

Inside Education Innovations in Schools

Clean Resources Program #222300190

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Alberta Innovates Funding: \$120,000

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“Inside Education is truly a gift to educators and students across Alberta. Fostering critical thinkers involving multiple perspectives through the work you do is inspiring. Thank you!”

*- Kerri-Ann Dalstra
Gateway Christian School, Red Deer*

Inside Education’s work connects us to the Traditional lands of the Treaty 6, Treaty 7 and Treaty 8 First Nations Peoples and Métis people province-wide. In our journey towards Reconciliation as an organization, we respectfully acknowledge the Indigenous people who have cared for and traveled through the land in the area currently known as Alberta.

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Acknowledgements

Inside Education acknowledges the contributions of several partners that made our Water Innovations in K-12 School Project possible. Thank you to Alberta Innovates and to the hundreds of the expert guests and tour hosts that contributed their time and expertise on our programs to facilitate knowledge sharing between your sectors and youth. A special thank you to the University of Lethbridge and University of Alberta for data sharing, to the Nature Conservancy of Canada and Ducks Unlimited Canada for the use of field sites.

Laudable support for this project was made possible by the following organizations: Alberta Conservation Association, Alberta Environment and Protected Areas, Alberta Innovates, Cenovus Energy, ConocoPhillips Canada, Enbridge Inc., Forest Resource Improvement Association of Alberta, Land Stewardship Centre, Natural Sciences and Engineering Research Council of Canada, Nutrien, Suncor Energy Foundation, Sustainable Canadian Agriculture Partnership, Syncrude.

Executive Summary

This comprehensive water, climate and agriculture education program supported teachers in bringing current, meaningful content to enrich curriculum outcomes and engaged students ranging from grades 4-12 in hands-on, interactive education programming. Bringing together students, teachers and leaders from a wide range of disciplines, this project provided a platform to highlight research, innovations and technologies that are shaping the environmental landscape in Alberta. The schools we work with have a growing appetite to gain the knowledge and skills needed to actively contribute to a healthy and prosperous future for our environment, economy and society. Engaging with the next generation of leaders through experiential learning demonstrates that the current workforce are working to solve technological challenges and meet environmental performance goals and that youth can play an active role now and into the future.

Through our unique program approach we worked with students in urban, rural and Indigenous communities across Alberta enabling thousands of young people to take part in meaningful Alberta-relevant science education. We had 156 experts and organizations engaged in knowledge sharing activities throughout our programs, all coming together with the common goal of high quality environmental education.

Programs delivered included three provincial youth leadership summits (Navigate: Youth Water and Environmental Leadership Summit; Generate: Youth Energy and Climate Leadership Summit; and Cultivate: Youth Agriculture Leadership Summit), over 15,000 students in-school and field-based water, wetlands and agriculture programming, 4 teacher professional development programs, 14 environmental innovation days focused on agriculture, water and careers and the development of digital-twin interactive educational video games.

Introduction

Sector Introduction

The program of studies for K-12 education provides launch points for discussion about water, agriculture and climate at multiple grades, however as our collective understanding of environmental topics evolves and new ideas and technologies are implemented, it is critical that we provide young people with the knowledge and skills needed to engage now and into the future.

Knowledge or Technology Gap

Teachers are often disconnected from environmental sectors and as such lack current knowledge, resources and networks to bring new technologies and Alberta-relevant content needed to arm their students with future-ready knowledge and skills. Inside Education has been a trusted and reliable source for environmental and natural resources education in school districts across Alberta. This project aimed to engage students and teachers with water, agriculture, energy and climate change research as well as the practical application of that research to inform the next generation of environmental stewards and decision-makers. The project has provided an opportunity for knowledge transfer, youth engagement and skill development at a series of education programs across the province.



"I felt that the information provided was invaluable. Thank you Inside Education because of you I have less anxiety about polarized perspectives regarding energy. I also have a heck of a lot more faith in the future. Thank you!"

- Allison Knodel | Teacher Medicine Hat High School, Medicine Hat

"The sessions were fantastic, I enjoyed hearing about the latest developments in agricultural sustainability."

Sean Green, Teacher, Career and Technology Centre, Calgary

Project Description

Knowledge or Technology Description

The project's primary objectives was to provide engaging, interactive and curriculum-enhancing water, energy and environmental programs for Alberta teachers and students and act as a conduit for knowledge transfer between leading researchers and schools. We provided numerous opportunities to profile Alberta Innovates-supported water, energy, agriculture and climate-related research to a crucial audience of youth and science teachers. Inside Education programs provide forums through which students can learn with and from experts representing academia, industry, NGO's, Indigenous communities, and all levels of government. Bringing together a myriad of ideas and perspectives is essential to achieving high quality education to support the next generation of stewards and decision-makers.

Updates to Project Objectives

Inside Education did not deviate from the project objectives. Midway through the project we did acknowledge the added value of programming designed specifically for engaging young women and girls in science-based education tailored to career development. With this we adapted two of our innovation days to be specifically for a female audience and invited female experts and scientists to create a unique learning environment.

Performance Metrics

The primary goal of this project was knowledge sharing between experts and K-12 schools by highlighting innovative technologies that are shaping water, agriculture and climate sectors across Alberta. Throughout the project we tracked engagement of students, teachers, experts and community representation to ensure a diversity of audiences were brought together for the common goal of education. Primary metrics included: *# of collaborators, knowledge mobilization, rural and Indigenous community engagement, contributions to the innovation ecosystem, new products/services and informing/influencing teaching practices.*

"This conference was one of the greatest experiences I have been a part of. It was truly inspirational and motivated me to be an active participant in this field. It was a breath of fresh air that opened so many new doors and opportunities"

Navigate Student Participant



Methodology

Inside Education provides a suite of education programs that are designed to:

- **Enrich the curriculum through experiential learning** - Professional educators work directly with teachers and students to create meaningful first-hand experiences and hands-on learning opportunities that enhance the Alberta Program of Studies.
- **Encourage future thinking and environmental stewardship** - We aim to give students and teachers the knowledge, skills and tools and to be leaders, to innovate, and to take action in topics related to the environment and natural resource development.
- **Use a multiple perspectives approach** - Inside Education works with a network of credible professionals from across the spectrum of perspectives. We bring people together for the common goal of education allowing our program participants to become creative and critical thinkers.
- **Be accessible across Alberta** - Inside Education believes in removing all barriers to teacher and student learning. As such our programming is made available province-wide at no cost.

Using this methodology we provide a unique platform to work with schools across Alberta on a wide variety of programs, including those supported by this project, while engaging the broader community under the common goal of high quality science education.

Project Results

Impact

The Inside Education programs supported by this project have a broad and lasting impact. Reaching over 15,000 students in urban, rural and Indigenous communities and over 150 experts we are creating generations of informed stewards, decision-makers and laying the foundation for future innovations. Inside Education creates opportunities and accessible programs prioritizing rural and Indigenous schools that would not otherwise have access to these types of programs due to cost or travel constraints; furthermore our intimate understanding of the school systems reduces administrative barriers to participation that might hinder ability of teachers to seek these opportunities. These programs held additional value post COVID pandemic as most schools/students had not been able to participate in curriculum enriching field trips for the past several years. Connecting students to the world around them, reminding them that much work is being done in Alberta to successfully tackle environmental challenges empowers and engages young people.

Milestone 1: Cultivate Youth Agriculture Leadership Summit

The Cultivate Summit was held October 20-23, 2022 at Olds College. Eighteen high schools from across Alberta participated. Full summary report can be found here - https://www.insideeducation.ca/uploads/source/reports/2022/2022_Cultivate_final_Report-compressed.pdf. School leadership and education action plans were implemented by each of the participating schools through the remainder of the 2022-23 school year.



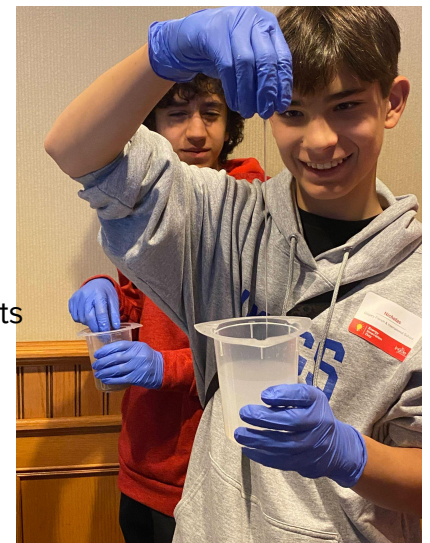
Milestone 2: Generate/Navigate Youth Energy, Water & Climate Leadership Summit

The Generate/Navigate Summit was held March 16-19, 2023 in Canmore. Twenty high schools participated. Full summary report can be found here - [https://www.insideeducation.ca/uploads/source/reports/2022/Generate_Navigate_Report_FINAL_\(compressed_for_web\).pdf](https://www.insideeducation.ca/uploads/source/reports/2022/Generate_Navigate_Report_FINAL_(compressed_for_web).pdf). Leadership and action plans were implemented by each of the participating schools through the remainder of the 2022-23 school year.

Milestone 3: Water, Agriculture and Climate Innovation Days

The Innovations Days approach is highly successful and provides a meaningful experience to expose students to real world technologies and innovations in a format that fits within a standard school day. We made efforts to host events across the province ensuring opportunities for urban, rural and Indigenous communities to participate. The Innovation Days held during the duration of the projects included:

- Calgary, November 2022, 78 students
- Grande Prairie, December 2022, 51 students
- Energy Innovation Day, Lethbridge January 2023, 36 students
- Girls in STEM, Leduc, March 2023, 120 students
- Agriculture Innovation Day, Calgary, April 2023, 100 students
- Energy Innovation Day, Edmonton, September 2023, 30 students
- Women in Outdoor Careers, Diamond Valley, October 2023 69 students
- Women in Outdoor Careers, Whitecourt, October 2023, 42 students
- Water Innovation Day Calgary, November 2023, 65 students
- Energy Innovation Calgary, December 2023, 74 students
- Energy Innovation Day, Red Deer December 2023, 72 students
- Energy Innovation Day Medicine Hat February 2024, 80 students
- Water Innovation Day, Edmonton March 2024, 47 students
- Agriculture Innovation Day, Maskwacis, April 2024, 38 students



Milestone 4: Interactive Digital Twin Video Games

Updates to the game include the bear having the ability to find and eat berries to maintain health, a road crossing and an industrial site were added to demonstrate human-wildlife interactions.

Profiled the Boreal and Westcastle video games at several events for both students and teachers:

- Alberta Teachers Conventions: Science Council Teachers Convention (November 2023), Career and Technology Studies Teachers Convention (October 2023).
- Regenerate: Forest and Wildlife Youth Summit (March 2024)
- Grasslands Teacher Professional Development Program (July 2024)



Variances: Wetlands game is not completed as planned and we are still working towards full implementation of the Boreal and Westcastle games.

Milestone 5: Wetlands and Water Field Studies and Classroom Presentations

We exceeded our deliverables with respect to direct delivery programming in communities across Alberta. The demand for these programs was higher than anticipated and our team worked diligently to provide support to all schools requesting programs. Due to demand exceeding capacity, we hosted Wetlands Teacher Professional Development Programs x 2 (Edmonton & Calgary) to provide teachers tools and resources to lead programming on their own.



“The students were having conversations about lowering the fertilizers around the ponds as they tested it high. A pond that appeared very clean did not end up having the best water quality for aquatic life.”

- Prabhjeet, Khalsa School, Calgary, Water Field Trip Participant

Key Learnings

Overall lessons learned surround the post-pandemic popularity of engaging, interactive learning experiences for students and teachers. As we expected, the 2+ years of screen time was quickly and enthusiastically discarded for in-person, interactive learning experiences, well timed with the initiation of this project in 2022.

Water, Energy, Climate and Agriculture themes are top of mind for teachers and students and well suited to enrich curriculum with an innovation-focused approach. Providing a unique forum for environmental topics and themes inspires young people to further develop an interest in, and desire to engage with, solutions to environmental issues today and into the future.

The Innovation Day approach is appreciated by schools and incredibly well received. The format is best suited to Junior and Senior High school audiences and is easily adaptable to meet curriculum objectives while profiling AI projects and other technologies. Teachers enjoy having a fully funded unique field-based day.

Wetlands education programs were in high demand, so much so that we exceeded our capacity to meet the requests. We expect this demand will continue at the upper grade levels, however with the changes to the program of studies in Grade 5 and removal of the wetlands unit it is unlikely to continue at the elementary level. We are continuing to include water management challenges and solutions in our Grade 5 classroom programming, specifically in the new areas focused on effects of climate change and conservation agriculture. The Grade 6 curriculum has also expanded and there is opportunity to combine water programming more formally with a forest ecosystems approach.

Teacher professional development workshops are a key method for knowledge transfer that has a potentially broader reach as each teacher reaches hundreds of students throughout their career as well as sharing their learnings among their professional networks and integration into school based projects.

“I am so thankful for this opportunity! I have learned so much through all the speakers and hands on projects that we have done. My favourite moments are learning about solar and wind power, and I hope to bring those ideas back to our school to create a more environmentally friendly planet.”

- ***Generate 2023 Student Participant***

Outcomes and Impacts

Inside Education was successful in creating numerous opportunities for knowledge sharing between schools and the broader community. The youth summit participants in particular described the experiences as “life-changing” and “inspiring.”.

- **# of collaborators:** Throughout the project we engaged with 156 experts in government, industry, academia, Indigenous Communities and NGO’s. These experts participated with us by delivering presentations, hosting workshops, facilitating tours, and as advisors during program development. Inside Education is proud to be the conduit by which everyone can come together to share ideas, hear directly from youth perspectives, profile their own projects and research and advance locally-based, science education in communities across Alberta.
- **Knowledge mobilization:** Inside Education has a broad network of schools that seek us out for our unique programs that bring current, relevant, and innovative content to enrich curriculum. Through the project we reached thousands of young people using grade-appropriate programming; our pre- and post- survey results indicated an average increase in knowledge of 35% in our energy, water and agriculture programs. Notably we engaged with a wide range of Alberta Innovates staff including Vicki Lightbown, Bryan Helfenbaum, David Van Den Assem, Vanessa White as well as AI-funded researchers and projects (Dr. Hannington, Dr. Hopkinson, MAGNA Engineering Services, Swirtex, Roshan Waters Solutions) have participated in numerous learning experiences.

The project has seen specific engagement with AI-supported programs from Dr. Patrick Hanington at the University of Alberta and Dr. Chris Hopkinson at the University of Lethbridge. Dr. Hanington’s work on invasive species has been modeled at our youth summits, qPCR equipment has been lent to high school teachers and we have actively participated in the research with students during field-based investigations of water/wetlands/stormwater ponds.

Dr. Hopkinson’s work collecting LiDAR maps from the Castle Mountain region and boreal forest (near Slave Lake) has been crucial in the development of the two interactive video games - the *Bear in the Boreal* and the *Fox in the Westcastle*. This online immersive digital twin technology is a fun and engaging platform to deliver rich multimedia-based interactive digital data and knowledge that develops understanding of changing environments and the mobilization of the data collected by Dr. Hopkinson.

Finally the youth summit programs include a follow up education and action project implemented by the participating schools. Some examples of these projects included:

- Piikani Nation Secondary School: developed energy efficient greenhouse infrastructure at the school including solar irrigation
- Holy Redeemer Catholic School delivered knowledge transfer of their own creating an outreach event about energy and water for the local elementary school
- Golden Hills Learning Academy: These students engaged with their classmates by inviting speakers to present to the high school students on agricultural careers and feature community connections to the industry.



Outcomes and Impacts con't

- Rural and Indigenous Communities:** Inside Education aims for 10% Indigenous participation across all programs. Throughout the project we were able to provide programs for the following Indigenous communities: Siksika First Nation, Stoney Nakoda First Nation, O'Chiese First Nation; Piikani First Nation, Sunchild First Nation; Wabasca; Paddle Prairie Metis Settlement, Fishing Lake Metis Settlement, Maskwacis (Erminskin, Samson Cree Nation, Montana Nation, Louis Bull). Building lasting relationships is ongoing and we continue to create new and tailor opportunities to best meet community needs. For example, upon receiving a request for an Innovation Day in the community of Maskwacis, we created a standalone program for the school that engaged all the junior and senior high school students and teachers at the Mamawi Atosketan Native School.
- Innovation Ecosystem:** Being active in the water and agriculture education space has brought on new partnerships for Inside Education within the environmental education community including a MOU with the Alberta Water Portal Society (soon to be Canada Water Portal), resource collaboration with Alberta Invasive Species Council and having an advisory role on the Outdoor Learning Conference. We are currently exploring a more formal education relationship with SAIT related to their World Water Day events and we engage directly with them during the Global Energy Show to promote energy literacy and science career development. Notably, one of our staff participated in CABIN training to elevate our water quality analysis. Finally, we continue to work with Dr. Hopkinson and are working together to bring high school students to the Canadian Remote Sensing Conference in 2025.
- New products/services created:** Inside Education worked with the University of Lethbridge and a 3rd party video game developer (FluidPlanet) in the production of two Video games - The Fox in the Westcastle and the Bear in the Boreal. Both games are playable at <https://fluidplanet.org/> (password: insideeducation), the boreal game is the north pin and Westcastle game is the south pin location. The video games are offered as a learning Resource aimed at a junior high school audience. Inside Education also integrates into classroom programming as a medium to discuss wildlife-human interactions, climate variability (ie: snow in the Westcastle) while highlighting remote sensing technologies.
- Practices informed/influenced:** 142 teachers participated in programs and gained new lesson ideas and best practices to utilize in the classroom throughout their career to inform and engage their students in meaningful climate, agriculture and water education.

Program Area	# of Teachers	# of Students	# of Schools/Communities
Cultivate	36	72	18
Navigate & Generate	40	120	20
Innovation Field Trips	14	1002	19
Interactive Video Game	~150	~200	~50
Classroom and Field Programming	645	15,015	645

Benefits

Ensuring youth are equipped with the knowledge and skills needed is critical to a vibrant future in all areas - economic, environmental, social. Providing students real-world examples of water, agriculture and climate innovations, emerging technologies and adopting a solutions-focused approach to these important topics will help inspire the next generation of water, climate, energy and environmental leaders.

- Economic/Building Innovation Capacity:** Education programs that feature the current workforce sharing ideas and innovations with the next generation inspires youth to consider new career pathways and opportunities. This is especially true as it relates to young women in environmental, science, technology, engineering and mathematics (E-STEM) careers. It is not uncommon for a junior or high school student to be unaware of the vast career opportunities available to them. Although guidance counselors and teachers strive to stay updated with innovations in industry, academic, and government, the rapid pace of change makes it challenging to keep up. Inside Education not only showcases cutting-edge work, but also connects the students directly to these career pathways and develops future-ready skills. Our expert guests and tour hosts are encouraged to share their educational background and career journeys while highlighting the technologies they work. In addition, several of our programs were directly linked with postsecondary institutions, even hosted on campus, and provided dedicated time in the schedule to discuss admission requirements and program offerings. For the younger grades, our programs connected them with real industry tools, techniques, and innovations, building curiosity about careers.
- Social/Environmental Capacity:** Building a strong province-wide alumni of Inside Education student-participants has the benefit of creating a community of youth who feel empowered to adopt more sustainable behaviors. As the province moves into an anticipated continuation of drought conditions in many agricultural areas of the province, demonstrating leading practices in responsible water management will be top of mind for many Albertans. Providing examples of Alberta-specific innovations to manage water scarcity builds awareness and demonstrates that Alberta has the capacity to address these challenges now and into the future.

Our past participants have influenced local policy, have stepped into leadership roles within their schools or communities, or actually worked to develop technological solutions to some of the environmental challenges of concern. Our teacher alumni are an educational force as well - the networking opportunities provided through our programs allow teachers to connect across the province, sharing ideas and helping to see that the work they do in their classroom has long-term cumulative effects. Finally, it bears noting that Inside Education programs have direct connections to the Alberta Program of Studies - especially crucial as Alberta Education undertakes a broad-based curriculum redesign - commencing with Elementary Science in 2024.

"The Innovation Day provides a unique opportunity for students to learn about the most recent and relevant technologies being applied in industry today. Students are able to engage with people and information that affect their lives today and perhaps in their future careers. Inside Education does a great job facilitating the field trip through detailed organization and communication."

- Matthias Cheung, Teacher at Strathcona Christian Academy

Recommendations and Next Steps

Working with K-12 schools means that there is always a new cohort of learners entering the system, creating a continuous need for opportunities and experiences to enrich the curriculum. We have seen a steady increase in the demand for Inside Education's unique program approach and we remain committed to our vision of generations of engaged stewards thinking critically about our environment and natural resources, and their important relationship with our economy and society. Additionally, new technologies and innovations are constantly emerging in the sector, necessitating the sharing of this information to equip young people with current knowledge and skills to utilize and implement these technologies into the future.

Inside Education hopes to continue to work with future and solutions-focused organizations, including Alberta Innovates and their sector partners, to advance science and technology literacy across Alberta. We are already planning for future youth leadership events including *Generate Youth Energy and Climate Leadership Summit* in March 2025 and *Cultivate Youth Agriculture Leadership Summit* in October 2025, as well as 10 more Innovation Days across Alberta throughout the 2024-2025 school year. We have an established team of professional educators that travel across Alberta delivering hands-on interactive programs to schools in urban, rural and Indigenous communities.



Knowledge Dissemination

The project connected a wide range of audiences making information widely accessible for youth, teachers, Alberta Innovates, and representatives from government, industry, academia, Indigenous communities, and NGO's. Additionally, we engaged with advisory committees for our program development and we connect with a broad network of educators who provide advice and insight into the best means for disseminating information to students province-wide

Furthermore, Inside Education shares our approach and outcomes at various events to support the broader education community including teachers conventions, professional conferences, and we participate in communities of practice, on boards and planning committees where appropriate.

We will continue to work with our program partners and collaborators at the University of Alberta, University of Lethbridge for ongoing opportunities to engage with projects.

Conclusions

Inside Education, with support from Alberta Innovates and a myriad of leading experts, helped teachers and students understand water, climate and agriculture research and its impact in environmental and natural resources decision-making. Through the implementation of dynamic, no-cost, grade-appropriate, hands-on programming we provided an accessible conduit to connect key topics, profiled cutting-edge research and promoted science literacy, and skill development in Alberta K-12 schools.

The support enabled the facilitation of three provincial scale high school youth summits that featured technology and innovation - Cultivate 2022: Youth Agriculture Leadership Summit, Generate 2023: Youth Energy and Climate Leadership Summit and Navigate 2023: Youth Water Leadership Summit. These programs resulted in dozens of school-based action projects to extend the impact of the events to the broader community, including work on invasive species and citizen science in collaboration with the University of Alberta School of Public Health.

Inside Education developed a unique "Innovation Days" program to host 14 days across the province sharing real-world examples of technology and innovation through expert speakers, tours and workshops. This field-trip approach offered schools in urban, rural and Indigenous communities the opportunity to understand Alberta-led projects that are making a difference in students' backyards.

Our team of professional educators also worked with both teachers and students in the classroom and at local wetlands and stormwater ponds to share knowledge.. We worked with over 15,000 young people while providing a meaningful and engaging experience that brought water and agriculture topics to life.

Finally the project allowed for the development of two interactive video games, Fox in the Westcastle and Bear in the Boreal, that utilize Lidar imaging and digital twin technology. These games featured Alberta Innovates funded research out of the University of Lethbridge on cumulative effects of climate, land cover & snowpack trends on Alberta's Eastern Slopes of the Canadian Rockies (ESCR) water resources.

This important project will have lasting impacts as students incorporate these experiences and the knowledge and skills they have gained into school based projects and their future career aspirations. We have provided a strong foundation for technology and innovation to thrive in Alberta and highlighted how the sector is critical to sustainable development.

Inside Education is looking forward to continuing this important work through new and existing partnerships, including working with Alberta Innovates to leverage their networks and share how technology and innovation are shaping our province.

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