Bringing FIRST into your Classroom and Engaging Youth in STEM

Wendy Austin, Regional Director FIRST
**FIRST is a Robotics Community Preparing Young People for the Future**

*Inspiring youth to become science & technology leaders & innovators, by engaging them in exciting, experiential, Mentor and project-based programs that teach science, technology, engineering, and math (STEM) skills, inspire innovation, and foster well-rounded life capabilities.*
It’s not about the robots. It’s never been about the robots.

We are not using kids to build robots. We are using robots to build kids.
— Dean Kamen, Founder, FIRST®
We express the FIRST® philosophies of **Gracious Professionalism®** and **Coopertition®** through our Core Values:

- **Discovery:** *We explore new skills and ideas.*
- **Innovation:** *We use creativity and persistence to solve problems.*
- **Impact:** *We apply what we learn to improve our world.*
- **Inclusion:** *We respect each other and embrace our differences.*
- **Teamwork:** *We are stronger when we work together.*
- **Fun:** *We enjoy and celebrate what we do!*
FIRST is...

...the only sport where everyone who plays can turn pro
### 2019 numbers at a glance

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students on teams</td>
<td>575K+</td>
</tr>
<tr>
<td>Countries</td>
<td>113</td>
</tr>
<tr>
<td>Mentor, coach, judge, and volunteer roles</td>
<td>300K+</td>
</tr>
<tr>
<td>Volunteer hours served</td>
<td>20M+</td>
</tr>
<tr>
<td>Scholarship opportunities from providers</td>
<td>$80M</td>
</tr>
<tr>
<td>Countries</td>
<td>107</td>
</tr>
<tr>
<td>Events</td>
<td>3,600+</td>
</tr>
<tr>
<td>Participants at annual FIRST® Championship</td>
<td>77K+</td>
</tr>
</tbody>
</table>

**FIRST is Growing our Global Community**
FIRST® IMPACT

10 years of evaluation data indicates that with participation in FIRST®, team members are:

**STEM MAJOR CITED BY FIRST PARTICIPANTS**

- **2x** as likely to major in science or engineering
- Major in engineering: **41%**
  - Of women majoring in engineering: **33%**

Source: Brandeis University, 2005 Evaluation of FIRST® Robotics Competition Alumni

**SCHOOL ENGAGEMENT INCREASES FOR FIRST PARTICIPANTS**

- **87%** FIRST® LEGO® League
- **86%** FIRST® Tech Challenge
- **88%** FIRST® Robotics Competition

- More interested in doing well in school
- Plan to take a more challenging math or science course: **84%**
- More interested in going to college: **88%**
- More interested in going to college: **87%**
- More interested in going to college: **91%**


**21ST CENTURY WORK-LIFE SKILLS GAINED BY FIRST PARTICIPANTS**

- Improved problem solving skills: **98%**
- Increased time management skills: **95%**
- Increased conflict resolution skills: **93%**
- Strengthened communication skills: **OVER 76%**


**FIRST ALUMNI IN STEM CAREERS**

- OVER 75% of Alumni are in a STEM field as a student or professional

Source: FIRST, 2015 FIRST Alumni Survey

For Inspiration & Recognition of Science & Technology
All FIRST programs drive to student engagement on FIRST competitive teams as the most impactful experience FIRST offers

- **Teams** – highest and most impactful experience FIRST offers.

- **Class Pack** – structured programming for in the classroom engagement. Reaches a greater number of students with the FIRST experience. Encourages students and educators to form competitive teams.

- **FIRST @ Home** – will continue to be an “On ramp’ for students, educators and parents looking for STEM Engagement. Materials also useful for Camps, Structured After School Providers, etc.
Current *FIRST* Curriculum Offerings

**CONNECTING COMMUNITY**
FIRST at Home, Kahoot, STEM series, Seesaw, Professional Learning Communities

**DIGITAL CURRICULUM**
Year-long *FIRST* Tech Challenge course, Introduction to Programming

**FIRST** Education

**PRINTED MATERIALS**
Guided experience for *FIRST* LEGO League facilitator and students

**SUPPORT RESOURCES**
Scope and sequence, Standards alignment, getting started and season modules, educator materials

*FIRST* Educator Curriculum Online Online
https://www.firstinspires.org/community/educators/curriculum
**FIRST Impact - Workforce Skills**

- **Communication**: 76% of students reported gains
- **Conflict Resolution**: 93% of students reported gains
- **Time Management**: 95% of students reported gains
- **Problem-Solving**: 98% of students reported gains

**Over 75%** of FIRST Alumni are in a STEM field as a student or professional.
FIRST Programs – Future Life & Work

Skill Requirement for the Future

Embracing Digital

Building Adaptability & Resilience

Sources for Future of Work & Life

Importance of Play
FIRST LEGO League Skills Progression

**FIRST LEGO League Discover (Ages 4-6, Grades PreK-1)**
- Engineering Design Process: Explore, Create and Share
- Computational Thinking: Pattern recognition or sequence events
- Early STEM language and skill acquisition
- Habits of Learning: solving meaningful problems, wonder, question, build and tinker
- FIRST Core Values: discovery and fun!

**FIRST LEGO League Explore (Ages 6-10, Grades 2-4)**
- Engineering Design Process: Explore, Create, Test and Share
- Coding: Create block-based programming to accomplish a specific task
- STEM word recognition and use in presentation of learning journey
- Habits of Learning: teamwork, application of knowledge, confidence
- FIRST Core Values: innovation, inclusion and fun!

**FIRST LEGO League Challenge (Ages 9-16, Grades 4-8)**
- Engineering Design Process: design evaluation, meeting criteria and constraints, optimize a design solution
- Programming: create complex programs using variables to create specific robot behaviors
- Research, sourcing, data analysis, and presentation of innovative STEM topics
- Habits of Learning: interdisciplinary application of knowledge, communication, persistence and taking risks
- FIRST Core Values – Coopertition & Gracious Professionalism

Full skill progressions [here](#)
Development of Programming Skills

**FIRST LEGO LEAGUE**
- Primarily mechanical and project-based learning
- Icon based, drag and drop, introduction to programming logic

**FIRST TECH CHALLENGE**
- Scratch-based graphical app development or full Java programming
- Teaches basic programming logic, app development, and text-based language programming used in most high school AP classes

**FIRST ROBOTICS COMPETITION**

Offers three programming options:
- **LabVIEW** – icon-based language teaching programming logic and structure
- **C++** - one of the most popular text-based languages
- **Java** – text-based used in most high school AP classes
**FIRST® Career Readiness**

Connecting with career readiness

Technical and holistic skills

**FIRST strengthened post-high school success**

- **83%** of students report feeling more confident in leadership roles
- **74%** of students feel more prepared for college courses
- **72%** of students gained access to mentors and peers in STEM
**FIRST Education: Beyond Checking the STEM Box**

**Rigor, Relevance and Relationships**

- **Rigor**: Facilitators guide a student-led, engaging experience involving activities related to robotics, coding, engineering, research, and innovative design that is experienced in a cross-curricular environment.

- **Relevance**: Students acquire technology literacy by experiencing authentic activities with ties to STEM careers that build technical and holistic skills through real-world problem solving.

- **Relationships**: Students are engaged in a mentor-based program that fosters pathways to STEM careers with the mission of building a better society and activating students to action in their communities.

**More Than Robots**

Education today in the U.S. is more than teaching facts and figures. Social and emotional learning in practice happens during participation in FIRST.

- **Ages: 9-16**
  - 95% Improve Time Management Skills

**FIRST Tech Challenge**

- **Ages: 12-18**
  - 93% Solve Disagreements

**FIRST Robotics Competition**

- **Ages: 14-18**
  - 95% Increased Leadership Skills

*Ages vary by country

**Project-Based Learning**

FIRST seeks to blend training and education through project-based learning that creates authentic learning opportunities through experiences provided by our programs, both competitive team and classroom-based opportunities.

- Intellectual Challenge
- Authenticity
- Public Product
- Collaboration
- Reflection
- Project Management
Meeting Educational Standards - In School

Education Standards Alignment Maps

*FIRST* has completed an external analysis and mapping of all *FIRST* Programs to 3 sets of educational standards: Common Core State Standards, Next Generation Science Standards and 21st Century Learning Skills.
Student Impact

*FIRST* promotes in holistic skills development

**Cognitive** – decision making, subject knowledge (math, science), reasoning, problem solving

**Physical** – spatial, fine, and gross motor

**Creative** – divergent thinking, inventiveness

**Emotional** – confidence, engagement, motivation, self-efficacy, persistence

**Social** – collaboration, communication, interpersonal, social connections

At 72 months, *FIRST students* are significantly more likely to show gains in STEM outcomes than comparison students.

<table>
<thead>
<tr>
<th>Component</th>
<th>Gain Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest</td>
<td>2.4x</td>
</tr>
<tr>
<td>Careers</td>
<td>2.1x</td>
</tr>
<tr>
<td>Identity</td>
<td>2.0x</td>
</tr>
<tr>
<td>Activity</td>
<td>1.8x</td>
</tr>
<tr>
<td>Knowledge</td>
<td>1.7x</td>
</tr>
</tbody>
</table>

Data Source: [Brandeis Study 2020](#)
A Way of Teaching

As a teacher, refining skills such as:

• Learning through Play
• Student Centered Instruction
• Project-Based Learning
• Design Thinking
• Facilitation of STEM Learning
• Mentor
• Holistic Skills
• Coding
• Integrating STEM

+ Official Professional Development Offered
**FIRST in the Classroom – Class Pack**

Available for all LEGO offerings
- *FIRST* LEGO League Jr. Discovery Edition
- *FIRST* LEGO League Jr.
- *FIRST* LEGO League

**Resources:**
- Student Engineering Notebook
- Team Meeting Guide – Teacher Lesson Plans
- Administrator Program Administrator Guide – How to run an event at your school
FIRST® in Florida Classrooms – Elementary School

FIRST LEGO League: Discovery, Explore and Challenge

- Co-Curricular with science, math
- As STEM elective or special class
- Aligns with Science, Math, Language Arts, FL Compute Science
# FIRST® in Florida Classrooms – Middle School

## FIRST LEGO League and FIRST Tech Challenge

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Industry Certification or Digital Tools Alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>6th Grade</td>
<td>Wheel</td>
<td>Introduction to Technology</td>
<td>CERTI803 IC3 Computing Fundamentals&lt;br&gt;CERTI804 IC3 Key Applications&lt;br&gt;CERTI805 IC3 Living Online</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Course Number: 8600010</td>
<td></td>
</tr>
<tr>
<td>7th Grade</td>
<td>Exploration of Robotics Technology&lt;br&gt;Course Number: 8600070&lt;br&gt;Full year or Semester</td>
<td>PROSO803 ICT – Multimedia Essentials&lt;br&gt;PROSO807 ICT - Computing Essentials&lt;br&gt;DIGIT802 Rapid Prototyping&lt;br&gt;PROSO804 ICT – Programming &amp; Logic Essentials</td>
<td></td>
</tr>
<tr>
<td>8th Grade</td>
<td>*Foundations of Robotics&lt;br&gt;Course Number: 9410110</td>
<td>ADESK011 Auto Desk Inventor&lt;br&gt;RECFN001 RECF Pre-Engineering</td>
<td></td>
</tr>
</tbody>
</table>

Career Interest Pathways: Various Engineering (Civil, Mechanical, Design, Systems, Industrial, Energy), Robotics, Physics, Machining, and other technology related fields.
**FIRST Tech Challenge Curriculum**

- Semester course; 7 modules
- Real-world, project-based learning
- Available with class pack purchase
- Targeted for in-classroom use
- Available within **FIRST** custom Thinkscape portal
- Digital content or PDF downloads
- Mini-game version of season’s challenge
- Uses a simplified Education version of the REV Competition kit
FIRST® in Florida Classrooms – High School

FIRST Tech Challenge or FIRST Robotics Challenge

<table>
<thead>
<tr>
<th>Grade Level</th>
<th>CTE - Robotics Pathway</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>9410110 - Foundations of Robotics</td>
</tr>
<tr>
<td>10</td>
<td>9410120 - Robotic Design Essentials</td>
</tr>
<tr>
<td>11</td>
<td>9410130 - Robotic Systems</td>
</tr>
<tr>
<td>12</td>
<td>9410140 - Robotic Applications Capstone</td>
</tr>
</tbody>
</table>

Industry Certifications Offered: Autodesk Inventor, RECF Engineering and Robotics, FANUC Certified Robot Operator, Electronics Technician for Industrial Engineering, Mechatronics Fitter, Microsoft Technology Associate (MTA) - Introduction to Programming
**FIRST Educator Resources**

https://www.firstinspires.org/community/educators

- **FIRST** Professional Development
- Curriculum FTC
- Guidebooks for FLL Divisions
  - Team Meeting Guide
  - Student Engineering Notebooks
  - Robot Rule Books
- Scope and Sequence Options
- Skills Progression
- Standard Alignments
- Custom Alignments
More Information

- On the web:
  - www.firstinspires.org

- Local
  - Wendy Austin, Regional Director – waustin@firstinspires.org

www.firstinspires.org
800-871-8326