

Grant Partnership Helps Break Down Barriers to STEM Access in First Nations Communities



AT-A-GLANCE

Background

Young people from First Nations communities in Canada experience graduation rates that are lower than the Canadian average, often attributed to low attendance rates and skill shortages. To engage students in school and help build STEM literacy, educational programs must provide hands-on, community-based opportunities that align with Indigenous ways of learning, as well as break down barriers to access in their remote and rural communities.

First Nations schools add robotics

In 2016, the Alberta Distance Learning Center (ADLC), which offers flexible distance learning to help students gain skills and earn credits toward graduation, received a *FIRST*® STEM Equity Community Innovation Grant to establish and grow robotics teams at three First Nations schools in Alberta. The funding also supported ADLC curriculum development, First Nations teacher training, and a celebratory robotics and cultural event.

Enabling community-based learning

Through ADLC, students could gain access to credits for participating meaningfully on *FIRST* teams. *FIRST*® LEGO® League teams learned to build, program, and present. *FIRST*® Robotics Competition teams built 120-pound robots over six weeks to compete in an off-reserve competition. *FIRST* engaged the students in STEM and helped increase school attendance.

Experiential learning in Indigenous communities

The Indigenous population in Canada, which includes First Nations, Metis, and Inuit, is young – most Indigenous people are under 25 years old – and this community is growing faster than the national average.¹ Yet graduation rates among Indigenous students are lagging. In Alberta, the on-time high school completion rate among Indigenous students is 50 percent, compared to 76.5 percent among the overall Alberta population.² Among young adults living on reserves across the country, just four in 10 have finished high school.³

Indigenous ways of knowing and learning include mentor-based learning, learning by doing, and learning through community. To engage students, educational programs need to provide opportunities that are community-based, meaningful, and experiential. Hands-on, mentor-driven, team-based STEM (science, technology, engineering, and math) programs like *FIRST*® engage students and motivate them to do well in school, build their STEM literacy, and create a fulfilling future for themselves.

Facilitating robotics capacity building in First Nations schools

In 2016, the *FIRST* STEM Equity Community Innovation Grants program, available to communities in the United States and Canada, was launched to increase access to *FIRST* robotics programs for underrepresented and underserved students and help more communities develop new and innovative approaches to address inequities in STEM fields. The grants were made available through *FIRST* thanks to the support of generous sponsors, including *FIRST* Strategic Partners Boeing, Caterpillar, GM, John Deere, and Qualcomm® Incorporated, as well as Arconic Foundation and GitHub, among others.

The grant funded an innovative partnership between the Alberta Distance Learning Center (ADLC), First Nations schools, and local *FIRST* resources to build First Nations robotics capacity in Alberta. Grant funding served 62 First Nations students, all of whom live on reserves and are from economically disadvantaged backgrounds.

The funding supported the creation and expansion of *FIRST* teams at three school sites: Alexander First Nation Kipohtakaw Education Centre on Alexander First Nation reserve north of Edmonton, Alexis School on Alexis Nakota Sioux Nation reserve in northern Alberta, and Kainai

STEM EQUITY GRANTS RESULT IN GREATER ACCESS TO *FIRST* PROGRAMS

FIRST launched its STEM Equity Community Innovation Grants program in 2016 to provide diverse and disadvantaged students and communities with hands-on learning opportunities and outlets for creative problem-solving. During the first year, nine grant recipient sites served 152 *FIRST* teams totaling 1,080 young people.

The nine sites were successful in their goals of reaching young people from underserved and underrepresented communities with *FIRST* programs. The grant program resulted in greater participation of young women (43 percent), economically disadvantaged students (72 percent), youth of color (44 percent), and youth from rural (42 percent) and urban (40 percent) communities.

To assess the reach and impact of the program, coaches and mentors completed a survey. Most (93 percent) indicated they were successful at recruiting team members who matched the demographics of their community, and over 90 percent indicated team members showed gains in almost all STEM and 21st century outcomes.

Youth were also surveyed as part of the evaluation, and as a result of their participation in *FIRST*, had gains in STEM learning activation, including statistically significant increases in engagement in STEM, STEM interest, skill mastery, self-efficacy, and innovation thinking. Overall, *FIRST* was successful at igniting youth interest and engagement for STEM learning among grant participants.

High School on Kainai First Nation reserve in southern Alberta. Beyond providing funding to register and equip the teams, the grant supported professional development and distance learning opportunities that were tailored to better meet the needs of the communities.

Grant funding also supported a culminating event that encompassed robotics demonstrations, First Nations ceremonies, and Traditional Teachings. At the end of the grant season in May 2016, the Alberta Indigenous Robotics Show & Share and Cultural Day was held at amiskwaciy Academy in Edmonton, a First Nations school that immerses students in a learning environment that honors their culture, language, and traditions. amiskwaciy is interested in starting a *FIRST* program, so the event also helped introduce robotics to the school's students.



FIRST® Tech Challenge participants from Alexander First Nation Kipohtakaw Education Centre work on their robot at the Red Deer Robot Riot training sessions in Alberta.

Building robotics into distance learning curriculum

Many First Nations students live and attend school on reserves that are remote and sparsely populated. They have a culture-based flexible notion of time and limited access to industry, technology, and mentors. Rates of school absenteeism are high. To break down barriers to academic success, the ADLC provides flexible distance learning opportunities that help students gain skills and earn credits toward graduation.

“ADLC has worked closely with Indigenous communities to help identify and design appropriate learning opportunities that will engage them and help them stay in school,” says Frank McCallum, principal of ADLC. Grant funding supported the development of curriculum aligned to *FIRST* through ADLC, so that students earned academic credits for participating on a *FIRST* team under Alberta’s career and technology curriculum programs.

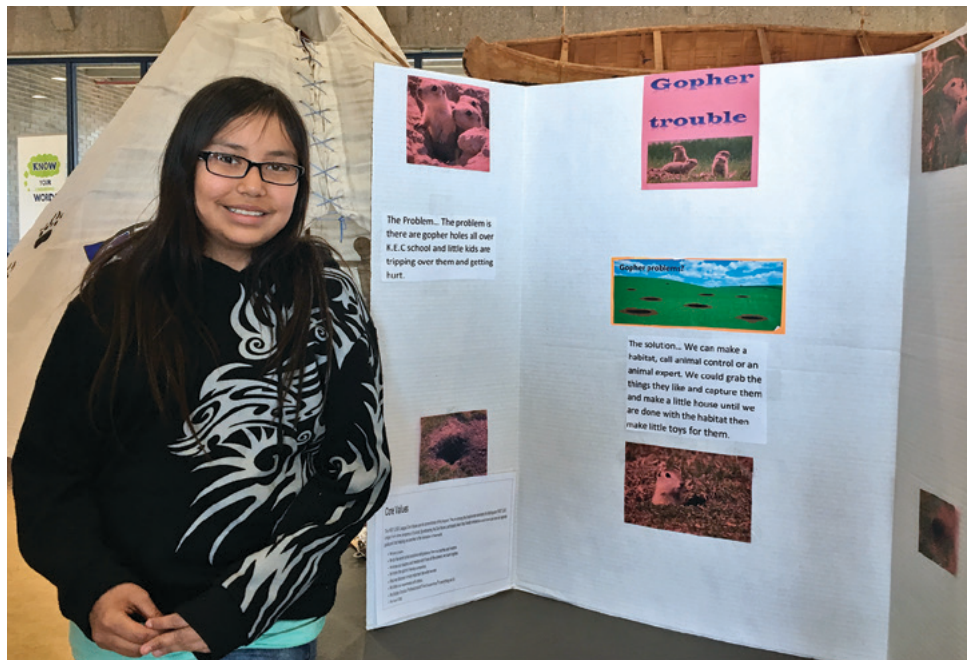
The *FIRST* teams established by the grant were coached by educators from the on-reserve schools, allowing them to tailor the programs for their students. The Alberta-based *FIRST* Regional Director, Phoebe Arcilla, built trust based on her experience as a First Nations school teacher and having a similar background of being a visible person of color, which enabled an opportunity to run professional development workshops with school staff and create kinship to bridge respect and communication between groups. Arcilla and her son, a *FIRST* alumnus and half Indigenous, became robotics resources for the First Nations communities. “When I walked into the schools, I wasn’t a stranger to the community members. Even if a staff member or parent wasn’t part of the robotics coaching groups, they were part of the culture of it,” Arcilla said. She added that after the robotics season ended, some of the teams brought their completed robots out into the community during powwows.

Project-based opportunities connect with students

At Alexander First Nation Kipohtakaw Education Centre, the teacher-coaches customized how they rolled out the program for their students. They held meetings for their *FIRST*® LEGO® League teams during lunch because students are unable to meet after school. They also had grade 6 and grade 8 teams work in close proximity, so that when the older team had success in solving a mission, it motivated the younger students to complete a mission as well.

"[FIRST LEGO League] is a very fun experience. ...I learned a lot of skills, from programming robots and building robots to setting up presentations."

— REEF, 12, STUDENT, ALEXANDER FIRST NATION KIPOHTAKAW EDUCATION CENTRE



A FIRST LEGO League participant from Alexander First Nation Kipohtakaw Education Centre presents her team's FIRST LEGO League project about gopher holes on the reserve at the Alberta Indigenous Robotics Show & Share and Culture Day at amiskwacy Academy in Edmonton.

Reef, 12, says he enjoys being a part of FIRST LEGO League, which challenges elementary and middle-school students to build a robot to complete missions on a playing field and to complete a project around a real-world theme. "At first, I thought of it as a way to get out of class or spend my lunch break," Reef said. "It's a very fun experience. It's a really nice change, and I like it. I learned a lot of skills, from programming robots and building robots to setting up presentations."

For the project portion of FIRST LEGO League, Reef's team was challenged with identifying a problem with human-animal interactions in their community and brainstorming solutions. The students recognized a problem on their reserve that stray dogs were being hit by cars. They proposed asking the Chief of Council to establish an animal patrol on the reserve, add more stop signs to roads, and encourage pet owners to keep dogs on a leash.

Increasing school attendance, gaining career-related skills

The Alexis School started a FIRST® Robotics Competition team, the Alexis Tech Warriors, through the grant funding. "We've never had robotics on our reserve. We felt it was important to help people learn about robotics because from robots you can launch careers into greater things: programming, building, design, repair," said Lloyd Verreault, a teacher at the school and the team's mentor.

FIRST Robotics Competition features a six-week robot build period and competition events. The new Alexis team ran out of time to complete their robot during the build season, which is a common experience for new teams. FIRST emphasizes that setbacks and failure are an important part of the innovation process. Verreault brought the team and the unfinished robot to a regional FIRST competition event in Calgary, where they found assistance and encouragement from other FIRST teams, all in the spirit of the FIRST value of *Coopertition*® – a philosophy that teams can and should help each other, even as they compete.

With the support of veteran FIRST participants, the Alexis Tech Warriors were able to finish building and programming their robot, which allowed them to compete in the event. They landed in the top 60 percent of teams. "We got a lot of help and support, and I think that's what FIRST is all about. That's been our experience, and it's been a lot of fun for us," Verreault said. "Just think: A year ago, we knew nothing about robots. Now we are building and achieving our designs."



A FIRST LEGO League participant and coach from Alexander First Nation Kipohtakaw Education Centre test the team's robot at the Alberta Indigenous Robotics Show & Share and Culture Day at amiskwacy Academy in Edmonton.



The Alexis Tech Warriors from Alexis School pose with their robot, which they built and programmed to climb as part of the *FIRST* Robotics Competition challenge.

Verreault said many of his students don't graduate on time because of absenteeism. But it's a different story for the students on the Alexis Tech Warriors. "Now that we've got robotics, they're in school full time. It increased attendance. The school is abuzz about it," he said. Next year, he plans to set up a Skype network so his students can call other *FIRST* teams for support.

Building confidence, expanding worldview

For Kainai High School, which had started a *FIRST* Robotics Competition team in 2014, the grant funding enabled the team to attend a second regional competition event, which helped the students gain more experience working on their robot. "Going to the competitions was actually pretty exhilarating," student Keyshaun, 17, said. "We built this robot, and you just can't wait to get it on the field and play with it."

Keyshaun, like many of his peers, was shy when he joined the team, but he became more outgoing, including contributing his ideas, communicating with judges, and helping other teams. Keyshaun says he doesn't care whether the team wins; he just appreciates a chance to be a part of the competition and do his best.

Keyshaun's team mentor, Matt Prete, says their community is very remote, so participating in *FIRST* helps expose his students to the world. "It's a ton of work, but there's a lot of benefits in so many different areas for the kids," Prete said.



At amiskwaciy Academy, student art on truth and reconciliation is displayed near the Canadian government's official apology for forced residential schools placement, showing the apology's influence on Indigenous students' sense of hopefulness and the resources available to them.⁵

Building toward equity

Indigenous people are underrepresented and underserved in Canada's economy. A 2016 study published by The National Aboriginal Economic Development Board found that closing the education and training gaps between Indigenous people and non-Indigenous people would add \$8.5 billion in income earned annually by the Indigenous workforce, including \$1.6 billion from Indigenous workers in Canada's Alberta province.⁴

FIRST STEM Equity Community Innovation Grants will continue to support community-based projects within First Nations communities in Alberta. Shelley Henderson, Diversity and Inclusion Manager for *FIRST*, says, "Working with the ADLC helped us debunk deficit ideologies that certain youth are less interested and less capable of achieving in STEM. Looking at how we deliver our programs through the eyes of youth with differing worldviews sharpens our capacity to create equity."

1 "Canada's indigenous people raise voices as youth activism surges," The Guardian, October 17, 2015. <https://www.theguardian.com/world/2015/oct/18/canada-indigenous-youth-activists-first-nations>

2 "Accountability Pillar Overall Summary Annual Education Results Reports – Oct 2016, Province: Alberta," Alberta Education, October 2016. https://education.alberta.ca/media/3273036/apori_201610_province_province-report.pdf; "Accountability Pillar Overall Summary Annual Education Results Reports – Oct 2016, Province: Alberta (FNMI)," Alberta Education, October 2016. <https://education.alberta.ca/media/3273035/fnmi-report-accountability-pillar-overall-summary.pdf>

3 "Low graduation rates at reserve schools put aboriginals in jeopardy: report," The Canadian Press, January 28, 2016. <https://beta.theglobeandmail.com/news/national/low-graduation-rates-at-reserve-schools-put-aboriginals-in-jeopardy-report/article28427544>

4 "Reconciliation: Growing Canada's Economy by \$27.7 Billion," Prepared for The National Aboriginal Economic Development Board by Fiscal Realities Economists, November 2016. http://naedb-cndea.com/reports/naedb_report_reconciliation_27_7_billion.pdf

5 Racial equity and reconciliation work is complex, so understanding the nuances around historical context and current community implications is important: "Truth, Racial Healing, and Transformation," W.K. Kellogg Foundation, 2016. <http://comingtothetable.org/wp-content/uploads/2016/01/WKKF-TRHT-Booklet.pdf>