

OPEN SPACE: ENGAGING TEENS IN WESTERN NEWFOUNDLAND IN PHYSICS AND ASTRONOMY

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Jasmine Penney, a physics major and a contributing author, asked several team members about their experience with the program; below are the reflections by physicists Dr. Svetlana Barkanova (SB), Dr. Maria Kilfoil (MK), Steve Day (SD) and Victor Hayden (VH); Theatre Professor Renate Pohl (RP); Parks Canada Public Outreach Education Officer Angelina Payne (AP) and students Kayla Warren (KW) and Alexandra Porter (APR).

JP: What has been your favourite event so far?

SB: My favorite moment was the Grade 9 students' shriek of excitement as our 6-metre observatory dome started to move. Since we can no longer welcome youth on our campus due to the COVID-19 pandemic, we are trying to engage them with themed webinars, which, as it turned out, can be even more inclusive since we are no longer limited by distance. For example, this summer we had a talk by Dr. Niamh Shaw, an Irish Scientist/Engineer and award-winning STEM Communicator, as well as many other amazing women and Indigenous role models.

RP: I am particularly fond of one of our first events which provided younger children with the opportunity to dress

in costumes and improvise to the story of *Muin and the Seven Bird Hunters*, a Mi'kmaw story tracing seasonal changes in the night sky. It fostered incredibly charming and spontaneous sensory-rich moments, which no doubt helped to solidify the night sky stories and lessons in the memories of both the young performers and the audience, and combined storytelling, trivia and tour of the observatory into one night.

KW: My favourite event so far was in summer 2019 for the grade 11 and 12 students from a Girl Guides jamboree. It sparked a lot of questions about space and Indigenous culture.

AP: I really enjoyed the webinar we hosted this summer about careers for STEM in the future with all-female presenters.

MK: Our first joint event with our Qalipu First Nation partners on sky stories was the most memorable for me, establishing the essential DNA of our program and using our collective strengths and passion for promoting science through engaging with the community. I also think it is important that we are sending the message to students that doing research around outreach is a valuable and valid form of research.

APR: My favourite event so far was the event in celebration of International Women's Day, with TED-style talks highlighting the lives and successes of women from all different backgrounds. These strong and powerful women helped to give me the boost of confidence I needed as I pursue the very male-dominated degree of engineering.

SD: I enjoy any Grenfell Observatory tour when the weather allows visitors to observe celestial objects. The breath-taking expressions when visitors see the moon, planets or nebulae through a large telescope is very satisfying and a rare opportunity for the demographic.

JP: What has been the impact of your program so far, in your opinion?

APR: All the events we have had so far have been inclusive to all but with focus on different groups. I believe we

SUMMARY

In partnership with NSERC PromoScience, Qalipu First Nation, Parks Canada, NL Hydro, and Memorial University of Newfoundland (Grenfell Campus), we are developing an integrative approach to STEM outreach by combining science and culture. Our team welcomes underrepresented youth on campus, visits rural schools, and hosts webinars with a diverse group of speakers, engaging more than a thousand participants per year. The main goal is to promote physics to Indigenous students, girls, and rural youth in Newfoundland. Each of the group members brings a different expertise that adds to the vibrancy of the team.

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have gotten our foot in the door with promoting physics to girls and Indigenous students, but I think the next step should be to better reach rural youth by working to overcome the barrier of travel [costs and time].

SB: Our joint events with community partners featuring Indigenous sky stories were especially popular, and I feel we are doing quite well featuring female role models. Reaching rural youth (truly remote, in our case) is more of a challenge, but we are working on that by investigating online delivery modes. Since we cannot travel anyway due to the COVID-19 pandemic, we are running a webinar series, which is even better for reaching all youth.

MK: With the help of our community partners, we have been expanding the network in schools that we need to reach rural youth. We have already seen an increase in youth in remote communities inquiring about programs in science, and we have had students connect with administrators of programs in Canada that they did not even know existed previously, such as Science North.

RP: Our events in the park, ongoing school tours and mini-lectures, focused Indigenous cultural events (*A Stellar Night with Muin* and *Sky Stories*), and *Spooky Space* (a Halloween event) have all felt successful in terms of attendance, level of engagement, and general enjoyment. Some of the engagement has been second-hand, with parents attending public events. Time will tell whether these students eventually choose STEM careers, but I do believe that we have enhanced their experience of science through these in-person events.

VH: It takes time to begin to break down the misconceptions and societal norms. There is quite a lot of resistance to change, the so-called “It was good enough for...” effect. A lot of individuals hold beliefs that “because I am a...” they must fall into a certain category/lifestyle and that is that. Helping people understand that yes, they can do it if they try has always been important to me.

KW: We could have an even better impact with better promotion. I help to manage the Facebook and Instagram pages for our team and share pictures and articles promoting women and Indigenous people in science.

JP: What do you think was the main impact of community partnerships?

VH: Partnerships open new avenues to expand beyond the school environment and allow for the interaction of ourselves and students in a different atmosphere. We lose some of the constraints on our programs through partnerships, whether that be time or material coverage. Connecting with community groups allows us to expand and target specific groups who may be too nervous or intimidated in other situations. If we can relate our promotion of science to the subject that binds the community

group together then it becomes far easier to encourage members of that group to at least think about a career in the sciences.

KW: Community partners have aided our success by giving us access to educational and material resources. The Qalipu First Nation partnership helped to gain insight into Mi’kmaq culture and diversify our presentations by incorporating traditional sky stories. The Makerspace allowed for the creation of materials to aid our presentations such as a fabric programable Orion to show constellations and circuits. And with Parks Canada, I was able to teach children about nocturnal ecology during a camping event.

AP: I think it broadens the perspective and the reach. We would not be able to engage so many Indigenous students without connecting with them through Qalipu First Nation.

MK: One of the things that really interests me is what sort of future are we creating for the next generation. I think we often don’t think as farsighted as we might about the future of our country. The community partnerships have made our events stronger because the Qalipu and Parks Canada partners do think farsighted, at their core. These partnerships have brought together all the different resources and networks we all can draw on.

APR: Community partnerships have helped illustrate that science is applicable almost everywhere, not just in your science class. Bringing different organizations together allows for the combination of a vast variety of themes. Joining forces in the community has helped to amplify the idea that science is a broad and extensive subject to those youth that may not realize it yet.

RP: Our partnership with Qalipu First Nation has been invaluable in contributing Indigenous voices, stories, and culture to aid in connecting with Indigenous students. Parks Canada got students out of the classroom and viewing the dark sky, while a local youth theatre group provided a creative mechanism to connect Indigenous culture with astronomy. Team and student volunteers at Grenfell campus led observatory tours and activities combining art and the physics of the EM spectrum and colour. These partnerships have helped to add creativity and a wider cultural perspective, both of which aid science promotion through positive emotional experiences attached to the learning/memory experience.

JP: What have you learned from your experience with this project?

AP: In my experience, I have learned the importance of community partnerships to promote awareness and inspire participation through as many channels as possible. I also really value the connection between traditional Indigenous ways of knowing and modern science.

MK: Our community partners have been a source of learning and inspiration to me. As well, the degree of positive response from female role model presenters to whom we have reached

out to share science and career advice in the webinar series this summer has been gratifying and inspiring. I have learned that there is a whole deep resource of people wanting to be involved.

RP: I've learned the importance of good survey data collection as a metric of success (something not typically used in my field), as well as the need to set up clear and efficient communication methods when working within an interdisciplinary team. Working with partnerships means working with many different schedules and ways of communicating — I've learned how to stay flexible to allow for these differences, while respectfully keeping the program moving forward.

SB: Excellence in science outreach, just like in science, depends on diversity of ideas and people. Ask for input from your community! I have been doing physics outreach and working on issues faced women in science for years, but nowhere close to the scale we have now, allowed by an NSERC PromoScience grant. I am constantly learning.

APR: I was uninformed of how physics encapsulates more than the topics discussed in a first-year physics course: I have learned

that introductory physics courses do not represent the discipline and there is so much more to know.

AP: Digital education is a very good medium if there is enough promotion.

In closing, we would like to express our deep gratitude to the NSERC PromoScience program for enabling us to expand our efforts to attract underrepresented youth to careers related to science and technology. We feature female and Indigenous role models, engage Indigenous storytelling, strive to provide wider access through webinars, discuss a vast range of career opportunities, and emphasize a diverse set of skills required in modern science, such as cooperation and communication. A science education based in physics provides students with a valuable and flexible skill set that opens doors to a wide variety of productive and enriching careers; this in turn leads to a successful local knowledge-based economy and increases rural resilience. The program is scalable and portable to any location with the dark sky, university campus, and engaged local partners. We are especially looking forward to extending virtual visits to remote schools enabled by recent improvements in rural internet connectivity.