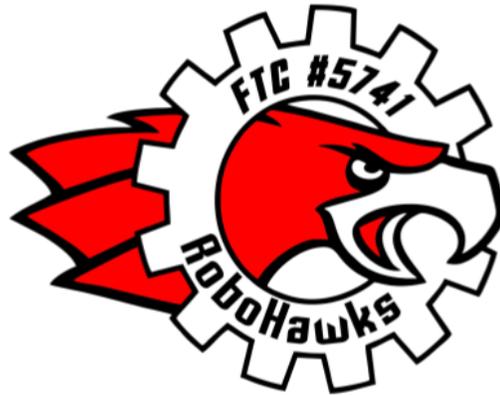


FLL Resource Packet

Prepared by The Robohawks, the Champlain Valley Union HS Robotics Team



A Guide to FIRST and FLL

3.29.22

What is FIRST?

“**FIRST**® (For Inspiration and Recognition of Science and Technology) is a robotics community that prepares young people for the future through a suite of inclusive, team-based robotics programs for ages 4-18 that can be facilitated in school or in structured afterschool programs. Boosted by a global support system of volunteers, educators, and sponsors that include over 200 of the Fortune 500 companies, teams operate under a signature set of FIRST Core Values to conduct research, fundraise, design, build, and showcase their achievements during annual challenges.

An international not-for-profit organization (501(c)(3)) founded by accomplished inventor Dean Kamen in 1989, FIRST has a [proven impact](#) on STEM learning, interest, and skill-building well beyond high school. [Alumni](#) of FIRST programs gain access to exclusive scholarships, internships, and other opportunities that create connections and open pathways to a wide variety of careers.”¹

This document offers highlights of the resources found on the Firstinspires.org website. You can read more about the [impact of FIRST](#) or [download their FAQs here](#).

The FIRST Core Values:

“The FIRST Core Values emphasize friendly sportsmanship, respect for the contributions of others, teamwork, learning, and community involvement and are part of our commitment to fostering, cultivating, and preserving a culture of equity, diversity, and inclusion. The FIRST Community expresses the FIRST philosophies of Gracious Professionalism® and Coopertition® through their Core Values.”²



Source: Firstinspires.org/community

The goal is to “Engage [PreK-12 \(ages 4-18\) students](#) in exciting, mentor-based, research and robotics programs that help them become science and technology leaders, as well as well-rounded contributors to society. FIRST works because our programs use strategies known to increase student interest in STEM: hands-on learning, working as a team on real-life problems, exposure to careers and adult mentors, emphasis on FIRST Core Values, and a culminating celebration where students can showcase what they created and learned. FIRST participants also develop skills in teamwork, problem solving, and communication, preparing them for success in school and the workforce, no matter what path they take.”¹

The Three Levels of FIRST Participation:

FIRST Robotics Competition (FRC):

- Up to 15 team members, grades 7-12.
- Under strict rules, limited time and resources, teams of students are challenged to raise funds, design a team "brand," hone teamwork skills, and build and program industrial-size robots to play a difficult field game against like-minded competitors. More information [here](#).

FIRST Tech Challenge (FTC):

- Grades 9-12.
- It's way more than building robots. FIRST Tech Challenge teams (up to 15 team members, grades 7-12) are challenged to design, build, program, and operate robots to compete in a head-to-head challenge in an alliance format...The robot kit is reusable from year to year and can be coded using a variety of levels of Java-based programming. Teams design and build robots, raise funds, design and market their team brand, and do community outreach to earn specific awards. More information [here](#).

FIRST Lego League (FLL):

- Grades Kindergarten to 8th grade.
- THREE different levels based on age.
- It's way more than building robots. Teams are asked to explore STEAM concepts in a collaborative setting. Teams design and build a robot & mechanisms, but are also required to complete a community science project along with team and design presentations. More information [here](#).

What is FIRST Lego League?

“FIRST Lego League (FLL) introduces science, technology, engineering and math (STEM) to children ages 4-16 through fun, exciting hands-on learning. FLL participants gain real-world problem-solving experiences through a guided, global robotics program, helping today’s students and teachers build a better future together...FIRST LEGO League’s three divisions inspire youth to experiment and grow their critical thinking, coding and design skills through hands-on STEM learning and robotics.”³

The three levels of FIRST Lego League (FLL):

FLL Discover - PreK- Grade 1: For children ages 4-6, this playful introductory STEM program ignites their natural curiosity and builds their habits of learning with hands-on activities in the classroom and at home using LEGO® Duplo bricks.

FLL Explore - Grades 2-4: In Explore, teams of students ages 6-10 focus on the fundamentals of engineering as they explore real-world problems, learn to design and code and create unique solutions made with LEGO bricks and powered by LEGO Education robots.

FLL Challenge* - Grades 4-8: Friendly competition is at the heart of Challenge, as teams of students ages 9-16 engage in research, problem-solving, coding and engineering – building and programming a LEGO robot that navigates the missions of a robot game. As part of Challenge, teams also participate in a research project to identify and solve a relevant real-world problem.

**This document focuses primarily on this level.*

Multiple skills FLL Challenge students will experience, practice and learn include:

- Problem solving
- Collaboration, Coopertition, Teamwork and Team spirit
- Listening to each other
- Time management
- Presentation skills
- Structures & Mechanics
- Computer Programming

How to Start a Team

Check out the FIRST Lego League “Start a team” [website](#) and “Start a FLL Challenge team” [flyer](#).

Here is a helpful index of FIRST resources for teams, the [Team Management Resource](#).

What do you need?

- 2-10 interested students
- 2 adult mentors/coaches (Experience can be limited. This is the [FIRST Coach/ Mentor checklist](#).)
- SPIKE Lego Prime Kit
- Laptop or Chromebook
- To register with FIRST
- (optional) Annual Challenge Kit

Budget

This is a link to FIRST’s sample of a [budget worksheet](#).

Recommended Budget:

Item	Cost	Additional
SPIKE Prime Kit	\$425.00 each	2 Kits for each school*
Rechargeable Battery	\$69.95	1 battery per kit will be provided*
Challenge Set	\$75.00	Annual Fee for competition materials
Registration	\$225.00	Annual Fee for competition
Team T-shirts	\$50.00	
Estimated Annual Cost:	\$300.00	Grant funding and additional support is available to help cover costs*

*In 2022, middle schools in the Champlain Valley School District are eligible to receive materials and additional support from the CVU Robohawks through a Vermont Agency of Education grant. Please see the CVU contacts at the end for more information.

Schedule

Here is what the first year might look like:

May - September

- Team Registration
- Coach Training
- Summer camps to garner student interest

September - October

- Teambuilding
- Challenge release event (usually mid Sept.)
- Challenge set ordered and set up
- Understanding the game and objectives

October - January

- Robot Prototyping, experimentation and construction
- Students can work in one large group, or smaller focused group if the team is making multiple robots.

January - May

- Local competition (dates vary by state)
- **End of Season Reflection** Each student should record what they enjoyed most about their experience, as well as what they look forward to in the next season. This is an opportunity for identifying personal passions and areas of interest.

Topics and Activities

Suggested topic checklist:

- Build field
- Build basic robot design
- Go through basic robot programming on base bot.
 - Forward/Backward
 - Go to distance - comeback (time, rotations, circumference!)
 - Commenting programs (do you know what code is doing!)
 - Psuedo Code to create Program code.
 - Sensors (Light, Touch, Ultrasonic, Color)
 - Go to line, come back
 - Go to third line
 - Loops
 - Programming with Switches
 - PhotoPhonium (light controlled music box.)
 - Line Follower
 - My Blocks
- Go through basic mechanical design
 - Gear ratio
 - Lego dimensions
- Mission Investigation/ Brainstorming
 - Which missions can be done simultaneously?
 - Which missions give higher (highest) score?
 - Attachment ideas / Attachment necessary?
 - Mission Selection (assign kids, assign mission/outing leader, swap builders/programmers)

Draft Vermont State STEAM Skills and Attributes

The Vermont Agency of Education is in the process of creating STEAM skills and attributes to communicate the vision and key attributes of STEAM learning. **The skills and attributes listed below are sourced from a draft document. They are for reference only and subject to change.**

Vermont has identified the following as STEAM skills and attributes:

A1: Effective Communication

- **A1.1: Digital and Media Literacy**

Students cultivate the ability to navigate various digital platforms effectively and critically.

- **A1.2: Technological Communication**

Students learn, utilize, and evaluate alternative technological communication media and choose the medium appropriate for their audience and message/content.

- **A1.3: Verbal Communication**

Students use active listening skills and effective argumentation to communicate clearly, accurately, and persuasively their thoughts, ideas, and action plans to multiple audiences, both formal and informal.

A2. Creativity

- **A2.1: Informed Solutions**

Students identify sources of information using a range of methods. They observe, analyze, and organize information to identify or create patterns, trends, and relationships that inform original solutions.

- **A2.2: Generate Ideas and Solutions**

Students collaboratively and individually generate a variety of solutions based on evidence. They use evidence to build a case for best responses, critically evaluate the effectiveness of responses, and repeat the process to generate alternate solutions.

- **A2.3: Present Ideas and Solutions for a Target Audience**

Students create original and valuable solutions for a real-world audience. They prepare visually engaging communications materials and presentations to advocate for and communicate the worth of their solutions and products.

A3. Critical Thinking and Problem Solving

o A3.1 Critical Thinking

Students ask questions, examine evidence, engage in research, analyze assumptions and biases, and respond to data objectively to define or better understand a problem that needs to be solved.

o A3.2 Problem Solving

Students engage in objective observation and analysis to infer and draw conclusions based on evidence prior to introduction of problem solutions. They will evaluate the solutions to the defined or delineated problem and choose the option that best meets constraints/criteria, following through on the resolution whether through their own actions or the actions of others.

A4. Multi-tasking

o A4.1: Organization

Students organize both digital and physical environments in order to manage their time, energy, and workspace. They attend to detail, learn to work under pressure, and engage in strategic planning to complete a projects and solve problems.

o A4.2 Prioritization and Time Management

Students learn to schedule and maximize their time by sequencing tasks appropriately, developing boundaries with peers, accounting for distractions and unexpected events, and measuring their effectiveness on certain tasks and activities.

A5. Team-Work Skills

o A5.1 Collaboration

Students are able to successfully navigate working relationships that enable them to achieve a common goal with others. They use a variety of means to negotiate the relationships within their team, leveraging strengths, adapting to new situations, debating ideas respectfully, and acting in supportive roles.

o A5.2 Leadership

Students are effective leaders in collaborative work, promoting creative problem-solving, encouraging team discourse, and taking initiative with the goal of building consensus among team members.

A6. Adaptability

- **A6.1: Real-World Application**

Students can apply content knowledge and skill to a variety of real-world settings based on context-specific needs.

- **A6.2: Decision-Making**

Students are self-directed in their decision-making processes, using evidence-based reasoning to communicate and act on a decision.

A7. Sociopolitical Lens

- **A7.1: Critical Consciousness**

Students can critically analyze the social, cultural, and economic systems that impact problems in STEAM fields.

- **A7.2: Cultural Perspectives**

Students apply their own cultural lens to STEAM learning opportunities and demonstrate appreciation for diverse cultural perspectives.

- **A7.3: Representation**

Students recognize the need for representation in STEAM fields and understand where to access expertise from underrepresented groups.

NOTE: The information included in the above section is from a draft document.

CONTACTS

- **Olaf Verdonk** - CVU Robotics Coach
 - Email: overdonk@cvsdvt.org
- **Lindsay Beer** - CVU Robotics Outreach Lead
 - Email: lindsaybeer@cvsdvt.org
- **Crawford Phillips** - CVU Robotics Outreach Lead
 - Email: crawfordphillips@cvsdvt.org
- Find additional local FIRST support through the Vermont **FIRST Program Delivery Partner**, Michael Cross mcross@firstpartners.org

Endnotes

1. <https://www.firstinspires.org/about/vision-and-mission>
2. <https://www.firstinspires.org/community/inspire/develop-students-holistic-skills-during-distance-learning>
3. <https://www.firstinspires.org/robotics/fll/what-is-first-lego-league>

“FIRST is more than robots. The robots are a vehicle for students to learn important life skills. Kids often come in not knowing what to expect – of the program nor of themselves. They leave, even after the first season, with a vision, with confidence, and with a sense that they can create their own future”

DEAN KAMEN