

### 2019-2020 ANNUAL REPORT

Shaping the future of STEM innovation across Canada.

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MindFuel ignites a passion for STEM learning and innovation in youth, inspiring them to shape our future by becoming the engaged knowledge workers, leaders and problemsolvers of tomorrow. As a STEM education technology leader, we have served K-12 students and teachers in Alberta, across Canada and around the world for three decades.

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## HIGHLIGHTS FROM THE CEO & CHAIR

Our biggest accomplishments of 2019/2020 (April 1, 2019 to March 31, 2020)

Digital is here to stay – any time, any place, any pace. Our online learning resources reach more students in more geographies than any prior year with over **6.6 million learning sessions**. MindFuel's online learning is made more powerful through games and animations and MindFuel introduces several new resources in mathematics and physics, including "Transformations Quest" and "Play with Pulleys" to its expansive digital libraries.

Youth leadership today builds a better tomorrow. MindFuel supports over **500 future innovators** in making real world connections between problems and solutions using STEM. Through skills development workshops, seminars, training, mentor connections and more, numerous prototypes using synthetic biology, robotics, artificial intelligence and more are developed with real world applications in clean tech, agricultural science, health/bio and computational solutioning.

Coding and digital literacy, building a better future. As pioneers and experts in digital education, MindFuel was selected as a national partner in the federal CanCode program, to develop and deliver an online coding platform. MindFuel is partnered with over **20 organizations** who will participate in this important project, delivering skills development to over **30,000 youth**, with a focus on under-represented student populations.

The impact today is an investment in Canada's future.

- **86%** of students said they learned about emerging tech and made real world connections to entrepreneurialism and innovation.
- 100% of teachers stated our resources helped them teach their subject.
- 91% of teachers said that their students learned more because of our resources
- **94%** of teachers stated that MindFuel's programs are effective in inspiring youth to pursue post-secondary STEM pathways.

30 years strong with a 20/20 vision for the next 30 years.

On the occasion of our 30th anniversary, we engaged speakers in our youth innovation series, designed to stimulate conversation about STEM innovation, and the important role youth innovation plays in economic diversification. With 20/20 vision, we celebrate our 30 years of service to Canada, and embrace the future opportunities with unparalleled enthusiasm.

## INTRODUCTION

Sparking imagination in the innovators of tomorrow and preparing them to thrive in future careers is our most important work. We inspire them to take risks, adopt a growth mindset, and build real-world connections between problems and solutions, to become creative problem-solvers and to think critically about the world around them.

Everyone who works with MindFuel – in schools and throughout our communities – plays a vital role in inspiring and engaging students and teachers in STEM education, through:

- Empowering and engaging students through STEM topics and entrepreneurialism
- · Empowering teachers to ignite a passion for science exploration and discovery in their students
- Developing and delivering high-quality, innovative, scientifically-unbiased STEM-learning resources that connect to real-world scenarios and help students build problem-solving and critical thinking skills
- Increasing science literacy and curiosity, and sparking student interest in STEM topics
- Inspiring students to pursue STEM-related post-secondary programs and careers



## INTRODUCTION: SKILLS DEVELOPMENT AREA

As a MindFuel supporter, you are part of an energetic team of individuals and organizations committed to the development of leading-edge programming to drive the future of STEM learning and discovery. Our award-winning resources and programs are designed to help students engage in real-world problem-solving and innovation across numerous crucial fields. We reached 195 countries and more than 13,244 communities globally in 2019.

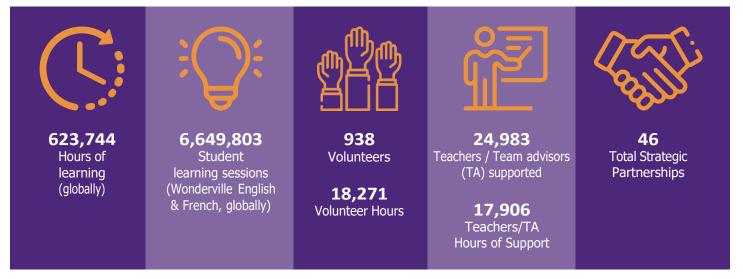
#### **Empowering STEM thinking**

Digital interactive learning, workshops, mentor-supported student activities and real-world problem solving led to 44,787 hours of learning.

BIODIVERSITY, ENERGY AND ALTERNATIVE ENERGY, AGRICULTURE AND ENVIRONMENTAL AND WATER MANAGEMENT SCIENCE	1,169,600
STEM KNOWLEDGE FOUNDATIONS (SUCH AS BIOLOGY, PHYSICS, CHEMISTRY AND EARTH SCIENCES)	203,409
HEALTH AND RELATED SCIENCES	59,679
DESIGN THINKING, INNOVATION AND ENTREPRENEURIALISM	76,546
SYNTHETIC BIOLOGY AND NANOTECHNOLOGY	22,572
STEM CAREER SHOWCASES AND GIRLS AND WOMEN IN STEM	8,874
COMPUTATIONAL THINKING, ROBOTICS, INFORMATION MODELLING, MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE	16,345
SPACE AND ASTRONOMY	5,188
INDIGENOUS WAYS OF KNOWING	4,172

Many thanks to our dedicated funding partners and donors, including those who chose to be anonymous. We would not be the organization we are without their support.

# **2019 HIGHLIGHTS**



# SUMMARY OF MINDFUEL SOCIAL MEDIA



18,000,952 Brand Impressions (web, social, traditional media, events etc.)



161,485 Radio/Print/TV



859,057 Unique Website Users



# WONDERVILLE PROGRAM OVERVIEW

Wonderville is an award-winning student engagement platform, which supports blended-learning in STEM classrooms. Students explore the wonder of STEM by engaging in game-based learning, hands-on activities, real-world videos and animations, handson experiments and STEM career showcases. These reliable, high-quality student activities are supplemented by lesson plans, assessment and professional learning resources for teachers.



#### **Empowering STEM thinking**

 DRIVING STUDENT ENGAGEMENT IN MATHEMATICS LEARNING: Developed "Transformations Quest" in collaboration with Werklund School of Education at the University of Calgary, geared for grade 7 math. Tranformations Quest was accessed over 1,000 times during the year.

• FUELING PHYSICS PASSION:

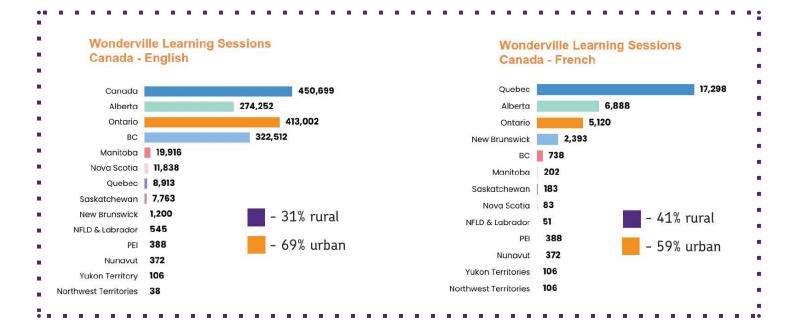
Completed the third year of PhysicsFuel Research work with the Schulich School of Engineering, University of Calgary, and funded by NSERC with project focus on updating the "Play with Pulleys" game based on research observations and findings, and continue piloting digital resources in schools in the 2019-20 school year. 70 students were engaged in 70 hours of learning, and 4 teachers supported.

 Continued to build the library of professional learning resources, featuring the following new resources: six quick tip videos and four webinars.

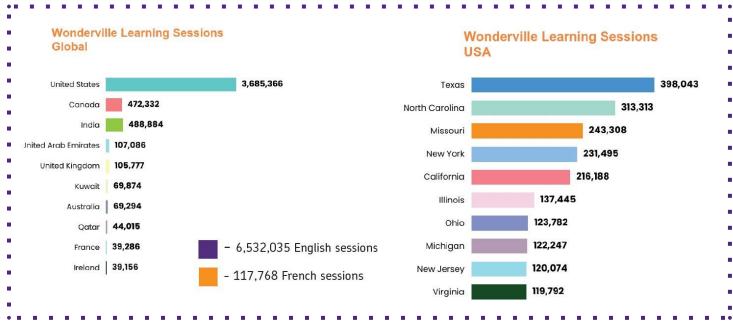


# WONDERVILLE PROGRAM OUTCOMES

- Distributed in 195 countries worldwide.
- 472,332 English + French Wonderville Learning sessions conducted in Canada



• 6,649,803 English + French Wonderville Learning sessions conducted globally



# WONDERVILLE PROFESSIONAL LEARNING

### 12

**Teacher Workshops** covering a variety of STEM-based topics

### **227** Alberta Teachers Workshops supported 227 teachers in 2019-20.

### 743

Hours of Learning MindFuel provided 743 hours of learning in 2019/20.

Launched in 2018, MindFuel's professional learning workshops offer K-12 teachers support in their professional development and growth in STEM education through impactful teaching practices, hands-on activities, educational presentations and engaging round-table discussions.





The "Keeping STEM Real" Collaboration Event on February 29, 2020:

- 19 educators and 19 STEM subject matter experts (SMEs) came together with focus on increasing teacher awareness & engagement of bringing SMEs into the AB STEM classroom as mentors.
- Provided helpful classroom tips, innovative teaching practices and learning resources to increase student engagement and learning of STEM topics.
- Workshop topics included design thinking, digital literacy, computer programming and coding in the classroom.
  - **93% of teachers** say they feel these workshops increased their interest in working with mentors and SMEs.
  - **90% of teachers** stated that they feel these workshops enhanced their ability to teach design thinking in their STEM classroom.
  - **88% of teachers** feel that these workshops make their classrooms more engaging for their students.

It has solidified my interest and passion to create experiences in mentorship. It has solidified my interest and passion to create experiences in mentorship.

> - Grade 5 teacher PL participant

The workshop provided unique tips and tools to improve my mentorship capacities.

> - Mentor, Workshop Participant, Edmonton

# CODINGVILLE PROGRAM OVERVIEW

In January 2020 we launched Codingville, including student activities and teacher professional learning resources to support students' learning of coding & digital skills. These high-quality, digital and hands-on activities & resources will increase students' overall coding/ digital literacy knowledge, skills & aptitude; and help them be more prepared for high school & post-secondary studies in coding/ computer science, and related future careers.



#### **Empowering STEM thinking**

Codingville.org is a self-directed online game-based platform sup- porting coding & digital skills development for Kindergarten
 – Grade 12 students & teachers, which includes three main Journeys that are supported by missions within adventures.



- 2693 STUDENTS
- 2331 HOURS OF LEARNING
- 50% FEMALE
- 3% INDIGENOUS
- 45% RURAL/REMOTE
- 55% URBAN



- 599 TEACHERS
- 504 HOURS OF TEACHER PROF. LEARNING
- 75% of students stated that they now feel they know more about coding after using Codingville.
- 80% of students stated that after using Codingville, they're interested in improving their coding skills.
- 75% of teachers stated that they would use Codingville in their classrooms.



This is the most interested in coding my kids have been.

Codingville Teacher,
 Edmonton

I thought it would be hard to learn but it's kind of easy when put into a fun game like this.

- Codingville Student, Edmonton It made me think of computational thinking as a basis for coding which I hadn't before.

> - Codingville Teacher, Okotoks

Helped me with basic coding that can be integrated with the grade 9 science electricity unit and CTF Robotics course that I teach.

> - Codingville Teacher, Edmonton

## GEEKSTARTER PROGRAM OVERVIEW

Developed in partnership with Alberta Innovates (formerly, Alberta Innovates Tech Futures), geek-Starter is part of MindFuel's youth innovation program – edacity – and focuses on engaging youth in grades 5-12 and post-secondary to build critical thinking skills as they develop solutions to real-world problems through hands-on workshops and entrepreneurial-inspired events. Through geekStarter, youth break down barriers that prevent them from embracing emerging STEM fields in post-secondary education and careers, and foster a belief that we are all innovators and problem-solvers who can contribute to the creation of a better future.



#### **Empowering STEM thinking**

- Engaged student teams in finding and solving real-world challenges and building solutions based in emerging STEM fields that could be commercialized.
- Supported teams and their real-world research-based projects through hands-on workshops, skill- building events and mentorship support.
- Continued to build connections between geekStarter teams and industry and academia subject matter experts to expand students' knowledge, direct experience and understanding of STEM industries and possible careers.



### 86%

of students said that they learned more about synthetic biology, IGEM, entrepreneurialism and robotics.

The program as a whole is an amazing learning experience for students and MindFuel/ geekStarter is an integral part of the experience.

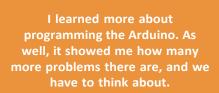
- High School team advisor, High School iGEM workshop participant



### 2019-20 geekStarter Program Outcomes

STUDENTS ENGAGED	551
HOURS OF LEARNING	54,258
% OF RURAL STUDENTS	27%
% OF URBAN STUDENTS	73%
% OF FEMALE STUDENTS	50%
% OF INDIGENOUS STUDENTS	3%
NUMBER OF TEACHERS/TEAM ADVISORS	63
TOTAL TEACHER/TEAM ADVISOR HOURS	3,686
NUMBER OF MENTORS	17
TOTAL MENTOR HOURS	178
Number of subject matter experts	23
Total SME hours	380





- Grade 9 student, Robotics & Automation workshop participant, Siksika Nation

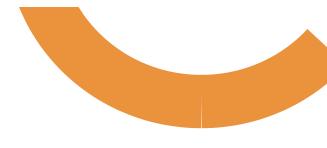
84% of students said that they can see themselves working in science.



## **2019-20 GEEKSTARTER TEAMS**

A majority of alumni pursue careers in emerging STEM fields. Some have turned their high school and post secondary projects into startup companies, such as Alberta-based synthetic biology startups FREDsense Technologies, Amino Labs, Synbiota Inc. and Nomadogen.

Team	Project	Special Accomplishments
University of Alberta (Edmonton)	Synbio project: aim to address the detection and treatment of Nosema Ceranae, a pervasive parasite affecting commercial honeybees and reduce hive productivity.	Won Bronze medal
University of Calgary (Calgary)	Synbio project: creating a solution using SynBio to tackle the green seed problem in canola seeds.	<ul> <li>Nominations for Best Model, Best New Basic Part, Best Part Collection, Best Poster, Best Presentation, Best Supporting Entrepreneurship, and Best Wiki</li> <li>Won Gold medal</li> <li>Won Two special awards for Best Integrated Human Practices and Best Software Tool</li> <li>2nd place overall - Undergrad, Best Food and Nutrition project</li> </ul>
University of Lethbridge (Lethbridge)	Sybio project: developing a recombinant algae called Algulin that produces an oral insulin.	• Won Gold medal
Lacombe Composite High School Robotics (Lacombe)	The CubeSat Project: Building a mini-satellite application for monitoring and managing wildfires.	
Lester B. Pearson High School Robotics (Calgary)	The pHisherbot Project: Building an aquatic robot for monitoring water quality in remote areas.	
Lethbridge High School SynBio iGEM (Lethbridge)	Small-scale composting project: Creating an efficient small-scale household composting unit.	Won Silver medal
NotreDame Collegiate High School Synbio (High River)	Save the Corals Project: Developing a sensor for a water pollutant from sunscreen.	
Our Lady of the Snows Catholic Academy SynBio and Robotics (Canmore)	Re-purposing Lignin Project: Turning lignin from a waste product into a useful material using bioengineering.	
Queen Elizabeth High School Robotics Team (Edmonton)	The Exobotics Project: Continuing from last year - Building a 3D printable affordable exoskeleton for physically disabled people.	



### **CTF ACCELERATOR PROGRAM OVERVIEW**

Developed in partnership with the Calgary Board of Education (CBE) - with support from EducationMatters, Enactus Mount Royal University and the University of Calgary Hunter Hub for Entrepreneurial Thinking - the CTF Accelerator gives students an opportunity to explore their interests and passions through hands-on experiences to solve real-world challenges using iterative problem-solving and rapid prototyping.

MindFuel's Career and Technology Foundations (CTF) - Accelerator focused on workshops and in classroom activities for middle school students to learn about rapid prototyping methods to solve real world problems. Finally, MindFuel worked with high school students in Career and Technology Studies (CTS) to continue piloting curriculum aligned for-credit course materials for ENT1010, ENT2010 and ENT3020.

	Number of Teams	Total Students	Hours of Learning	Rural/ Remote	Urban
Middle School	9	201	20,100	44%	56%
Collegiate	3		3,700		
Total	12	201	23,800		

198 16 3883 183 Teachers Students Impacted Impacted **Empowering STEM thinking** Engaged students in solving real-world challenges using iterative problem-solving and rapid prototyping.

- Provided teachers with high-guality CTF • teaching materials and professional learning workshops on rapid prototyping methods and interdisciplinary learning environments.
- Connected teachers and students with • community mentors, local innovators and subject matter experts who provided feedback and shared insights about future STEM career possibilities.
- Co-planned the Spring 2019 Program • Celebration event where students presented their projects to other CTF Accelerator students and teachers, mentors and pre-service teachers.

of students said that

they can use new techniques and methods when trying to solve problems.

### 75%

of students said they are able to incorporate feedback when solving problems/ challenges in their learning.

What I liked best about the **CTF** Accelerator Program being creative, talking with each other and utilizing our talents. Also, learning how to run a business.

- Student, CTF Accelerator Program, Spring 2019 cycle, Calgary



\*Students showcasing their project during the 2019 Spring Celebration\*

\* MindFuel Team Member Danielle viewing projects at the 2019 CTF Spring Celebration\*

Learning

### 88%

of teachers rate the value of specific prototyping highly.



\* MindFuel Team Member Alma viewing projects at the 2019 CTF Spring Celebration\*

I just thought when it comes to business, you work behind a desk (it was very stereotypical for me until I was in this class and now I know what business is really like).

66

- Student, CTF Accelerator Program, Spring 2019 cycle, Calgary In general, I think seeing the students being able to be innovative and taking some calculated risks with their ideas and then planning one of a kind prototypes is extremely beneficial.

- Grade 7 Teacher, CTF Accelerator Program, Spring 2019 cycle, Calgary

### 100%

of teachers stated that they utilized the resources provided by the program.

### **IGNITION PACK OVERVIEW**

Ignition Pack is a permanent resource that transforms science classes by combining the best of 21st century learning, hands-on resources and digital components. Aligned with the Alberta program of studies, students learn fundamental science concepts through exploration, experimentation and critical thinking.



Each unit kit - grade 5 Wetland Ecosystems, grade 7 Interactions & Ecosystems and grade 8 Mix & Flow of Matter and Freshwater & Saltwater Systems - has over 40 resources and 20-25 hours of teaching material.





\*Students from Edmonton Public Schools working with the Grade 5 Wetlands Ignition Pack\*

#### **Empowering STEM thinking**

- Increase students' engagement and experience with complex science concepts through inspiring Alberta-based real-world examples and fun, hands-on activities.
- Provide teachers with high-quality, blended learning resources and detailedlesson plans that enable them to teach a complete unit of science.

### 71%

of students said that the Ignition Pack resources, videos and lessons increased my interest in science. This is an amazing package. I was away on leave due to an accident, so I left the Ignition Pack for my sub. It really enhanced student learning and my/my substitute teacher's confidence in teaching science.

- Grade 5 teacher, Wetland Ecosystems Ignition Pack user

### 81%

of students said they learned something more about this science topic. Students at Westbrook School, (Edmonton PS) working with the Grade 5 Wetlands Ignition Pack.





I liked the whole thing, but my favorite part was researching our own wetland animal individually because I liked that you got to learn more about a wetland animal.

- Grade 5 student, Wetland Ignition Pack user

### 93%

of teachers stated that Ignition Pack helped me enrich and enhance my ability to teach the science topic.

### 91%

of teachers said that their students learned more about the science topic through Ignition Pack.

### **2019 SCHOLARSHIP WINNERS**



#### Winner: Peter Shmerko, Calgary Award: Jim Gray

- Graduated from Western Canada High School (Calgary)
- Studying at University of Calgary, Schulich School of Engineering
- Goal: to become a mechanical engineer, potentially in aerospace engineering

66

"It is an incredible opportunity to have been selected as the recipient for the James Gray scholarship. This will help me greatly as I pursue my studies at the University of Calgary in the Schulich School of Engineering. My current goal is to study mechanical engineering with a minor in aerospace engineering. As I continue to pursue my passions with UAVs and other aerial vehicles, I wish to inspire others to seek STEM as a career and be encouraged by my contributions and achievements. This scholarship has given me more confidence to pursue my goals as I've seen how MindFuel values my contributions towards STEM."



"I am greatly humbled and beyond grateful to be the recipient of the 2019 AsTech Foundation Scholarship! This scholarship has greatly supported my pursuit of a future in STEM, both through its financial aid for my Cell Biology studies at the University of Alberta, and in its motivational support, by recognizing my abilities and encouraging me to keep learning and innovating. To MindFuel and AsTech, I give my most sincere thank you!"



"With this generous award, I will continue to develop knowledge in the STEM fields until I possess the skill set to be able to contribute myself. In the future, I will follow my passion and help to push STEM studies to the next level. This next step, I hope will have an immense impact on the worldwide community and improve the lives of millions."



"Receiving the 2019 Anne Tingle Scholarship has brought me one step closer to a successful future. Success is by no means defined by a person's income or social statues, but instead by one's ability to act on their curiosity. My curiosity has drawn my attention to the wonderful world of science, especially biology and physics. I am now able to act on my curiosity and learn more about what fascinates me."



"With the Arlene Ponting award, I am more free to fully focus on school, and pursue career opportunities wherever they may lead me without having to worry about if it is financially affordable. For that, I am extremely grateful to those who have worked so hard to make that award a possibility. I intend to use the scholarship toward my studies in Environmental Science and Plant Biology, as I work towards first undergrad, then Masters and PhD degrees in a biological field."



#### Winner: Karen He, Lethbridge Award: ASTech Foundation

- Graduated from Chinook High School (Lethbridge)
- Studying at University of Alberta, Bachelor of Science
- Goal: to study cell biology



#### Winner: Emily Nattress, Cochrane Award: ASTech / GrowSafe Systems

- Graduated from Cochrane High School
   (Cochrane)
- Studying at University of Alberta, Bachelor of Science in Biochemistry
- Goal: to have an immense impact on the worldwide community



### Winner: Amy Lundstrom, Mayerthorpe Award: Anne Tingle

- Graduated from Mayerthorpe High School (Mayerthorpe)
- Studying at University of Alberta, Bachelor of Science
- Goal: to specialize in Biology, working to better our quality of life



#### Winner: Allison Guthrie, Red Deer Award: Dr. Arlene Ponting

- Graduated from Notre Dame High School (Red Deer)
- Studying at University of Calgary, Environmental Science and Plant Biology
- Goal: to complete a Masters degree and PhD in a biological field

### **BOARD MEMBERS & STAFF**

### **Board of Directors**

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