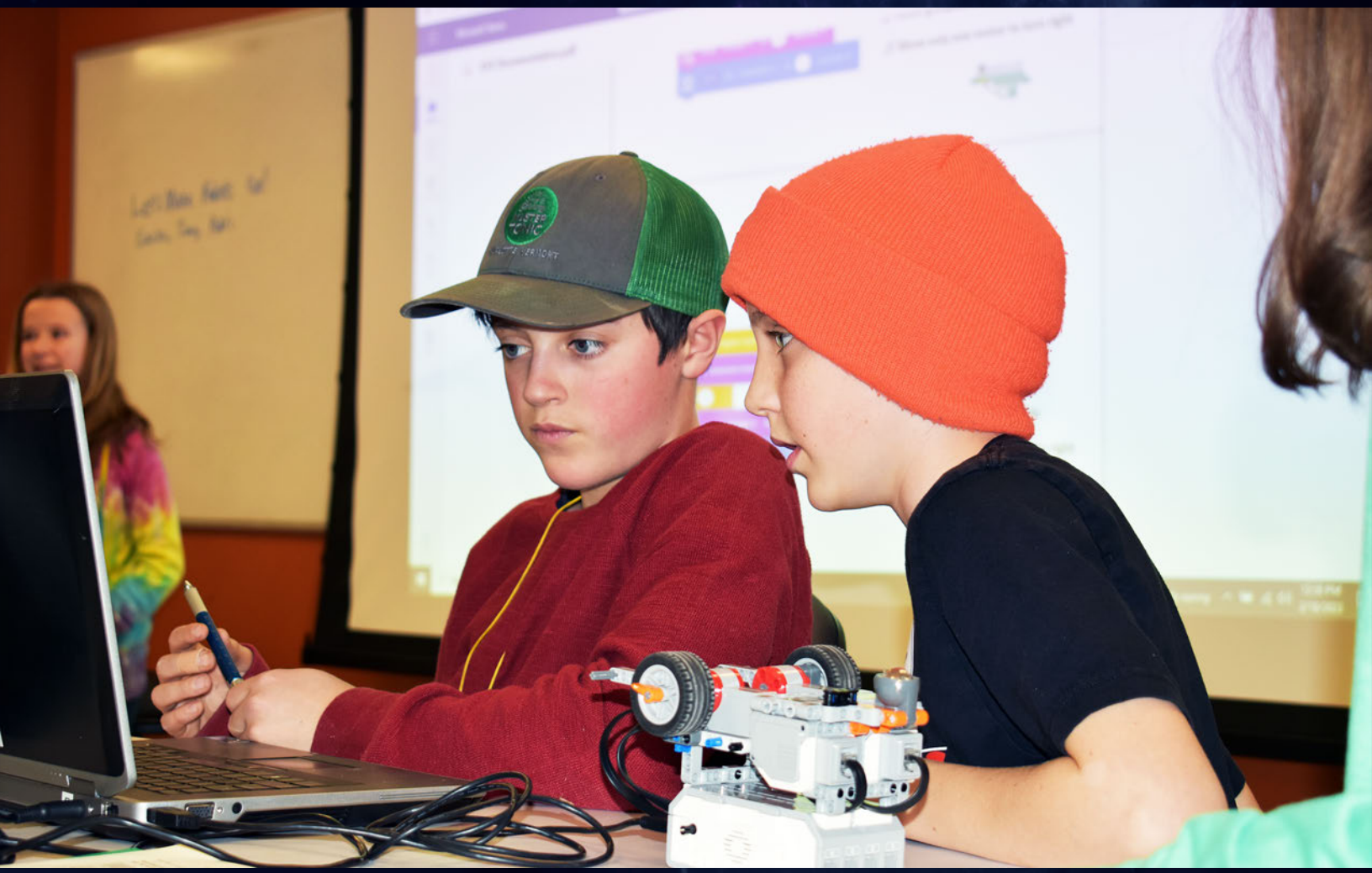
UVM CEMS and Extension 4-H Partnership for Youth Outreach

Program Report
2022–2023



THE UNIVERSITY OF VERMONT
COLLEGE OF ENGINEERING &
MATHEMATICAL SCIENCES

THE UNIVERSITY OF VERMONT
EXTENSION

UVM CEMS and Extension 4-H Partnership for Youth Outreach
Program Report
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Overview

University of Vermont Extension's 4-H Program provides positive youth development experiences for young people in science, civic engagement and healthy living education. These experiences help build necessary life skills while providing opportunities to explore and find the "spark" which ignites a path leading to important relationships, education and careers.

Offered across Vermont, UVM 4-H opportunities (in-person and virtual) are facilitated by trained staff and volunteers through clubs, afterschool programs and community-based or third space programs. 4-H'ers can be found exploring robots, livestock, food systems, physical literacy, health coaching, emotional wellness, babysitting skills and more.

Having just completed its second year of a three-year partnership, UVM's College of Engineering and Mathematical Sciences (CEMS) alongside UVM Extension 4-H has seen growth in outreach and impact across the state in STEAM (science, technology, engineering, arts and mathematics) initiatives. CEMS Dean Linda Schadler understands that 4-H's existing infrastructure and relationships across Vermont, and that 4-H's existing focus on and work in STEAM education, is beneficial to both entities. Connecting CEMS faculty and staff, and UVM students to 4-H staff as well as Vermont organizations and partners has proved fruitful all around.

This investment continues to allow 4-H to increase capacity, establish new initiatives, and strengthen programs. Throughout FY23, the CEMS/4-H partnership strengthened the STEM Ambassador Program; enhanced and increased support of FIRST Technical Challenge (FTC) Robotics and, with partners from industry and education, launched FIRST in Vermont as a new nonprofit to support the continuum of youth robotics; strengthened and grew the Aiken Discover Engineering Month; and helped coordinate Vermont's Science Olympiad.

This report highlights the success of these programs. Visit K–12 Stem Outreach (https://www.uvm.edu/cems/k-12-stem-outreach) to learn more about these and other experiences.

Discover Engineering

Aiken Discover Engineering is a free annual event for youth in grades 5 through 12 who want to learn about engineering, build skills and network with engineering students, faculty and professionals. Our overall goal was to expose youth to engineering, build skills and help youth understand different pathways they can take to pursue a future as an engineer. This hallmark event of UVM's College of Engineering and Mathematical Sciences (CEMS) and Vermont 4-H took place on Saturday, February 18, 2023 at the University of Vermont. This year, 165 youth participated along with over 100 volunteers representing 20 businesses and student groups, including our STEM Ambassadors.

The day was split into two distinct parts. In the morning, participants engaged in an Engineering Scavenger Hunt. Innovation Hall was filled with exhibit tables hosted by engineering businesses and CEMS student groups. Each exhibitor submitted a question which was included on the scavenger hunt sheet and participants could discover the answers by visiting the exhibit tables. This was an engaging way to foster learning about different kinds of engineering and career pathways.

In the afternoon, participants continued to connect with engineering professionals and UVM engineering students through hands-on skill-building workshops.

Some feedback

Milo had *such* a good time at the engineering day yesterday! What a great event! He was full of so many awesome stories about his day and just loved the experience overall. Thank you all for all that you do to create learning opportunities like this for kids!

Thank you so much! My kiddos — Waylon & Cheyanne Ernst had such a wonderful time! Waylon said he felt so much better after you spoke with him! Thank you again for that! They are super excited about coming back next year and they are hoping more of their homeschool friends will come then as well! He loves the car he built! He wants to see if he can convert it into a helicopter! Cheyanne adores the plane she made and now she is thinking she wants to learn more about aerodynamics!

I want to congratulate you [on] a well-organized Discover Engineering event this past Saturday. From our perspective at the NRG Systems station, we experienced a group of really engaged students — and supportive parents. It was fun and we would love to do it again in future.

Other Events Connected to Engineering Week:

The virtual "4-H World Changers: Learn to Code" program ran for six one-hour sessions from February 2 to March 9, 2023 focused on learning p5.js to program a collecting game. Each week 35 participants in grades 5 through 12 learned and practiced new code to design their own game. At the final session, everyone got to showcase the game they created for all to play.

On February 11, 2023 the VTeen 4-H Science Pathways Café was led by Jeff Gibson, a propulsion test engineer with Benchmark Space Systems. The café title was: "It is Rocket Science: How to Design, Build, and Fly Homemade Rockets" and 42 participants in grades 7 through 12 learned about basic rocket concepts, different calculations and tests used by engineers, and how to build and fly a model rocket. They then were given a model rocket to build and test on their own.

Science Olympiad

Science Olympiad is a national non-profit organization dedicated to improving the quality of K–12 science education, increasing student interest in science, creating a technologically literate workforce, and providing recognition for outstanding achievement by both students and teachers. Events are held in every state in the country, with the intent of boosting students' knowledge of and engagement with a wide range of science-related fields including genetics, chemistry, anatomy, physics, geology, mechanical engineering and technology.

Vermont started hosting a state tournament back in 2018 and has been trying to grow the program ever since. The 2023 tournament held on April 1 welcomed teams from 6 different high school teams. Returning teams included Burr and Burton Academy, Essex High School, Peoples Academy and St. Johnsbury Academy. New teams included Williamstown High School and Randolph Union High School/Randolph Technical Career Center. Sixty-five students competed in 16 different events across a variety of academic disciplines over the day. These events were created and judged by 34 UVM faculty, graduate and undergraduate students, with the support of our STEM Ambassadors. This year, 14 graduate students were invited to showcase their STEM work by hosting Science Sparks — informal presentations and discussions to increase learning opportunities throughout the day.

STEM Ambassadors

The STEM (science, technology, engineering and mathematics) Ambassador program, in its second year, provided numerous opportunities for Vermont youth to experience STEM subjects through hands-on learning with UVM undergraduate students. Twenty STEM Ambassadors trained in experiential learning, assertion-evidence presentation style, child safety and protection, educational equity, curriculum design and leadership skills. They created unique hands-on STEM activities such as Edible Anatomy: Crafting with Candy; What is Nanotechnology: Getting patients the medicine they need!; Sustainable Plastics: Safe Enough to Eat; and Waterworks: How Nature Cleans our Water.

These programs were run in various venues including, afterschool programs, libraries, teen drop-in centers and high schools, reaching approximately 575 youth ages 8 to 18. The signature event, STEM Showcase, held once each semester, drew capacity enrollment in Fall 2022, doubling attendance from the previous showcase.

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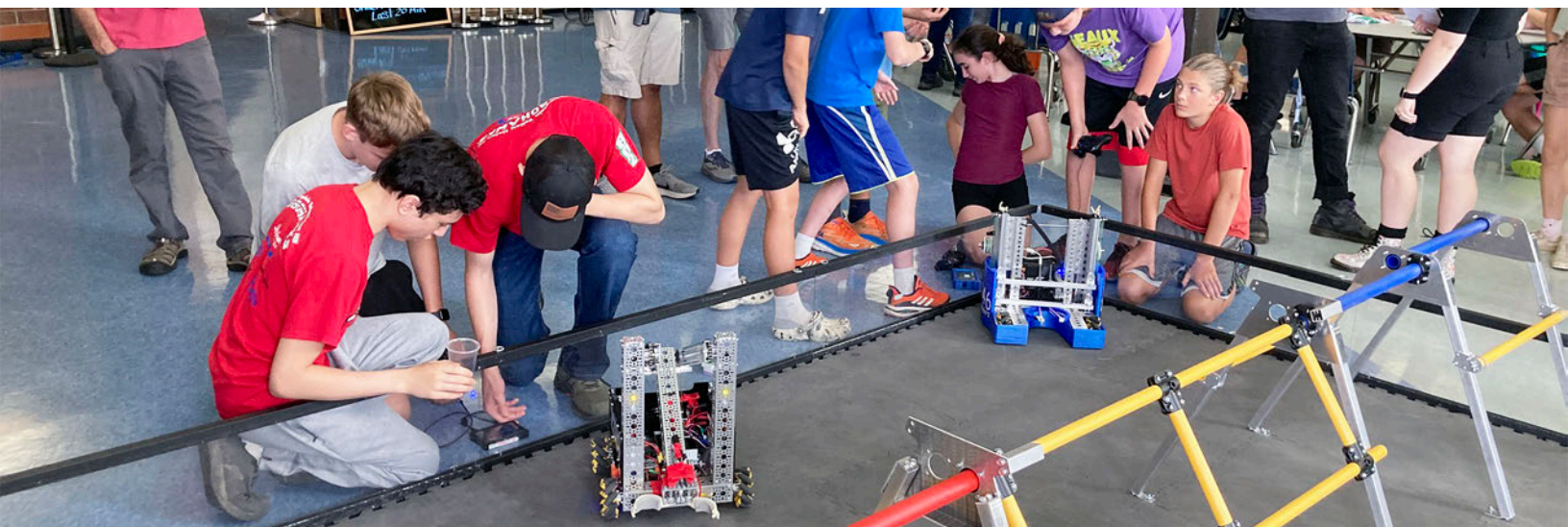
STEM AMBASSADORS
NETWORK

Events and Participation

Event Title	Date of Event	Participants	Age Range
JFK Health HEROES	10/3/2022	8	Grades 3-5
LEGO® Robotics	10/6/2022	12	Grades 5-8
Health HEROES Trainings	10/15/2022	8	Grades 9-11
STEM Showcase 3.0	11/5/2022	72	Ages 8-14
Hurricane-Proof House Challenge	11/7/2022	10	Grades 9-12
STEM Academy College Panel	11/11/2022	39	Grades 9-12
Latin American Youth Group, Engineering Challenge	12/5/2022	18	Grades 11-12
Junk Drawer Engineering	1/30 – 5/1/2023	9	Grades 3-5
LEGO® Robotics	2/7/2023	4	Grades 3-5
LEGO® Robotics	2/28/2023	4	Grades 3-5
Vermont Flower Show Volunteering	3/3/2023	50	All ages
LEGO® Robotics	3/9/2023	5	Ages 13-15
LEGO® Robotics	3/21/2023	4	Grade 5
LEGO® Robotics	3/23/2023	5	Ages 13-15
Health HEROES Showcase	3/25/2023	33	Ages 8-15
STEM Showcase	4/15/2023	40	Ages 8-14
How to Build a Better Bird: How Animals Adapt to Habitat	4/21/2023	4	Grades 3-5
Newspaper Building Challenge (Engineering)	4/21/2023	21	High school
LEGO® Robotics	4/25/2023	4	Ages 7-12
Total		**350**	



FIRST Technical Challenge (FTC)

In this second year of Vermont 4-H providing outreach for the youth robotics program FIRST Technical Challenge (FTC), the number of teams has held steady, outreach and mentoring of younger teams has increased, and the grassroots supporting organization has strengthened.

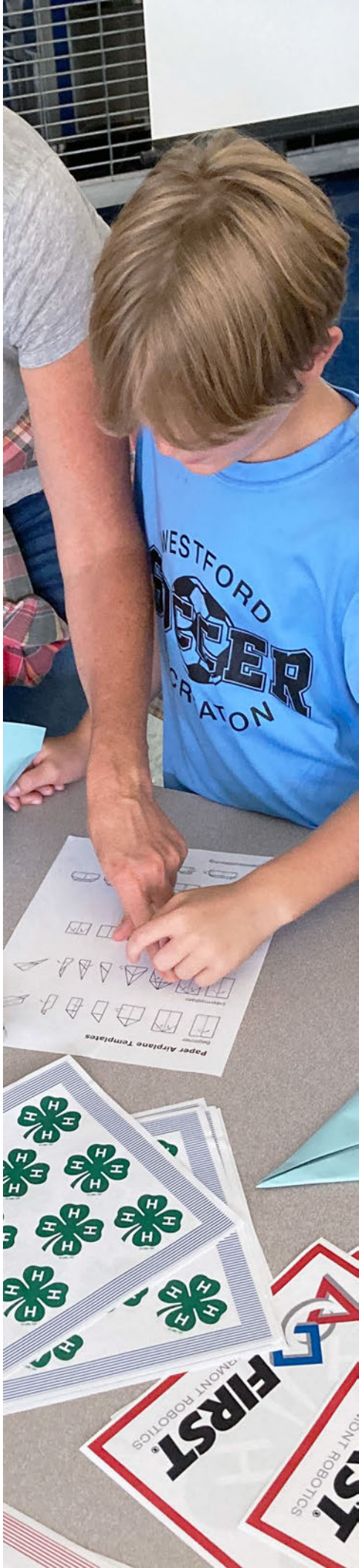
FIRST in Vermont (FiV) has an active state coordinator, is pursuing non-profit status, and has successfully attracted both state and corporate funding.

All program levels had teams at Tech Jam, an annual tech business sector event, and FiV has been invited to participate again, in our new spot right up front. At the 2022 event, FiV joined over 50 other organizations in telling their story to an estimated 1,000 visitors. A QR Code campaign built the contact list to nearly 250 individuals expressing a range of interests including volunteering, collaborating and even starting teams.

A $50,000 grant to FiV from the Vermont Agency of Education supported 10 summer robotics day camps in nine locations around the state, with 23 FTC team members employed as camp counselors and 183 younger campers who learned to build and program FIRST Lego® League (FLL) robots. FTC participants are increasingly part of a continuum that connects STEM learning and play with tech education and business. Younger kids in FLL (FIRST Lego® League) state that they are eager to continue with robotics when they "graduate" to FTC, and multiple locations in Vermont have teams at both levels.

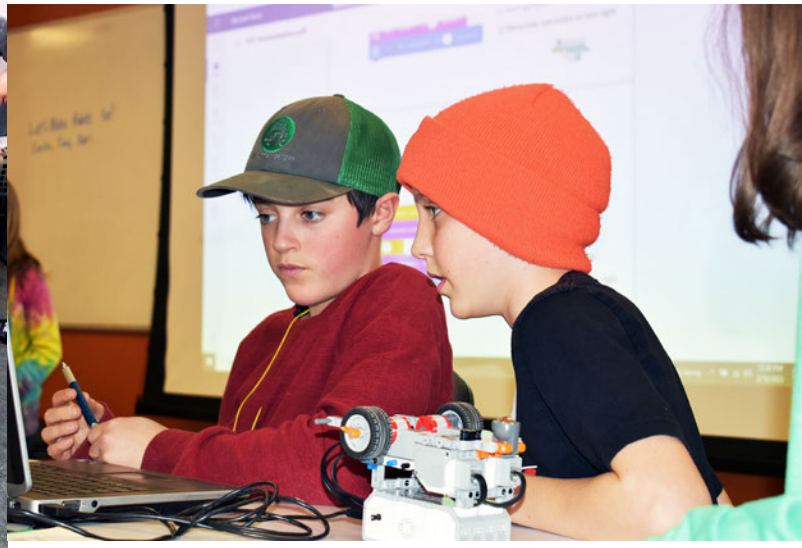
A snapshot from one team's grant reporting speaks to the value of FIRST robotics for Vermont youth:

> One very shy boy on our team had struggled with academics, but had always loved taking apart engines to understand how they worked. When we met him, he was applying to trade school to become an auto mechanic, and had started working at a local auto shop to build his skills. However, as he got deeper into the auto business, he started to have his doubts about his career choice, finding the work not as satisfying as he had hoped. At the same time, he joined our joined our FRC team... He learned he had a gift for explaining mechanical principles to others and for imagining technical solutions and predicting outcomes from different designs... He started to realize that his mind worked more like an engineer and that he wanted to create machines, rather than repair them. After his rookie season in the FRC community, he withdrew his application to auto trade school and decided to stay in high school and pursue higher education in engineering.



4-H Summer Science Educators

Additionally, from the success of this investment, a new effort was realized this year, called 4-H Summer Science Educators. The Vermont Agency of Education became aware of the various STEM opportunities being spearheaded by 4-H and they reached out to offer a noncompetitive grant for summer STEM learning. With these funds, 4-H was able to hire five existing STEM Ambassadors to provide workshops outside of Chittenden County. In eight weeks, the renamed 4-H Summer Science Educators were able to run 17 workshops mostly in the Northeast Kingdom, Rutland, and Lamoille Counties and reached over 450 youth. A few of them also helped run the Science Exploration Camp at UVM.



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