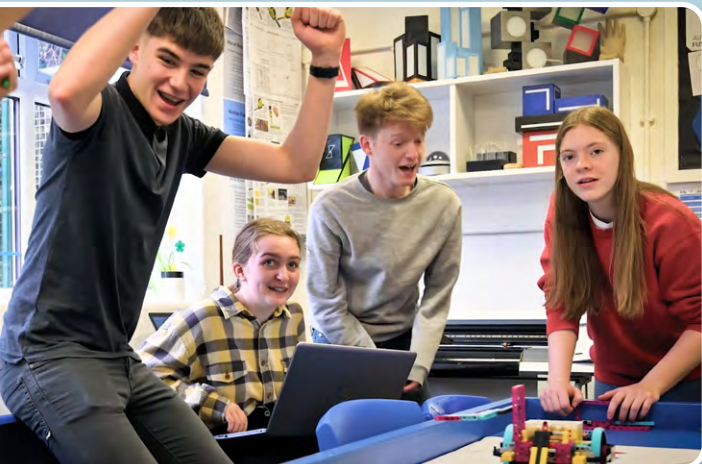
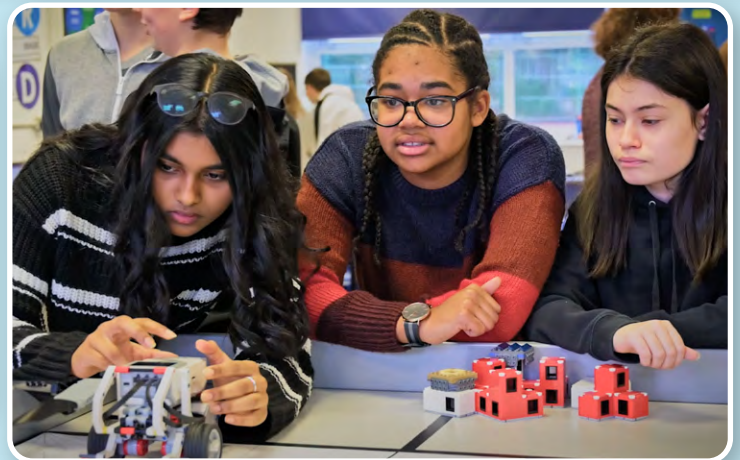




# CLASS PACK IMPLEMENTATION GUIDE



# Welcome to the Program

Welcome to *FIRST*® and the *FIRST*® LEGO® League program. *FIRST*LEGO League captures children’s curiosity and directs it toward discovering the wonders of science and technology. The program was created through a partnership between *FIRST* (For Inspiration and Recognition of Science and Technology) and LEGO® Education. *FIRST*LEGO League has three divisions: Discover, Explore, and Challenge. Your students will take part in the Challenge Class Pack!

Thank you for participating in this innovative STEM program for students. Your students join a global community across more than 110 countries. Its impact is profound and leads to a further progression of STEM exploration, skills, and experiences even after students complete the program.

The Class Pack provides schools with the tools to implement *FIRST*LEGO League Challenge in daily classroom lessons or as a structured after-school program. As the teacher, your role is to facilitate learning for your students and organize your implementation of the program. The guide is designed to help you do this.

This guide also contains information on how students can share their experiences and what they have learned throughout their journey – from highlighting your students’ hard work in a classroom showcase to putting on your own school or organization-based *FIRST*LEGO League Challenge event.

Useful resources are the [Class Pack Videos](#), which show how to implement the program in the school environment.



# Getting Started Checklist

Thank you to all the teachers and youth leaders who will be delivering the *FIRST*® LEGO® League Challenge Class Pack to your students.

Please read the *Engineering Notebook* and *Robot Game Rulebook* (these guidebooks are given to the

students) and the *Team Meeting Guide*. They are full of very useful information to guide you through the program. After completing the 12 sessions, your students will be prepared to participate in a tournament that celebrates the magnificent achievements made by the teams.

## We've created a checklist to guide you toward success. Use this to help you get started.

Ensure you have received all materials needed to run the program. See page [4](#) for list. Identify the space where you will implement the program and store materials. Think about the robot sets and any assembled models that may need to stay together for many days.

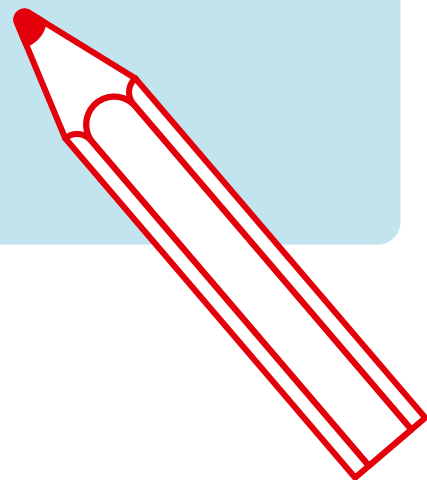
Think about the size of the event you want to have. Your tournament could be in your classroom or be a bigger event for the whole school. The event is outlined in the *Class Pack Event Guide*.

Create an implementation plan and timeline for how you will use the program. See pages [7-10](#) for implementation tips and options.

Determine who will be participating in the program. Is it your entire class? Will the same materials need to be shared by different classes or other teachers?

Encourage family and home engagement. See *Developing Your FIRST Community* on page [13](#) for ideas!

Determine how you will place the class into teams. Each team should have no more than 6 students.



# Material Needs

Look over the following list for what materials and space you will need in your classroom. It is recommended that students work in teams of six. Each team will need space to design, build, and program their robot. They will need space to have

brainstorming sessions, research, draw diagrams and participate in teamwork activities. Access to electronic devices and the Internet are important for each team to have, and for a successful program implementation.

For each student:

- 1 *Engineering Notebook*\*

For each team (within class):

- LEGO® Education SPIKE™ Prime or MINDSTORMS® EV3 Core and Expansion Sets
- 2 electronic devices (see *Team Meeting Guide* for specific details)
- Supplies to create Innovation Project and poster board recommended\*

For each class:

- 2 Challenge Sets
- 4 *Robot Game Rulebooks*

\*Items with an asterisk are consumable each time a team goes through this experience. If you need additional printed copies of the *Engineering Notebooks*, you can order them through the *FIRST* Dashboard or access digital PDFs of the *Engineering Notebooks* through the Access Thinkspace button on the dashboard.

Classroom space:

- 2 tables (recommended) or space on the floor for two Challenge mats with assembled models
- **OR** 1-2 *FIRST*® LEGO League Practice Tables (4' X 8') – OPTIONAL
- Small workstations/tables for each team (enough space for robot building, computers, assembled models, and project work)
- Portable or permanent storage
- Internet access
- Electrical support



# Storage and Material Management

## Getting Ready

Before you get started with the *FIRST*® LEGO® League Challenge program content, you might want to play a game where the teams identify pieces in their LEGO sets. It is recommended that students organize their LEGO sets to help in taking ownership of materials. This would allow you to start processes and procedures for keeping the sets organized.

## Managing Materials Tips

- Assign and label the SPIKE Prime/MINDSTORMS® EV3 sets with the team name and/or number so the students know which sets to grab each time.
- Be sure to have the students check the battery levels of your hardware devices and the robot controller and charge them as needed between sessions.

## Storage Tips

- Designate a safe area for the robot sets, computers, Mission Models/table, and materials that students have been working on so they remain safe between class days/periods.

## Possible Storage Solutions



# Classroom Management

## Teacher Role

The role of the teacher in a *FIRST*® Class Pack environment is more of a facilitator. Your teaching style should include a focus on developing holistic skills, building STEM confidence, embracing challenging activities and using play, discovery, and exploration.

Important things to consider when using the facilitator mindset is to:

- Reinforce *FIRST* Core Values.
- Ask the right kind of questions; guiding questions.
- Be comfortable with not having all the answers.
- Let students learn for themselves through problem-solving.
- Create opportunities for students to have ownership of the learning process and outcomes.
- Reflect on student and team goals and how they are working to achieve them.
- Guide students to the resources to help them achieve their goals.
- Celebrate mistakes and see learning opportunities.

## Student Growth Mindset

As you guide students through their experience, having the right mindset is important. Creating student ownership of learning can assist with this. Ownership can be achieved by allowing students to focus on the skills they are developing and what they want to achieve and to use their problem-solving skills.

There are no right or wrong solutions, just different ways of solving problems. There is plenty of opportunity for students to enjoy their successes and learn from their mistakes.

As a teacher, if you can establish perseverance and resilience as traits to celebrate and be grateful for, students will be more likely to strive for them. Students need to be challenged just enough that it stretches their minds and creativity without overwhelming them.



# Classroom Implementation

## Flexible Implementation

First and foremost use your professional judgement to augment this program to meet the needs of your students, class space, class timing and additional curricular requirements. Set student expectations for participation in the program based on the student growth mindset of holistic and STEM skills.

## Teaming as Designed

The sessions in the guidebooks have guided tasks for two different groups within each student team. Here are the reasons behind this design:

- Ensures equitable experience for every student in all aspects of the program (robot, innovation project, Core Values).
- Additional opportunity for collaboration and communication.
- Small groups promote deeper learning of content and build holistic skills to share out learning with other team members.
- Fewer materials are needed, and they can be used by more students.

- Having smaller groups allows for students to get hands-on time with building, robot design, and project work.

## How to Run Differentiated Groups

- Physically split space to facilitate working in small groups.
- Establish norms for movement and talking in small groups.
- Be comfortable with talking and movement within groups.
- Orient students to daily goals for learning using the student outcomes for each session listed in the *Team Meeting Guide*.
- Have individual check-ins with each team at the start of class.
- Determine the length of time for daily tasks ahead of class and share with students.
- End each class with whole group sharing using the Share task and the guiding questions outlined in the *Engineering Notebook* as inspiration.



# Classroom Implementation

You will need to adjust how each session is completed by your students if your designated class time to complete each session is different than the allotted 120 minutes per session outlined in the guides. The length this program will take to complete will depend on time within the day you have available to do *FIRST*® LEGO® League Challenge and how often you will teach this program (daily, weekly, etc.).

Following is a daily lesson planning example for how to adjust the session content to meet a different class time frame. This example is from Session 1 and uses a 50-minute class time.

## Day 1 (Session 1)

Time	Activity	Teacher Notes
10 minutes	Introduction Tasks	Review the <i>Team Meeting Guide</i> . Pull up season video on YouTube.
30 minutes	Complete robot tasks on first page of session.	The introductory pages in the <i>Engineering Notebook</i> are important. Provide PDFs of the building instructions to teams.
5 minutes	Reflection Time	Look over the Reflection Questions on the first page of the session in the <i>Engineering Notebook</i> .
5 minutes	Clean Up	Store any relevant LEGO pieces to the robot in a plastic bag.

## Day 2 (Session 1)

Time	Activity	Teacher Notes
5 minutes	Check-in with teams.	Review Session outcomes in <i>Team Meeting Guide</i> .
35 minutes	Complete project tasks on second page of session.	The <i>Robot Game Rulebook</i> is a great resource to also use. It is recommended that the mats are set up on tables in the classroom.
5 minutes	Reflection Time	Look over the Reflection Questions on the second page of the session in the <i>Engineering Notebook</i> .
5 minutes	Clean Up	If models aren't finished, show teams where to place them.

\*If your school or district is running as a cohort using reusable materials, collaborate with other teachers who will run the program on daily lesson planning and timing



# Scope and Sequence Options

FIRST® has created various scope and sequences to provide options for implementation in the classroom. Below are high-level summaries of the scope and

sequence options. Detailed documents for each of the different scope and sequence options can be found on the FIRST Education website [here](#).

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**26 Hours**

**24 Hours:** Sessions 1-12 outlined in guides

**2 Hours:** Event

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**40 Hours**

**7 Hours:** Robot Skill Learning (Choose from LEGO® Education Unit Plans on next page)

**24 Hours:** Sessions 1-12 outlined in guides

**2 Hours:** Event

**7 Hours:** Continue Robot Skills (Choose from LEGO Education Unit Plans on next page)

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**60 Hours**

**9 Hours:** Robot Skill Learning (Choose from LEGO Education Unit Plans on next page)

**24 Hours:** Sessions 1-12 outlined in guides

**2 Hours:** Event

**25 Hours:** STEM Learning and Skill Growth (FIRST @ Home Unit Plan on next page)

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**90 Hours**

**25 Hours:** Robot Skill Learning (Choose from LEGO Education Unit Plans on next page)

**38 Hours:** Sessions 1-12 with Extended Challenge Experience

**2 Hours:** Event

**25 Hours:** STEM Learning and Skill Growth (FIRST @ Home Unit Plan on next page)

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# Scope and Sequence Resources

## Additional Resources

FIRST® and LEGO® Education have additional educator content. These resources and other relevant content can be used prior to starting the FIRST LEGO League Challenge, during the program, or as an extension once the program is complete.

FIRST resources can be found on the [FIRST Educator page](#) or the [FIRST @ Home page](#).

### FIRST @ Home Unit Plan

<b>3 Hours:</b> Core Values Activities	<b>3 Hours:</b> Coding Activities	<b>3 Hours:</b> 3-D and CAD Activities
<b>3 Hours:</b> Electronics and Mechanics Activities	<b>3 Hours:</b> Engineering Design Activities	<b>5 Hours:</b> Capstone Activities

## LEGO Education Resources

This program utilizes the complete solution packages that LEGO Education has available. The robotics sets purchased for use with the FIRST LEGO League Challenge also include additional lesson plans and resources available through the LEGO Learning System and the [LEGO Education website](#).

### SPIKE Prime Unit Plans

<b>6 Hours:</b> Invention Squad	<b>9 Hours:</b> Kickstart a Business	<b>6 Hours:</b> Life Hacks	<b>4 Hours:</b> Extra Resources
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### MINDSTORMS EV3 Unit Plans

<b>7 Hours:</b> Robot Trainer	<b>8 Hours:</b> Engineering Lab	<b>15 Hours:</b> Coding Activities
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# Teacher Resources

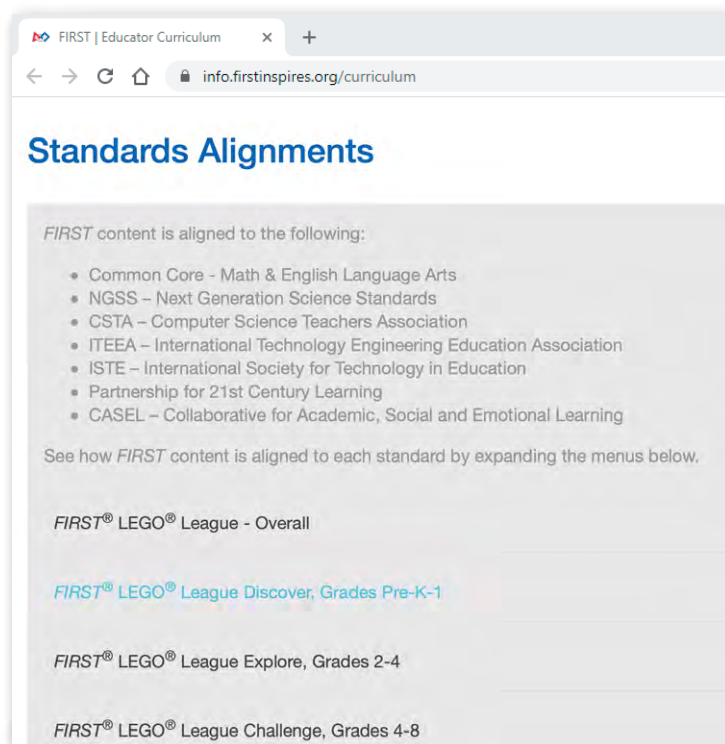
## Standards Alignments

FIRST® has completed an external analysis and mapping of all its programs to national educational standards. In an effort to increase the usefulness of the standards alignments, they are provided for each program division and standard set. Below is a list of the available standards alignments located [here](#).

- 21st Century Skills
- CASEL SEL
- CC ELA
- CC Math
- CSTA
- ISTE
- ITEEA
- NGSS

## Learning Progression

FIRST has created a learning progression of skills used in FIRST LEGO® League Challenge and their correlation to various subject areas. The document allows teachers to see how FIRST LEGO League can be used across different grades to develop skills. The Learning Progression document can be accessed [here](#).



## Additional Resources

Some of the resources below are from third-party sites not developed or managed by FIRST or LEGO Education, but they're too great not to share!

- [LEGO Education Lesson Plans](#)
- [SPIKE Prime Lessons](#)
- [EV3 Lessons](#)
- [Virtual Fieldtrip](#)
- [Core Value Activities](#)
- [Coding with Scratch](#)
- [Hour of Code](#)
- [Autodesk Tinkercad](#)
- [MIT Full STEAM Ahead](#)
- [NASA STEM](#)
- [PBS Design Squad](#)
- [Carnegie Mellon Robotics Academy](#)

# Assessment Resources

## Formative Assessments

You can keep track of how your students are progressing against the outcomes for each of the 12 sessions using this formative assessment sheet. Place the session outcomes into the formative assessment templates on pages [17-18](#).

## Engineering Notebooks

The *Engineering Notebook* serves as a proof of learning and is a great resource for student teams to document the process they went through to create their robot and project solution. Encourage them to document core values concepts demonstrated throughout their experience.

## Summative Assessments

There are multiple summative assessments within the program. The culminating event or showcase serves as a capstone of the students' achievements and participation in the program. Evidence of learning includes the rubric, final event, final presentations, robot game score sheet, and final products: robot and innovation project.

## Public Celebration

During the tournament, student teams will get the chance to showcase all the work they have prepared. You will be able to observe and record a summative assessment of how they have done using the Class Pack judge questions and rubric which can be found in the Challenge *Class Pack Event Guide*.



# Making Connections

## Developing Your *FIRST*® Community

Consider hosting an open-house event for participating children and their families before the start of the program to share a preview of what they will experience. Also, let families know if there will be a culminating event that will take place at the end of the program and invite them to attend.

A great way to enhance the *FIRST*® LEGO® League Challenge program in your classroom is to use your community for support. They could serve as experts to your students as they develop their Innovation Project solutions. They could provide background information related to the challenge topic for the project research or provide feedback to the teams

on their project solutions. They could also serve as volunteer judges to provide insight on their final products. You could ask if any parents or guardians would be willing to help during the program or at the final event.

## Connect with Others

Get connected with other educators that are implementing this program.

- [LEGO Education Teacher Community](#)
- [FIRST LEGO League](#)

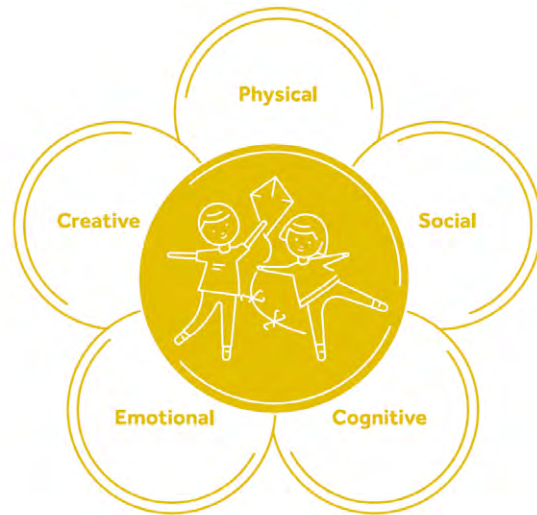


# FIRST® LEGO® League Education Philosophy

FIRST® LEGO® League is a program created through a partnership between FIRST and LEGO Education and is infused with the educational philosophies of both organizations. All three divisions of FIRST LEGO League (Discover, Explore, and Challenge) follow these philosophies.

## Learning Through Play

This program encourages schools to incorporate play throughout all grades into the learning process. Play has positive impacts on holistic skill development. Through the design of guided materials, this program allows for the increase in STEM confidence of both the students and teachers. Content is designed with the idea that the teacher does not know all the answers. The materials provided don't give the exact answers but provide guidance and tips to the teacher on how to support their students. It is for the students to determine the way forward in solving the problem through play, discovery, and exploration.



Five Skills for Holistic Development



Intellectual Challenge



Authenticity



Public Product



Collaboration



Project Management



Reflection

## Project-Based Learning

FIRST LEGO League is a project-based learning program that creates meaningful, authentic learning opportunities for the students. Students gain knowledge and skills by working towards goals through the investigation of solutions and complex problem solving.

Key project-based learning elements include:

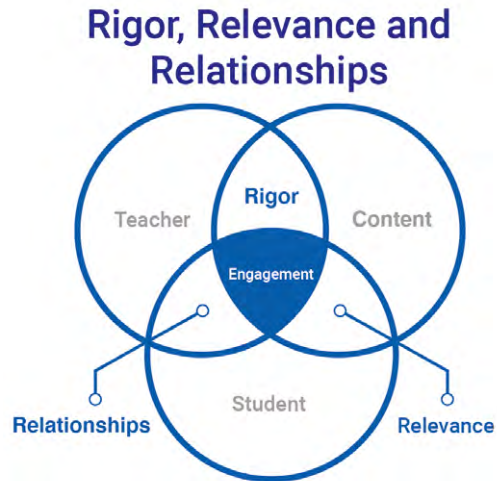
- **Intellectual Challenge:** To start the engineering design process, this program begins with a challenge to solve.
- **Authenticity:** This program features age-appropriate real-world contexts and includes career awareness.
- **Public Product:** Teams present public products as a showcase of work to a public audience.
- **Collaboration:** Teams work together to brainstorm and develop design ideas and then make decisions to create public products.
- **Project Management:** Scaffolded through the engineering design process and teams hone these skills throughout their experience.
- **Reflection:** Reflecting on an experience is a key tool that is incorporated after achieving a learning outcome.

# FIRST® LEGO® League Education Philosophy

## Rigor, Relevance, and Relationships

Through the data of our longitudinal study, it has been proven that experiencing just one year of FIRST® LEGO® League Challenge has an impact on STEM outcomes for students. These outcomes are manifested by this program’s rigorous and relevant content that incorporates relationships within a team and the larger community.

- **Rigor:** The teacher is the facilitator of a student-led, engaging experience involving activities related to robotics, coding, engineering, research, and innovative design.
- **Relevance:** Students acquire technology literacy by experiencing authentic activities with ties to careers that build technical and holistic skills through real-world problem solving.
- **Relationships:** This program engages students to foster pathways to careers with the mission of building a better society and activating students to action in their communities.



## Core Values

The FIRST Core Values and ethos are the foundation of the program. For the FIRST Core Values to have effect, they must be known and practiced. The Core Values should be woven into all activities, projects, assessments and reflection tools to infuse them into the student learning. The Core Values are used within every step of the engineering design process as teams develop their solutions.

*Gracious Professionalism®* and *Coopertition®* are part of the ethos of FIRST. *Gracious Professionalism* is a way of doing things that encourages high-quality work, emphasizes the value of others, and respects individuals and the community. *Coopertition* is displaying unqualified kindness and respect in the face of fierce competition.

To read more about the LEGO Education Philosophy, click [here](#).

### FUN

We enjoy and celebrate what we do!

### IMPACT

We apply what we learn to improve our world.

### INCLUSION

We respect each other and embrace our differences.

### INNOVATION

We use creativity and persistence to solve problems.

### TEAMWORK

We are stronger when we work together.

### DISCOVER

We explore new skills and ideas.

# Formative Assessment

## SESSION 1

The team explored/showed these Core Values:  *Discovery*  *Innovation*  *Impact*  *Inclusion*  *Teamwork*  *Fun*

**Feedback**

## SESSION 2

The team explored/showed these Core Values:  *Discovery*  *Innovation*  *Impact*  *Inclusion*  *Teamwork*  *Fun*

**Feedback**

## SESSION 3

The team explored/showed these Core Values:  *Discovery*  *Innovation*  *Impact*  *Inclusion*  *Teamwork*  *Fun*

**Feedback**

## SESSION 4

The team explored/showed these Core Values:  *Discovery*  *Innovation*  *Impact*  *Inclusion*  *Teamwork*  *Fun*

**Feedback**

## SESSION 5

The team explored/showed these Core Values:  *Discovery*  *Innovation*  *Impact*  *Inclusion*  *Teamwork*  *Fun*

**Feedback**

## SESSION 6

The team explored/showed these Core Values:  *Discovery*  *Innovation*  *Impact*  *Inclusion*  *Teamwork*  *Fun*

**Feedback**



# Formative Assessment

## SESSION 7

The team explored/showed these Core Values:  *Discovery*  *Innovation*  *Impact*  *Inclusion*  *Teamwork*  *Fun*

**Feedback**

## SESSION 8

The team explored/showed these Core Values:  *Discovery*  *Innovation*  *Impact*  *Inclusion*  *Teamwork*  *Fun*

**Feedback**

## SESSION 9

The team explored/showed these Core Values:  *Discovery*  *Innovation*  *Impact*  *Inclusion*  *Teamwork*  *Fun*

**Feedback**

## SESSION 10

The team explored/showed these Core Values:  *Discovery*  *Innovation*  *Impact*  *Inclusion*  *Teamwork*  *Fun*

**Feedback**

## SESSION 11

The team explored/showed these Core Values:  *Discovery*  *Innovation*  *Impact*  *Inclusion*  *Teamwork*  *Fun*

**Feedback**

## SESSION 12

The team explored/showed these Core Values:  *Discovery*  *Innovation*  *Impact*  *Inclusion*  *Teamwork*  *Fun*

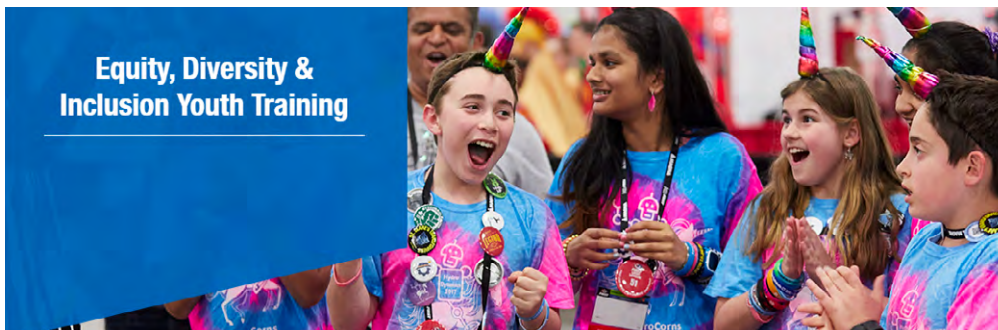
**Feedback**

# Professional Development Resources

## Training Opportunities

As part of our commitment to creating a diverse, inclusive, and equitable community for all our participants, *FIRST*® has trainings on how you can

inspire the youth voice, create a sense of belonging, and more. You can access these trainings [here](#).



LEGO® Education offers product-specific training available that you can access [here](#).

Your local *FIRST* Program Delivery Partner may offer *FIRST* training in your area. Find your local *FIRST* Partner [here](#).

*Within this box, you can add information relevant to your country.*

