

---

## **Written Submission for the Pre-Budget Consultations in Advance of the 2021 Federal Budget**

Submitted by: MindFuel

August 7, 2020

### **Recommendation:**

That the Government of Canada provide funding in the amount of \$5 million over five years to support and scale MindFuel's programs focused on developing an innovation mindset in youth, a prerequisite to emerging technological innovations, economic diversification and growth, and skilled employment creation.



## Executive Summary

Innovation doesn't just happen. Rather, it results from a context where a problem is identified, and the desire for change, coupled with the right mindset, leads to an innovative production. Innovation will be a critical factor in achieving a durable, inclusive and diversified economic recovery for Canada.

Our challenge is that we are falling behind in the world's innovation index, despite the fact that a recent OECD report shows Canada as one of the most highly educated populations. If left unaddressed, this Canadian innovation challenge has the potential to be exacerbated by the global pandemic. Therefore, developing an innovation mindset among Canadian youth is a critical priority for Canada's economic recovery and to our broader, long-term goal of an inclusive, diversified and globally competitive economy.

Preparing youth for the demands of the 21<sup>st</sup> century requires learning environments (both curricular and extracurricular) that are inclusive and supportive of diversity. They must allow for peer-based collaboration and cultivate the development of critical thinking and higher order communication skills. Foundational knowledge in emerging technologies such as AI, robotics, synthetic biology, data science, is very important, but it is only one part of a society's future innovation roadmap. MindFuel's area of expertise is supporting the development of an innovation mindset among youth.

MindFuel's strategic business plan focuses on expanding its *Canada Tech Futures – youth innovation gateway* program in service to Canada's innovation sector over the next five years. This \$22M project will focus on working with youth to help develop an innovation mindset, which is critical to increasing human capital and research inputs, leading to higher technology and innovation outputs. MindFuel's multi-year pilot, entitled **geekStarter**, ran from 2014 to 2019. It demonstrated critically relevant outcomes to increasing Canada's production of human capital in order to meet the demands of our future knowledge based workforce.

The five year plan (2020-2025) for *Canada Tech Futures – youth innovation gateway* focuses on expansion to northern, western and central regions in Canada that will engage 318,950 students in online and experiential extracurricular learning in innovation mindset development. Based on past experience and by collaborating with 578 partners in northern, western, and central Canada, we estimate that 42,787 students will achieve an innovation mindset, 205 employment positions will be created in local regions and 120 innovations will be produced that have demonstrated commercialization potential in emerging sectors such as nanotechnology, synthetic biology, agri-science, robotics and artificial intelligence.

Of critical importance is the potential for commercialization of the 120 innovations that could, potentially, result in the ultimate outputs of the creation of 6,510 High Quality Positions (HQP) in northern, western, and central Canada. Over a five-year period, this could produce 1,079 patents and trademarks, which would generate \$152,900,000 in contributions to Canada's GDP, with a projected 25% being Indigenous led and 50% female led.

MindFuel is seeking \$5 million in funding support from the federal government over the course of the next five years, as a federal contribution to this \$22M project.

## Canada's Innovation Challenge

The Organization for Economic Cooperation and Development (OECD) ranks Canada as the most educated country in the world with 56.71% of adults meeting the OECD criteria. Japan has the second-highest percentage of 51.44%, followed by Israel with 50.92%. The other most educated countries include: Korea, United Kingdom, United States, Australia, Finland, Norway, and Luxembourg.

In general, and unsurprisingly, the lowest education rates occur in underdeveloped countries. According to the Global Partnership for Education, education plays a key role in human, social, and economic development. Education can promote gender equality, reduce child marriage, promote peace, and overall increases a person's chances of having a healthy life.

However, while Canada ranks as the most educated country globally, it ranks as only 17<sup>th</sup> out of 129, as an innovative country, behind Switzerland, Sweden, USA, Netherlands, UK, Finland, Denmark, Singapore, Germany, Israel, South Korea, Ireland, Hong Kong, China, Japan, and France, with a score of 53.88 out of 100 (Global Innovation Index 2019).

The rankings are based on 80 indicators, grouped into innovation inputs and outputs, which represent the multidimensional facets of innovation. Significantly, Canada ranks only 19<sup>th</sup> in human capital and research, which focuses on education, tertiary education, and research and development.

While Canada is recognized with several high ranking inputs, such as institutions, political environment and government effectiveness, it is offset by the low ranking inputs. Canada's core weaknesses specific to human capital inputs include low government funding per pupil, low graduate numbers in science and engineering, and low ICT services exports.

There is significant work to be done that directly increases Canada's human capital development, and this is the area in which MindFuel focuses its youth innovation programs, explicitly on our *Canada Tech Futures*. We applaud the Ministry of Innovation, Science, and Industry for its substantial funding increases in areas of the National Science and Engineering Research Council and in programs such as CanCode, which provide critical examples of important inputs. However, our work is not done there. Digital and STEM education must be coupled with an innovation mindset in order to truly realize the

benefits of these skills investments and MindFuel is fully committed to this important cause through its *Canada Tech Futures – youth innovation gateway* initiative.

## **MindFuel’s Canada Tech Futures – youth innovation gateway framework**

In 2013 - 2015, MindFuel surveyed 1,200 Canadian teachers, with 86% reporting they are either ill-equipped or lacking the requisite skills, knowledge, expertise to engage students in the world of ideation, design thinking, entrepreneurialism or innovation. In 2015, MindFuel surveyed leading STEM innovators to gain insights into necessary extracurricular learning frameworks supportive of developing an innovation mindset in youth.

MindFuel then conducted a five year pilot (2014-2019), called *Canada Tech Futures – phase 1*, engaging over 4,300 students, 200 teachers, and hundreds of mentors, subject matter experts and judges from academia and industry with the goal of supporting the development of an innovation mindset in youth through transformative, hands-on, collaborative problem solving.

### **Canada Tech Futures – phase 1 (2014-2019)**

Based on market insights and in partnership with the Government of Alberta, Economic Development and Trade and Alberta Innovates Tech Futures (AITF), MindFuel focused on engaging students (middle through collegiate) in solving authentic problems and building solutions based in cutting-edge STEM fields. This included synthetic biology, nanotechnology, machine learning and robotics.

The project-based learning experience aided in the development of entrepreneurial thinking and included hands-on workshops and skill-building events. The students’ experiences culminated in prestigious international competitions and events (Harvard’s BIOMOD, MIT’s iGEM, Microsoft Imagine Cup, etc), where student teams shared their research and innovations with other young scientists, as well as with international leaders in STEM.

The results of phase 1 of Canada Tech Futures are positive, with 83% of students agreeing that the program increased their interest in science; 85% agreeing their knowledge of science increased; 82% agreeing that they are interested in working in a science related field; and 82% expressing interest in post secondary STEM studies.

### **Canada Tech Futures Model – Inclusion and Diversity in a Transformative Learning Framework**

MindFuel’s Canada Tech Futures model of success is twofold: First, its transformative learning framework supports mentor-based, collaborative, experiential learning, and second, its Signature Projects are developed in support of underrepresented youth.

MindFuel’s Signature Projects are foundationally critical to inclusion, which is fundamental to increased and diversified Human Capital and Research development, and each signature project is multi-year in nature. Below is a summary:

- Diversity and Inclusion focuses on building intercultural competence
  - Indigenous Ways of Knowing Series – launched in 1995

- Girls in STEM – launched in 2001
- Economically disadvantaged – launched in 2012
- Digital Literacy and Coding – launched in 2008
- Energy Literacy (Renewable /Clean-Tech and Non-renewable) and the Environment – launched in 2013
- Youth skills development in Robotics, Artificial Intelligence, Synthetic Biology, Computational Solutioning – launched in 2012
- A Healthy Canada – Youth Mental Health – *in development – launched in 2018*
- Climate Change – in development – launched in 2017

Most critically, the model has demonstrated effectiveness in preparing youth to *Dream It! Build It! Expand It!* Finally, five of MindFuel’s alumni have spun-out their projects in clean tech, enviro-bio and health bio solutions into Canadian based, venture capital backed companies. These alumni have remained critical mentors to our new youth entering the program.

## **Canada Tech Futures – Phase 2**

### ***5 Year Expansion Plan – Outputs and Ultimate Outputs***

MindFuel’s proposal focuses on a national expansion initially in Yukon, British Columbia, Alberta, and then Saskatchewan, Northwest Territories, Manitoba, and Ontario. MindFuel expects after three years to report the following meaningful outcomes:

- A validated model for an expanded Youth Innovation Network.
- Insights into required operational factors to develop a sustainable human capital and research framework geared toward Canadian youth.
- Identification of indicators for governments to determine variable youth innovation index inputs; and,
- Community impacts and assessments from a Social Progress Index perspective

By 2025, MindFuel’s goal is to establish a sustainable national *Canada Tech Futures - youth innovation gateway*, where 318,000+ students will be engaged in the world of innovation. Of this, a subset of 42,000 youth will have demonstrated an innovation mindset by having participated in deep-thinking and real-world problem solving in critical areas of emerging STEM futures.

Of critical importance in Canada Tech Futures is the path forward for the youth innovators who have already shown that they have what it takes to produce world-class innovations. The ultimate output is the positive impact of these new innovations that will lead to emerging technologies, inventions, and entrepreneurship fostered right here in Canada.

## About MindFuel

Established in 1990 by James (Jim) Gray, OC, and led by technology start-up leader, Cassy Weber, CEO, MindFuel is a registered charitable organization committed to creating young innovators by developing and distributing captivating, high-quality, 21st century programs that ignite a passion for science, technology, engineering and math (STEM) in students of all ages. The programs are both technology based and technology infused, and are developed to serve the-out-of-classroom market and extracurricular learning. To date, the organization has invested \$105M into Canada's innovation ecosystem and delivers programs through distributed learning to over 1,600 communities in Canada each year, in French and English, and serves the underrepresented youth population including Indigenous students, girls in STEM, economically disadvantaged, remote/rural, newcomers, and more. MindFuel's partnerships include Google, Microsoft, Enbridge, Syncrude, TELUS Community Foundation, RBC Foundation, Anon, NSERC, ISED, Heritage Canada, Hunter Family Foundation, TDFEF, Rotary Clubs, NEXEN, Shell, Motorola USA, and more.

MindFuel maintains its head office in Alberta, with operating offices in B.C. and Yukon, reaches hundreds of thousands of teachers/students/parents each year in every province and territory, and supports over 600,000 learning sessions annually in Canada. Since inception, MindFuel has reached over 147,000,000 in over 170 countries with its online learning programs.