

# Research & Innovation **Impact Report**

2022-2023



**CONESTOGA**  
Connect Life and Learning

RESEARCH, INNOVATION  
& ENTREPRENEURSHIP

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## Land acknowledgement

At Conestoga College, we would like to acknowledge that in Kitchener, Waterloo, Cambridge and Brantford we are located on the Haldimand Tract, land promised to the Haudenosaunee people of Six Nations, which includes six miles on either side of the Grand River. This is the traditional territory of the Anishinaabe,

Haudenosaunee, and Neutral peoples. To recognize the land is an expression of gratitude and appreciation to those whose territory we reside on, and a way of honouring the Indigenous people who have been living and working on the land for thousands of years.



# Research, Innovation & Entrepreneurship at Conestoga

Through research and innovation, faculty and students actively contribute to the enrichment of our community and economy by applying theoretical knowledge and practical expertise to solve complex challenges. These hands-on experiences prepare students for future careers and equip them with the ability to nurture innovation and embrace entrepreneurial thinking in their respective fields.

At Conestoga, we strive to establish meaningful connections between academia, industry, and the community. By fostering collaboration and leveraging our collective strengths, we facilitate the transfer of knowledge, technology, and ideas, ultimately benefiting our partners and society at large. Through our commitment to innovation and entrepreneurship we provide exceptional support to faculty, students, and staff as they address the ever-evolving needs of industry, community, and society.

# Vision, mission, and research objectives

“ Student and faculty researchers at Conestoga collaborate with industry and community partners to deliver innovative solutions to real-world problems. ”

## Vision

A leader in applied research and innovative entrepreneurship programming that provides students the experiences they need to meet the challenges of tomorrow.

## Mission

To provide high-quality research services and entrepreneurship supports for students, faculty, and community partners as they collaborate to create healthy, equitable, and prosperous communities.



## Research Objectives

1. Foster college-wide culture of quality research, innovation, professional currency, and scholarship
2. Grow Conestoga’s applied research capacity
3. Develop sustainability in priority areas of applied research
4. Contribute to the economic prosperity of Waterloo Region, Ontario and Canada by preparing a high-quality workforce that is both innovative and competitive.

# A message from Dr. Barbara Kelly

Senior vice president of Academic/Student Affairs and Human Resources, vice president of Research



It is my pleasure to present our Annual Research and Innovation Impact Report, which showcases our accomplishments and progress in research and innovation for the year 2022-2023.

During the past year, we have focused on expanding our research efforts by providing access to new funding opportunities, engaging with industry and community to tackle new challenges, and offering experiential learning opportunities to our students. Our commitment to providing career-focused education programs that prepare our students for the ever-changing job market is reflected in our achievements, and we take pride in the innovative, high-quality research conducted by our students and faculty.

I would like to take this opportunity to acknowledge the invaluable contributions of our staff, faculty, and students in positioning Conestoga as one of the top 15 research colleges in Canada. This recognition is a testament to the dedication and hard work of everyone involved in our research and innovation initiatives.

As we move forward, we are confident that we will continue to build on our successes and maintain our position as a leader in polytechnic education. We sincerely appreciate your continued support and contributions to our research and innovation efforts. Thank you.

# A message from Dr. Michelle Chrétien

Associate vice president, Research & Innovation



Conestoga is committed to making innovation accessible to everyone and providing opportunities for students from across the college to engage in entrepreneurship and research activities. By intentionally creating these opportunities, Conestoga fosters a culture of innovation and creativity that benefits not only our students but also our community.

I'm particularly proud that in 2022, Conestoga was ranked sixth among Canadian colleges in terms of paid student researchers. This demonstrates our strong commitment to student engagement in research and a recognition of the value that students bring to the research process.

We are also committed to being collaborative and intentional in meeting the needs of our industry and community partners; that's why we undertook 82 research projects focused on solving the unique challenges of 78 industry and community partners. Engaging with partners continues to be an important focus as we work with

community leaders and industry stakeholders to support economic prosperity, social justice, and environmental sustainability.

As we move towards a more equitable, diverse, and inclusive future, Conestoga is focused on providing equitable access to funding opportunities and breaking down barriers that may prevent certain individuals or groups from participating in applied research. We are working to build a research community that is more diverse and representative of different perspectives, experiences, and expertise. As part of this effort, we launched the Conestoga New and Emerging Research Grant (CNERG) to encourage a diverse range of faculty to engage in applied research. We are excited to profile the inaugural cohort in this report.

As you read through this report, I hope you will be inspired by the curiosity and ingenuity of the Conestoga community and join me in celebrating the contributions of our faculty, researchers, and students.

# Research Ethics Board

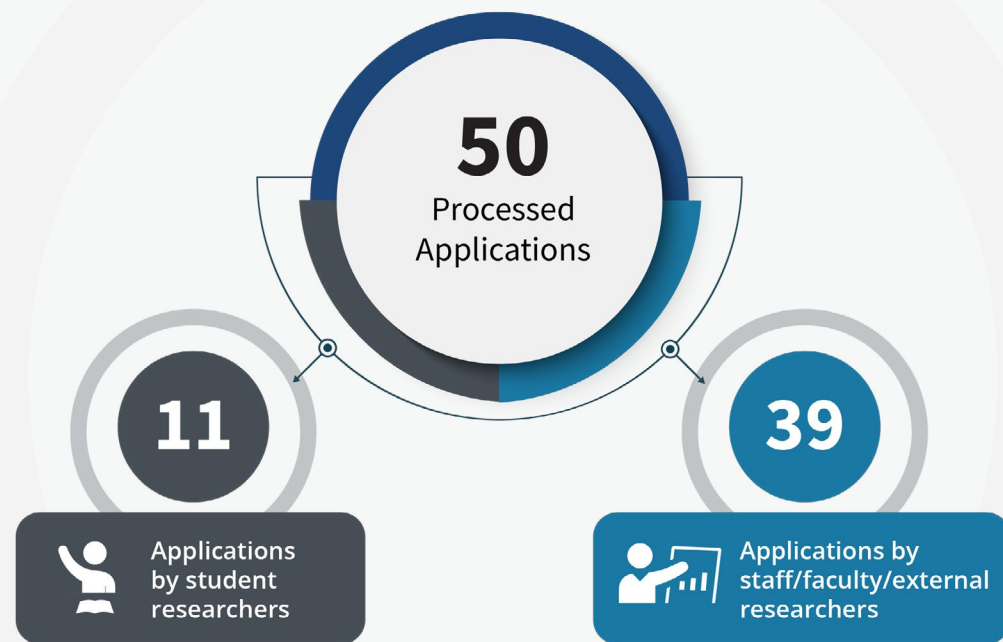
## About the board

The Research Ethics Board (REB) is a volunteer committee of experienced researchers and subject matter experts who review all research protocols involving human participants and apply the principles of the [Tri-Council Policy Statement \(TCPS 2\): Ethical Conduct for Research Involving Humans](#).

These principles-- respect for persons, concern for welfare, and justice-- are essential pillars to research conducted under the auspices of Conestoga. The REB has the goal of facilitating applied research activities, and research activities within the classroom, in accordance with these principles.

### Current members of REB include:

- Linda Scott Campbell (chair), School of Business
- Ryan Huckle (vice-chair), School of Engineering & Technology
- Dianne Allen, School of Health & Life Sciences
- Leanne Gosse, School of Community Services
- Steve Hendrikse, School of Applied Computer Science & Information Technology
- Kelsy King-Gill, legal/external member, Giffen Lawyers
- Erin Patterson, School of Health & Life Sciences
- Shannon Rea, School of Hospitality & Culinary Arts
- Holly Shoemaker, Student Engagement

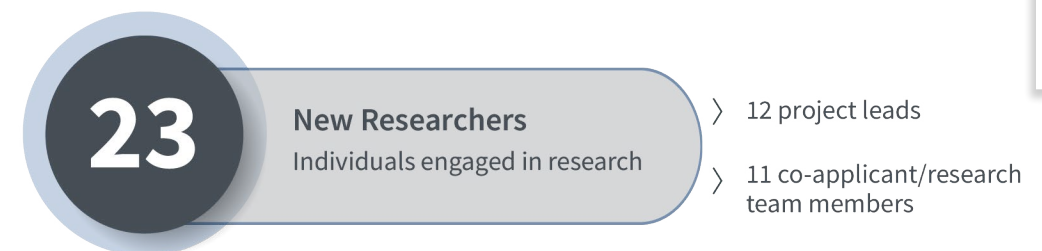
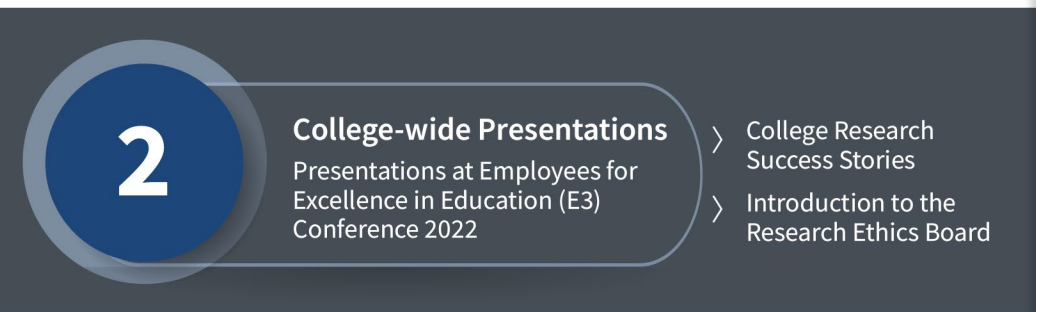
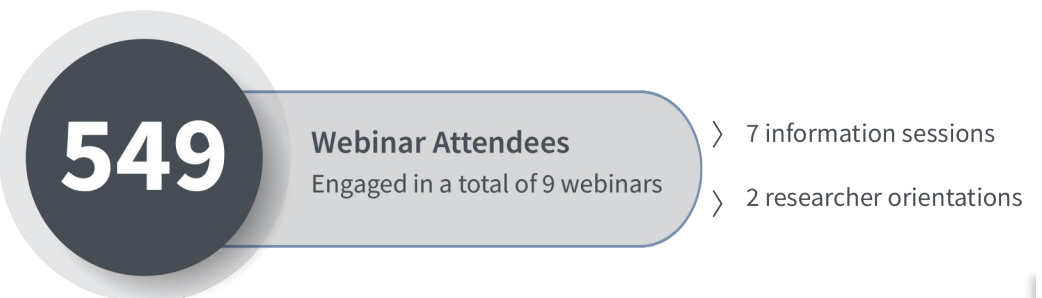


# Research outreach

## Social Outreach (LinkedIn)



## Education Initiatives

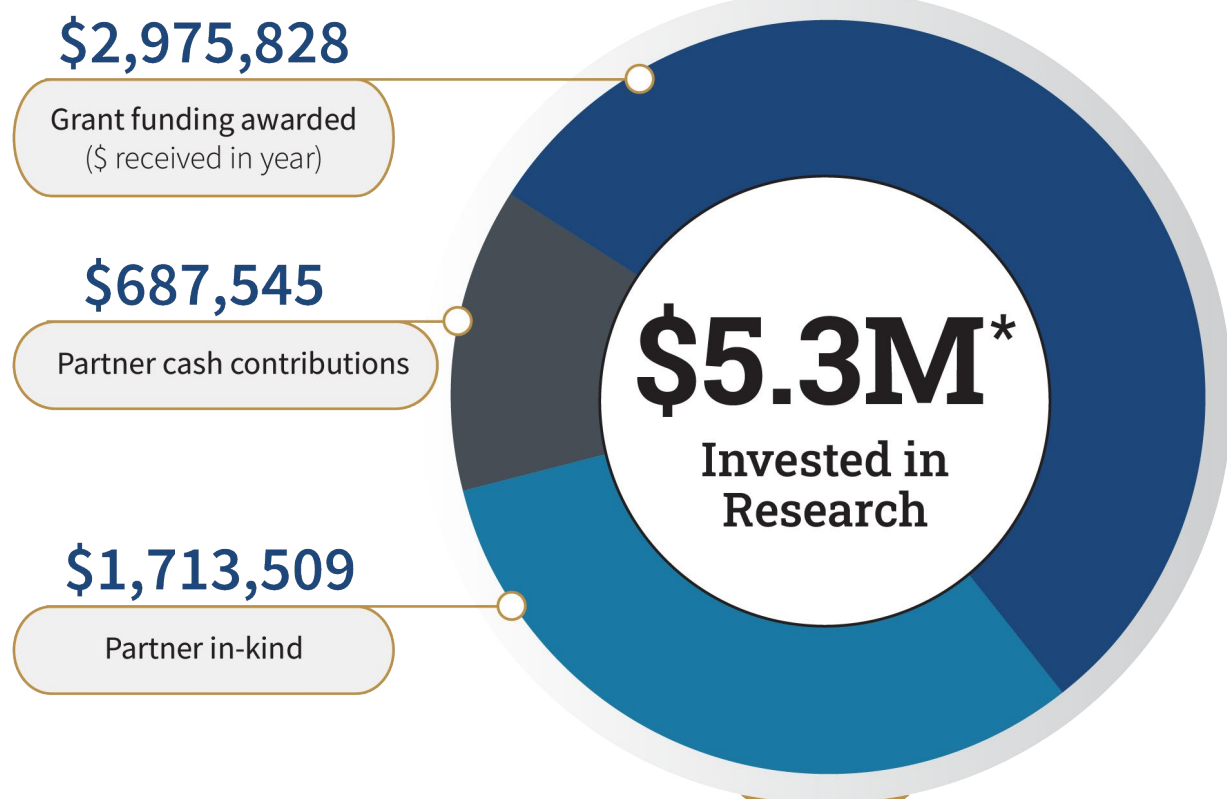


# By the numbers

Research Portfolio\* as of March 31, 2023:  
\$5,376,882



2022 [Research Infosource Inc.](#)  
Ranking: **15th**



## The people behind the projects:



\* Approximate numbers

# Notable awards

## XR Mobile Learning Lab Partnership with Rural and Northern Communities



**NSERC CCSIF - \$360,000 over three years**

Deploying augmented and virtual reality technologies to deliver post-secondary vocational training to remote northern and rural communities in Ontario.



## Open Electronic Medical Record Platform Improvements for Hybrid Healthcare

**NSERC Applied Research and Development - \$40,000**

Enhancements to open-source Electronic Medical Record platform to improve patient care in a post-pandemic hybrid care model that incorporates both in-person and virtual care.

# Conestoga New and Emerging Research Grant (CNERG)

The Conestoga New and Emerging Research Grant (CNERG), the college's first internally funded grant, launched in fall 2022 as a pilot program and returned for 2023. During the pilot year, 13 CNERG projects were awarded funding, with 96 per cent of recipients being first-time researchers.

“CNERG provides up to \$10,000 in funding for small-scale projects to support the growth of new and emerging areas of research and new researchers across a variety of disciplines.”

## Grant Recipients by School of Study

### School of Applied Computer Science & IT



**Elliott Coleshill**

Fine Dextrous Haptics for VR Flight Simulation

### School of Business



**Shankha Bhattacharyya**

Investigating Barriers to Entry to the Workforce for Single Parents and Caregivers in Waterloo Region

### School of Business

**Aaron Blair**

Applying Agile Methods to Health Information Management Workflows to Improve Productivity

**Michael Kukhta**

Database for Sustainability Projects that Reduce Greenhouse Gas Emissions

**Tanya Staples**

Disparity at the Top: Gender Issues and Advancement in the Financial Planning Profession

### School of Engineering & Technology



**Hamidreza Gol Afshani**

Solar Water Heater Feasibility Study

**Konstantinos Karanasios**

Sustainable Facility Management: Reviewing Recent Research Findings and Creating a Research Agenda

**Fatih Yegul**

Impact of Supply Chain Integration on Corporate Responsible Management Performance

### School of Interdisciplinary Studies



**Rita Palacios**

From Huehuetla to Turtle Island: A Collaborative Model for Indigenous Language Preservation and Revitalization

**Cinthia Watson**

General Arts & Science Modular Program Research

**Suzanne Rintoul**

Community-Engaged Writing Initiative

### School of Health & Life Sciences



**Wendy Pons**

The Use of Environmental DNA Sampling in Mosquito Control Activities

### School of Culinary Arts



**Carrie Herzog**

Challenges and Opportunities in the Hospitality Industry on Islands in the Great Lakes: An Analysis of Hospitality Businesses During Crisis

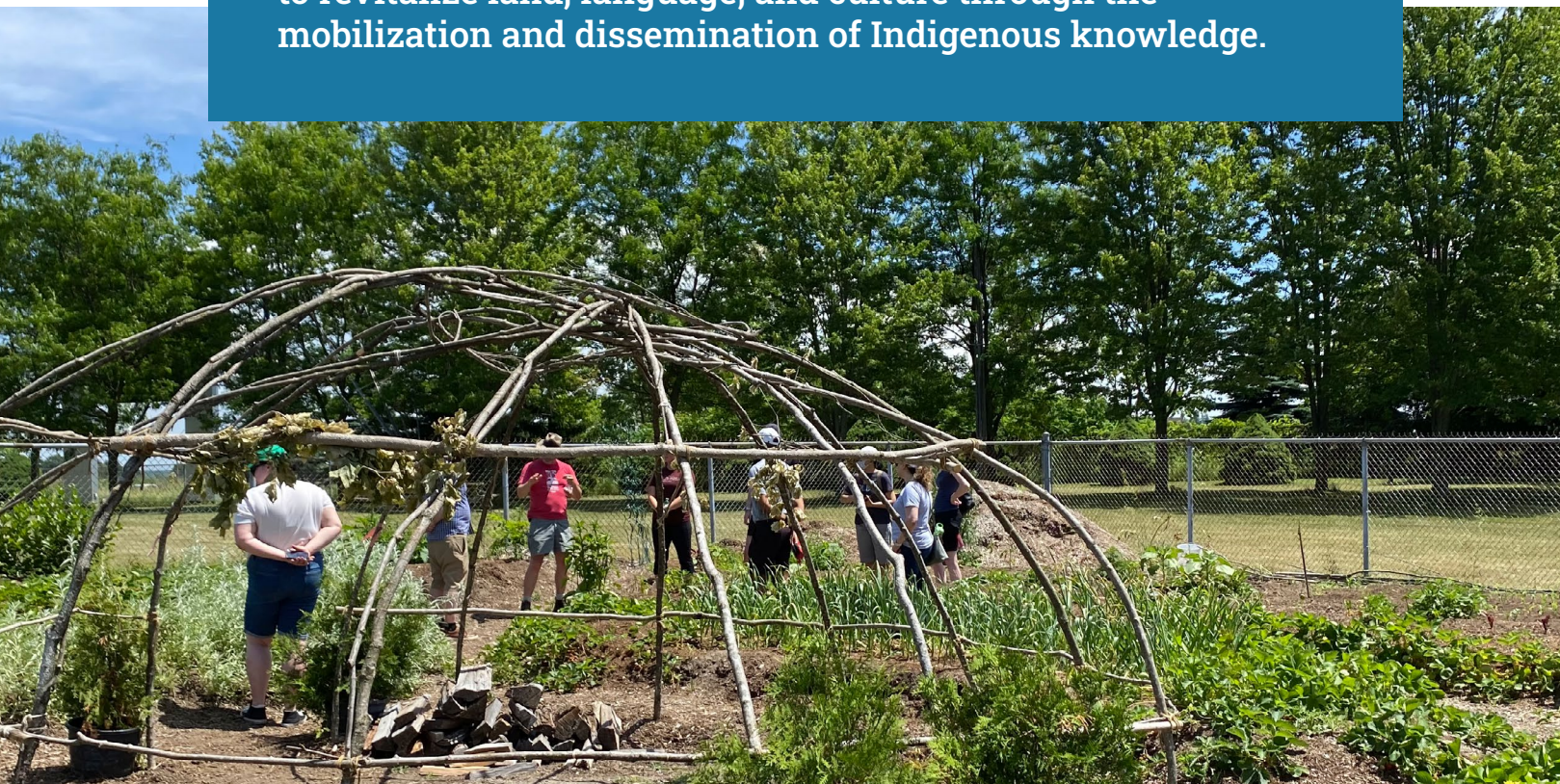


# Indigenous Research Activities

## Restoring Language, Culture and Land: Mobilizing a Community Around Indigenous Knowledge

Faculty from Conestoga's Indigenous Studies program and Be-Dah-Bin Gamik have partnered on an applied research project to create the Indigenous Teaching Garden at the Kitchener-Doon campus. The garden is a living classroom designed to foster cross-cultural relationships and deepen understanding of Indigenous land-based practices and knowledge.

**This initiative is part of a larger effort at Conestoga to revitalize land, language, and culture through the mobilization and dissemination of Indigenous knowledge.**



Conestoga is working with a network of local organizations on various projects aimed at building knowledge and understanding of Indigenous cultures and practices while creating opportunities for community engagement.

The garden, which spans nearly 4,000 sq. ft., is shaped like a medicine wheel with a maple and willow sapling lodge at its center. The planting of sacred medicines and local Indigenous foods, including tobacco, sweetgrass, corn, bush beans, and squash, began in May 2021. The garden also includes non-local Indigenous foods like Peruvian purple potatoes, which help to highlight connections between food systems and trade networks.

Plans for the project include building relationships and exchanging knowledge with Elders, conducting workshops, and creating online resources. The garden will serve as an essential component, with practical and tangible impacts on the community, such as hosting seed-saving workshops, demonstrating traditional food preparation methods, and donating produce to the Cambridge Self-Help Food Bank.

The Indigenous Teaching Garden project is supported in part by the Social Sciences and Humanities Research Council (SSHRC) through the College and Community Social Innovation Fund (CCSIF).



# CICan Living Lab

## Bloom Net-Zero Living Lab

**Principal investigators:** Nicole Detlor and Stephen Thomson

**Funder:** Colleges & Institutes Canada

**Student researchers:** 2

Led by a team of researchers, faculty, and students, Conestoga’s student-run Bloom restaurant was transformed into a climate action living lab to reduce greenhouse gas emissions related to food and packaging choices. To achieve this goal, the Living Lab team developed a model that calculates the greenhouse gas impact of the ingredients used in menu items, enabling the chef to understand the impact of substituting ingredients.\* Simple icons were placed beside each menu item to share the greenhouse gas information with customers indicating low, medium, or high impact. Further findings discovered that including the greenhouse gas contribution of menu items on the menu influenced restaurant patrons’ choices when choosing a dish.

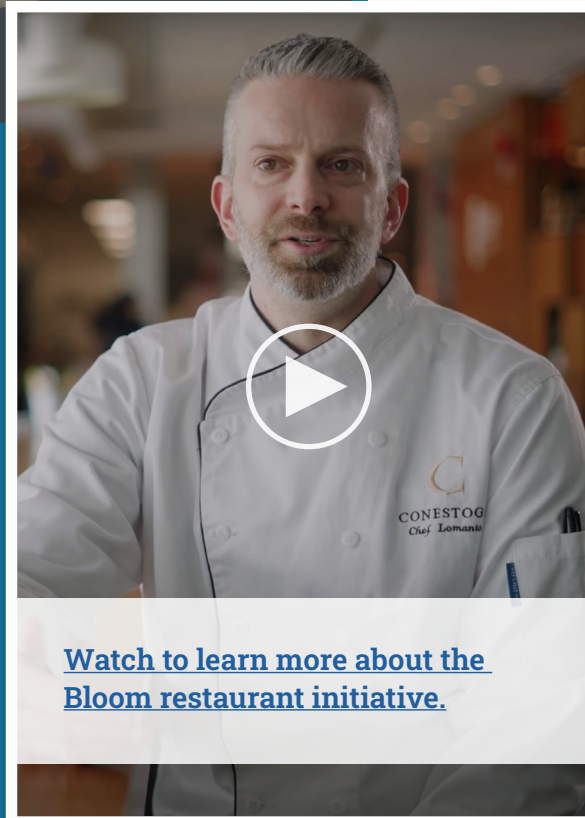
The project also conducted a food waste audit, finding that 76 per cent of waste from Bloom

was organic waste, totaling 65.2 kilograms or 152 lost meals. Additionally, a study of plate waste found that beverages accounted for 48 per cent of waste during the one-day study period. To reduce food waste further, the Bloom team will continue to utilize the waste hierarchy diagram, which ranks the preferred approaches to waste management. To eliminate single-use packaging, Bloom has partnered with Friendlier, a local provider of returnable containers, to promote sustainability, reduce waste, and conserve valuable resources. As of March 1, 2023, 1647 containers were returned, the equivalent of 1920 2 litre plastic bottles saved.

*\*The model used to calculate the greenhouse gas impact of menu items currently does not include scope one and scope two emissions created from the activities of the restaurant and greenhouse gases associated with energy production.*

## Featured Project

Led by a team of researchers, faculty, and students, Conestoga’s student-run **Bloom restaurant was transformed into a climate action living lab** to reduce greenhouse gas emissions related to food and packaging choices.



[Watch to learn more about the Bloom restaurant initiative.](#)



# Canadian Institute for Safety, Wellness & Performance

The Canadian Institute for Safety, Wellness & Performance (CISWP) is committed to building productive and sustainable workplaces through a collaborative and transdisciplinary approach. CISWP's goal is to position Canada as a global leader in empowering business to adapt and thrive in a competitive economy and aims to improve the safety, wellness, and performance of the Canadian workforce through knowledge generation, research transfer, and workforce development. Working closely with stakeholders, the institute strives to conduct cutting-edge research and develop evidence-informed products, tools, and services to advance their capacity and address knowledge gaps.



## Project spotlight: Canadian First Responder Fatigue Risk Management System Standard

**Principal investigators:** Dr. Amin Yazdani and Dr. Marcus Yung

**Funder:** Defence Research and Development Canada

First responders are at high risk of burnout, cognitive fatigue, and physical fatigue. The adverse outcome of fatigue is not limited to personal health and safety of first responders but also the health and safety of their fellow responders and the public they serve. The Canadian Institute for Safety, Wellness &

Performance (CISWP) led a multi-year research and development project funded by Defence Research and Development Canada to develop the first of its kind new National Standard on First Responders Fatigue Risk Management System.

In partnership with several partners across Canada, CISWP researchers



developed a body of evidence to help inform the requirements and provided guidance to support first responder organizations in mitigating the risk of fatigue. The [CSA Z1615:22, First responder fatigue risk management system](#) and its requirements were developed to address any type of risk related to fatigue and can be applied to both sleep-related and task-related fatigue. Alongside the new standards

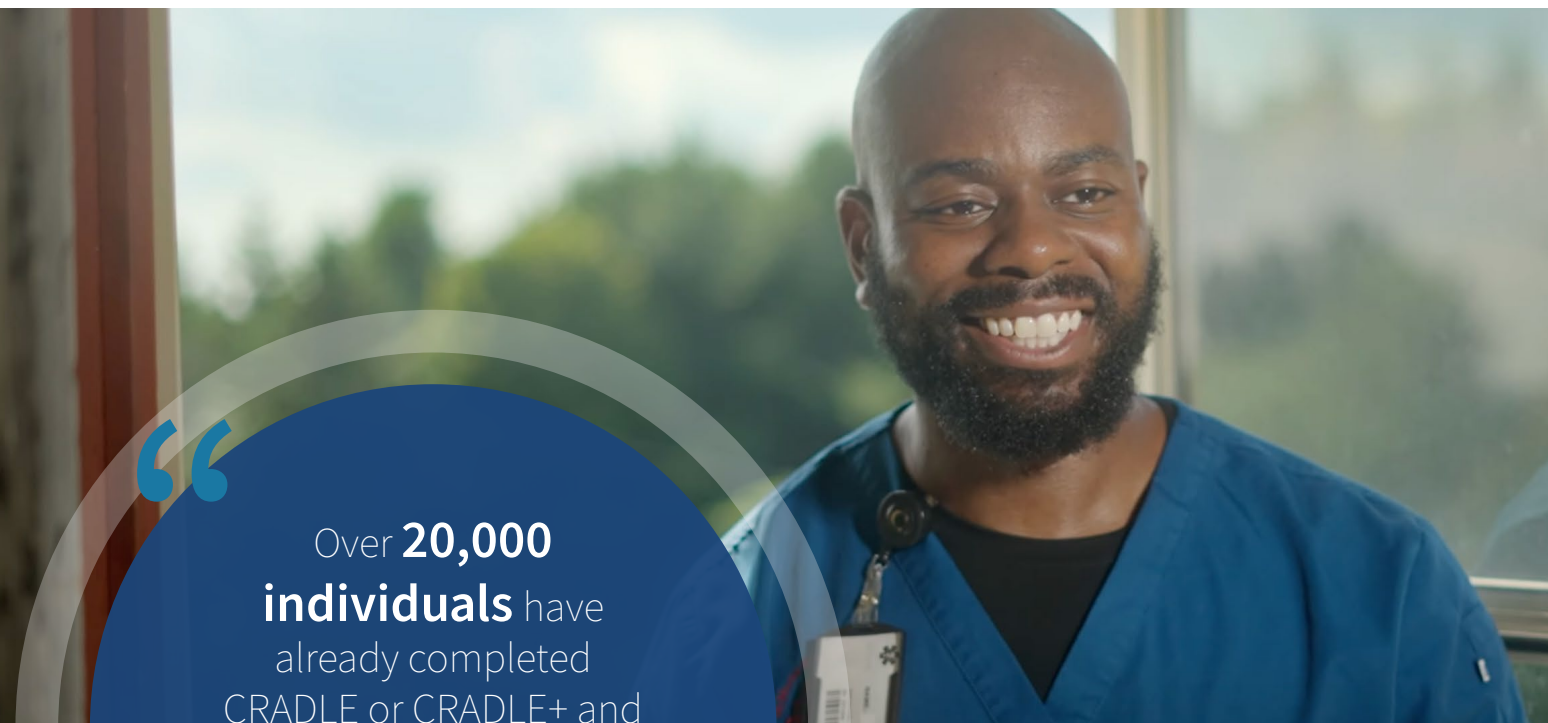
CISWP researchers authored several peer-reviewed scientific publications and conference proceedings and hosted several webinars with stakeholders across the country. Immediate outcomes of this applied research were several resources to support first responder organizations in implementing an effective fatigue risk management system.

**CISWP is currently building upon their partnership with the paramedic community and pursuing new and innovative applied research projects to address fatigue and the risk of injuries or performance decrements.**

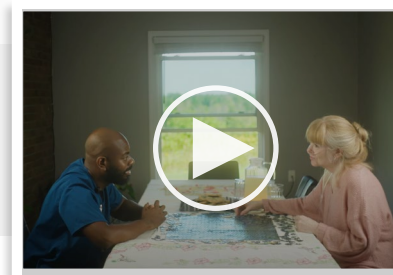
# Canadian Institute for Seniors Care



The Canadian Institute for Seniors Care (CISC) works together with various groups to create equitable and person-centered care models and practices, employment-focused education and training, and technological advancements for seniors and their care partners. CISC's goal is to improve the health and well-being of seniors while supporting the growth of the seniors' care industry.



“Over **20,000 individuals** have already completed CRADLE or CRADLE+ and have provided positive feedback regarding their experience with the program.”



[Watch to learn more about the CRADLE initiative.](#)

## Project spotlight: Canadian Remote Access for Dementia Learning Experiences

**Funder:** Future Skills Centre



According to the Alzheimer's Society (2023), the prevalence of dementia in Canada is expected to double by 2030. As a result, the Canadian government has granted an additional \$1.85 million to Conestoga's Canadian Institute for Seniors Care to expand and scale the Canadian Remote Access for Dementia Learning Experiences (CRADLE) program. The goal is to provide training for unregulated care providers with specialized skills in dementia care. In October 2023, [an enhanced version of the online course was launched](#), featuring five new modules that highlight the stories of individuals living with dementia and their caregivers. These modules promote practical approaches to care while maintaining high standards of quality.



Over 20,000 individuals have already completed CRADLE or CRADLE+ and have provided positive feedback regarding their experience with the program. In February 2023, a French version of CRADLE+ was released, and Mandarin, Tagalog, and Indigenous (Cree and Ojibwe) versions of the course will be available in the future. To better understand the unregulated care provider workforce and the challenges and opportunities associated with the occupation, the project team will distribute voluntary surveys to participants before, immediately after, and three and six months after course completion. The project aims to provide immediate support to those who care for individuals with dementia.

# Centre for Supply Chain Innovation

The Centre for Supply Chain Innovation (CSCI) uses integrated supply chain systems thinking to support building sustainable, adaptable, agile, and resilient supply chains through applied research and development of highly qualified supply chain graduates. Their mission is to create an ecosystem that leverages interdisciplinary research to create and disseminate practical solutions for the complex issues facing today's supply chains.



## Project spotlight: Sienci Labs capacity optimization project

**Principal investigators:** Dr. Fatih Yegul and Stephen Thomson

**Funder:** NSERC ARTP Option 1 | **Student researchers:** 1

Sienci Labs partnered with the Centre for Supply Chain Innovation to meet the rapidly growing demand for their CNC machines, which are mostly purchased by hobbyists for personal use. Operating out of their 8,500 sq. ft. facility in Waterloo, Ontario, Sienci Labs needed to optimize their supply and inventory management systems, standardize their business and production processes, and mitigate

the impact of supply chain disruptions. Using the Define, Measure, Analyze, Improve, Control method, CSCI piloted improvements to Sienci Labs' production and inventory management practices. These improvements helped address excess inventory, leading to an increase in production, sales, and growth, all without requiring new capital investments.



# Conestoga Entrepreneurship Collective

The Conestoga Entrepreneurship Collective empowers members of the Conestoga community to pursue their entrepreneurship potential and participate in the innovation economy. Programming supports new venture founders, freelancers and high-growth sales professionals.

## Venture Lab

The Venture Lab is a universal business incubator that helps early-stage startups validate and develop their business idea. Businesses can be from any industry, use any business model and be at any scale.

**Featured Grad: Amadeu Ferreira**  
Venture Lab | Graduated April 2016

Founded Vambora, a new venture focused on streamlining the process of relocating internationally including housing, banking, and insurance. Secured pre-seed funding in October 2022.



## Gig Lab

The Gig Lab is Canada's first business incubator for freelancers, designed to address the nuances and specific needs of self-directed professional service providers while developing the skills, mindsets and tools to thrive in the professional Gig Economy. Graduates of the Gig Lab launch their freelance businesses on the Conestoga Gig Marketplace at [www.conestogagigs.ca](http://www.conestogagigs.ca)

**Featured Grad: Kate Bradfiel**  
Gig Lab winter 2021 cohort | Graduated April 2019

Launched a freelance branding and design company called Field & Co. in Spring 2021.



## Sales Lab

The Sales Lab is Canada's only incubator for high-tech sales careers. Designed in consultation with tech companies, this program focuses on the most critical skills, attitudes and behaviours for success. Graduates of the program are supported in securing sought-after positions to launch their careers in high-tech.

**Featured Grad: Prachi Gupta**  
Sales Lab winter 2022 cohort | Graduated April 2022

Secured a job as a business development representative at Auvik Networks in May 2022.



# Conestoga Food Research & Innovation Lab

As an applied food research lab, the Conestoga Food Research & Innovation Lab (CFRIL) meets the needs of industry through education, training, research, and technical expertise. CFRIL's advanced facilities are essential in providing solutions for small, medium, and large businesses in the food and culinary sector. CFRIL's focus is to work with partners to provide innovative solutions and support throughout the product development cycle, including formula development, shelf-life studies, packaging testing, and scale-up using pilot plant equipment.



## Project spotlight: Real-time and accelerated shelf-life study

**Principal Investigator:** Nicole Detlor

**Funder:** National Research Council, Industrial Research Assistance Program, Contribution to Organization



National Research Council Canada

Conseil national de recherches Canada

**Student researchers:** 2

Good Food for Good is an Ontario-based Certified B Corp selling certified organic sauces at major retailers in the North American market. They wanted to investigate extending the shelf-life of their sauces to create production efficiencies and reduce food waste. Due to consumer requests, Good Food for Good also wanted to explore alternative packaging options for their current glass ketchup bottles. With sustainability in mind, Good Food for Good partnered with CFRIL to provide data to inform decision-making regarding product shelf-life

and investigate alternative sustainable packaging for their ketchup.

A real-time and accelerated shelf-life study provided quantitative data regarding potential modes of product failure by measuring oxidation, colour, pH, consistency, and sensory properties. This data demonstrated that the shelf-life of the sauce could be extended significantly. Alternative packaging solutions were also provided with a focus on overall sustainability while considering the impact to barrier properties.

# Smart Manufacturing & Advanced Recycling Technologies Centre



The Smart Manufacturing & Advanced Recycling Technologies (SMART) Centre was established in 2020 to support applied research, technical services, and training in the areas of advanced manufacturing, advanced recycling technologies, and cybersecurity. With over 13,000 sq. ft. of space containing state-of-the-art equipment, the SMART Centre engages faculty and students to connect industry with the expertise necessary to address manufacturing, recycling, and cybersecurity-related issues.

The SMART Centre is one of Canada's 60 NSERC-funded [Technology Access Centres \(TACs\)](#), a network of state-of-the-art applied research and innovation centres spanning the country.

## Project spotlight: Developing legacy modules

**Principal investigators:** Mark Buchner and Bassim Elhassan

**Funder:** NSERC

**Student researchers:** 14



A person's last will can be prone to fraud, theft, and forgery, making the security and integrity of it an important consideration when they are stored and secured. In addition to the importance of protecting a will from compromise, wills can also be time consuming for lawyers to draft and manage. InheritChain, a legal tech company focused on

legal process automation based in Mississauga, partnered with the SMART Centre to develop a blockchain-backed will management solution. Utilizing blockchain and the expertise of the SMART Centre, InheritChain was able to develop and launch a beta version of its digitized and secure vault for managing and storing wills securely.

# Thank you to our funders

We would like to express our sincere gratitude for the support and contributions from our funding partners. Your generous funding has made it possible for us to continue our research, innovation and entrepreneurship initiatives and pursue our mission to provide high-quality research and innovative entrepreneurship programming that provides students the experiences they need to meet the challenges of tomorrow.

Your support has allowed us to attract and retain top talent, provide state-of-the-art facilities and equipment, and offer a dynamic and collaborative environment that fosters creativity and innovation. Your partnership has been instrumental in our success and has helped us achieve numerous milestones that would not have been possible without your assistance.

**Thank you for your contributions and we look forward to continuing our work together.**

## Contact

To learn more about Research, Innovation and Entrepreneurship at Conestoga:

**visit [research.conestogac.on.ca](https://research.conestogac.on.ca)**

to explore our research initiatives, projects, research centres, and learn how to get started as a partner with Research, Innovation & Entrepreneurship.



RESEARCH, INNOVATION  
& ENTREPRENEURSHIP



CONESTOGA

Connect Life and Learning