



# BUILDING AN INNOVATION COMMUNITY

A 10-YEAR LONGITUDINAL STUDY ON THE  
INNOVATION JOURNEY OF STUDENT IGEN  
PARTICIPANTS



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# TRANSFORMATIVE LEARNING

## BUILDING CANADA'S YOUTH INNOVATION TALENT SUPPLY

With a constantly changing world of work, youth need pathways to prepare for new upcoming careers that will be innovation led. With data showing Canada is falling behind in the world's innovation index as evidenced by successive OECD reports, there is a strong need for greater investments into K-12, tertiary, and research and development initiatives. Making investments into youth innovation programs is a critical part of the long-term objective to build a stronger innovation community within the province and across the country.

This study aims to understand and correlate the impact of innovation programming on youth to the outcomes they experience in Alberta's innovation ecosystem. While it is intuitive that making investments into youth towards science-based innovation projects can support STEM-based industrial growth, there has been no formal analysis on the investments made since 2009 in the outcomes of innovators across the Alberta ecosystem, which forms the basis for this study supported by **MindFuel**, **GenomeAlberta**, and made possible with funding from **ATB Financial**.

Organizations such as MindFuel have made significant investments through programs such as **geekStarter**, **Tech Futures Challenge**, **Young Entrepreneurs Boot Camp**, **Build It! Dream It! Expand It!**, and more to supply high school and collegiate students with ideation, design thinking, entrepreneurialism, and financial tools, coupled with advisory services and support mechanisms to build competencies and compete on the international stage in deep technology competitions.

One such key competition that has been funded is the **International Genetically Engineered Machines Competition (iGEM)**, formerly based out of MIT in Boston. Critically, the competition provides student teams the opportunity to develop a synthetic biology (biotech, clean-tech, agri-tech, health tech, etc) approach to a real-world problem, giving student teams from around the world the opportunity to participate in a science Olympics environment to impact communities across the globe

The projects developed by Canadian teams have won significant awards and participants in these programs have gone on to lead VC backed start-up companies in biotechnology and various other industries. **This study evaluates the innovation outputs of these student participants from 2008 – 2022, analyzing their impact to Canada's innovation ecosystem.**

# INVESTING IN ALBERTA YOUTH RESULTS IN INNOVATION OUTCOMES

Overall, 757 students were identified as being part of 76 Alberta-based iGEM projects from 2007-2022 of which 440 individuals were surveyed and 162 responses, or 21%, were collected. Critically important is that each of the 76 biotechnology projects were represented by team members who participated in the full survey. Participants ranged from a wide background and all Alberta iGEM teams were represented. The survey probed into attributes of the iGEM experience, and the respondent's journey from student to professional, and critically, determining the impact that iGEM and geekStarter (Tech Futures Challenge) had on the participants post-secondary, career and/or innovation journey. Respondents were asked questions about their experiences in Alberta's innovation ecosystem and through this we learned:



**40% OF RESPONDENTS CONTINUE TO USE THEIR BIOLOGY SKILLS IN THEIR JOBS TODAY**



**1-IN-5 RESPONDENTS (20%) HAVE STARTED A COMPANY**

**AND**

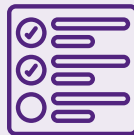
**1-IN 3 (36% OF) RESPONDENTS HAVE COMMERCIALIZED A TECHNOLOGY**



**45% FEMALE, 14% LGBTQIA+, AND 40% IDENTIFIED AS A RACIAL MINORITY**



**96% OF RESPONDENTS AGREED OR STRONGLY AGREED THAT IGEM MADE A POSITIVE IMPACT ON THEIR CAREER**



**AFTER RESPONDENTS' IGEM EXPERIENCE, 91% REMAINED IN THE CANADIAN ECONOMY, WITH 79% STAYING IN ALBERTA**

## THE RESULTS

### WHO

**Respondents are a diverse group.** 40% of respondents identified with a racial identity outside of "Caucasian". LGBTQIA+ representation included 14% of respondents and the male/female ratio was 51:45%, respectively. All respondents were part of iGEM teams and received programming, funding, mentorship and skill support from geekStarter (Tech Futures Challenge) MindFuel programs. **This diversity is significantly higher compared to the national average in particular for female innovators.**



**APPROXIMATELY 1-IN-3 OF THOSE WHO COMMERCIALIZE TECHNOLOGY ARE FEMALE, MUCH HIGHER THAN FEMALE INNOVATORS IDENTIFIED BY THE CANADIAN INTELLECTUAL PROPERTY OFFICE AND SIMILAR TO DATA FROM WIPO.**

We found that **22% of all female respondents (representing a third of all responses)** have been involved in commercializing a technology compared to 48% of those who are male. As a guiding benchmark, nationally, 17% of women have started a company, although this is only a guideline and not direct comparison. While female rates of commercialization are higher in Alberta than the national average, there still exists a significant gender gap.

## WHERE

**Respondents are still innovating today.** 40% of those who were polled continue to use their molecular biology skills they learned in iGEM today in their jobs and >20% of those respondents have gone on to engage in Canada's technology sector including finance, healthcare, agri-tech, clean-tech and biotech. Their roles range from CEO's to managers, technologists to researchers. Critically, 91% are still in Canada and 79% are still in Alberta, which is a positive indicator in the national and provincial resolve to reduce brain-drain. This study indicates that program participants, who become innovators, remain in Canada!



**79% REMAINED IN ALBERTA**

**91% REMAINED IN CANADA**

## WHAT

**iGEM alumni consider themselves to be entrepreneurs.** When asked what respondents consider themselves to be and if they chose to identify with any of the following labels: 21% of the respondents consider themselves to be entrepreneurial and 30% are both entrepreneurial and intrapreneurial.

**The iGEM competition itself and the support mechanisms provided set respondents up for their innovation journey.** Many of the respondents had the opportunity to engage in innovation through the iGEM experience and much of this innovation also occurred after the competition itself. The ages of respondents who participated in the competition ranged from 16.8-24.7.

	DURING IGEM	AFTER IGEM	TOTAL
Commercialized a product or service	10%	25%	35%
Filed a trademark or patent	16%	21%	37%
Started a company	8%	14%	22%

**iGEM made a dramatic impact on respondents future careers > with 96% of respondents who agreed or strongly agreed** that iGEM made a positive impact on their future career. Respondents identified that MindFuel and the geekStarter (Tech Futures Challenge) program positively impacted their iGEM experience through programming supports including mentor connections, funding, and other workshops.

# LETS PUT IT IN CONTEXT

The inaugural State of Youth Report (2021) undertaken by Canada reveals significant areas of opportunity, both self-identified by youth and through expert recommendation, including highlighting Innovation, Skills and Learning as a priority area for youth investment and policy. Notable, are the recommendations for investment in entrepreneurship and innovation fellowships, work integrated learning opportunities, and in the development of a skills building strategy.

Moreover, the pandemic has accelerated a shift to digital technologies, platforms, and learning environments that are unlikely to be reversed. Equipping young people with the tools of innovation and skills in this new and emerging environment will give them the foundation they need to succeed, whether as entrepreneurs, innovators, or professionals. Investment in these critical areas lays the foundation for youth across Canada to build an innovation mindset, acquire new skills, and even translate this into economic growth from a young age. The partners in this study believe, based on over 10 years of youth innovation programming, that these investments are critical to building a diversified pipeline of innovation talent. This, as we've demonstrated through impact assessments, results in two critical outcomes:

1. increased interest in STEM innovation post-secondary pathways, and
2. entrepreneurship in STEM

This study focuses primarily on youth talent development in Alberta over the last 10+ years, however, based on successful programming expansion to Yukon, British Columbia and Ontario, it is clear that this validated youth innovation model adapts to other geographies within Canada. Through continued academic, public agency and private investments, Canada will become a place for innovators to generate growth opportunities. However, we must continue to invest in early-stage development of innovators through programming with various attributes such as youth programs that focus on engaging diversified talent, critical skills training, building mentorship networks, and having access to project funding.

MindFuel, formerly Science Alberta Foundation, a national organization dedicated to youth innovation, has set a critical goal of enabling innovators across Canada to achieve such outputs and recognizes the imperative nature of preparing our youth innovation talent pipeline for the future. Public agencies and not-for-profits, such as MindFuel and Genome Alberta have been running programming which has made significant investments towards this end. And, for over a decade, the program has invested into high school and post-graduate youth interested in building novel biotechnology products and ideas, taking them to large international audiences through the International Genetically Engineered Machines (iGEM) competition and providing one-of-a-kind training support to setup these youth for success. To date, prior to this study, no longitudinal analysis has focused on gathering comprehensive insights connecting youth skills training, mentor network support, project funding support, under the lens of economic outputs and social progress.

This study will aim to create a thesis for why continued and increased investment in programming such as the Tech Futures Challenge and strategic youth innovation supports will be critical to ensuring Alberta, and Canada, continue to increase its innovation capital, bringing economic advantage into the future.

# WE LEARNED....

- iGEMers are innovators not just in the competition but in their pursuits as they have joined the Canadian economy;
- 75% of iGEMers supported by geekStarter (Tech Futures Challenge) indicated that this programming helped to create a pathway to enter into the innovation environment and gain supports needed to accelerate their impacts;
- iGEM and geekStarter (Tech Futures Challenge) helped these respondents grow their skills and abilities in iGEM, and iGEM was a powerful program that influenced their careers;
- Investment into project driven work led to 1-in-3 building and commercializing a technology and 1-in-5 building a company largely in the Canadian economy;
- Overall, investments into youth innovation programming result in accelerated outcomes in technology start-ups, patent filings, and other commercialization activities, which, in the longer term result in investment capital attraction, employment creation, and reduction in brain-drain. Also, there is fair and equitable representation and program participation among female/male/non-binary; LGBTQ+; and racialized minorities. These economic and social progress results positively impact Alberta and Canada's innovation goals with tangible outcomes.

**WHEN WE MAKE INVESTMENTS INTO  
CANADIAN YOUTH INNOVATION PROGRAMS  
WE SEE KEY INNOVATORS LEAD THE CHARGE  
IN BUILDING OUR INNOVATION ECOSYSTEM.**

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