

**FIRST[®]
LEGO[®]
LEAGUE JR.**

TEAM MEETING GUIDE



AQUA
ADVENTURESM



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LEGO[®]
LEAGUE JR.**

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AQWA
ADVENTURESM





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The mission of *FIRST* is to inspire young people to be science and technology leaders by engaging them in exciting Mentor-based robotics programs that build STEM skills, inspire innovation, and foster well-rounded life capabilities including self-confidence, communication, and leadership. Learn more about *FIRST* Programs: FIRSTinspires.org.

LEGO® Education offers playful learning experiences and teaching solutions based on the LEGO system of bricks, curriculum-relevant material, and physical and digital resources to preschool, elementary, middle school and after school. In partnership with educators for more than 35 years, we support teaching in an inspiring, engaging and effective way. Our educational solutions enable every student to succeed by encouraging them to become active, collaborative learners, build skills for future challenges, and establish a positive mindset toward learning. Learn more at LEGOeducation.com. Follow us on Twitter [@LEGO_Education](https://twitter.com/LEGO_Education).



FIRST LEGO League Jr. gratefully acknowledges its collaboration with Sea Research Foundation, Inc., a 501(c)(3) nonprofit organization. The mission of Sea Research Foundation is to inspire people to care for and protect our ocean planet through conservation, education, and research. Sea Research Foundation operates Mystic Aquarium — one of America's premier nonprofit marine science research and education institutions, and an accredited member of the Association of Zoos & Aquariums and the Alliance of Marine Mammal Parks and Aquariums.



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Introduction to **FIRST**[®] and **FIRST**[®] LEGO[®] League Jr.

What is **FIRST**[®]?

FIRST[®] (For Inspiration and Recognition of Science and Technology) was founded in 1989 to inspire young people's interest and participation in science and technology. Based in Manchester, NH, the 501(c)(3) not-for-profit public charity designs accessible, innovative programs that motivate young people to pursue education and career opportunities in science, technology, engineering, and math (STEM), while building self-confidence, knowledge, and life skills. **FIRST** learning never stops building upon itself, starting at age 6 and continuing through middle and high-school levels up to age 18. Young people can join the international, K–12, after-school, STEM programs at any level.



What is **FIRST**[®] LEGO[®] League Jr.?

FIRST[®] LEGO[®] League Jr. is a non-competitive, hands-on STEM program geared toward children ages 6 to 10. Each year, **FIRST** LEGO League Jr. presents a new and exciting Challenge to ignite the creativity of these children. Each team of up to six children begins the exploration of this real-world theme with an exclusive LEGO[®] Education Inspire Model. Using this model as a starting point, they design a new model of their own with LEGO[®] elements. As they work, they learn basic engineering and programming skills with LEGO Education WeDo and apply those concepts to make their model move. Teams also document their work in an *Engineering Notebook* and share their journey through a team *Show Me* poster. Throughout their experience, teams operate under the **FIRST** LEGO League Jr. Core Values, celebrating discovery, teamwork, and *Gracious Professionalism*[®].

What is the Challenge for this season?

This season's **FIRST** LEGO League Jr. Challenge is called AQUA ADVENTURESM. Teams will begin by learning about water and its importance. Then they will choose a way that they use water at home or in their community. They will learn as much as they can about the water's journey and will design a solution to improve a part of the journey. All teams will show what they learn through a Team Model and *Show Me* poster. See p. 5 for a description of the AQUA ADVENTURE Challenge that you can share with your **FIRST** LEGO League Jr. team.

What does my team need to do to successfully complete the Challenge?

This guide includes detailed meeting plan suggestions for 12 sessions to guide your team through the entire AQUA ADVENTURE season. Although completing all the sessions is encouraged, it is not required. You are welcome to help your team complete the AQUA ADVENTURE Challenge any way you like, as long as team members honor the **FIRST** LEGO League Jr. Core Values (see p. 10) and follow the rules for the Team Model (see pp. 22–23) and *Show Me* poster (see p. 26).



AQUA ADVENTURESM Challenge



In the *FIRST*[®] LEGO[®] League Jr. AQUA ADVENTURESM Challenge, you will:

- **Explore** how you use water at home or in your community, the water’s journey, and how to improve a part of this journey.
- **Create and test** a Team Model to show your ideas.
- **Share** what you learn through your Team Model and a *Show Me* poster.

Hi, I’m Hydro the water drop! Find out how water like me gets to you. Can you help make my journey better?



Join me on an AQUA ADVENTURE!

Explore!

You and your community use water for many things every day. Where does your water come from? How does it get to you? Is the water cleaned or treated before you can use it? Why is it important to use water wisely? **Pick one way that you use water at home or in your community. Learn as much as you can about the water’s journey. Then design a solution to improve a part of this journey.**

Create and Test!

Design, build, program, test, and improve a Team Model to show your chosen water use, the water’s journey, and your idea for how to improve a part of the journey. Include the AQUA ADVENTURE Inspire Model (a LEGO[®] water pump) in your design. Also be sure to use LEGO[®] Education WeDo 2.0 or WeDo to build and program at least one motorized part of your Team Model.

Share!

Make a *Show Me* poster, and use it and your Team Model to share what you have learned with others. Participate in an Expo, invite your family and friends to a special team meeting, or share your *Engineering Notebook* to show what you know about water.

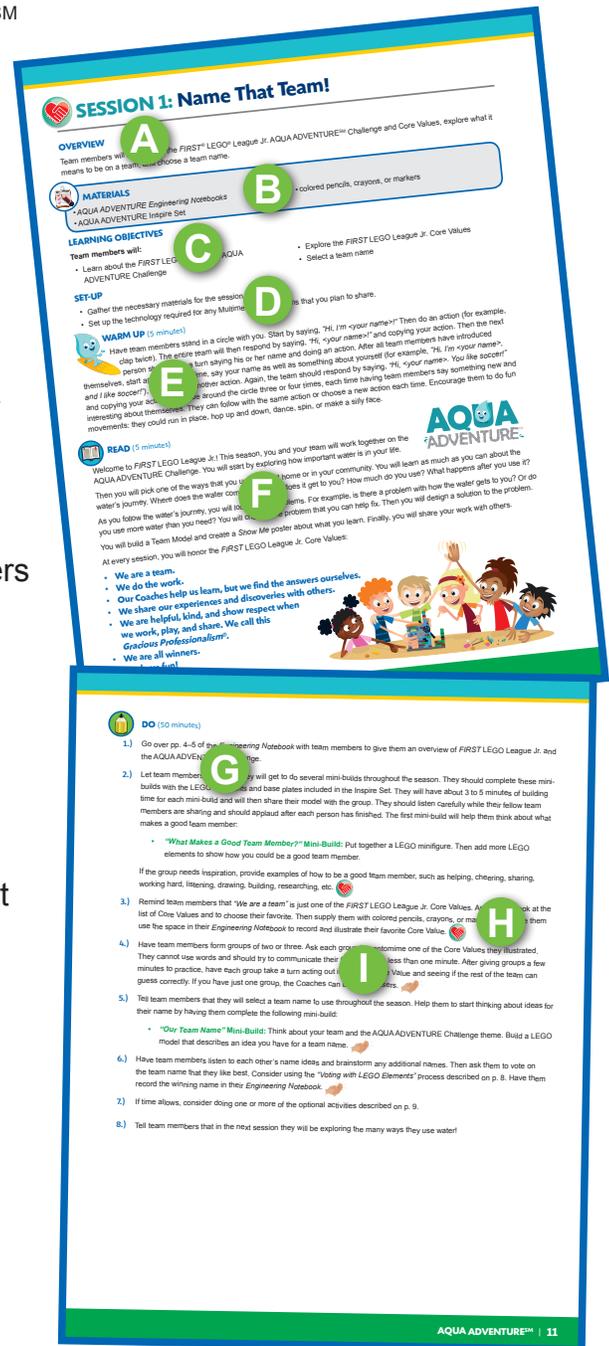
No matter what you do, have fun!



How Is Each Session Organized?

There are 12 sessions outlined in the AQUA ADVENTURESM *Team Meeting Guide*. In general, plan for one team meeting lasting about one hour to complete each session. Note that at least two hours are needed to build and program the Team Model (Sessions 8–9) and to create the *Show Me* poster (Sessions 10–11). Each session is organized as follows:

- A.) The session begins with a short **Overview**.
- B.) The **Materials** list outlines the resources needed for the session. For more information on the materials you will need for your team, see p. 7.
- C.) The **Learning Objectives** outline what team members should accomplish during the session.
- D.) The **Set-Up** section details anything special that you will need to do or prepare prior to the start of the session.
- E.) The **Warm Up** is a brief activity to help team members focus and build teamwork skills at the start of the session.
- F.) Each session has a **Read** component that can be read aloud by you and/or team members to build reading comprehension skills and introduce the context of the session.
- G.) The **Do** portion of the session includes a step-by-step list of what team members should do during the session.
- H.) The **Core Values** icon  appears any time reference is made to the *FIRST*[®] *LEGO*[®] League Jr. Core Values.
- I.) The **Applause** icon  appears any time that team members should give one another positive encouragement or applause, such as after they share an idea with the group. This helps to bring the *FIRST* *LEGO* League Jr. Core Value of *Gracious Professionalism*[®] to life.





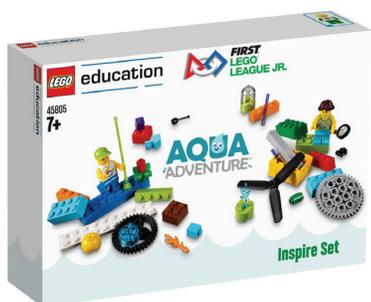
What Materials Do I Need for My Team?

The materials for the 12 sessions outlined in the *AQUA ADVENTURESM Team Meeting Guide* are listed at the start of each session. Below are notes about some of the specialized materials.

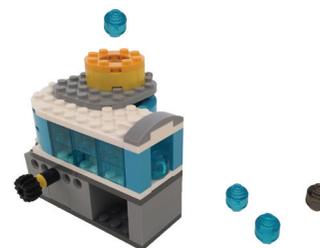
AQUA ADVENTURESM Engineering Notebooks

Each registered *FIRST*[®] LEGO[®] League Jr. team will receive a set of *AQUA ADVENTURE Engineering Notebooks*. The sessions in the *Engineering Notebook* correspond directly to the sessions in the *Team Meeting Guide*. Provide one *Engineering Notebook* per team member. Team members should follow the prompts in their *Engineering Notebook* to draw and write about their ideas and discoveries as they progress through the season.

AQUA ADVENTURE Inspire Set and Inspire Model



Each registered *FIRST* LEGO League Jr. team will receive one *AQUA ADVENTURE Inspire Set* consisting of more than 700 LEGO[®] elements, including those needed to build the *AQUA ADVENTURE Inspire Model* (a LEGO water pump) as part of Session 2. The link to the building instructions for the Inspire Model can be found on the back of the Inspire Set box as well as on the “*AQUA ADVENTURE Challenge and Resources*” page of the



FIRST LEGO League Jr. Resource Library. See p. 8 for directions on how to access this page. All teams must include the Inspire Model as part of their Team Model.

Note that several of the sessions include mini-build activities, in which team members are asked to use LEGO elements to build small models that express their thoughts and ideas. You can have your team use the Inspire Set for these mini-builds. Provide each team member with an assortment of LEGO elements from the Inspire Set, as well as one of the six square base plates from the set to use as the base for their mini-build model. For more information on how to guide your team through the mini-build process, watch the “LEGO Mini-Build” video, which is also accessible from the “*AQUA ADVENTURE Challenge and Resources*” page.

LEGO[®] Education WeDo

All teams must program and motorize at least one part of their *AQUA ADVENTURE Team Model* using LEGO[®] Education WeDo. To facilitate this, provide your team with one or more of the following LEGO Education WeDo sets for use throughout the season:

- 45300 LEGO Education WeDo 2.0 Core Set*
- 9580 LEGO Education WeDo Construction Set*

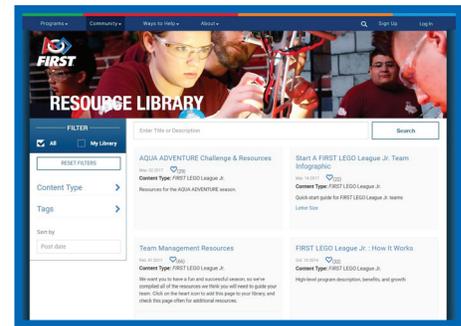
** In order to use your WeDo set, you must have a compatible hardware device (for example, a tablet, laptop, or desktop computer) and download the corresponding WeDo software onto the device. To view the system requirements for your WeDo set and to download the corresponding software, visit education.lego.com/downloads. For additional support, including “Getting Started” guides, FAQs, troubleshooting tips, and more, visit education.lego.com, and select “Support.”*



What Help Is Available to Me As a Coach?

Online Resources

The *FIRST*® LEGO® League Jr. Resource Library has many resources to help you be as successful as possible. To access these resources, visit the *FIRST*® website at firstinspires.org, and select “*FIRST* LEGO League Jr.” Then select “Resource Library” from the “Quick Links” menu. The “AQUA ADVENTURESM Challenge and Resources” page within the Resource Library includes links to the AQUA ADVENTURE Challenge, Multimedia Connections, LEGO® Education resources, FAQs, and more.



Follow *FIRST* on Pinterest at pinterest.com/firstinspires for more ideas, tips, and resources. Visit the *FIRST* LEGO League Jr. YouTube Channel at youtube.com/user/JrFLLGlobal for “Getting Started Tutorials” and other helpful videos.

If you still have questions, feel free to email firstlegoleaguejr@firstinspires.org for support. Read on for some specific tips to help you manage your team during team meetings.

Team Management Tips

Voting with LEGO® Elements

Use the “Voting with LEGO® Elements” process described below to help team members select one LEGO model out of a group of LEGO models and as a way to make decisions on key issues throughout the season (for example, which topic to choose as a focus for the Challenge):

1. Arrange all the LEGO models in a central area.
2. Have each team member select two LEGO elements to use for voting. Tell team members that they can use each LEGO element as one vote, but they cannot vote for the same model twice. Remind team members that they are voting on the ideas being expressed by the models, not the models themselves.
3. Ask team members to vote by placing their LEGO elements next to the models whose ideas they like best. Then tally and announce the results.
4. In the event that there is a tie, or no decision can be reached, remove all the options except for the ones in contention for first place. Repeat the process until a winner is determined.

Storing and Transporting the Team Model

The rules for the Team Model require that the footprint be no bigger than 30 in. x 15 in. (76 cm x 38 cm); there is no height limit. However, consider your available meeting space and storage space, and decide ahead of time if you need to impose any additional size restrictions based on your capacity to store the Team Model between sessions and transport it to team meetings and any events. Let team members know about any such additional restrictions before they begin planning their Team Model. No matter what you decide, be sure to provide a large plastic container, a cardboard box, a wooden board, or some other container or platform of an appropriate size to store and transport the Team Model between sessions.

Optional Activities

Below are a few activities that you might find useful in one or more of the following situations:

- Your team finishes all scheduled activities in a session, but you still have time remaining in your team meeting.
- Your team breaks into groups during a session, and one group finishes earlier than the other group(s) and needs something to do while waiting for other group(s) to finish.
- You have more than 12 team meetings available for your team and would like to do some extension activities.

Create a Team Logo

Ask each team member to design a team logo that has one or more simple symbols and includes the team name. They can illustrate their ideas in the last pages of their *Engineering Notebook*. After team members have designed their logos, have them share the logos with one another. Have them vote on a team logo. If they cannot agree on a design, have them work together to create a new logo that incorporates their favorite parts of various designs. Save their final design and incorporate it into the *Show Me* poster in Sessions 10 and 11.

Explore the Multimedia Connections

Each session has one or more suggested “Multimedia Connections.” These are curated websites, videos, and other online tools related to the content of the session. Consider sharing some or all of the resources with the whole group at team meetings, and encourage team members to explore them individually during or between sessions (with permission and supervision from a parent or guardian). You can find descriptions of and links to these resources on the “AQUA ADVENTURE Challenge and Resources” page of the *FIRST LEGO League Jr. Resource Library*. See p. 8 for directions on how to access this page.



Engage an Expert

At one or more points during the season, arrange for team members to listen to a guest speaker, interview an expert, go on a field trip, and/or use the computer to go on a virtual field trip to learn about their water use and the water’s journey. Consider engaging an expert from your local conservation district office, water treatment facility, parks department, science museum, aquarium, college or university civil or environmental engineering department, etc.



SESSION 1: Name That Team!

OVERVIEW

Team members will learn about the *FIRST*® LEGO® League Jr. AQUA ADVENTURESM Challenge and Core Values, explore what it means to be on a team, and choose a team name.



MATERIALS

- AQUA ADVENTURE Engineering Notebooks
- AQUA ADVENTURE Inspire Set
- colored pencils, crayons, or markers

LEARNING OBJECTIVES

Team members will:

- Learn about the *FIRST* LEGO League Jr. AQUA ADVENTURE Challenge
- Explore the *FIRST* LEGO League Jr. Core Values
- Select a team name

SET-UP

- Gather the necessary materials for the session.
- Set up the technology required for any Multimedia Connections that you plan to share.



WARM UP (5 minutes)

Have team members stand in a circle with you. Start by saying, “Hi, I’m <your name>!” Then do an action (for example, clap twice). The entire team will then respond by saying, “Hi, <your name>!” and copying your action. Then the next person should take a turn saying his or her name and doing an action. After all team members have introduced themselves, start again. But this time, say your name as well as something about yourself (for example, “Hi, I’m <your name>, and I like soccer!”), and then do another action. Again, the team should respond by saying, “Hi, <your name>. You like soccer!” and copying your action. Continue around the circle three or four times, each time having team members say something new and interesting about themselves. They can follow with the same action or choose a new action each time. Encourage them to do fun movements: they could run in place, hop up and down, dance, spin, or make a silly face.



READ (5 minutes)

Welcome to *FIRST* LEGO League Jr.! This season, you and your team will work together on the AQUA ADVENTURE Challenge. You will start by exploring how important water is in your life.

Then you will pick one of the ways that you use water at home or in your community. You will learn as much as you can about the water’s journey. Where does the water come from? How does it get to you? How much do you use? What happens after you use it?

As you follow the water’s journey, you will look for any problems. For example, is there a problem with how the water gets to you? Or do you use more water than you need? You will choose one problem that you can help fix. Then you will design a solution to the problem.

You will build a Team Model and create a *Show Me* poster about what you learn. Finally, you will share your work with others.

At every session, you will honor the *FIRST* LEGO League Jr. Core Values:

- **We are a team.**
- **We do the work.**
- **Our Coaches help us learn, but we find the answers ourselves.**
- **We share our experiences and discoveries with others.**
- **We are helpful, kind, and show respect when we work, play, and share. We call this *Gracious Professionalism*®.**
- **We are all winners.**
- **We have fun!**





DO (50 minutes)

- 1.) Go over pp. 4–5 of the *Engineering Notebook* with team members to give them an overview of *FIRST* LEGO League Jr. and the AQUA ADVENTURE Challenge.
- 2.) Let team members know that they will get to do several mini-builds throughout the season. They should complete these mini-builds with the LEGO® elements and base plates included in the Inspire Set. They will have about 3 to 5 minutes of building time for each mini-build and will then share their model with the group. They should listen carefully while their fellow team members are sharing and should applaud after each person has finished. For more information on how to guide your team through the mini-build process, watch the “LEGO Mini-Build” video, which is accessible from the “AQUA ADVENTURE Challenge and Resources” page of the *FIRST* LEGO League Jr. Resource Library; see p. 8 for directions on how to access this page. The first mini-build will help them think about what makes a good team member:

- **“What Makes a Good Team Member?” Mini-Build:** Put together a LEGO minifigure. Then add more LEGO elements to show how you could be a good team member.

If the group needs inspiration, provide examples of how to be a good team member, such as helping, cheering, sharing, working hard, listening, drawing, building, researching, etc. 

- 3.) Remind team members that “*We are a team*” is just one of the *FIRST* LEGO League Jr. Core Values. Ask them to look at the list of Core Values and to choose their favorite. Then supply them with colored pencils, crayons, or markers, and have them use the space in their *Engineering Notebook* to record and illustrate their favorite Core Value. 
- 4.) Have team members form groups of two or three. Ask each group to pantomime one of the Core Values they illustrated. They cannot use words and should try to communicate their Core Value in less than one minute. After giving groups a few minutes to practice, have each group take a turn acting out its chosen Core Value and seeing if the rest of the team can guess correctly. If you have just one group, the Coaches can be the guessers. 
- 5.) Tell team members that they will select a team name to use throughout the season. Help them to start thinking about ideas for their name by having them complete the following mini-build:
 - **“Our Team Name” Mini-Build:** Think about your team and the AQUA ADVENTURE Challenge theme. Build a LEGO model that describes an idea you have for a team name. 
- 6.) Have team members listen to each other’s name ideas and brainstorm any additional names. Then ask them to vote on the team name that they like best. Consider using the “*Voting with LEGO Elements*” process described on p. 8. Have them record the winning name in their *Engineering Notebook*. 
- 7.) If time allows, consider doing one or more of the optional activities described on p. 9.
- 8.) Tell team members that in the next session they will be exploring the many ways they use water!



SESSION 2: The PlayPump Story

OVERVIEW

Team members will learn about the successes and challenges of using pumps powered by merry-go-rounds to access water in South Africa. Then they will build and use the AQUA ADVENTURESM Inspire Model (a LEGO® water pump) and other LEGO models to show what they have learned.



MATERIALS

- AQUA ADVENTURE Engineering Notebooks
- balled-up piece of paper, beanbag, or other small, soft object
- AQUA ADVENTURE Inspire Set
- AQUA ADVENTURE Inspire Model building instructions
- colored pencils, crayons, or markers
- *optional:* additional assorted LEGO elements
- *optional:* LEGO® Education WeDo 2.0 or WeDo Set, corresponding software or app, and compatible hardware device

LEARNING OBJECTIVES

Team members will:

- Describe how PlayPumps work
- Explain the successes and challenges of using PlayPumps to access water
- Build the Inspire Model and other LEGO models and use them to act out the PlayPump story
- *Optional:* Motorize the Inspire Model using WeDo 2.0 or WeDo

SET-UP

- Gather the necessary materials for the session. Be sure to have an Internet-connected device available for displaying the AQUA ADVENTURE Inspire Model building instructions online during the session and/or print them out in advance. You can find a link to the building instructions on the back of the Inspire Set box as well as on the “AQUA ADVENTURE Challenge and Resources” page of the FIRST® LEGO® League Jr. Resource Library. See p. 8 for details on how to access this page.
- Set up the technology required for any Multimedia Connections that you plan to share.
- *Optional:* If you plan to use a WeDo 2.0 or WeDo Set to motorize the Inspire Model, be sure to download and install the corresponding software or app on your compatible hardware device. See p. 7 for more detailed information. If possible, spend at least 60 minutes familiarizing yourself with the WeDo 2.0 or WeDo Set, software or app, and hardware device before the session.



WARM UP (5 minutes)

Have team members take turns tossing a balled-up piece of paper, beanbag, or other small, soft object to one another.

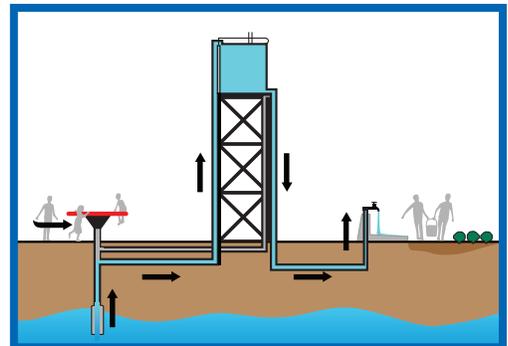
When they catch it, they must say their name and one way they have used water that day (for example, “*Maria. Washed hands.*”) Play until everybody has had two or three turns. Challenge team members to come up with a different use each time. Remind them to encourage one another and to assist their teammates with ideas if they need help. 



READ (5 minutes)

When you want water, how do you get it? Do you turn on a tap? Do you get it from a bottle? Do you use a pump? People in some places do not have any of these choices. They must get water another way. They might have to walk to a river or lake. This can take a long time. The water might not be clean. Water engineers visit these places to look for water that is nearby and clean. They drill deep holes into the ground. If they find water, they put in a pump to help people get the water.

In 1989, a water engineer in South Africa had an idea. He knew that some places needed water. He also knew that some schools did not have playgrounds. His idea was to attach a merry-go-round to a water pump. Children could use it to play at school and get water at the same time. A group of people liked this idea. They built a model of it and added more parts. They called it the PlayPump. As children spun on the merry-go-round, the pump got water from under the ground. The water went up into a tank. A tap let people get the water when they needed it.



The group built many PlayPumps. They put them in South Africa and other countries. Children had fun playing on them. People used the water to drink, wash hands, water gardens, and more. Children got sick less often. They were able to go to school more.

But PlayPumps were not perfect. Sometimes people who wanted water found an empty tank. They had to push the merry-go-round by themselves. When a PlayPump broke, it could take a long time to get parts to fix it. Some PlayPumps were replaced with hand pumps.

In 2008, a new group took over the PlayPump project. They knew about the problems. They have worked hard to solve them. When a PlayPump breaks, they fix it fast. They also put in new PlayPumps only if it makes sense. There must be a need for water. A PlayPump must be able to meet the need. And the local people must want a PlayPump.



Today there are more than 900 PlayPumps in South Africa. They help people get clean water, and they help children have fun!



DO (50 minutes)

- 1.) After going over the **Read** section with team members, consider sharing additional resources about how PlayPumps work, different ways that people access water, and/or the importance of clean water. This session's Multimedia Connections include several suggested online resources. See pp. 8–9 for details on how to access them via the “AQUA ADVENTURE Challenge and Resources” page of the *FIRST* LEGO League Jr. Resource Library.
- 2.) Tell team members that they will now act out the PlayPump story using LEGO models. They will begin by building the AQUA ADVENTURE Inspire Model. It is a LEGO water pump. Tell them that they will be including this water pump model in their Team Model that they build later in the season. For this activity, the team can build either a hand-cranked version of the pump or a motorized version powered by WeDo 2.0 or WeDo; there are building instructions available for all of these options. Provide the team with an Internet-connected device and the link to view the building instructions online, and/or supply a printed version of the building instructions. See the **Set-Up** section for more details.
- 3.) If you have a small team, they all can work together to build the Inspire Model. Consider giving them roles such as “navigator” (keeps team members on track by announcing the steps, moving through the building instructions, etc.), “finder” (finds the LEGO elements needed for each step), “builder” (adds the elements to the model), and “checker” (checks that the elements have been placed correctly). Be sure to have team members switch roles every so often so that everyone gets a chance to do more than one role. If you have more than four team members, some could build the Inspire Model and some could start on Step 4.
- 4.) Ask team members to think about what other LEGO models they can use to act out the important parts of the PlayPump story. Have them draw their ideas for up to four models in their *Engineering Notebook*. If they need help, suggest ideas such as a merry-go-round, a water storage tank, a pipe with a tap, children, a school, a garden, etc.
- 5.) Invite team members to share their ideas with one another. Depending on the amount of time and the types of LEGO elements available, help the group decide whether to build some or all of their proposed models.
- 6.) After the team has built the Inspire Model and any additional LEGO models, have them act out the PlayPump story using these models.

Note: *Keep the Inspire Model intact at the end of the session, as you will need it for future sessions.*

- 7.) Tell team members that in the next session they will get to choose a water use to focus on for the AQUA ADVENTURE Challenge!



SESSION 3: Choose Your Water Use

OVERVIEW

Team members will select one way that they use water at home or in their community to explore for the AQUA ADVENTURESM Challenge. They will also do some introductory building and programming activities using LEGO[®] Education WeDo 2.0 or WeDo.



MATERIALS

- AQUA ADVENTURE Engineering Notebooks
- WeDo 2.0 or WeDo Set, corresponding software or app, and compatible hardware device
- AQUA ADVENTURE Inspire Set
- colored pencils, crayons, or markers

LEARNING OBJECTIVES

Team members will:

- Name examples of ways they use water at home and in their community
- Select one water use to focus on for the AQUA ADVENTURE Challenge
- Build and program one or more “Getting Started” models using WeDo 2.0 or WeDo

SET-UP

- Gather the necessary materials for the session.
- If this is your first time using a WeDo 2.0 or WeDo Set, download and install the corresponding software or app on your compatible hardware device. See p. 7 for more detailed information. If possible, spend at least 60 minutes familiarizing yourself with the WeDo 2.0 or WeDo Set, software or app, and hardware device before the session.
- Set up the technology required for any Multimedia Connections that you plan to share.



WARM UP (5 minutes)

Ask team members to think about the many ways they use water. Have them write or draw in their *Engineering Notebook* at least two ways they use water at home and two ways they use water in their community. If they need help, they can refer to the illustration and list in the **Read** section. Then have team members take turns sharing their water uses by pantomiming them and having the rest of the team guess what they are.



READ (5 minutes)

If you had to name the five most important things in your life, what would you say? Water might not be on your list. But without water, there would be no life at all! Every living thing on Earth needs water.

People use water for many things. We drink it. We use it to grow food. We use it to clean. We use it to play and have fun. Look at the list below. It shows just some of the ways that people use water at home and in their communities.

- boating
- brushing teeth
- cleaning
- cooking
- drinking
- fighting fires
- filling fish tanks
- filling fountains
- fishing
- flushing toilets
- generating electricity
- ice skating
- making art
- making ice
- making steam
- showering
- swimming
- taking a bath
- washing clothes
- washing dishes
- washing hands
- watering crops
- watering flowers
- watering grass

For the AQUA ADVENTURE Challenge, your team will choose one way that you use water at home or in your community.

Then you will learn as much as you can about how water gets to you for this use!



What water use will you choose?



DO (50 minutes)

- 1.) Tell team members that today they will select one water use to focus on for the AQUA ADVENTURE Challenge. They will also begin to familiarize themselves with the WeDo 2.0 or WeDo Set that they will be using for building and programming part of their Team Model.

Group Management Tip: If your team has three or fewer members, have everyone do all activities in this session; allow 10–20 minutes for Steps 2–3 and 30–40 minutes for Step 4. If your team has more than three members, split the team into two groups. Have one group start working on Steps 2–3, and have the other group start working on Step 4; after about 20 minutes, have the groups switch so that everyone tries each activity.

- 2.) Consider sharing videos, books, websites, and/or other resources about how people use water. Encourage the team to use these resources to learn more before selecting their focus topic. This session's Multimedia Connections include several suggested online resources. See pp. 8–9 for details on how to access them via the “AQUA ADVENTURE Challenge and Resources” page of the *FIRST*® LEGO® League Jr. Resource Library.
- 3.) Ask team members to choose one water use from the list in the **Read** section or their own lists that they might like to explore for the AQUA ADVENTURE Challenge. Then have them complete the following mini-build:
 - **“Pick a Water Use” Mini-Build:** Build a LEGO® model that shows a water use that you would like your team to explore for the AQUA ADVENTURE Challenge. 🙌
- 4.) Have team members complete the following introductory building and programming activities:
 - If using WeDo 2.0: *Getting Started A: Milo the Science Rover*
 - If using WeDo: *Getting Started 1–5, 7–10, and/or 12–15*

As team members do these activities, have them share what they are learning about building and/or programming with WeDo 2.0 or WeDo. Ask them to think about how they might use this knowledge when it is time to design and build their Team Model.

- 5.) When there are 5–10 minutes left in the session, have team members stop what they are doing and share the LEGO models they made in Step 3. Have them explain the reasons why they think the team should focus on the water use they modeled.
- 6.) Once all team members have shared, arrange the models in a central area so they can vote on which water use to explore. Consider using the “Voting with LEGO Elements” process described on p. 8. After the vote, announce which water use the team will be exploring. If team members are disappointed that their particular water use was not chosen, let them know that although their Team Model should focus on the team’s chosen water use, it can show additional water uses as well.
- 7.) Have team members use colored pencils, crayons, or markers to draw a picture of the team’s chosen water use in their *Engineering Notebook*. Also have them write down a short description of the water use.
- 8.) Tell team members that in the next session they will be exploring how water gets to them for their chosen use!



SESSION 4: Follow Your Water's Journey

OVERVIEW

Team members will explore how water gets from sources to people. They will begin to research how water gets to their own home and/or community for the use they selected in Session 3. They will also do some introductory building and programming activities that utilize LEGO® Education WeDo 2.0 or WeDo sensors.



MATERIALS

- AQUA ADVENTURESM Engineering Notebooks
- WeDo 2.0 or WeDo Set, corresponding software or app, and compatible hardware device
- AQUA ADVENTURE Inspire Set
- colored pencils, crayons, or markers

LEARNING OBJECTIVES

Team members will:

- Identify the source(s) of their water
- Investigate how the water travels from the source(s) to them for their chosen use
- Build and program one or more “Getting Started” models that incorporate WeDo 2.0 or WeDo sensors

SET-UP

- Gather the necessary materials for the session.
- Set up the technology required for any Multimedia Connections that you plan to share.

Note: Team members may spend additional time outside of their regularly scheduled team meetings to research their chosen water use and the water’s journey — especially if you decide to take them on a field trip. Note that teams can move on to Session 5 while still conducting research; in fact, research can continue throughout the next several sessions. However, if your team is not able to do research outside of team meetings, try to gather as many resources as possible (relevant videos, websites, books, etc.) for them to reference during this session and the next few sessions.



WARM UP (5 minutes)

Let team members know that they will soon start to build their Team Model for the AQUA ADVENTURE Challenge. But before they build their model they will need to learn more about how water gets to them for their chosen use. To help them think about this topic, have them complete the following mini-build:

- **“Moving Water” Mini-Build:** Build a LEGO® model that shows one real or imaginary way that you could help water travel from one place to another. 



READ (5 minutes)

You chose a water use. Now it’s time to learn how the water gets to you for that use! To begin, you must find the source of your water. That is, where does it come from? Under the ground? On Earth’s surface? From the sky?

People in many places use groundwater. This is water found under the ground. It is in the spaces and cracks of underground layers of soil and rock. People use wells, pipes, and pumps to bring groundwater up to the surface. In some places, people use water that is already on Earth’s surface. Rivers, lakes, and the ocean are examples of surface water. When water falls from the sky in the form of rain or snow, it can add to surface water. Water from the sky can also soak into the ground and make more groundwater. Sometimes people collect rain or snow as it falls. They might use it right away or store it for later.

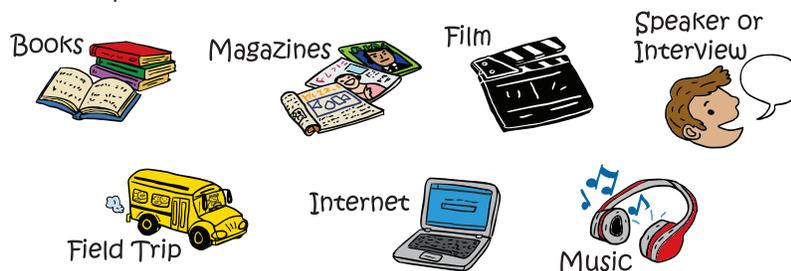
Water must often be cleaned before people can use it. Towns and cities help clean water at water treatment plants. Water treatment plants take sand, dirt, and trash out of the water. If the water is from the ocean, they take out salt, too. They kill any bacteria in the water. Then they use pipes, pumps, and other tools to send clean water to the community.



Where does your water come from?

Does your home or school have its own well? Does your town provide your water? Does the water get cleaned? If so, how? How far does the water travel? What kinds of pumps and pipes does it go through? Once it reaches you, do you use a tap to get it? Or do you get it some other way? What happens to the water when you are done with it?

Look at the pictures below. They show some ways you could learn more about water. You will need to do research so you can build a great Team Model and *Show Me* poster.



It's time to follow your water's journey!



DO (50 minutes)

- 1.) Let team members know that today they will begin learning where their water comes from and how it gets to them for their chosen use. They will also use a WeDo 2.0 or WeDo Set to learn more building and programming skills, including how to use motion and tilt sensors.

Group Management Tip: If your team has three or fewer members, have all team members do all activities in this session; allow 10–20 minutes for Steps 2–3 and 30–40 minutes for Step 4. If your team has more than three members, split the team into two groups. Have one group start working on Steps 2–3, and have the other group start working on Step 4; after about 20 minutes, have the groups switch so that so that everyone tries each activity.

- 2.) Ask team members to share what they know about the source(s) of their water. Have them circle any sources they identify in their *Engineering Notebook*. If they do not know where their water comes from, have them skip this section for now and complete it once they learn more. Then ask if any team members are familiar with a *KWL chart*. If so, ask a volunteer to explain the concept. If not, tell them to look at the chart in their *Engineering Notebook*, and explain that the “K” stands for “*What I Know*,” the “W” stands for “*What I Want to Know*,” and the “L” stands for “*What I Learned*.” Tell team members to write or draw at least one thing that they *know* about the journey of their water in the “K” column and at least one thing that they *want* to know in the “W” column. After about five minutes, have them share what they wrote. Over the next several weeks, encourage team members to add to all three columns of their KWL chart as they research their water's journey. 
- 3.) Have team members look at the illustrations in their *Engineering Notebook* to see examples of ways to research their water's journey. Encourage them to gather information between sessions and then share it with the team at subsequent meetings. If possible, allow them to use Internet-connected computers or tablets to begin their research right away. This session's Multimedia Connections include several suggested online resources. See pp. 8–9 for details on how to access them via the “AQUA ADVENTURE Challenge and Resources” page of the *FIRST*® LEGO® League Jr. Resource Library. Have team members record any new questions or information they learn in their KWL chart.
- 4.) Have team members complete the following introductory building and programming activities that incorporate sensors:
 - If using WeDo 2.0: *Getting Started B: Milo's Motion Sensor* and *Getting Started C: Milo's Tilt Sensor*
 - If using WeDo: *Getting Started 6, 10, and/or 16–20*

As team members do these activities, have them discuss how sensors help robots sense the world around them. Encourage them to think about how they could incorporate one or more sensors as part of their Team Model.

- 5.) Tell team members that in the next session they will learn more about engineering design. This will help them as they identify a problem with their water's journey and create a solution to fix it.



SESSION 5: Be an Engineer

OVERVIEW

Team members will learn about the engineering design process and explore how it can be used to find solutions to problems.



MATERIALS

- AQUA ADVENTURESM Engineering Notebooks
- LEGO® Education WeDo 2.0 or WeDo Set, corresponding software or app, and compatible hardware device
- AQUA ADVENTURE Inspire Model
- AQUA ADVENTURE Inspire Set
- colored pencils, crayons, or markers
- *optional*: additional motor and WeDo 2.0 Smarthub or WeDo USB Hub
- *optional*: additional assorted LEGO® elements

LEARNING OBJECTIVES

Team members will:

- Describe the parts of the engineering design process
- Use the engineering design process and LEGO elements to collect the LEGO water from the Inspire Model pump and store it for future use
- *Optional*: Motorize the Inspire Model using WeDo 2.0 or WeDo

SET-UP

- Gather the necessary materials for the session, including the Inspire Model that was built in Session 2.
- Set up the technology required for any Multimedia Connections that you plan to share.



WARM UP (5 minutes)

Remind team members that their Team Model for the AQUA ADVENTURE Challenge should show how water gets to them for their chosen use. Their water might travel through various tools and structures such as pumps, wells, pipes, water towers, filters, etc. To help team members decide which of these to show in their Team Model, have them complete the following mini-build:

- **“Water Tools and Structures” Mini-Build:** Think about all the tools and structures that your water travels through to get from its source to you. Build a LEGO model of one tool or structure that you definitely want to include in your Team Model.



READ (5 minutes)

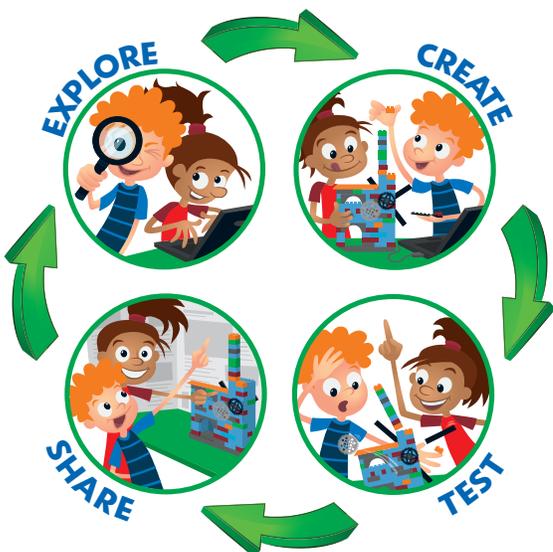
Think back to the PlayPump story. The PlayPump started as an idea. Engineers worked hard to bring the idea to life. They had to solve some problems along the way. How can

a merry-go-round be used to pump water? What is the best way to collect the water? How should the water be stored? They tested many solutions. If one did not work, they tried a new one. They kept working to find the best solutions.



You are an engineer, too! All engineers use the engineering design process. The four main parts of this process are *explore*, *create*, *test*, and *share*. Sometimes you have to do a part more than once. And the parts do not always go in order. They can go in a circle!

Explore a problem. *Create* one or more solutions. *Test* the solutions. *Share* what you learn.



Practice being an engineer by solving a problem with your team. Look at the AQUA ADVENTURE Inspire Model. What happens when the LEGO water comes out of the pump? Imagine that you need to collect the water and store it to use later. But you must follow some rules.



- 1.) You can use only LEGO elements.
- 2.) You cannot touch the water with your hands once it comes out of the pump.
- 3.) You must store the water at least 6 in. (15 cm) away from where it comes out of the pump.

Start by exploring the problem. Then create and test a solution. Can you think of any ways to make your solution better? Don't forget to share what you learn!



DO (50 minutes)

- 1.) If any team members have done research about their chosen water use or the water's journey since the last session, invite them to share what they have learned with the group. 
- 2.) Go over the problem presented in the **Read** section with the team. Make sure they understand the goal: to collect the LEGO water that comes out of the pump and store it to use later. Remind them that they 1) can use only LEGO elements; 2) cannot touch the water with their hands once it comes out of the pump; and 3) must store the water at least 6 in. (15 cm) away from where it comes out of the pump.
- 3.) Have the team look closely at the Inspire Model in operation. They can use the motorized version or the hand-cranked version to transport the LEGO water through the pump. However, if you have only one motor and one WeDo 2.0 Smarthub/ WeDo USB Hub available, they might want to use the hand-cranked version so that they can utilize the motorized elements as part of their water storage solution. Ask team members to observe what happens to the water as it comes out of the pump. (It should spill out haphazardly.)
- 4.) Ask team members to think about different ways they could collect the LEGO water. (For example, they could build a container to catch the water as it comes out of the pump, or they could build a ramp to send the water into a container located somewhere else.) Also have them think about how to transport the water to the storage location. (For example, they could build a collection container away from the pump, put a container on wheels in order to move the collected water, or use a pulley system to raise up the collected water.) Ask them to share ideas about why it might be important to store water away from the opening of a pump.
- 5.) Have team members draw and/or write about their ideas for possible solutions in their *Engineering Notebook*. Then have them share their ideas with the group. 
- 6.) If possible, divide the team into pairs based on their interests in trying various solutions. Supply each pair with LEGO elements from the Inspire Set, the WeDo 2.0 or WeDo Set, and/or other assorted LEGO elements. Then have them create, test, and improve their solutions. If some team members need help getting started, encourage them to explore the following models:
 - If using WeDo 2.0: Modify the *Pull-Robot* to collect the water and move it somewhere else.
 - If using WeDo: Modify the *Hungry Alligator* to collect and store the water.
- 7.) If team members solve the problem quickly, have them brainstorm other ways to solve the problem. Challenge them to see how many different solutions they can develop. After they have tested all of the solutions, have them share their results and select a favorite solution.
- 8.) Tell team members that in the next session they will identify a problem with their water's journey. Then they will use the engineering design process to develop a solution to the problem. They will incorporate their ideas about the problem and their solution into their Team Model.



SESSION 6: Improve Your Water's Journey

OVERVIEW

Team members will design a solution to improve a part of their water's journey.



MATERIALS

- AQUA ADVENTURESM Engineering Notebooks
- LEGO® Education WeDo 2.0 or WeDo Set, corresponding software or app, and compatible hardware device
- AQUA ADVENTURE Inspire Set
- colored pencils, crayons, or markers
- *optional*: additional motor and WeDo 2.0 Smarthub or WeDo USB Hub
- *optional*: additional assorted LEGO® elements

LEARNING OBJECTIVES

Team members will:

- Identify a problem with their water's journey
- Design a solution to the problem
- Model the solution with LEGO elements

SET-UP

- Gather the necessary materials for the session.
- Set up the technology required for any Multimedia Connections that you plan to share.



WARM UP (5 minutes)

Ask team members to share why it is important to use water wisely. Let them know that in some regions there is not enough accessible fresh water to meet the demands of the people who live there. Even in places that currently have enough water, conserving water can save money, energy, and other resources. To help the group think about how engineers might tackle a problem such as wasting water, have them complete the following mini-build:

- **“Water Conservation” Mini-Build:** Think about one way that people use more water than they need. Build a LEGO model of a tool that could help people use less water. It could be something that already exists or something that you imagine. 

If team members need help, offer some examples of existing engineering solutions such as low-flow showerheads, dual-flush toilets, motion sensors for public faucets, hose nozzles, sprinkler timers, etc.



READ (5 minutes)

You have done a lot so far as part of the AQUA ADVENTURE Challenge! You chose a way that you use water at home or in your community. You learned how water gets to you for this use. Now it is time to take a closer look at your water's journey. What part of the journey could you make better?

Think about the beginning of your water's journey. What source does your water come from? Is this source the only place for you or your community to get water? If not, are there any sources that might be better?

Now think about the middle of the journey. How does your water get to you? Does it get cleaned along the way? What kinds of pipes does it travel through? Are they new or old? Does the water get stored anywhere before it comes to you? If so, are there any problems with how it is stored?

Also think about the end of the water's journey. How do you use the water? Is the water safe for this use? Could you make it safer? Do you ever use more water than you need? If so, how could you use less? And what happens



to the water when you are done with it? Where does it go? Is this the best place for it to go?

Make a list of any problems you found with your water's journey. Your team must choose one of these problems to explore. Pick one that you can help fix. Then get ready to improve your water's journey!



DO (50 minutes)

- 1.) If any team members have done research about their chosen water use or the water's journey since the last session, invite them to share what they have learned with the group. 
- 2.) Tell team members that today they will be tackling the third part of the AQUA ADVENTURE Challenge: to design a solution to improve a part of their water's journey. As team members consider the questions in the **Read** section, have them use their *Engineering Notebook* to draw and/or write about any problems at the beginning, middle, and/or end of their water's journey. Note that they might not find a problem at every stage of the water's journey.
- 3.) Ask the group to share the problems they identified and, as a team, to select one problem to focus on for the Challenge. Let the team know that for whatever problem they choose, they must design a solution that they can model with LEGO elements. However, they are not required to create a working prototype of the solution.

Note: For younger team members, problems might focus on how to conserve water, and solutions could include simple actions such as 1) turning off the tap when brushing teeth or 2) installing rain barrels to collect rainwater for watering flowers. An advanced team might explore more complex problems and solutions such as 1) accessing water from a new source, 2) replacing pipes contaminated with lead, or 3) using timers to control water usage at home or in the community.

- 4.) Help team members identify resources such as books, websites, or community experts to help them investigate their chosen problem and any existing solutions. If possible, have them use some of these resources to conduct some research during the session. Let them know that they can modify an existing solution or create a new solution for their Team Model.
- 5.) Ask team members to share their thoughts about possible solutions. Have them draw and/or write about one or more solutions in their *Engineering Notebook*. Then have them work alone or in small groups to create a model of their favorite solution using LEGO elements. They can build a stationary model and/or use a WeDo 2.0 or WeDo Set to build a motorized model.

Group Management Tip: If you have more than three members on your team, consider splitting them into two groups during Step 5. One group could build a stationary model of their solution using the Inspire Set and/or other assorted LEGO elements. The other group could explore the WeDo 2.0 or WeDo software for ideas on how to create a motorized model of their solution.

- If using WeDo 2.0: Explore motorized actions such as the *Flex* base model and *Floodgate*, *Grab* base model and *Robotic Arm*, *Revolve* base model and *Alarm Device*, *Sweep* base model and *Sea Cleaner*, and *Motion* base model and *Detector*. *Optional:* Have team members use the WeDo 2.0 documentation tool to record notes, take photos, take screenshots of any programs they create, etc. These can be printed out later to include on the team's *Show Me* poster.
- If using WeDo: Explore how to make lever arms rotate via the *Drumming Monkey* model, how to use a motion sensor to activate movement via the *Hungry Alligator* model, and how to create side-to-side motion via the *Goal Keeper* model.

- 6.) Have all groups share their models. Then have them use the "Voting with LEGO Elements" process described on p. 8 to vote on which solution to show in their Team Model. Let them know that they can continue to work on the details of their solution over the next few sessions.
- 7.) Tell team members that in the next session they will learn the rules for their Team Model and begin planning it. They will also have time to continue exploring, creating, testing, and sharing their ideas about their solution to the problem they chose.



SESSION 7: Plan Your Team Model

OVERVIEW

Team members will plan their Team Model for the AQUA ADVENTURESM Challenge.



MATERIALS

- AQUA ADVENTURE Engineering Notebooks
- LEGO® Education WeDo 2.0 or WeDo Set, corresponding software or app, and compatible hardware device
- AQUA ADVENTURE Inspire Set
- colored pencils, crayons, or markers
- *optional*: additional assorted LEGO® elements
- *optional*: copy paper

LEARNING OBJECTIVES

Team members will:

- Describe the rules for the Team Model
- Share ideas about what the Team Model should include
- Develop a design for the Team Model

SET-UP

- Gather the necessary materials for the session.
- Set up the technology required for any Multimedia Connections that you plan to share.



WARM UP (5 minutes)

Tell team members that they will begin planning their Team Model during this session. Remind them that the basic parts of the AQUA ADVENTURE Challenge are to 1) Choose a way that you use water at home or in your community; 2) Learn as much as you can about the water's journey; 3) Design a solution to improve a part of the water's journey; and 4) Show what you have learned through your Team Model and *Show Me* poster. Ask team members to complete the following mini-build to help show what they have learned so far:

- **“Show What You Know” Mini-Build:** Build a LEGO model that shows one thing you have learned about water that you did not know at the start of the season. 



READ (5 minutes)

Think back to the start of this season. Did you know how much water you use? Or where your water comes from? Or how it gets to you? Or how you could improve its journey? You probably know much more now!

The next step of the AQUA ADVENTURE Challenge is to create a Team Model to show everything you have learned. Today, you will plan this model. Start by learning the rules for building it:

- **Your Team Model must show your chosen water use, the journey that water takes to get to you for this use, and the solution you designed to improve the water's journey.**
- **You must use only LEGO elements. You can use any LEGO bricks, minifigures, base plates, or other elements. You may not use glue, paint, or any other art or craft materials.**
- **You must include the AQUA ADVENTURE Inspire Model.**
- **You must use LEGO Education WeDo 2.0 or WeDo to build and program at least one motorized part.**



- **The footprint of your Team Model must be no bigger than 30 in. x 15 in. (76 cm x 38 cm). There is no height limit. However, your team must be able to move the model safely.**
- **Use your imagination as you design and build. Be creative!**



DO (50 minutes)

- 1.) If any team members have done research since the last session about their chosen water use, the water's journey, or their proposed solution to improve the water's journey, invite them to share what they have learned with the group. 
- 2.) After going over the **Read** section, help team members brainstorm what to include in their Team Model by having them do the following mini-build:
 - **"Idea Generation" Mini-Build:** Build a LEGO model that shows one or two things that you definitely want to include in your Team Model.
- 3.) After team members have listened to everyone's ideas, supply them with colored pencils, crayons, or markers. Ask them to write about and draw a design for their Team Model in their *Engineering Notebook*. Encourage them to include notes and/or drawings based on their teammates' ideas.
- 4.) Remind team members to be sure to include their water use, the water's journey, their solution to improve the water's journey, and the Inspire Model in their design. Also remind them that they will need to use WeDo 2.0 or WeDo to build and program at least one motorized part. If they are having trouble with motorization ideas, ask them some questions to get them thinking, such as: Could you use movement to show your water use or part of the water's journey? Could you use a motorized part to show the solution to improve your water's journey? Could there be any moving people or tools in your Team Model?

Note: *If team members do not have an original idea for a motorized part, they can always use and/or modify an existing WeDo 2.0 or WeDo program, such as the one used to motorize the Inspire Model. If they use an existing program, be sure they understand the program, and encourage them to modify it in some way. Also have them think about how they might use the motorized version of the Inspire Model to help tell the story of their water use, the water's journey, and/or their solution.*

- 5.) After team members have finished writing about and drawing their designs, have them share their ideas with the group. Make sure they describe how their designs include their water use, the water's journey, their idea to improve the water's journey, the Inspire Model, and at least one motorized part.
- 6.) Have the group vote on which design (or design elements) they like best. If they cannot agree, consider supplying copy paper so they can work together to create a design that incorporates their favorite parts of various designs. If they start to argue, be prepared to mediate. It is important that all team members feel valued and get to express their thoughts. Repeat the *FIRST*® *LEGO*® *League Jr.* Core Values of "We are a team." and "We have fun!" to remind them to support one another and to enjoy the AQUA ADVENTURE Challenge. 
- 7.) Tell team members that in the next two sessions they will build their Team Model!



SESSIONS 8 and 9: Build Your Team Model

OVERVIEW

Team members will build and program their Team Model for the AQUA ADVENTURESM Challenge.



MATERIALS

- AQUA ADVENTURE Engineering Notebooks
- colored pencils, crayons, or markers
- AQUA ADVENTURE Inspire Set
- AQUA ADVENTURE Inspire Model
- LEGO® Education WeDo 2.0 or WeDo Set, corresponding software or app, and compatible hardware device
- container for storing the Team Model
- *optional*: additional assorted LEGO® elements

LEARNING OBJECTIVES

Team members will:

- Review their design plan for their Team Model
- Work together to build the Team Model
- Use WeDo 2.0 or WeDo to program a motorized part of the Team Model

SET-UP

- Gather the necessary materials for the session.
- Secure a large plastic container, a cardboard box, a wooden board, or some other container or platform to store and/or transport the Team Model between sessions.
- Set up the technology required for any Multimedia Connections that you plan to share.



WARM UP (5 minutes — Session 8 only)

Tell team members that today they will begin building their Team Model. They have spent the past few sessions preparing for this task and might be feeling excited and/or nervous. Help team members express their feelings by completing the following mini-build:

- **“Get Ready to Build” Mini-Build:** Put together a LEGO minifigure. Then add a few more LEGO elements to show how you feel about starting your Team Model. 



READ (5 minutes — Session 8 only)

You have worked hard on the AQUA ADVENTURE Challenge! You learned about water and its many uses. You chose one of these uses to explore. You learned about the water’s journey. You looked for problems along the way. You asked questions and did research to get answers. You designed a solution to improve the water’s journey. You built small models and programmed them to move. Now it is time to build a bigger model to show everything you have learned.

Today you will begin to build your Team Model. Remember to follow the building rules that you learned about in the last session. Use the design your team made to guide you as you build. But if something does not work, do not be afraid to change it. There are no right or wrong answers when it comes to building.

**What are you waiting for?
Start building, and have fun!**





DO (110 minutes total: 50 minutes in Session 8; 60 minutes in Session 9)

- 1.) Have team members review the final design of their Team Model. Show them the WeDo 2.0 or WeDo Set(s), Inspire Set, and any additional LEGO elements that will be available to them for building. Have them discuss which elements they think will work best for each part of the model. If they have trouble with this, let them know that they do not have to plan everything ahead of time. They can select elements as they build. Also, reassure them that if they do not finish building and/or programming their model during these two sessions, they can finish during the next few sessions.
- 2.) Ask the group to think about how they can work together to build their Team Model. Remind them that it is important for everyone to have an equal chance to build. Part of your job as a Coach is to make sure that the work (and the fun) is divided fairly. Consider splitting the team into pairs or small groups and rotating tasks at set intervals. Alternatively, ask if different team members want to work on certain parts of the model. Emphasize that every task is important. While some team members are working on the program, others could be building and/or conducting additional research. Encourage the team to use the notes and drawings from their *Engineering Notebooks* to inspire them as they work.
- 3.) Be sure that all team members have a turn working on the motorized and programmable part(s) of the Team Model.
- 4.) Remind the group about the “test” part of the engineering design process. They should continually be testing and looking for ways to improve their work — especially any motorized and/or programmable parts. Have them answer the questions in their *Engineering Notebook* to evaluate their Team Model at the beginning of Session 9. Then have them discuss whether they want to make any changes based on their answers.
- 5.) If you have not yet taken photos of the team to use on the *Show Me* poster, take some during these two sessions. Try to take at least one individual photo of each team member and Coach, a team photo, several action shots of team members working, and a photo of the final Team Model.
- 6.) Allow team members plenty of time to clean up at the end of each building session. Have them put their Team Model into a large plastic container or cardboard box, or onto a wooden board or other stable platform. If they are using multiple base plates from the Inspire Set to form the base of their Team Model, be sure they incorporate ways to stabilize the base plates so that the model can be stored and transported safely between sessions.
- 7.) Let team members know that they will create their *Show Me* poster during the next two sessions to demonstrate what they have learned and accomplished during the season.

SESSIONS 10 and 11: Make Your Show Me Poster

OVERVIEW

Team members will create a *Show Me* poster about their experience with the AQUA ADVENTURESM Challenge.



MATERIALS

- AQUA ADVENTURE Engineering Notebooks
- 22-in. x 28-in. (flat) or 36-in. x 48-in. (tri-fold) poster board
- colored pencils, crayons, or markers
- copy paper
- construction paper
- scissors
- glue sticks or tape
- photographs of team members working on the AQUA ADVENTURE Challenge
- Team Model
- *optional*: printouts from LEGO® Education WeDo 2.0 documentation tool

LEARNING OBJECTIVES

Team members will:

- Describe the guidelines for the *Show Me* poster
- Gather information to include on the poster
- Create the poster

SET-UP

- Gather the necessary materials for the session.
- Print any season photos that you have taken. Try to print at least one individual photo of each team member and Coach, a team photo, a photo of the Team Model, and several photos of team members working throughout the season (researching, designing, building, programming, etc.).
- Set up the technology required for any Multimedia Connections that you plan to share.
- *Optional*: If your team has used the WeDo 2.0 documentation tool during the season, consider exporting and printing any notes, screenshots of the team's program(s), etc., that could be included on the *Show Me* poster.



WARM UP (10 minutes — Session 10 only)

Have team members gather information about one another by playing an interview game. They can use this information to help create the “*Our Team*” section of the *Show Me* poster. Ask the group to sit in a circle. You will start as the reporter. Ask each team member an interview question, for example: *What is your name? How old are you? What grade are you in? What do you like to do for fun? What has been your favorite part of working on the AQUA ADVENTURE Challenge so far? What is one thing you have learned? How have you helped your team? What part(s) of the Team Model did you work on?* Team members can also take turns acting as the reporter and asking interesting questions of their teammates.

Hint: Choose a different person to answer first for each question.



READ (5 minutes — Session 10 only)

You have learned so much this season! Now it is time to share what you have learned so others can learn about it, too. You will start by making a *Show Me* poster.

Your poster should have three main parts: *Explore*, *Create and Test*, and *Share*.

- **Explore:** Explain what you learned this season and how you learned it.
- **Create and Test:** Tell how you created and tested your Team Model and program.
- **Share:** Share information about your team.

You can use words, drawings, and photos on your poster. You can also attach small objects. Below are some ideas of what you could include in each part of your poster.





DO (105 minutes total: 45 minutes in Session 10; 60 minutes in Session 11)

- 1.) If team members did not finish working on their Team Model during the previous sessions, they can continue building, programming, and/or making changes throughout these two sessions.
- 2.) Whether or not the Team Model is completed, have everyone review the *Show Me* poster guidelines in the **Read** section. Then have each team member fill out the “*Our Team*” section in their *Engineering Notebook*. Each team member should also choose at least one of the other five groups of questions (“*Our Water Use*,” “*Our Water’s Journey*,” “*Our Problem and Solution*,” “*Our Team Model*,” and “*Our Program*”) to answer on a separate sheet of paper. Be sure that at least one person is working on each group of questions:
 - **Our Water Use:** What water use did your team choose to explore? Why did you choose this water use? How did you learn more about it? What did you learn? Is there anybody you should thank for helping you with your research? If so, who?
 - **Our Water’s Journey:** How did you research your water’s journey? What did you learn about how water gets to you for your chosen use? Is there anybody you should thank for helping you with your research? If so, who?
 - **Our Problem and Solution:** What problem did you find with your water’s journey? What is your solution to this problem? How could your solution help improve your water’s journey?
 - **Our Team Model:** What does your Team Model show? How did you create it? What part is motorized? Why did you make this part move? How did you test it? How did you improve it?
 - **Our Program:** What does your program do? How did you create it? How did you test it? How did you improve it?
- 3.) Have the group share their answers to the questions and decide which answers to include on their poster. They might want to cut out their answers and glue them on colored construction paper to make them more noticeable. They will also need to decide what to include in the “*Our Team*” section of the poster. They could rewrite or type and print their ideas from their *Engineering Notebooks* for this section. They could also decorate the section with individual and/or group photos (including the Coach(es)).
- 4.) Ask team members what other information or objects they want to include on their poster. For example, they could attach relevant photos of their chosen water use or examples of their writing or drawings from previous sessions.

Optional: If you printed notes, screenshots of the team’s program(s), or anything else from the WeDo 2.0 documentation tool, give the printouts to team members for possible inclusion on their poster.
- 5.) After all the information is assembled, have team members lay it out on the poster to make sure it fits and is in the proper order. Have them put the section headings on their poster (“*Our Water Use*,” “*Our Water’s Journey*,” etc.) first. Then have them add their team name and attach the rest of their information using glue sticks or tape.
- 6.) Encourage team members to decorate their poster to make it colorful, fun, and visually appealing.
- 7.) Allow team members plenty of time to clean up and store their Team Model and poster before each session ends.
- 8.) Tell team members that during the next session they will develop and practice the presentation they will use when sharing their experience with family, friends, and/or Volunteers called “Reviewers” at a *FIRST*® LEGO® League Jr. Expo or special team meeting.



SESSION 12: Prepare to Share

OVERVIEW

Team members will prepare a presentation about their experience with the AQUA ADVENTURESM Challenge.



MATERIALS

- AQUA ADVENTURE Engineering Notebooks
- handful of assorted LEGO® elements or other small objects
- Team Model
- Show Me poster
- optional: index cards and pencils

LEARNING OBJECTIVES

Team members will:

- Review what they have learned during the AQUA ADVENTURE Challenge
- Create a presentation about their experience
- Practice giving the presentation

SET-UP

- Gather the necessary materials for the session.
- Set up the technology required for any Multimedia Connections that you plan to share.



WARM UP (5 minutes)

To help team members practice their public speaking skills, have them introduce themselves in a fun way. Spread out a handful of LEGO elements or other small objects on a flat surface. Try to include objects of different shapes, colors, sizes, etc. Ask all team members to choose an object they like or that best represents them. Offer a few examples to help them get started: “Hello. My name is <your name>. I chose the LEGO wheel because I like to roll around and do somersaults.” Or, “I chose the blue LEGO brick because my favorite color is blue.” Then ask team members to find a partner and take turns saying their name, sharing which object they chose, and explaining why they selected it. Encourage them to use good eye contact and a strong speaking voice while they are introducing themselves to their partner. If time allows, have them share with the whole group as well.



READ (5 minutes)

There are many ways to share what your team has learned during the AQUA ADVENTURE season. You could:

- **Participate in a FIRST® LEGO® League Jr. Expo.** This is an event where you will talk with Volunteers called “Reviewers” and other teams. You can invite your family, friends, and others to come, too. You will share your Team Model and Show Me poster. Remember that the Reviewers at an Expo want to learn about what you have done. They are not there to make you nervous. This is your chance to show off your work and explain what you have learned. All team members will receive an award at the end of the Expo.
- **Invite your family and friends to a special team meeting.** Display your Team Model and Show Me poster. Tell how you created them. Explain how your program works. Share what you learned. Let your guests ask questions. When you are done, high-five one another to celebrate the end of the season.



Whatever you do, have fun!



DO (50 minutes)

- 1.) If team members did not finish their *Show Me* poster during the previous sessions, let them complete it. Leave enough time for them to prepare and practice their presentation also.
- 2.) Remind the group of the *FIRST*® LEGO® League Jr. Core Value of “*We share our experiences and discoveries with others.*” Explain that there is more than one way for them to share what they have learned during the season. For example, they could participate in a *FIRST* LEGO League Jr. Expo and/or do a presentation for their family and friends at a special team meeting. If they will have the opportunity to participate in an Expo, let them know that Volunteers called “Reviewers” will ask them to introduce themselves, describe their *Show Me* poster, and explain their Team Model. Emphasize that no matter how they will be sharing their work, they should practice. 

Note: For more information on attending an official *FIRST* LEGO League Jr. Expo in your area, please contact *FIRST*® Team Support via firstinspires.org/about/contact-us.

- 3.) Have each team member prepare a short presentation about one of the sections of their *Show Me* poster (“*Our Water Use*,” “*Our Water’s Journey*,” “*Our Problem and Solution*,” “*Our Team Model*,” “*Our Program*,” and “*Our Team*”). If you have fewer than six team members, have some of them work on more than one section. Note that if your team did not use the poster sections suggested in Sessions 10–11, just divide up the different parts of their poster, and make sure that someone is prepared to present about each part.

Optional: Have team members put their presentation speaking points on index cards for easy reference.

- 4.) Encourage team members to practice their presentation about their *Show Me* poster. Suggest that they practice their part(s) at home, too.

Hint: Encourage the group to think about how to make their presentation memorable for Reviewers and/or other audience members.

- 5.) Let team members know that they should be prepared to answer questions and explain their project more informally as well. Help them practice by following the suggestions below:
 - Have team members gather around their completed *Show Me* poster and Team Model, and ask them questions as if you were a Reviewer (or someone else to whom they are presenting). Also allow them to take turns role-playing as a Reviewer. Whoever is the Reviewer can ask their own questions or choose from the ones listed in the *Engineering Notebook*.
 - Give feedback on team members’ answers, and have them evaluate their own responses. Ask them to make appropriate changes for the next time they practice. 

- 6.) If your team will be participating in a *FIRST* LEGO League Jr. Expo and/or if you will be holding a special team meeting, let team members know where and when the event(s) will take place, and encourage them to invite their family and friends.
- 7.) Allow team members plenty of time to clean up and store their Team Model and *Show Me* poster before the session ends. If this is going to be your last meeting, ask the group to put away any LEGO sets that they used during the season. Also remind them that after they are done presenting their Team Model, they will need to disassemble it and put all the pieces back where they belong. This will enable other teams to use the LEGO sets again in future *FIRST* LEGO League Jr. seasons.
- 8.) Emphasize that you are proud of the whole team for accomplishing so much!

bacteria

Tiny living things made of one cell; they can live in soil, water, plants, animals, and other places; some can make people sick

core values

Guidelines that help people know how to act; the Core Values of *FIRST*® LEGO® League Jr. are: We are a team; We do the work; Our Coaches help us learn, but we find the answers ourselves; We share our experiences and discoveries with others; We are helpful, kind, and show respect when we work, play, and share — we call this *Gracious Professionalism*®; We are all winners; We have fun!

engineer

A person who designs solutions to problems

engineering design process

The steps that an engineer uses to design a solution to a problem: Explore a problem; Create one or more solutions; Test the solutions; Share what you learn

FIRST® LEGO® League Jr. Expo

An event where *FIRST* LEGO League Jr. teams come together to show what they learned during the Challenge season; each team presents its Team Model and *Show Me* poster to Volunteers called “Reviewers,” and each team member gets an award

groundwater

Water found in spaces and cracks of underground layers of soil and rock

Inspire Model

A Challenge-specific model made of LEGO® elements that is included in the Inspire Set and that must be incorporated into the Team Model

Inspire Set

A Challenge-specific LEGO® Education set containing over 700 LEGO elements that a team can use to build its Team Model

journey

The act of traveling from one place to another

KWL chart

A chart that is divided into three sections for recording information; the “**K**” section stands for “*What I Know*,” the “**W**” section stands for “*What I Want to Know*,” and the “**L**” section stands for “*What I Learned*”

motor

A machine that can be used to make something else move

pulley

A machine that is a wheel with a groove on the rim, around which a rope or belt fits; can be used to raise, lower, or move something

reservoir

A lake or tank that is used to collect and store a large amount of water for people to use; can be natural or human-made

solution

A way to solve a problem

source

The starting point of something

surface water

Water that collects on Earth’s surface; includes rivers, lakes, and the ocean

tap

A tool that can be used to control the flow of water from a pipe or other container

Team Model

The model that a *FIRST* LEGO League Jr. team designs and builds using LEGO elements and that includes the Challenge-specific Inspire Model, at least one motorized part programmed with LEGO Education WeDo 2.0 or WeDo, and the team’s design solution based on the Challenge

water pump

A machine used to move water from one point to another; can be used to bring water up from under the ground

water treatment plant

A place that cleans water by taking out anything harmful in order to make it safe for people to use and/or cleans water after people use it to make it safe to return to the environment

water well

A hole or structure created in the ground to let people get groundwater



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