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Project Insights Report

Virtualization of Experiential Learning Platforms and their Pedagogical Models

PARTNERS

British Columbia Institute of Technology

Siemens Canada

B.C. Ministry of Post-Secondary Education

LOCATIONS

Across Canada

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Executive Summary

Training programs for Canada's critical infrastructure workforce have always depended on on-site access to specialized equipment and complex infrastructure systems that cannot simply be replicated in a classroom. When COVID-19 forced post-secondary institutions online, this reality created an urgent problem for programs that had been built around experiential learning. How do you train people on utility-grade equipment when physical access is no longer possible?

In response to this challenge, the British Columbia Institute of Technology (BCIT) tested the potential of virtual training by building the Virtualized Experiential Learning Platform (VELP). The platform provided learners, instructors and researchers with remote access to a physical training environment. Rather than replacing physical assets, VELP virtualized access to them, giving trainees hands-on experience with actual utility-grade systems from anywhere in Canada.

Over four phases of FSC-funded work from 2021 to 2025, the project grew dramatically. It began with building and testing the technology. At later stages, it was compared with market alternatives, piloted with industry partners, and its potential use with Indigenous and remote communities was explored. In the comparative analysis, VELP scored 88% across 37 features, largely matching its closest competitors and outperforming them on 12 features. Pilots with BC Hydro, Siemens, and EdgeTune Power reached over 40 professionals, with participants requesting training that was more tailored to their specific operational contexts. VELP is now embedded in two micro-credential programs at BCIT. Although learning has largely returned to the classroom, the case for remote experiential learning has grown stronger, particularly for remote communities and sectors facing regional labour shortages.

In 2025, BCIT turned its attention to Indigenous and remote communities, partnering with Johnston Research to conduct interviews and surveys with First Nations members in BC, Alberta, Saskatchewan, and Ontario. Many communities are deeply motivated to pursue clean energy as a path to energy sovereignty and cultural preservation. However, they face obstacles including high costs, unreliable infrastructure, limited digital access, and decades of exclusion from energy decision-making. First Nations members asked for training within their communities that involves their Elders and leads to recognized credentials. VELP has the potential to help these communities, with the recognition that it will need to be embedded within culturally grounded programs. Indigenous communities will need to be engaged as partners and rights-holders, not recipients of a technological solution.

KEY INSIGHTS

1. Trainees using VELP gained a comparable understanding to in-person learning, and the platform performed well against its closest Canadian competitors on 37 features, outperforming on 12 features.

2. VELP's model of virtualizing access to hands-on learning can be adapted for any sector that uses physical equipment for training, but its effectiveness depends on co-development with partner organizations rather than generic delivery.

3. For Indigenous and remote communities, there is a gap between the promise of remote training and the reality of accessing it. Closing that gap requires the sector to develop cultural competency, relational skills, and genuine partnership models that have largely been absent.

The Issue

Canada's critical infrastructure, such as electricity grids, clean energy systems, and digital networks for everyday use, depends on a skilled and continuously trained workforce.

Training this workforce has traditionally required physical access to utility-grade equipment, making it difficult to scale and nearly impossible to deliver remotely. The COVID-19 pandemic made an existing access problem impossible to ignore. It also revealed a deeper structural challenge: many Canadians lacked meaningful access to specialized critical infrastructure training even before the pandemic. Remote and rural communities, Indigenous peoples, newcomers, and those who cannot relocate for training have long been underserved by a system built around physical presence in urban facilities.

This gap carries particular significance for Indigenous and remote communities, who are increasingly central to Canada's clean energy transition. Many are actively pursuing renewable energy projects as pathways to energy sovereignty and cultural preservation. Yet they encounter compounding barriers, including high costs, unreliable internet, limited digital literacy, and decades of exclusion from energy decision-making. Existing training models have not been built with these communities in mind.

The challenge is growing on multiple fronts. Critical digital infrastructure faces increasing threats from sophisticated cyberattacks. Canada's transition to clean energy is accelerating demand for workers who can manage and operate new sustainable technologies. Indigenous nations, whose stewardship of the land predates the state, should be full partners in shaping the infrastructure development and training systems that support these industries. Within this context, BCIT turned its attention to Indigenous and remote communities in 2025, exploring how VELP could help remove barriers to critical infrastructure training for them.

What We Investigated

The principal aim of this project was to shift experiential learning to a virtual platform for those training to work in Canada's critical utilities infrastructure.

From 2021 to 2023, BCIT set out to answer the question: Could the hands-on experience of working with real utility-grade infrastructure be meaningfully replicated in a virtual environment? This system would involve migrating control-and-command systems into a secure online environment, developing digital twin models of real infrastructure, and testing whether teams could collaborate effectively from different physical locations. Two pilot sessions with students helped evaluate whether the platform delivered genuine hands-on learning during this phase.

Phase two of the project in 2024 involved a comparative analysis of the VELP against two market alternatives (CRIRN and CIC) on key metrics. Training was also piloted with BC Hydro, EdgeTune Power, and Siemens to assess its relevance for working professionals and gather feedback for improvement.

Guiding questions for phase 2 were:

1. How does VELP compare to existing market alternatives in terms of cost, accessibility, flexibility, and cybersecurity?
2. Can it work for other audiences, specifically utility and industry professionals?

In the third phase in 2025, BCIT partnered with Johnston Research Inc. Following OCAP principles, BCIT conducted 15 interviews and 16 surveys with Indigenous community members across BC, Alberta, Saskatchewan, and Ontario, alongside interviews with utility and clean energy employers. The phase sought to understand:

1. What skills and approaches does the utility sector need to support Canada's clean energy transition with and for Indigenous communities?
2. What are the clean energy training needs and barriers facing Indigenous and remote communities?
3. What would it take for VELP to meaningfully serve these communities?

✔ What We're Learning

VELP showed that hands-on experiential learning can be delivered remotely without sacrificing quality
Two pilot sessions with students confirmed that trainees could gain comparable understanding and experience to in-person learning. The majority reported that the platform provided real-world experiences that mimicked likely workplace scenarios. The platform successfully replicated more than 150 signals in the cloud, enabled simultaneous multi-user remote access, and maintained reliable communication between physical assets and cyberspace. VELP is now embedded in two BCIT micro-credential programs, marking an important step toward formal credentialing pathways.

A rigorous comparative analysis confirmed VELP's unique position in the Canadian market
VELP was evaluated against two comparable Canadian platforms, NRCan's CRIRN and UNB's Canadian Institute for Cybersecurity, across 37 features. VELP performed on par with the competition across 20 features, outperformed one or both on 12, and had 5 areas for improvement, including availability, flexibility for instructors, and cybersecurity features. The analysis also confirmed that very few platforms combine multi-user remote access, advanced cloud applications, digital twin technology, and cybersecurity training in a single environment, reinforcing VELP's value as a rare and specialized offering.

Piloting VELP with industry partners showed its promise and limitations for professional training
Training sessions with BC Hydro, EdgeTune Power, and Siemens reached over 40 professionals. Participants generally responded positively to the platform's hands-on, systems-level approach to critical infrastructure training. However, utility professionals in particular felt the training was not specific enough to their day-to-day operational contexts. BC Hydro participants, for instance, noted that the training covered multiple cybersecurity compliance frameworks while their organization uses only NERC CIP. As such, VELP-based training is most effective when co-developed with the partner organization and tailored to specific roles, experience levels, and operational realities rather than delivered as a generic program.

The utility sector's ability to support Indigenous communities in the clean energy transition depends on more than technical expertise

Research with 15 Indigenous community members and 16 survey respondents across BC, Alberta, Saskatchewan, and Ontario revealed that remote and Indigenous communities are deeply motivated to pursue clean energy training. Many see it as a pathway to energy sovereignty and cultural preservation. However, limited internet infrastructure, varying levels of digital literacy, and a strong cultural preference for in-person, Elder-guided, and community-based learning mean that VELP as a standalone platform is not sufficient. Participants were clear: they want training that comes to them, happens in their language, leads to recognized credentials, and is delivered by partners who treat them as rights-holders. Interviews with utility and clean energy employers reinforced this, revealing that working effectively with Indigenous communities requires cultural competency and relationship-building as much as technical knowledge.

Why It Matters

With Clean Energy Canada estimating more than 600,000 clean energy jobs by 2030, the country faces a growing skills gap at a time it can least afford one. VELP shows that virtualized experiential learning can close the geographic gap between training and learners, and that the technology is ready for deployment. For policy-makers and funders, investing in platforms like VELP is a strategic necessity for Canada's economic and energy future.

This work also highlights the fact that virtualizing access to physical assets while maintaining the quality of hands-on learning is transferable to any sector that depends on experiential training and faces access barriers. The learnings open the door to virtualized experiential learning in other sectors critical to Canada's economy, from healthcare to natural resources to advanced manufacturing, and to engaging learners from across the country who have historically been left out.

The research with Indigenous and remote communities revealed that approaches to skills development must honour Indigenous rights, respect community priorities, and create pathways that allow Indigenous workers and communities to benefit equitably. A green economy that concentrates opportunity in urban centres while leaving remote and Indigenous communities behind is neither sustainable nor just.

State of Skills:
Unleashing AI into the Skills Development Ecosystem

FSC-supported AI tools have bolstered outcomes in skills matching, career development guidance, and recruitment. The overall effectiveness of these tools was underpinned by recognizing and mitigating the inherent bias and discrimination embedded into these technologies.

Read Thematic Report

The gap that no technology can fill on its own is trust. Trust between utilities and Indigenous communities is built slowly, relationally, and over years rather than through a single training session or platform deployment. Canada's ability to meet its clean energy goals depends not only on how many workers are trained, but on whether the training systems, partnerships, and governance models being built reflect the rights, knowledge, and leadership of the communities at the heart of the transition.

What's Next

The most significant work ahead lies in translating these findings into action. Engaging Indigenous and remote communities as genuine partners in the co-development of culturally grounded training programs will require sustained investment in relationship-building, community outreach, and program adaptation. Similarly, expanding VELP's content to address the cultural competency and relational skills that utility sector professionals need when working with Indigenous communities represents a clear and meaningful next step.

The broader opportunity is substantial. As Canada's clean energy transition accelerates and demand for critical infrastructure training grows, VELP's model of virtualizing access to hands-on learning has the potential to serve learners and sectors well beyond its current scope, but only if the platform continues to evolve in response to the communities it aims to serve.

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Have questions about our work? Do you need access to a report in English or French? Please contact communications@fsc-ecf.ca.

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