Implementation Plan for Student Spaceflight Experiments Program (SSEP)
Mission 8 to the International Space Station (ISS)
http://ssepncesse.org

Community:
Ryerson University and Local High Schools in the Toronto District School Board (TDSB)

Proposed SSEP Community Program Co-Directors:

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Proposed Participating University:
Ryerson University (and local area high schools)

Abstract of Proposed Program:

Ryerson University proposes to participate in SSEP Mission 8 to the ISS. The Ryerson-led program will reach out to more than 150 students (90 second and third year science undergraduates and 60 senior high school students) to engage in microgravity experimental design and proposal writing. Leveraging the Office of Science Outreach and Enrichment at Ryerson University, this student dynamic seeks to have teams of 5 students, where undergraduate students (3) will mentor marginalized secondary students (2) from local inner city high schools, who would not normally get the opportunity to participate in advanced STEM (science, technology, engineering and math)-based learning. We expect a minimum of 30 flight experiment proposals to be submitted, and will therefore host a regional competition at Ryerson and reach out to former Canadian astronauts Col. Chris Hadfield and Dr. Roberta Bondar as celebrity judges. Ultimately, we expect to select the top 5 experiments with at least one being selected for Mission 8 to the ISS.
Community Overview:

The City of Toronto covers 630 km\(^2\) and has a population over 2.7 million, making it Canada’s most populous city, and the 4\(^{th}\) largest city in North America. Ryerson University is in the heart of Toronto’s downtown core, and the large commuter based student population draws heavily from beyond the city of Toronto to include the Greater Toronto Area (GTA) a metropolitan area with a population of over 6 million inhabitants and a coverage of 7,124 km\(^2\). The demographics of Toronto make Toronto one of the most multicultural cities in the world. Data released by Statistics Canada as part of the 2006 census indicated that 49.9% of Toronto's population is foreign-born.

Ryerson University is a non-traditional Canadian university that mirrors the sense of inclusion and diversity found in the City of Toronto. Originally a polytechnic institute of technology and community college, Ryerson has now grown into a research-intensive University, with strong connections to community and it’s historical origins. Nowhere is this trajectory more apparent than the growth observed over the last twenty years; Ryerson University has developed from a polytechnic university with its first graduate programs into a full-fledged comprehensive research-intensive institution. It is one of the fastest-growing universities in the country, with 36,000+ undergraduate students, 2,000+ graduate students, and 70,000 yearly certificate and continuing education registrations. Ryerson is ranked 4th in Ontario and 10th in Canada by undergraduate student enrollment. Research intensity has also grown as Ryerson and is currently ranked first in Ontario and fourth nationally for research growth, its research funding is ranked 11\(^{th}\) in the country among non-medical universities. The university’s research funding has grown by approximately 80% since 2007-08, from $20 million to a projected $36 million in 2013-14. Ryerson’s striking level of growth is largely attributed to its substantial investment in supporting the research and training of highly qualified personnel (HQP) across the areas specified in the University’s Strategic Research Plan. The University is currently developing a state-of-the-art research environment with new buildings and facilities designed to attract outstanding national and international scholars, as well as a variety of cross-disciplinary research centres and initiatives.

Ryerson University Timelines

- **1948** - Ryerson Institute of Technology was founded
- **1993** - Ryerson receives approval to award graduate degrees and changes the institution's name to Ryerson Polytechnic University
- **2001** - the school assumes its current name as Ryerson University.
- **2012** - the university approves the formation of the Faculty of Science, the newest faculty at Ryerson University in approximately 40 years. The Faculty of Science consists of the four founding departments - Chemistry & Biology, Physics, Mathematics, and Computer Science.

Faculty of Science - Representing the most significant change in Ryerson’s academic structure in the past 40 years, Ryerson inaugurated the Faculty of Science (FoS) in 2012. Ryerson FOS received a strong mandate from the University to bolster research activities related to the sciences in order to help resolve societally-relevant challenges and Ryerson
has made significant investments into this new faculty to help it meet its mandate. In alignment with Ryerson’s strategic research emphasis on *Health and Well-Being* and *Energy, Sustainability, and the Environment*, particular emphasis in FoS has been placed on building applied biomedical and environmental research capacity.

**The Office of Science Outreach & Enrichment (OSOE)** - Founded in 2011, within the Faculty of Science, OSOE is dedicated to promoting science to the Greater Toronto Area. Faculty and students alike in the areas of Biology, Chemistry, Computer Science, Mathematics and its Applications, and Medical Physics support the OSOE. Many of our activities are organized in collaboration with the Engineering Enrichment and Outreach Office. While it has grown substantially since 2011, the OSOE has hosted over 3300 students (from 75 schools), and inspired more than 150 teachers in its first 3 years. While the original focus was to organize high school class visits to campus and running a summer day camp for youth, they have now taken a leadership role in a variety of community organizations (see below).

**Community Outreach Partnerships**

A) Let’s Talk Science ([www.letstalkscience.ca](http://www.letstalkscience.ca)) - This organization’s objective is to engage children and youth in meaningful STEM learning. Science Outreach is one of their four core programs, and Ryerson has just joined as an associate site.

B) Pathways to Education ([www.pathwaystoeducation.ca](http://www.pathwaystoeducation.ca)) - Pathways to Education is a community-based non-profit organization dedicated to supporting youth from some of Toronto’s most vulnerable neighbourhoods. The organization boasts successes such as doubling high school graduation rates and increasing post-secondary education up to 300%. Their programs provide academic, social, financial and mentoring support. OSOE has committed to the tutoring programs in which Ryerson’s undergraduate students work at the different Pathways sites.

C) Visions of Science Network for Learning ([www.vosnl.org](http://www.vosnl.org)) - This non-for-profit organization works to enhance educational achievements and career goals of youth underrepresented in the STEM fields. Their network of community-based science clubs across the greater Toronto Area provides year-long enrichment.

D) Science Rendezvous ([www.sciencerendezvous.ca](http://www.sciencerendezvous.ca)) - Canada’s largest public science festival, held annually in May; a fun-filled, educational day for people of all ages. Ryerson University is a proud sponsor of this event and OSOE organizes Ryerson’s annual contribution (the largest in Canada).

E) Camara Skills Training Network ([www.camaraskills.org](http://www.camaraskills.org)) - Camara Skills Training Network (CSTN) is a federally registered not-for-profit charitable organization that provides introductory and promotional skills training in the industrial manufacturing trades to at risk youth in the inner city areas of Toronto and Hamilton. Created in 2006, CSTN offers innovative and progressive interdisciplinary programs to span the fields of the industrial manufacturing industry and science education.
Our Vision for STEM Education and How SSEP Fits In:

Space is one of the few things that can inspire nearly all-human consciousness. As such it is one of the best modalities to reach out to underrepresented groups and engage them in STEM-based learning. Ryerson University prides itself in offering unique conditions for experiential science learning, and engaging in the SSEP it arguably the most engaging opportunity towards that goal. SSEP will enable the students to experience and participate in authentic scientific experimentation while developing teamwork and mentorship skills. This opportunity is a real world experience that breaks from the model of traditional teaching and creates excitement for all students.

Through the OSOE, Ryerson reaches out to some of the most underprivileged neighbourhoods in the city, and providing these students with an authentic and unique experimentation opportunity will go a long way in encouraging these students to pursue post secondary school education and potentially bringing them towards STEM fields of study. This is consistent with the City of Toronto’s Strong Neighbourhoods initiative. (http://www.toronto.ca/legdocs/mmis/2012/cd/bgrd/backgroundfile-45145.pdf).

A focus on transferable skills is also in Ryerson’s mandate. As such, this is also an excellent opportunity for our participants in the science mentorship program (RySciMatch – vide infra) to build their own leadership and mentorship skills, while reaching out to underrepresented groups. To this end, undergraduate students from chemistry, physics, biology, math and computer science, can give back to their local community and strengthen Ryerson’s reputation as a community builder.

Proposed Program Scope and Process:

Approximately 90 science and engineering students from Ryerson and 60 local area high school student participants will be selected by late January 2015. Leveraging the OSOE, we anticipate the involvement of a minimum of 30 local areas high schools. Teams of 5 people will be comprised of 3 Ryerson students and 2 high school students. Owing the mentoring nature of this high school/university program, Ryerson Students will be selected from our RySciMatch mentoring program (http://www.ryerson.ca/science/RySciMatch.html).

All participating students will meet regularly on Ryerson University campus and the SSEP community program directors and student mentors will meet with the teams weekly throughout Mission 8, assisting in both experimental design and proposal writing. The experimental proposals will be submitted to a local SSEP Step 1 Review Board convened by Ryerson, and using the SSEP proposal evaluation criteria, the top 3 finalist experiments will be selected during the last week of April 2015, and submitted to the SSEP national office for Step 2 Review and selection of the flight experiment. The top 3 experiments will be showcased at Science Rendezvous (vide supra) on May 9, 2015.

Reaching out to the greater student community, and SSEP participant teams, we will also host a mission patch design competition that will further enhance community
engagement. This art and design competition will be heavily promoted throughout the experimental design process, but will be actively advertised to the greater scientific community during Science Rendezvous 2015. An internal submission deadline for the competition has been set for May 18, 2015, where a Ryerson panel will select the winning artwork. The top three designers will receive local prizes and have their artwork promoted through various media. The top design will represent the community’s experiment in space.

Owing to the co-op program and the continuing education stream at Ryerson, the university will be open for the summer and students will be encouraged to fine-tune their experiments. Students will complete an online evaluation before and after participating in the SSEP program and will receive a certificate upon completion of the program. All students will be invited back for the

**Budget:**

The cost of this program is ~$27,000 and will fluctuate based on the CDN$ - US$ conversion rate. At this point, we are diligently looking into fundraising initiatives and partnerships.

**Matching Funds and In-kind Support:**

The Ryerson community is fully supportive of this implementation plan for the SSEP. Table 1 below demonstrates the level of dedicated staff time, and provides the in-kind staff hours that are being allocated for successful delivery.

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* OSOE employs undergraduate student leaders to assist in delivering content, and help run/organize events