event.
- Make sure unused pieces from the SPIKE™ Essential set are returned to it.

Sessions 10&11

Outcomes

- The team will create a plan for what they will include on their team poster.
- The team will design and create their team poster.

Guiding Questions

- What different topics did you explore?
- What did you create and build?
- How can you share information about the creature you discovered?

Session Tips

1 You will need to provide a large poster board and various art supplies. A trifold poster board works well.

2 The goal is for the team to create the poster themselves. You can support them and provide insight.

3 The team can look back at the Team Journey and Core Values pages in their *Engineering Notebooks*.

Extension

- Look back at the Explore story and extension suggestions to further explore the season theme.
- The Multimedia Resources also have additional activities you could do with your team.

Introduction *(10 minutes)*

Innovation and Inclusion Builds

- Have the team provide examples of how they have used **innovation** (Session 10) and **inclusion** (Session 11) throughout the sessions.
- Have the team build something using the prototyping pieces representing these Core Values or examples of the team using them.

Sessions 10&11

Your team needs:

Session Tasks

1 ☐ Find your poster board and art supplies.

2 ☐ Brainstorm what to put on your poster.
☐ Use the next page as a draft for your ideas.
☐ Work together to create your team poster. Teamwork!

3 ☐ Be creative. You can use words, drawings, and photos on your poster.
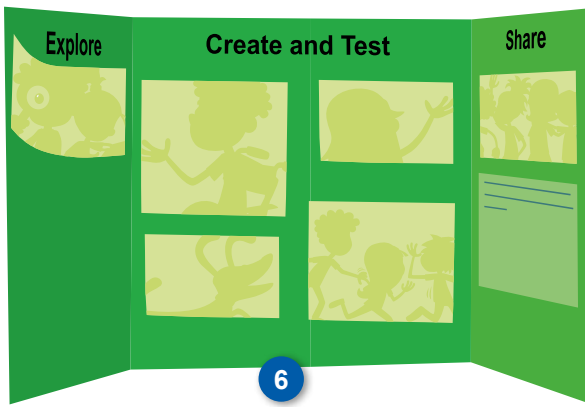
Congratulations on all you have learned!

Now, make a team poster to share about it.

Describe your team journey throughout the sessions.

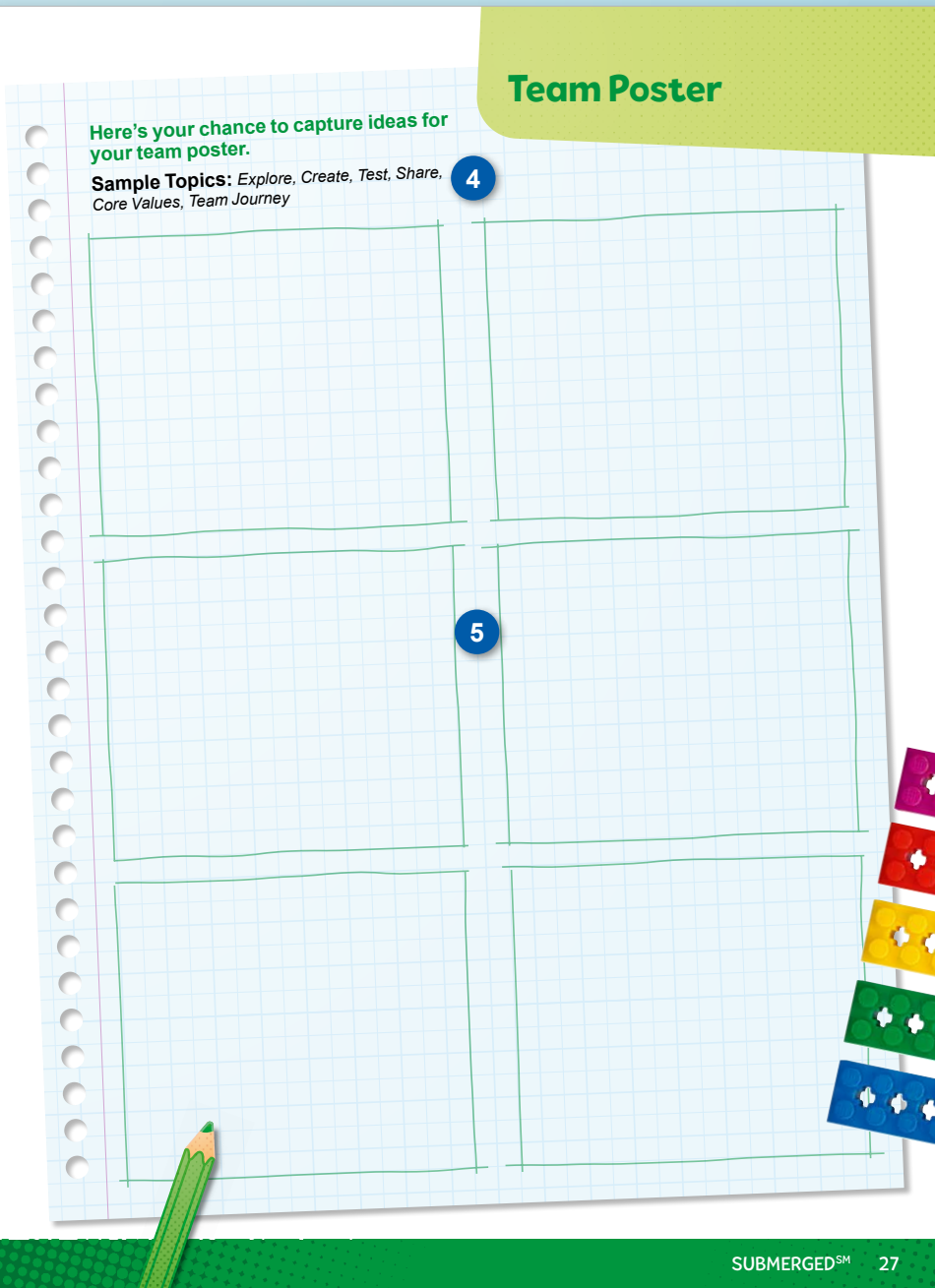Explore Team Journey Share

Create and Test

Team Poster

Share *(10 minutes)*

Have the team:

• Share what they did at the end of each session.
• Show their team poster design.
• Explain their team journey.
• Demonstrate how they will present their team poster.

Team Poster

Here's your chance to capture ideas for your team poster.

Sample Topics: *Explore, Create, Test, Share, Core Values, Team Journey*

Guiding Questions

• How can you show your team journey on the poster?
• What will you include on your team poster?
• How will each person on the team share about the poster?

Session Tips

4 Sample topics for the poster are provided for the students. They can choose to include whatever they want!

5 Provide extra scrap paper for the team to draw and write their ideas for their team poster.

6 Two boxes would fit on each fold on a trifold poster board.

Cleanup

• Make sure you have a safe place to store the poster, especially if it needs to lay open to dry.
• You may need extra time at the end of each session to clean up the art supplies.

Session 12

Outcomes

- The team will reflect on their SUBMERGED[SM] experience.
- The team will create a plan for what to share at their final event.

Introduction *(10 minutes)*

Impact Build

- Have the team provide examples of how they have had an **impact** throughout the sessions.
- Have the team build something using the prototyping pieces representing this Core Value or examples of the team using it.

Guiding Questions

- Can you explain the code you created for your motorized part?
- How does your team model relate to the SUBMERGED[SM] theme?
- Can you share about your team's journey?

Session Tips
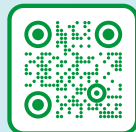
1. Scan here to go over the reviewing sheet and reviewing questions with your team.

2. Ask the team the reviewing questions and practice the responses they would give the reviewers.

3. A festival is a critical part of the *FIRST* ® LEGO® League Explore experience. If you are unable to attend an official one, plan a celebration of your own. Class Pack teachers can use the *Class Pack Guide*.

Extension

- Present your presentation to another team, class, or group of adults.
- Ask for feedback to make improvements before your final event.

Session 12

Tasks

1.
- [ ] Gather your completed team model and team poster.
- [ ] Talk about what your team would like to share at your event!
- [ ] Complete the next page to prepare for your event.

2.
- [ ] Look over the reviewing sheet with your coach.
- [ ] Practice your presentation.
- [ ] Communicate what you have learned with others.

You will be taking part in a *FIRST*® LEGO® League Explore festival. Invite your family and friends to your special event!

Share what you have learned and how your team had fun!

Sample Festival Roles

3.

I'm going to share what we explored.

I will describe the team model.

I will explain the program and how it motorizes the team model.

We will show how the poster captures our team journey!

I can reflect on how our team used Core Values.

Prepare for Event

Share *(10 minutes)*

Have the team:

• Practice their team model presentation.
• Practice their team poster presentation.

Prepare for Event ⑤

Think about what you will share at the event. ④

• Can you describe your team model?
• Explain how your team used innovation and creativity to explore the oceans.

• What did you learn about the season challenge?
• How did you use Core Values?

• What part of your team model is motorized?
• How did you code your motorized part?

• What did you include in your team poster?
• How does the poster show your team journey?

⑥ *Let's celebrate how well we all worked together! It is much more fun when everyone on the team is included.*

Guiding Questions

• How will you present your poster and model at the event?
• How do you show Core Values?
• What does your team need for the event?

Session Tips

④ The team doesn't need to answer every question on this page. These are meant to help the team feel ready for the event.

⑤ You could have the team practice their presentation by presenting to others before their event.

⑥ Your team could register for an Explore festival or you can run your own. Whatever you decide, be sure to celebrate what the children have learned and accomplished during their Explore experience.

Cleanup

• Make sure the team model and team poster are stored and ready to be transported to the event.
• Check that you have the device, charging cord, and fully charged battery for the event.

Festival Preparation

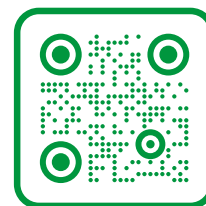***FIRST*® LEGO® League Explore events are called festivals.**

The main goal of a festival is for the team to celebrate their hard work while sharing what they have learned with others.

- ☐ Remind the team that the festival is a learning experience and the goal is to have fun!

- ☐ Encourage the team to interact with other teams to share what they have learned and to support each other.

- ☐ Determine what type of event you're attending and who is organizing it. Find out the requirements and details for the event you are attending.

- ☐ If you purchased a Class Pack, the event will be your responsibility. Check out the *Class Pack Guide* for more details!

- ☐ Have the team prepare a checklist of materials needed for the festival.

- ☐ Review the time and location where you are meeting for the festival and how long teams are expected to stay – share this with families. Encourage families to attend if possible.

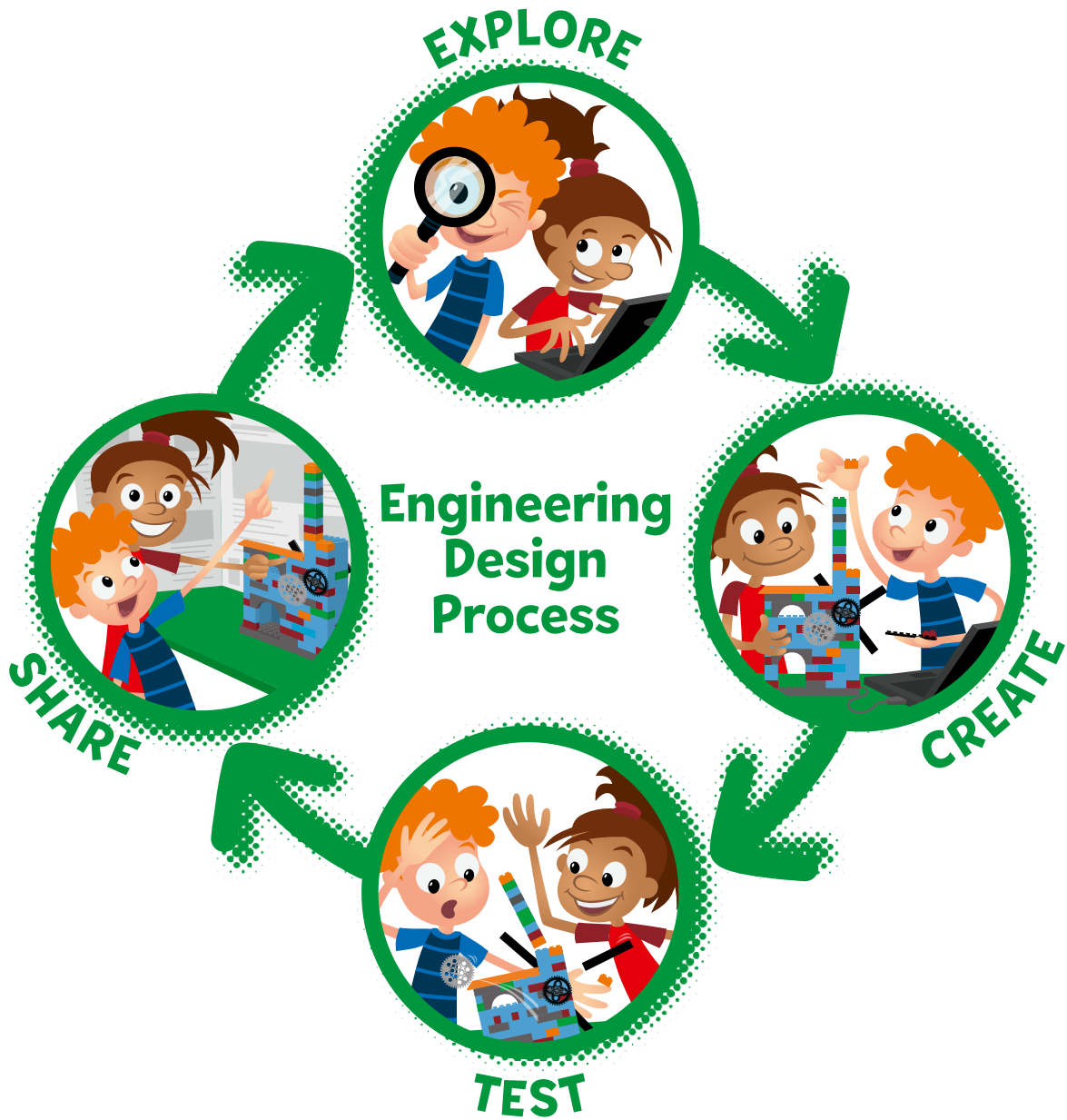# Events complete and finished with your season?

Here are some tips for wrapping up after the last event your team will participate in:

- Clean up and take apart the team model. Make sure SPIKE™ Essential elements go back to their set.
- Inventory the SPIKE Essential set to make sure all the pieces are there.
- Decide what to do with Explore set elements.
- Provide time for the team to reflect on their experience.
- Hold a team celebration and give out certificates!

Scan me for event resources and examples of posters/models

EXPLORE

CREATE

TEST

SHARE

Engineering Design Process