



Unlocking young people's potential through big data

Providing experiential learning programmes for today's 'data-native' generation, **STEM Fellowship**, in Canada, is empowering young people to use computational thinking and develop science communication skills. Founder **Dr Alexandre (Sacha) Noukhovitch** explains how the charity's programmes are enabling young people to engage with real-world datasets and develop their potential as scientists and changemakers.

What motivated you to set up STEM Fellowship?

STEM Fellowship was founded in 2015 as an extracurricular programme in three Toronto high schools, giving students the opportunity to engage with real 'big data'. At the time, data analytics was largely reserved for mathematicians and computer science graduates and professionals. However, my observations of the data-native generation – particularly their learning behaviours and pattern recognition skills in computer games – suggested that they had an intuitive ability to detect trends and correlations, even without formal training in statistics or computational methods. The results of our first big data analytics programme exceeded all expectations. Students intuitively navigated data analytics tools, independently rediscovering statistical principles and computational techniques, demonstrating a natural affinity for data-driven inquiry. The programme was a game changer, making computer classes more attractive to girls who had previously been less interested and those who were struggling with academic subjects but were keen gamers.

In what way are today's young people 'natural data scientists'?

Observations from the STEM Fellowship Big Data Challenge (now the Open Data

Analytics and AI Inquiry Program) reveal that today's young people possess a strong intuitive ability to identify trends and patterns within data. This natural aptitude enables them to use analytical tools effectively, even without a deep understanding of the underlying mathematics and algorithms. While this ability varies among individuals, students generally demonstrate confidence in experimenting with data tools, readily applying them to explore and validate their assumptions.

How do you see artificial intelligence (AI) helping young people to explore, aspire and achieve their ambitions?

I have always imagined teaching as some sort of museum tour, where educators guide students through carefully curated exhibits of science or mathematics discoveries or medieval history. Like curators, teachers design structured learning journeys, ensuring concepts are presented in a logical order. These structured paths form the foundation of traditional classes and courses. However, generative AI reshapes this model by empowering every student to navigate the vast museum of knowledge on their own terms. Instead of following a predetermined path, they can explore freely, guided by curiosity, cognitive connections, and discoveries made at their own pace and in alignment with their interests.

Why is it important – today, more than ever – that learning is student-driven?

Even renowned educational experts often have a simplified view of AI as a programme that plays back what is put in. It is important to note that generative AI fundamentally shifts the power of learning into the hands of individual students. With AI acting as an ever-expanding, on-demand library, students can explore, question and construct knowledge independently – beyond the structured guidance of a classroom. This transformation presents both a challenge and an opportunity. It requires educators not only to co-teach alongside AI but also to share authority in the learning process. The role of a teacher is evolving from a sole source of instruction to a facilitator who helps students critically assess AI-generated information, develop analytical skill, and navigate the ethical implications of AI-assisted learning. In this new educational landscape, student-driven learning is no longer an option – it's a necessity. Empowering students to take ownership of their education ensures they become active participants rather than passive recipients.

How does experiential learning empower young people?

In STEM Fellowship, we immerse students in 21st-century career-connected, experiential, inquiry-driven learning. They

Students from Hillfield Strathallan College, Hamilton, Canada, enjoying the National High School Open Data Inquiry and AI Challenge 2025 finals
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actively engage with real-world data, AI and interdisciplinary problem-solving through programmes such as the Open Data Analytics and AI Inquiry Program (previously the High School Big Data Challenge) and the **STEM Fellowship Journal**. Students are given the freedom to explore, analyse and innovate. The key feature of a STEM Fellowship programme is that it guides students through a real open-data investigative process.

By integrating student-driven learning with the latest advancements in AI and data science, STEM Fellowship equips young learners to become creators rather than just consumers of knowledge, unlocking their potential to shape the future of science, technology and society.

How are students addressing real-world applications in their learning?

STEM Fellowship programmes are deeply aligned with the **United Nations Sustainable Development Goals** (SDGs). Through experiential learning, students

use open data, analytics and AI to tackle pressing global challenges such as climate change, biodiversity conservation and sustainable development.

For example, the Open Data Analytics and AI Inquiry Program has empowered students to explore topics such as:

- **Biodiversity Conservation** – using AI to

analyse ecological patterns and threats to local species.

- **Urban Sustainability** – investigating the impact of urban heat islands on wildlife, such as monarch butterfly populations.
- **Climate Change Mitigation** – using big data to assess carbon emissions, pollution and renewable energy solutions.



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A student from the Virtual Learning Center, Homeschool, GTA, Canada, at the National High School Open Data Inquiry and AI Challenge 2025 finals
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A student from the School for the Talented and Gifted at Townview, Dallas, USA, speaking at the National High School Open Data Inquiry and AI Challenge 2025 finals
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By engaging with real-world datasets and interdisciplinary problem-solving, students contribute to evidence-based sustainability research. They often publish their findings in the STEM Fellowship Journal, demonstrating their potential as young scientists and changemakers. Through this approach, STEM Fellowship fosters a new generation of scientifically literate, socially responsible innovators who can leverage technology and research for a sustainable future.

What does STEM Fellowship's High School Data Analysis and AI Challenge for Sustainable Development involve?

The High School Data Analysis and AI Challenge for Sustainable Development is an interdisciplinary experiential learning programme that empowers students to harness big data, AI and computational tools to tackle real-world sustainability challenges, aligning with the UN's SDGs.

Participants search and find open datasets to support their work from sources like government agencies, environmental organisations and global research databases. They apply AI and machine learning techniques to find and analyse trends, make predictions and propose solutions. They team up with their peers

(up to 4-5 students) to work together and engage in an iterative and collaborative inquiry, applying **Agile teaching strategies** to refine their research and methodologies and developing skills in critical thinking, problem-solving and teamwork. Students receive guidance from STEM professionals, AI specialists and sustainability researchers to enhance their projects. Participants submit their research findings in the form of scientific manuscripts or data-driven reports to be published in a scholarly STEM Fellowship Journal and get exposure in the professional community.

What does STEM Fellowship's Digital Citizenship Graduation Award recognise?

The Digital Citizenship Graduation Award not only honours outstanding students but also inspires the next generation of leaders to think critically about the intersection of technology, society and ethics. By celebrating students who demonstrate exceptional digital leadership, responsible technology use and contributions to their communities through digital innovation, data science and AI-driven initiatives that support sustainability, education and social equity, the award reinforces the idea that digital fluency is a powerful tool for positive change.

In an era where digital transformation is reshaping education, work and civic engagement, it is crucial to celebrate students who harness technology for community good. STEM Fellowship acknowledges that digital citizenship goes beyond responsible internet use. It encompasses using technology for social impact, promoting ethical AI and cybersecurity awareness, and encouraging open-access knowledge sharing. Digital citizenship is also about building inclusive digital communities, using digital tools to advocate for equity, diversity and accessibility.

What collaborations does STEM Fellowship benefit from?

STEM Fellowship is a grassroots organisation driven by students and teacher-visionaries, supported by professionals and academics who are passionate about pioneering new approaches to learning and knowledge acquisition.

STEM Fellowship's work is driven by a dedicated network of volunteers, including programme alumni, graduate student mentors, industry experts and STEM Fellowship club leaders. Our amazing volunteers plan competitions and conferences, guide students in research methodology and scientific writing, and run the hands-on projects that are so vital

to our work. We also collaborate with RBC Future Launch Foundation, Canadian Science Publishing, Let's Talk Science, National Research Council of Canada, Microsoft Canada and the University of Calgary Hunter Hub, amongst other industry and academic organisations. If any teachers and students would like to join the STEM Fellowship network of volunteers, we'd love to hear from you!

What impact has STEM Fellowship had in the last 10 years?

STEM Fellowship has made a significant impact in transforming education through experiential, data-driven and AI-enhanced learning. The expansion of our High School Big Data Challenge has been a highlight. What began in 2015 as a pilot in three Toronto schools has grown into the Canada-wide Open Data and AI Inquiry Program, engaging thousands of students in interdisciplinary research using real-world datasets.

STEM Fellowship helps students to connect traditional subject-specific education with digital interdisciplinary expectations of modern work and research, bridging the gap between education and the data-driven economy.

We are empowering underrepresented groups in STEM by actively increasing female, neurodiverse and rural student participation in STEM fields by offering tailored learning approaches that embrace the 'anytime, anywhere, any device' (ATAWAD) model.

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Our student-led clubs across Canada have provided localised opportunities for peer learning, scientific exploration and leadership development, fostering a new generation of independent thinkers. Our Digital Citizenship Graduation Award is honouring students who use digital tools and AI to contribute to their communities, recognising the role of ethical technology use in society.

Through these initiatives, STEM Fellowship continues to reshape STEM education, preparing students to tackle real-world challenges in sustainability, data science and AI, while fostering curiosity, critical thinking and innovation.

What does the future hold for STEM Fellowship?

We'll continue fostering student-driven innovation and shaping the next generation of data-native leaders.

We'll be building on the success of the Open Data Analytics and AI Inquiry Program, expanding it to more schools across Canada and internationally. Through research and partnerships, we will continue developing new pedagogical models that align with ATAWAD learning and empower neurodiverse and digitally native students. STEM Fellowship will continue to develop industry and academic collaborations, support educators through teacher training programmes and expand student leadership.

As our name highlights, STEM Fellowship is about people – and we're committed to expanding a community of innovative and skilled thinkers who engage with big data for the benefits of society, tackling challenges such as public health, climate change, biodiversity conservation and social equity.



Students from Central Peel Secondary School, North Park Secondary School, GTA, Canada, presenting at the National High School Open Data Inquiry and AI Challenge 2025 finals
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